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Foreword

This European Standard (EN 12975-1:201x) has been prepared by Technical Committee CEN/TC 312 "Thermal solar systems and components", the secretariat of which is held by ELOT.

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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by publication of an identical text or by endorsement, at the latest by, and conflicting national standards shall be withdrawn at the latest by.

This European Standard supersedes EN 12975-1:201x

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This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annexes ZA (and ZB ~~and ZC~~ if relevant) which are an integral part of this document: ~~[ZA related to the Construction Product Directive and ZB related to dealing with the Low Voltage Directive \(for -electrical hybrid solar collectors, so called PVT PVT solar collectors\)-and ZC with PED-](#)~~

Comment [JEN1]: I have included an annex D dealing with PED.

Comment [SF2]: There is no Annex D and no Annex ZC should there not be something in there like this?

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

1 Scope

This European Standard specifies performance requirements for fluid heating collectors with respect to mechanical resistance to climatic loads, fire safety, weather tightness, release of dangerous substances, electrical safety, operating pressure, sound level, thermal output and collector efficiency. Fluids included are anti-freeze fluids, thermo oil, air and water which are not intended for human consumption. The intended use of the solar collector is to heat up the working fluid. It also includes provisions for evaluation of conformity to these requirements.

The standard covers only the solar collector consisting of its components: i.e. absorber, frame, insulation and glazing; it does not cover the fluid.

It is applicable to glazed and un-glazed solar collector, flat plate solar collectors, evacuated tubular solar collectors, concentrating solar collectors, tracking solar collectors and thermal-electrical hybrid solar collectors (so called PVT solar collectors).

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

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1027	Windows and doors. Water tightness. Test method
EN 13501-1	Fire classification of construction products and building elements — Part 1: Classification using test data from reaction to fire tests
EN 13501-5	Fire classification of construction products and building elements — Part 5: Classification using test data from external fire exposure to roof tests
ISO 3741-2:2010	Acoustics -- Determination of sound power levels and sound energy levels of noise sources using sound pressure -- Precision methods for reverberation test rooms
EN ISO 3743-2:2009	Acoustics - Determination of sound power levels of noise sources using sound pressure - Engineering methods for small, movable sources in reverberant fields - Part 2: Methods for special reverberation test rooms (ISO 3743-2:1994)
EN ISO 3747-2:2010	Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering/survey methods for use in situ in a reverberant environment (ISO 3747:2010)
EN ISO 9488	Solar energy – Vocabulary (ISO 9488:1999)
EN ISO 9806	Solar energy – Solar Thermal collectors – Test methods

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3 Terms and definitions

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

4 Symbols and units

For the purposes of this European Standard, the symbols and units given in EN ISO 9488 and EN ISO 9806 apply.

5 Requirements

include definition of classes in the sections for the specific requirements Part 2 EN 12975

Comment [SF3]: As discussed we should include the classes into the scheme rules

in case of collectors used for drinking water include clause "quality of water"

Comment [SF4]: Delete?

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 A.

5.2 Required tests

5.2.1 Mechanical resistance to climate loads

When tested in accordance with 16 of EN ISO 9806 the cover, the solar collector box and the fixings between solar collector box and mounting system shall not show any major failure as defined in chapter 20 of EN ISO 9806. The permissible and the maximum positive and negative pressure shall be recorded in the installer manual.

The solar collector shall be classified with respect to mechanical load according to xxx of EN ISO 9806.

Comment [SF5]: I think we do not have this in the En ISO 9806, delete sentence?

5.2.2 Fire safety

Reaction to fire: When required the materials used in solar collectors shall be tested and classified in accordance with EN 13501-1.

External fire performance: When required roof integrated solar collectors shall be tested and classified in accordance with EN 13501-5.

5.2.3 Weather tightness

When required solar collectors shall be tested in accordance with 14 of EN ISO 9806 the solar collector shall not show any major failure as defined in chapter 20 of EN ISO 9806.

5.2.4 Release of dangerous substances

Any release of dangerous substances defined in Council Directive 76/760/EEC shall be avoided.

Comment [JEN6]: How to formulate this?

5.2.5 Electrical safety (for PVT solar collectors only)

PVT-solar collectors have to comply with Annex ZB

5.2.6 Maximum operating pressure

Solar collectors shall be tested in accordance with 6 of EN ISO 9806 the solar collector shall not show any major failure as defined in chapter 20 of EN ISO 9806.

The maximum operating pressure shall be stated in the installer and user manuals and on collector label.

Comment [SF7]: Delete? is already in chapter 7 of this standard

5.2.7 Sound level

When required (e.g. in case of air collector with integrated ventilator) sound level shall be tested and reported according to either ISO 3741-2:2010, EN ISO 3743-2:2009 or EN ISO 3747-2:2010.

5.2.8 Durability

~~CollectorSolar collectors shall be tested in accordance with 5.4 of EN 12975-2:201x the collectorsolar collector shall not show any major failure as defined in xxx of EN 12975-2:201x.~~

Comment [JEN8]: This is not included in the performance characteristics - to be deleted?

Comment [SF9]: Ok

5.2.95.2.8 Thermal output and collector efficiency

Solar collectors shall be tested according to the chapter 22 of EN ISO 9806. The following values shall be stated on the collector label:

- Solar collector maximum operating temperature, $T_{m,max}$, to be stated by manufacturer
- Peak power, P_{peak} : Power output of the solar collector module for $G = 1000 \text{ W/m}^2$ and $\vartheta_m - \vartheta_a = 0 \text{ K}$
- Power at maximum operating temperature, P_{Tmax} : Power output of the solar collector module for $G = 1000 \text{ W/m}^2$, $\vartheta_a = 20 \text{ °C}$ and $\vartheta_m = \vartheta_{m,max}$
- Solar collector peak efficiency $\eta_{0,them,ap} = P_{peak} / (A_a * 1000 \text{ W/m}^2)$, A_a being the aperture-gross area.
- Solar collector efficiency at max operating temperature $\eta_{\vartheta_a \mp} = P_{Tmax} / (A_a * 1000 \text{ W/m}^2)$, A_a being the aperture-gross area.

Comment [SF10]: Do we really need this?

