

Specific CEN Keymark Scheme Rules for Solar Thermal Products

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Editors note:

Parts in blue indicate inclusion of “solar water heater stores” and sub types

Parts in yellow indicate inclusion of “system subtypes”

0. Introduction

These Specific CEN Keymark¹ Scheme Rules for Solar Thermal Products are acting as a supplement to the CEN/CENELEC INTERNAL REGULATIONS –Part 4: Certification – 2006 [1].

Together these specific and general rules give the complete set of requirements for “Keymarking” solar thermal products covered by EN 12975 and EN 12976.

Therefore, in order to get the Solar Keymark one shall follow both the general rules and these specific rules.

The basic elements/requirements of the scheme are:

- A quality system (i.e. product related factory production control) covering the production line based on the EN ISO 9000 series of standards
- Third party initial inspection of the manufacturing site (and especially the quality system management)
- Third party initial type testing
- Third party periodic surveillance (i.e. periodic inspection)

The specific scheme rules are made in order to make the scheme operational for the involved parties. They are kept as close as possible to the minimum requirements for Keymark Scheme Rules as given in 4.2 of [1].

Be sure always to have the latest version of these scheme rules, available at www.solarkeymark.org.

1. Definition of scope

1.1 Products covered by the scheme

The scheme covers the following products within the work programme of CEN/TC 312 for thermal solar systems and components:

- Solar thermal collectors
- Factory made solar thermal systems
- Solar water heater stores

1.2 List of European Standards concerned

The scheme refers to the normative requirements in the following European Standards:

- EN 12975: Thermal solar systems and components - Solar collectors

¹ The Keymark is a third-party certification system on the basis of European Standards, demonstrating to users and consumers conformity to the requirements of the relevant European Standard(s). It is granted after the satisfactory completion of a certification procedure, comprising product conformity tests (initial type tests), assessment of the documented factory production control for the related production line, production site inspection and surveillance.

- EN 12976: Thermal solar systems and components - Factory made systems
- EN 12977-3: Thermal solar systems and components – Custom built systems – Part 3: Performance test methods for solar water heater stores

The standards are available from the national standardisation bodies (see: www.cenorm.be/catweb/27.160.htm).

2. Requirements and assessment procedures for bodies engaged in certification, testing and inspection

2.1 Requirements for certification, testing and inspection bodies

The general requirements are given in:

[1], part 4.1.5:

“Bodies engaged in certification, testing and inspection shall fulfil the requirements of the relevant standards for their operation, e.g. EN 45000 series and EN ISO/IEC 17000 series of standards, as well as the additional requirements defined in the Keymark scheme rules...”

[4], part A.2.3.2:

Certification bodies shall comply with EN 45011 and be accredited by a signatory of the EA-MLA

[4], part A.2.3.3:

“All testing laboratories and inspection/assessment bodies ... shall be accredited against the relevant standard ... “

(Relevant standards: see list of standards in part 1.2. of present document)

The additional requirements/rules in this specific scheme are:

- The certification body in agreement with the manufacturer (license applicant) employs any of the approved testing laboratories fulfilling the requirements in this scheme and listed in paragraph 8 “List of bodies for the implementation of the scheme”.
- Evaluation of testing laboratories by the certification body is not an alternative to accreditation.
- Temporarily the certification body, its testing laboratories and inspection bodies may receive temporary financial subsidy from independent national or European authorities to support their certification, testing or inspection activities in order to assist achieving the target given in the White Paper of the European Union: 100 million square meters of solar thermal collectors installed in EU in 2010. If certification bodies, testing laboratories and/or inspection bodies are directly or indirectly subsidised, such institutes shall apply a uniform price level towards all EU manufacturers and suppliers. From the beginning of 2010 no subsidies for these bodies shall be allowed. The Solar Keymark secretariat will follow and evaluate if these requirements are fulfilled.