Comment [SF11]: Do we really need this?

6 Evaluation of conformity

6.1 General

The compliance of solar collectors with the requirements of this standard and with the declared values (including classes) shall be demonstrated by:

- Initial Type Testing;
- Factory production control by the manufacturer, including product assessment.

The manufacturer shall always retain the overall control and shall have the necessary means to take responsibility for the product.

6.2 Initial Type Testing – Type Testing

6.2.1 General

Initial Type Testing and Type Testing shall be performed to demonstrate compliance with this European standard.

All essential characteristics for which the manufacturer declares performances are subject to Initial Type Testing. In addition, the need to perform Type Tests applies to all other characteristics included in a standard when the manufacturer claims compliance, unless the standard gives provisions (e.g. use of previously existing data, CWFT and conventionally accepted performance) for declaring performances without performing tests.

Comment [JEN12]: Is this the case?

Comment [SF13]: This is standard text from the template

Tests previously performed in accordance with the provisions of this standard, may be taken into account provided that they were made to the same or a more rigorous test method, under the same system of attestation of conformity on the same product or products of similar design, construction and functionality, such that the results are applicable to the product in question.

Note: Same system of attestation of conformity means testing by an independent third party.

— For the purposes of testing, the manufacturer's products may be grouped into families, where it is considered that the results for one or more characteristics from any one product within the family are representative for that same characteristics for all products within that same family (a product may be in different families for different characteristics).

Note: Products may be in different families for different characteristics.

Note: Reference to the test method standards should be made to allow the selection of a suitable representative sample.

In addition, Type Tests or Initial Type Testing shall be performed for all characteristics included in the standard for which the manufacturer declares performances:

- at the beginning of the production of a new or modified solar collector (unless a member of the same family), or

- at the beginning of a new or modified method of production (where this may affect the stated properties); or

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Comment [SF14]: I would keep the text from the template as it was.

- they shall be repeated for the appropriate characteristic(s), whenever a change occurs in the solar collector design, in the raw material or in the supplier of the components, or in the production process (subject to the definition of a family), which would affect significantly one or more of the characteristics.

Where components are used whose characteristics have already been determined, by the component manufacturer, on the basis of compliance with other product standards, these characteristics need not be re-assessed. The specifications of these components shall be documented, as shall be included in the inspection scheme for ensuring their compliance.

Products marked in accordance with appropriate harmonized European specifications may be presumed to have the performances stated with that marking, although this does not replace the responsibility on the solar collector designer to ensure that the solar collector as a whole is correctly designed and its component products have the necessary performance values to meet the design.

6.2.2 Test samples, testing and compliance criteria

The number of samples of solar collectors to be tested/ assessed shall be in accordance with Table 6.2.2.

Table 6.2.2 — Number of samples to be tested and compliance criteria

Characteristic	Requirement	Assessment method	No. of samples	Compliance criteria	Min. frequency
Mechanical resistance to climatic loads (wind, snow...)	5	5.2.1	1	5.2.1	1/(5 years) or after any product change
Fire safety	5	5.2.2	1	5.2.2	1/(5 years) or after any product change
Weather tightness (when relevant – i.e. for roof integrated or façade integrated solar collectors)	5	5.2.3	1	5.2.3	1/(5 years) or after any product change
Release of dangerous substances	5				1/(5 years) or after any product change
Electrical safety	Annex ZB	Annex ZB	-	Annex ZB	1/(5 years) or after any product change
Maximum operation pressure	5	5.2.6			1/(5 years) or after any product change
Sound level	5	5.2.7			1/(5 years) or after any product change
Thermal output Collector efficiency	5	5.2.8			1/(5 years) or after any product change

Comment [SF15]: This was required by the CEN consultant. Should we include here a higher frequency?

Comment [SF16]: Still to be done

6.2.3 Test reports

All Type Tests, and/or Initial Type Tests and their results shall be documented in test reports according to format given in EN ISO 9806. All test reports shall be retained by the manufacturer for at least 10 years after the last date of production of the solar collectors to which they relate.

Comment [SF17]: EN ISO 9806 does not give formats for e.g. fire resistance

6.3 Factory production control (FPC)

6.3.1 General

The manufacturer shall establish, document and maintain an FPC system to ensure that the products placed on the market comply with the declared performance of the characteristics.

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The FPC system shall consist of procedures, regular inspections and tests and/or assessments and the use of the results to control raw and other incoming materials or components, equipment, the production process and the product. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures.

This production control system documentation shall ensure a common understanding of conformity evaluation and enable the achievement of the required product characteristics and the effective operation of the production control system to be checked. Factory production control therefore brings together operational techniques and all measures allowing maintenance and control of the compliance of the product with this European standard.

6.3.2 Requirements

6.3.2.1 General

The manufacturer is responsible for organizing the effective implementation of the FPC system. Tasks and responsibilities in the production control organization shall be documented and this documentation shall be kept up-to-date.

The responsibility, authority and the relationship between personnel that manages, performs or verifies work affecting product conformity, shall be defined. This applies in particular to personnel that needs to initiate actions preventing product non-conformities from occurring, actions in case of non-conformities and to identify and register product conformity problems. Personnel performing work affecting product conformity shall be competent on the basis of appropriate education, training, skills and experience for which records shall be maintained.

In each factory the manufacturer may delegate the action to a person having the necessary authority to:

- identify procedures to demonstrate conformity of the product at appropriate stages;
- identify and record any instance of non-conformity;
- identify procedures to correct instances of non-conformity.

The manufacturer shall draw up and keep up-to-date documents defining the factory production control. The manufacturer's documentation and procedures should be appropriate to the product and manufacturing process. The FPC system should achieve an appropriate level of confidence in the conformity of the product. This involves:

- a) the preparation of documented procedures and instructions relating to factory production control operations, in accordance with the requirements of the technical specification to which reference is made;
- b) the effective implementation of these procedures and instructions;
- c) the recording of these operations and their results;
- d) the use of these results to correct any deviations, repair the effects of such deviations, treat any resulting instances of non-conformity and, if necessary, revise the FPC to rectify the cause of non-conformity.

Where subcontracting takes place, the manufacturer shall retain the overall control of the product and ensure that he receives all the information that is necessary to fulfill his responsibilities according to this European Standard.

If the manufacturer has part of the product designed, manufactured, assembled, packed, processed and/or labeled by subcontracting, the FPC of the subcontractor may be taken into account, where appropriate for the product in question.

The manufacturer who subcontracts all of his activities may in no circumstances pass these responsibilities on to a subcontractor.

NOTE - Manufacturers having an FPC system, which complies with EN ISO 9000 series standard and which addresses the requirements of this European standard are recognized as satisfying the FPC requirements of the Council Directive 89/106/EEC.

6.3.2.2 Equipment

6.3.2.2.1 Testing

All weighing, measuring and testing equipment shall be calibrated and regularly inspected according to documented procedures, frequencies and criteria.

6.3.2.2.2 Manufacturing

All equipment used in the manufacturing process shall be regularly inspected and maintained to ensure use, wear or failure does not cause inconsistency in the manufacturing process. Inspections and maintenance shall be carried out and recorded in accordance with the manufacturer's written procedures and the records retained for the period defined in the manufacturer's FPC procedures.

6.3.2.3 Raw materials and components

The specifications of all incoming raw materials and components shall be documented, as shall the inspection scheme for ensuring their compliance. In case supplied kit components are used, the attestation of conformity level of the component shall be that given in the appropriate harmonised technical specification for that component.

6.3.2.4 Design process

The factory production control system shall document the various stages in the design of products, identify the checking procedure and those individuals responsible for all stages of design. During the design process itself, a record shall be kept of all checks, their results, and any corrective actions taken.

This record shall be sufficiently detailed and accurate to demonstrate that all stages of the design phase, and all checks, have been carried out satisfactorily.

6.3.2.5 Traceability and marking

Individual solar collectors and their main components (if applicable); Cover sheet, absorber, insulation, reflector, polymer sealings and gaskets and heat pipes shall be identifiable and traceable with regard to their production origin. The manufacturer shall have written procedures ensuring that processes related to affixing traceability codes and/or markings are inspected regularly.

6.3.2.6 Controls during manufacturing process

The manufacturer shall plan and carry out production under controlled conditions.

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6.3.2.7 Product testing and evaluation

The manufacturer shall establish procedures to ensure that the stated values of the characteristics he declares are maintained. The characteristics, and the means of control, are:

- Mechanical resistance to climatic loads (wind, snow...) shall be subject to the tests indicated in *clause 5.2.1*, at least every five years and in case of changes in design etc., as referred in paragraph 6.2.1.
- Fire safety shall be subject to the tests indicated in *clause 5.2.2*, at least once and in case of changes in design etc., as referred in paragraph 6.2.1.
- Weather tightness (when relevant i.e. for roof integrated or façade integrated solar collectors shall be subject to the tests indicated in *clause 5.2.3*, at least every five years and in case of changes in design etc., as referred in paragraph 6.2.1.
- Release of dangerous substances shall be subject as indicated in *clause 5.2.4*, at least every five years and in case of changes in design etc., as referred in paragraph 6.2.1.
- Electrical safety shall be subject to as indicated in *clause 5.2.5*, at least every five years and in case of changes in design etc., as referred in paragraph 6.2.1.
- Maximum operation pressure shall be subject to the tests indicated in *clause 5.2.6*, at least every five years and in case of changes in design etc., as referred in paragraph 6.2.1.
- Sound level, when relevant shall be subject to the tests indicated in *clause 5.2.7*, at least every five years and in case of changes in design etc., as referred in paragraph 6.2.1.
- Thermal output and collector efficiency shall be subject to the tests indicated in *clause 5.2.8*, at least every five years and in case of changes in design etc., as referred in paragraph 6.2.1.

6.3.2.8 Non-complying products

The manufacturer shall have written procedures which specify how non-complying products shall be dealt with. Any such events shall be recorded as they occur and these records shall be kept for the period defined in the manufacturer's written procedures.

6.3.2.9 Corrective action

The manufacturer shall have documented procedures that instigate action to eliminate the cause of non-conformities in order to prevent recurrence.

6.3.2.10 Handling, storage and packaging

The manufacturer shall have procedures providing methods of product handling and shall provide suitable storage areas preventing damage or deterioration.

6.3.3 Product specific requirements

The FPC system shall:

- address this European Standard

and

- ensure that the products placed on the market comply with the declared performance characteristics.

The FPC system shall include a product specific FPC, which identifies procedures to demonstrate compliance of the product at appropriate stages, i.e.:

- a) the controls and tests to be carried out prior to and/or during manufacture according to a frequency laid down in the FPC test plan,

and/or

- b) the verifications and tests to be carried out on finished products according to a frequency laid down in the FPC test plan

If the manufacturer uses only finished products, the operations under b) shall lead to an equivalent level of compliance of the product as if FPC had been carried out during the production.

If the manufacturer carries out parts of the production himself, the operations under b) may be reduced and partly replaced by operations under a). Generally, the more parts of the production that are carried out by the manufacturer, the more operations under b) may be replaced by operations under a).

In any case the operation shall lead to an equivalent level of compliance of the product as if FPC had been carried out during the production.

NOTE: Depending on the specific case, it can be necessary to carry out the operations referred to under a) and b), only the operations under a) or only those under b).

The operations under a) refer to the intermediate states of the product as on manufacturing machines and their adjustment, and measuring equipment etc. These controls and tests and their frequency shall be chosen based on product type and composition, the manufacturing process and its complexity, the sensitivity of product features to variations in manufacturing parameters etc.

The manufacturer shall establish and maintain records that provide evidence that the production has been sampled and tested. These records shall show clearly whether the production has satisfied the defined acceptance criteria and shall be available for at least three years.

Where the product fails to satisfy the acceptance measures, the provisions for non-complying products shall apply, the necessary corrective action shall immediately be taken and the products or batches not complying shall be isolated and properly identified.

Once the fault has been corrected, the test or verification in question shall be repeated.

The results of controls and tests shall be properly recorded. The product description, date of manufacture, test method adopted, test results and acceptance criteria shall be entered in the records under the signature of the person responsible for the control/test.