3. Specification of the manufacturer's application file

The manufacturer and/or applicant shall supply the certification body with the information as required in the application form of the certification body. The application form is available from the certification body.

This information must also include the documentation required in:

- paragraph 7. “Collector identification” of EN 12975-1
- paragraph 4.6 “Documentation” of EN 12976-1
- paragraph x “Documentation/Identification” of EN 12977-3

4. Selection and submission of type test samples

4.1 Selection

The test samples for initial type testing are taken out of the current production or from the stock of the manufacturer. The inspector points out the test samples and records their serial numbers. The manufacturer shall prove through his factory production control and quality management system conformity of the test sample with the series production of the type.

A type is generally defined as products with the same specifications for materials, sub-components, configurations and dimensions/sizes.

4.1.1 Type definition - collectors

Some degrees of freedom are allowed concerning the type definition of solar collectors:

- If the manufacturer produces the “same” collector in different lengths and/or widths (i.e. the only difference between two collectors is the length and/or the width) the collector is considered the same type and only one sample of the smallest and one sample of the largest module shall be taken and tested². The largest module shall be subject to all the tests required in EN 12975-1 clause 5.2, and the smallest shall be subject to a thermal performance test (clause 6 of EN 12975-2). Thus, only one Solar Keymark license is necessary for the whole series of modules with different sizes. The performance figures used for this type shall be the performance figures corresponding to the measured instantaneous efficiency having the lowest integral in the interval of the reduced temperature³ from 0 – 0,1 K/(W/m²). In other words, the efficiency curve used for this type shall be the one embracing the smallest area.
- Custom built collectors (built in, roof integrated collectors that do not comprise factory made modules and are assembled directly on the place of installation) are handled as described in EN 12975-1, paragraph 1 “...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”. The manufacturer has to explain the conformity of the test module with the normal production and must provide a detailed description of the components.

² The module sizes are compared based on gross area. Gross area is defined in EN 12975-2, Annex I. The inspector shall inspect all the different sizes of the type to verify conformity.

³ The reduced temperature is defined in EN 12975-2, paragraph 6.1.4.8.3, and the instantaneous efficiency in 6.1.4.8.4.2.

- Very large collector modules may be treated as the custom built ones, see above, if testing of the full size module is not possible.

4.1.2 Type definition – factory made systems

Some degrees of freedom are allowed concerning the type definition of factory made systems:

- If the manufacturer produces the “same” system with different ... “flex rules to be included” ... only one Solar Keymark license is necessary for the whole series of systems with different sizes. The performance figures used for this type shall be the performance figures corresponding to ...

4.1.3 Type definition – solar water heater stores

Some degrees of freedom are allowed concerning the type definition of solar water heater stores:

- If the manufacturer produces the “same” tanks in different sizes results of the whole series can be determined according to EN12976-3 Annex E. Only one Keymark license is necessary for whole series of tanks in different sizes.

4.2 Submission

The inspector either takes with him the type test samples and delivers them to the testing laboratory, or he marks them with a permanent mark (alternatively seals their packing) and instructs the manufacturer to deliver them to the testing laboratory.

4.3 Changes in products – re-testing

The Keymark licence is not valid if a keymarked product is changed/modified. However, depending on the modifications, it might not be necessary to carry out a complete new initial type test. In order to keep the license, the manufacturer shall supply the certification body with a revised “manufacturers application file” noting that the product is a modification of an already keymarked product (specifying exactly which one) and specifying exactly which modification(s) will be made. The certification body will then assess the necessity of re-tests/supplementary tests on the basis of table C.1 in Annex C of EN 12975-1 (collectors) and table A.3 in Annex A of EN 12976-1 (systems); *reference to corresponding table for tanks included as annex to these scheme rules*. Depending on the degree of changes in the production process, the certification body will evaluate if a new initial inspection of the production line is needed. If the certification body approves the new tests (and inspection), the manufacturer may mark the modified product.