With regard to any control result not meeting the requirements of this European standard, the corrective measures taken to rectify the situation (e.g. a further test carried out, modification of manufacturing process, throwing away or putting right of product) shall be indicated in the records.

Individual products or batches of products and the related manufacturing documentation shall be completely identifiable and retraceable.

6.3.4 One-off products, pre-production products (e.g. prototypes) and products produced in very low quantity

The solar collector produced as a one-off, prototypes assessed before full production is established, and products produced in very low quantities (< 500 pieces per year) shall be assessed as follows.

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For type assessment, the provisions of 6.2.1, 3rd paragraph apply, together with the following additional provisions:

- in case of prototypes, the test samples shall be representative of the intended future production and shall be selected by the manufacturer;
- on request of the manufacturer, the results of the type assessment of prototype samples may be included in a certificate or in test reports issued by the involved third party.

The FPC system of one-off products and products produced in very low quantities shall ensure that raw materials and/or components are sufficient for production of the product. The provisions on raw materials and/or components shall apply only where appropriate. The manufacturer shall maintain records allowing traceability of the product.

For prototypes, where the intention is to move to series production, the initial inspection of the factory and FPC shall be carried out before the production is already running and/or before the FPC is already in practice. The following shall be assessed:

- - the FPC-documentation; and
- - the factory.

In the initial assessment of the factory and FPC it shall be verified:

- a) that all resources necessary for the achievement of the product characteristics required by this European standard will be available, and
- b) that the FPC-procedures in accordance with the FPC-documentation will be implemented and followed in practice, and
- c) that procedures are in place to demonstrate that the factory production processes can produce a product complying with the requirements of this European standard and that the product will be the same as the initial type testing/type testing samples, for which compliance with this European standard has been verified.

Once series production is fully established, the provisions of clause 6.3 shall apply.

7 Solar collector identification

7.1 Drawings and data sheet

The solar collector submitted for test shall be accompanied by a set of drawings describing the solar collector's dimensions and structure along with a list of materials used in the solar collector and important physical and optical properties as well as by the solar collector description in A1 of EN ISO 9806. Drawings shall have a number, date of issue and possible revision date. These documents shall be filled by the test institute for at least the period of time that the solar 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 solar collector type is valid.

7.2 Marking, labelling and packaging

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

Comment [SF18]: I would like to have this complete moved to the certification scheme what do you think?

Annex A (informative) **Description of solar collectors materials and manufacture**

A.1 General

The operational ability and long lifetime of solar collectors depend on the correct choice of appropriate materials. Testing of the materials, including accelerated life testing, is very important for the development of new solar collectors and the prediction of service life. Respective literature is referred to in the Bibliography.

Solar collectors may be affected by airborne fire or radiant heat. The use of non-combustible materials should be preferred. Solar collectors should comply with the European regulations to fire-classification.

The solar collector box should be water-tight to prevent penetration of rain water. The solar collector box should be constructed in such a way that condensed water does not accumulate in the solar collector, as this might impair its functional capability and durability. For that purpose the solar collector should be properly designed to enable ventilation of air through the solar collector box.

The construction of the solar collector should ensure that no undue stress is built up in the cover, even at the maximum stagnation temperature of the solar collector. The materials of solar collector components should be selected and constructed so that they can withstand the maximum temperature which may occur at stagnation conditions and the thermal shocks they may be exposed to during the summer period. The materials of the solar collector should preferably be resistant to exposure to UV-radiation and in cases where materials selected are not so, they should be protected against incident and reflected UV-radiation.

Bushings and ducts, leading through the box, should be constructed so that no leakage can occur caused by thermal expansion. The solar collector box bushings should withstand any damage, if they have to be soldered for assembly. The design of solar collector should be such that heat bridges between the solar collector box and the absorber are avoided.

The components and the materials of the solar collector should be able to withstand the mechanical loads resulting from the heating up and cooling down of the solar collector. They should also be resistant to environmental stress from outdoor climate caused by factors such as rain, snow, hail, wind, high humidity and air pollutants.

A.2 Absorbers

Note: In the following "Absorber" describes the assembly of a photo-thermal layer, an absorber sheet, a joining technique, and fluid channels.

Absorbers should be made from suitable materials to cope with mechanical, thermal and chemical requirements of the application. The effect of the manufacturing processes like cutting, brazing, soldering etc., on the properties of the absorber, should be considered.

The fluid channels which guide the flow of the heat transfer fluid, including the connection lines, should, in the case of liquid heating solar collectors, be designed and constructed in such a way that venting can be effected in the installed condition, thus ensuring the functional capability of the solar collector.

Fluid channels should be dimensioned on the basis of a calculation pressure corresponding to the permissible working overpressure specified by the manufacturer taking into consideration a safety factor of 1,5. The properties of the heat transfer medium should be considered as well.

The effect of the maximum temperature (stagnation temperature) of the absorber should be considered in the selection of material.

In the case of materials with strength characteristics, which vary appreciably with the temperature and/or UV-exposure, the evaluation criteria should be determined individually in each case.

The surface of the fluid channels which are directly in contact with the fluid, should withstand corrosion under normal operating conditions. The admixture of possible additives to the heat transfer fluid of closed loop or environmental pollution of air for open loop solar collectors should be taken into account. The walls of swimming pool solar collectors which are wetted by the swimming pool water should be resistant to the additives used for the treatment of the swimming pool water.

Absorber coatings should retain their optical properties under high temperature, high humidity and condensation, and sulfur dioxide at high humidity.

A.3 Transparent covers

Solar collectors might be covered with glass or transparent plastic glazing. The durability of glass and tempered glass under the service conditions found in solar collectors is good, but the resistance of plastics and glass treated with a special coating to the combined effects of UV radiation and temperature may be poor. There may be significant degradation with time, and in the case of a reduced transmission in the solar wavelengths, this will lead to degradation in solar collector performance. A reduction in the tensile strength or impact strength of a cover material may lead to a failure of the solar collector cover.

The transparency of the covers should not deteriorate appreciably during the service life of the , the covers should be resistant to ultraviolet (UV) radiation, air pollution, high humidity and condensate as well as high temperatures depending on the solar collector design.

A.4 Insulation materials

Insulation materials should withstand the local temperature arising during stagnation temperature conditions of the solar collector. At this temperature no melting, shrinkage or outgassing of the insulation with consequent condensation inside the solar collector cover, or absorber/ fluid channels performance reduction or corrosion of metallic surfaces should occur to the extent of seriously reducing the solar collector performance.

Water or humidity absorption by the insulation material may shortly or permanently reduce the insulation performance of the material.

Thermal expansion of the material used in the solar collector due to the wide range of temperatures should be taken into consideration because of different thermal expansion coefficients. Furthermore transparent insulation materials or PTFE layers used, should not deteriorate appreciably, both mechanically and optically, during the service life of the solar collector due to ultraviolet (UV) radiation, high temperature and humidity.

A.5 Reflectors

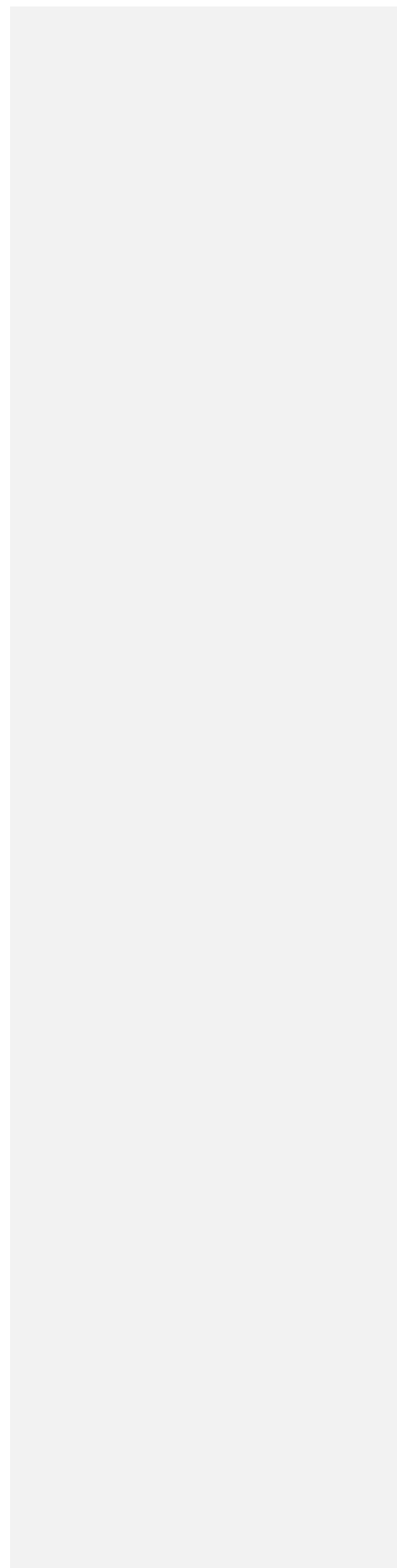
Reflectors, diffuse or specular, are reflecting surfaces used to increase the radiation, incident on the absorber. The reflecting surface should be resistant to environmental influences such as air pollution and to corrosion

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through humidity or rain. Outside the solar collector box reflectors should also resist mechanical loads through wind, snow and hail, whereas inside reflectors should withstand high temperatures.

A.6 Diffusion barriers

Diffusion barriers are materials used between absorbers and insulation material to prevent diffusion into or out of the insulation material. They should be able to withstand the absorber high temperatures and the incident UV radiation without shrinking and the high humidity or condensate accumulated remaining tight.



Annex B (informative) **Environmental protection**

B.1 Heat transfer fluid

The heat transfer fluid used should not be toxic, seriously irritant to the human skin or eyes, or water polluting and it should be fully biodegradable.

B.2 Insulation materials

For the solar collector insulation no materials should be used, which have been manufactured using or containing CFCs. Furthermore, the insulation materials should not contain components, which outgas at the stagnation temperature, specified in Clause 6, which are toxic and seriously irritant to the human skin or eyes.

B.3 Recycling of the solar collector materials

Solar collectors are mainly used to save energy and reduce pollution. Therefore the design of the solar collectors should take into consideration the possibility to recycle the materials used. Materials which are not to be recycled should be avoided or used to the lowest possible extent.

NOTE Information on the classification and identification of toxic substances can be found e.g. in the Directives 67/548/EEC (classification, packaging, labelling of dangerous substances) and 76/769/EEC (restriction on the use of dangerous substances) and amendments.

ANNEX C
(informative)

Tests to be repeated in solar collector design modifications

If the solar collector design is changed, Table C.1 may be used as a guideline to assess whether one or more tests should be repeated.

Table C. 1- *Tests that should be repeated for the respective modification in the solar collector design*

	Absorbers/ Fluid channels	Covers	Insulation materials	Boxes	Reflectors	Diffusion barriers
Therm. Performance	+	+	+	+	+	+
Internal pressure	+	-/+*	-	-	-	-
High temp. resistance	+	+	+	+	+	+
Exposure	+	+	+	+	+	+
External therm. shock	+/+*	+	-	+	+	-
Internal therm. shock	+	-/+*	-/+*	-	-	-
Mechanical tests	-	+	-	+	-	-
Final inspection	+	+	+	+	+	+
Leakage test (air heating solar collectors only)	+	+	-	+	-	+
Pressure drop (air heating solar collectors only)	+	-	-	+	-	+
Impact resistance test	-	+	-	+	-	-
Reaction to fire	-	+	+	+	-	-
External fire performance	-	+	+	+	-	-
Weather tightness	-	+	-	+	-	-
Electrical safety PVT-solar collectors only	-	-	-	-	-	-
+ Test should be repeated						
- Test not to be repeated						
* Only for air heating solar collectors						

Annex ZA (informative)

Clauses of this European Standard addressing the provisions of the EU Construction Products Directive

Clauses of this European Standard addressing the provisions of the EU Construction Products Directive

ZA.1 Scope and relevant characteristics

Parts of this European Standard have been prepared under Mandate M/129¹⁾ "Space heating appliances" given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European Standard shown in this annex meet the requirements of the mandate given under the EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of the construction products covered by this annex for the intended uses indicated herein; reference shall be made to the information accompanying the CE marking.

~~**WARNING:** Other requirements and other EU Directives, not affecting the fitness for intended uses, can be applicable to the construction products falling within the scope of this European Standard.~~

~~**NOTE 1** In addition to any specific clauses relating to dangerous substances contained in this standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.~~

~~**NOTE 2** An informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (accessed through http://ec.europa.eu/enterprise/construction/cpd_ds)~~

Construction Product: Solar collectors. This annex has the same scope as Clause 1 of this standard with regard to the products covered. It establishes the conditions for the CE marking of solar collectors intended for the use indicated below and shows the relevant clauses applicable (see Table ZA. 1).

Comment [SF23]: Deleted according to CEN consultant

¹⁾ including amendment M/369

Table ZA. 1— Relevant clauses

Products:		Fluid heating solar collectors	
Intended use:		In buildings	
Essential Characteristics	Requirement clauses in this and other European Standards	Levels and/or classes	Notes
Mechanical resistance to climatic loads (wind, snow, ...)	5.2.1	Test result	-
Fire safety (e.g. initiation, reaction to fire, risk to adjacent elements, ..., as relevant)	5.2.2	Classes	-
Whether tightness (when relevant – i.e. for roof integrated or façade integrated collectors)	5.2.3	pass/fail	-
Release of dangerous substances**	5.2.4	-	-
Electrical safety*	5.2.5	-	-
Maximum operating pressure	5.2.6	pass/fail	-
Sound level (if relevant, e.g. in case of air collector with integrated ventilator)	5.2.7	Test result	-
Thermal output	5.2.8	Test result	-
Collector efficiency			

Comment [SF24]: Shall we follow the advise of the CEN consultant given in my remark below?

Comment [SF25]: Define collectors outside building and part of building envelope in scope already

The requirement on a certain characteristic is not applicable in those Member States (MSs) where there are no regulatory requirements on that characteristic for the intended use of the product. In this case, manufacturers placing their products on the market of these MSs are not obliged to determine nor declare the performance of their products with regard to this characteristic and the option “No performance determined” (NPD) in the information accompanying the CE marking (see ZA.3) may be used. ~~The NPD option may not be used, however, for durability of declared characteristics and where the characteristic is subject to a threshold level.~~

Comment [SF30]: deleted according to CEN consultant

ZA.2 Procedure for attestation of conformity of solar collectors

ZA.2.1 System of attestation of conformity

The system of attestation of conformity of the solar collectors, in accordance with the decision of the Commission as given in Annex III of the mandate for "Space heating appliances", is shown in Table ZA. 2 for the indicated intended use and relevant level or class.

Table ZA. 2 — System of attestation of conformity

Product	Intended use	Level or class	Attestation of conformity system
energy capturing appliances	in buildings	-	3
System 3: See Directive 89/106/EEC (CPD) Annex III.2.(ii), Second possibility.			

The attestation of conformity of solar collectors shall be according to the evaluation of conformity procedures indicated in Table ZA. 3 resulting from application of the clauses of this or other European Standards indicated therein.

[1999/471EC of 29 June 1999 \(OJEU L184 of 17.7.1999\)](#)

Table ZA. 3 — Assignment of evaluation of conformity tasks for solar collectors under system 3

Tasks	Content of the task	Evaluation of conformity clauses to apply
Factory production control (FPC)	Parameters related to all characteristics of Table ZA.1 relevant for the intended use	6.3.
Tasks under the responsibility of the manufacturer Initial type testing by a notified test laboratory	Mechanical resistance to climatic loads (wind, snow, ...) Fire safety (e.g. initiation, reaction to fire, risk to adjacent elements, ..., as relevant) Weather tightness (when relevant - i.e. for roof integrated or façade integrated solar collectors) Release of dangerous substances** Electrical safety* Maximum operating pressure Sound level (if relevant, e.g. in case of air collector with integrated ventilator) Thermal output Collector efficiency	6.2

- Comment [SF31]:** include in an appropriate way
- Comment [SF32]:** I do not recall what this is, that's why I deleted it, ok?
- Comment [SF33]:** elaborate for 1 and 4 as well
- Comment [SF34]:** I do not intend to elaborate for 1 and 4 since the mandate states system 3. Do you

ZA.2.2 EC Certificate and Declaration of conformity

When compliance with the conditions of this annex is achieved, the manufacturer or his agent established in the EEA shall draw up and retain a declaration of conformity (EC Declaration of conformity), which entitles the manufacturer to affix the CE marking. This declaration shall include:

- name and address of the manufacturer, or his authorised representative established in the EEA, and place of production,

NOTE 1 The manufacturer may also be the person responsible for placing the product onto the EEA market, if he takes responsibility for CE marking.

- description of the product (type, identification, use,...), and a copy of the information accompanying the CE marking,
- provisions to which the product conforms (i.e. Annex ZA of this EN),
- particular conditions applicable to the use of the product, (e.g. provisions for use under certain conditions),
- name and address of the notified laboratory(ies),
- name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or his authorised representative.

NOTE 2 Where some of the information required for the Declaration is already given in the CE marking information, it does not need to be repeated.

The above mentioned declaration shall be presented in the language or languages accepted in the Member State in which the product is to be used.

ZA.3 CE marking and labelling

The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE marking symbol to affix shall be in accordance with Directive 93/68/EC and shall be shown on the solar collector (or when not possible it may be on the accompanying label, the packaging or on the accompanying commercial documents e.g. a delivery note). The following information shall accompany the CE marking symbol:


- name or identifying mark and registered address of the manufacturer (see Note 1 in ZA.2.2),
- the last two digits of the year in which the marking is affixed,
- reference to this European Standard,

- description of the product: generic name, material, dimensions, ... and intended use,
- information on those relevant essential characteristics listed in Table ZA. 1 which are to be declared presented as:
 - declared values and, where relevant, level or class (including “pass” for pass/fail requirements, where necessary) to declare for each essential characteristic as indicated in "Notes" in Table ZA. 1,
 - “No performance determined” for characteristics where this is relevant,
 - as an alternative, a standard designation which shows some or all of the relevant characteristics (where the designation covers only some characteristics, it will need to be supplemented with declared values for other characteristics as above).

The “No performance determined” (NPD) option may ~~not be used where the characteristic is subject to a threshold level. Otherwise, the NPD option may~~ be used when and where the characteristic, for a given intended use, is not subject to regulatory requirements in the Member State of destination.

Comment [SF35]: deleted according to CEN consultant

Figure ZA.1 gives an example of the information to be given on the product, label, packaging and/or commercial documents (as established in first paragraph of this clause ZA.3).

	<i>CE conformity marking, consisting of the “CE”-symbol given in Directive 93/68/EEC.</i>
AnyCo Ltd, PO Box 21, B-1050 06	<i>Name or identifying mark and registered address of the producer</i> <i>Last two digits of the year in which the marking was affixed</i>
EN 12975-1:20XX solar collectors, intended to be used in buildings Mechanical resistance to climatic loads: Positive load: <u>Class A2400 Pa</u> Negative load: <u>Class A5200 Pa</u> Reaction to fire: Class A1 Weather tightness: pass Release of dangerous substances: no Electrical safety: pass Max. operating pressure: <u>40 bar</u> pass Sound level: NPD	<i>No. of European Standard</i> <i>Description of product</i> <i>Information on regulated characteristics</i>

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Thermal output / collector efficiency:

- $P_{peak} = 1700 \text{ W} / 0.80$
- $P_{Tmax} = 500 \text{ W} / 0.30$; $T_{max} = 90 \text{ }^{\circ}\text{C}$

Figure ZA.1 — Example CE marking information

~~In addition to any specific information relating to dangerous substances shown above, the product should also be accompanied, when and where required and in the appropriate form, by documentation listing any other legislation on dangerous substances for which compliance is claimed, together with any information required by that legislation.~~

~~NOTE 1 — European legislation without national derogations need not be mentioned.~~

~~NOTE 2 — Affixing the CE marking symbol means, if a product is subject to more than one directive, that it complies with all applicable directives. This applies to TC 312 products if electrical safety and pressure related safety are relevant~~

Comment [SF36]: deleted according to CEN consultant

Annex ZB (informative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies

Publication	Year	Title	EN/HD	Year
–	–	Datasheet and nameplate information for photovoltaic modules	EN 50380	2003
IEC 60112	– ¹⁾	Method for the determination of the proof and the comparative tracking indices of solid insulating materials	EN 60112	2003 ²⁾
IEC 60189-2	– ¹⁾	Low-frequency cables and wires with PVC insulation and PV sheath – Part 2: Cables in pairs, triples, quads and quintuples for inside installations	–	–
IEC 60216-1	– ¹⁾	Electrical insulating materials - Properties of thermal endurance – Part 1: Ageing procedures and evaluation of test results	EN 60216-1	2001 ²⁾
IEC 60216-5	– ¹⁾	Electrical insulating materials - Thermal endurance properties – Part 5: Determination of relative thermal endurance index (RTE) of an insulating material	EN 60216-5	2003 ²⁾
IEC 60364-5-51 (mod)	– ¹⁾	Electrical installations of buildings – Part 5-51: Selection and erection of electrical equipment - Common rules	EN 60364-5-51	2006 ²⁾
IEC 60417	data- base	Graphical symbols for use on equipment	–	–
IEC 60512-5-1	– ¹⁾	Connectors for electronic equipment - Tests and measurements – Part 5-1: Current-carrying capacity tests - Test 5a: Temperature rise	EN 60512-5-1	2002 ²⁾
IEC 60512-5-2	– ¹⁾	Connectors for electronic equipment - Tests and measurements – Part 5-2: Current-carrying capacity tests - Test 5b: Current-temperature derating	EN 60512-5-2	2002 ²⁾
IEC 60529	– ¹⁾	Degrees of protection provided by enclosures (IP Code)	EN 60529 + corr. May	1991 ²⁾ 1993
IEC 60664-1	– ¹⁾	Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests	EN 60664-1	2003 ²⁾

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Publication	IEC	Year ¹⁾	Title	EN/HDEN	Year
60695-1-1			Fire hazard testing – Part 1-1: Guidance for assessing the fire hazard of electrotechnical products - General guidelines	60695-1-1	2000 ²⁾
IEC 60947-1		– ¹⁾	Low-voltage switchgear and controlgear – Part 1: General rules	EN 60947-1 + corr. November	2004 ²⁾ 2004
IEC 61140		2001	Protection against electric shock - Common aspects for installation and equipment	EN 61140	2002
IEC 61215		– ¹⁾	Crystalline silicon terrestrial photovoltaic (PV) modules - Design qualification and type approval	EN 61215	2005 ²⁾
IEC 61646		– ¹⁾	Thin-film terrestrial photovoltaic (PV) modules - Design qualification and type approval	EN 61646	1997 ²⁾
IEC 61730-2 (mod)		2004	Photovoltaic (PV) module safety qualification -- Part 2: Requirements for testing	EN 61730-2	2007
IEC 61984		– ¹⁾	Connectors - Safety requirements and tests	EN 61984	2001 ²⁾
ISO 261		– ¹⁾	ISO general purpose metric screw threads - General plan	–	–
ISO 262		– ¹⁾	ISO general purpose metric screw threads - Selected sizes for screws, bolts and nuts	-	-
ISO 4892		Series	Plastics – Methods of exposure to laboratory light sources	EN ISO 4892	Series
ANSI Z97.1		– ¹⁾	American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test	–	–
ASTM E162-02a		– ¹⁾	Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source	–	–

1) Undated reference.

2) Valid edition at date of issue.

Annex ZC (informative)

With respect to the pressure equipment directive 97/23/EC—a solar collector is a pressure equipment, and shall be considered as a heat exchanger containing super-heated or hot water (with or without additives) [1].

Categorization of a solar collector with respect to the pressure equipment directive 97/23/EC depends on whether it is made for withstanding the stagnation temperature under all circumstances or not.

For ~~solar collectors designed to withstand stagnation temperature~~ (to be tested according to EN12972-2 section 5.4 *High-temperature resistance test*), categorization shall be made using **table 2**, Annex II of [2]—see figure ZBC-1.

For ~~solar collectors not designed to withstand stagnation temperature~~ (to be tested according to EN12972-2 section 5.4 *High-temperature resistance test*), categorization shall be made using **table 5**, Annex II of [2]—see figure ZBC-1.

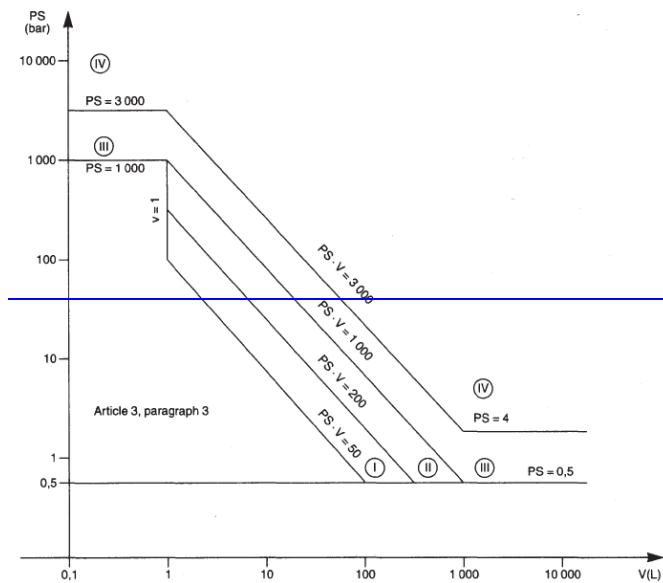


Figure ZBC-1. Table 2 from [2] giving the classification for collectors solar collectors designed to withstand stagnation temperature.

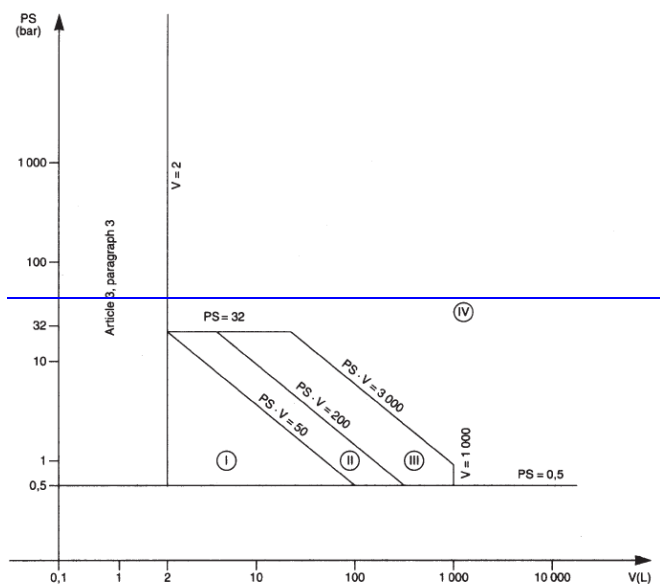


Figure ZBC 2- Table 5 from [2] giving the classification for collectors not designed for withstanding stagnation temperature.

[1]— Guideline 2/23, Amended version of guideline adopted on 23 May 2002, confirmed on 2006-03-31.

— http://ec.europa.eu/enterprise/sectors/pressure-and-gas/files/classification_categories_all_en.pdf

[2]— Directive 97/23/EC of the European Parliament and of the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment.

— <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:1997L0023:20031120:en:PDF>

Bibliography

- [1] ~~ISO 9806-1 Test methods for solar collectors – Part 1: Thermal performance of glazed liquid heating collectors including pressure drop.~~
- [2] ~~ISO 9806-2 Test methods for solar collectors – Part 2: Qualification test procedures~~
- [3] ~~ISO 9806-3 Test methods for solar collectors – Part 3: Thermal performance of unglazed liquid heating collectors (sensible heat transfer only) including pressure drop.~~
- [4] ~~ISO 9808 Solar water heaters – Elastomeric materials for absorbers, connecting pipes and fittings – Method of assessment.~~
- [5] ~~ISO/TR 10217 Solar energy – Water heating systems – Guide to material selection with regard to internal corrosion.~~
- [6] ~~NF P 50-511, 1985, Solar energy – Solar collectors using heat transfer liquid – Suitability for use.~~
- [7] ~~DIN V 4757-3:1995, Solar heating systems – Part 3: Solar collectors, definitions, safety requirements, test of stagnation temperature.~~
- [8] ~~ONORM M 7710:95 Solar collectors for use of solar energy – Performance requirements, test specifications and procedures.~~
- [9] ~~UNI 8796, 1987, Solar systems – Liquid solar collectors – Acceptance criteria~~
- [10] ~~E. Aranovitch, D. Gilliaert, W.B. Gillet, J.E. Bates EUR 11606 Recommendations for Performance and Durability Tests of Solar Collectors and Water Heating Systems. Luxembourg : Office for Official Publications of the European Communities, 1989~~
- [11] ~~Paradissiadis I., Siskos B., Tzamouranis H.: Proposal for a Greek standard for the certification of active solar systems. CRES, Greece, 1994~~
- [12] ~~Wennerholm H.: Rules for P-Marking of Thermal Solar Collectors. SP, Swedish National Testing and Research Institute, Energy Technology CEN-TC 312/N16, 1994~~
- [13] ~~ISO 9553:1997 Solar energy- Methods of testing preformed rubber seals and sealing compounds used in collectors.~~

Comment [SF37]: deleted not needed, do you agree?

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~~[14] ISO/DIS 9495 Solar energy-Transparent covers for collectors-Ageing test under stagnation conditions~~

~~[15] ISO/DIS 12952 Solar Energy - Materials for flat plate collectors - Qualification test procedures for solar absorber surface durability~~

~~[16] Carlsson B., Frei U., Kochl M., Moeller K.: Accelerated life testing of solar energy materials. Case study of some selective solar absorber coating materials for DHW systems. A report of Task X, solar materials research and development. International Energy Agency, Solar Heating and Cooling Programme. February 1994. SP-Report 1994:13, ISBN 91-7848-472-3~~

~~[17] EN TC 127 WG 2 Fire classification~~