Note: The fees for the modified product are the same as for a new product, but some expenses for testing and inspection might be saved. The manufacturer may keep the license for the original product.

Note: If the changes are only changes in sub-components/materials a new initial inspection should not be necessary.

5. Factory production control and initial inspection of manufacturing site

With the initial inspection it is checked whether the manufacturing site fulfils the requirements stated in 4.1.3 in [1]:

“The manufacturer shall operate a quality system covering the production line of the product for which the licence to use the Keymark is granted and which should be based on the quality standards which are at least of the level of the EN ISO 9000 series of standards.

In granting the licence, the empowered certification body shall take into account the existence of any quality system certificate issued by a certification body that is accredited by a member of the European co-operation for Accreditation (EA).”

6. Surveillance

The general surveillance procedures are given in 4.1.4 of [1]:

“Periodic surveillance by the empowered certification body including testing of samples from the production line or from the market and surveillance of the manufacturer's quality system.”

The test samples for surveillance testing are taken out of the current production or from the stock of the manufacturer. The inspector points out the test samples and records their serial numbers. The surveillance test is a physical inspection of the product and a comparison with the specifications of the original type tested sample.

6.1 Special test

A special test can be ordered through the certification body in justified cases by anyone if the fulfilment of the requirements of the certification program or the registered values of a certified product is doubted.

The special test is normally to be made as a type test and in agreement with the manufacturer by a second approved testing laboratory listed in paragraph 8. If only one or a few points of the certification program are failed by a product, the certification body decides in agreement with the testing laboratory if the special test can be made as a partial or supplementary test.

If the tested product does not fulfil the requirements and/or does not comply with the registered values⁴, the manufacturer has to carry the costs of the special test.

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- Collectors: The integral of the measured instantaneous efficiency at the special test shall be more than 90% of the already registered integral in the interval of the reduced temperature from 0 – 0,1 K/(W/m²). The reduced temperature is defined in EN 12975-2, paragraph 6.1.4.8.3, and the instantaneous efficiency in 6.1.4.8.4.2.
- Systems:
 - Solar-plus-supplementary systems: The calculated $Q_{aux,net}$ based on the special test shall be less than 110% of the originally calculated $Q_{aux,net}$. $Q_{aux,net}$ is defined in EN 12976-2, paragraph 5.9.3.2. The calculations to be compared shall be based on the Würzburg climate

If the tested product fulfils the requirements and complies with the registered values, the costs have to be carried by the party which questioned the fulfilment of the requirements or registered values and ordered the test through the certification body.

If the special test shows that the failure of the product to conform to the requirements and/or registered values is due to random manufacturing error or transport damage, the testing laboratory has to take a second sample. The result of this test is the obliging result for the special test.

The manufacturer or a person authorised by the manufacturer must have the opportunity to take part during the whole procedure of the special test. He must be informed of the results of the test without delay to have the chance to react directly.

If the special test states deviations from the requirements and/or the registered values, the certification body requires the manufacturer to rectify the faults within a certain limited time which should not exceed one month, depending on the extent and manner of the fabrication. Thereafter the testing laboratory performs a new special test, the extent and manner being determined by the certification body consulting the testing laboratory.

7. Supervised manufacturers testing

Procedures such as "supervised manufacturers' type testing" and/or "type testing at manufacturers' premises" are not included in these scheme rules.

Note: At the moment no manufacturer is doing the type testing itself. In the future it might be taken into consideration to specify the rules for such an option

8. List of bodies for the implementation of the scheme.

An updated list of empowered certification bodies and approved inspection bodies and testing laboratories is available at the Solar Keymark web site: www.solarkeymark.org.

9. Fees

By applying for the licence to use the Keymark, the manufacturer also agrees to meet the costs specified in [1], 5.2.

data and the design load already given by the manufacturer (see: EN 12976-2, Annex B, table B.1).

- Solar-only and solar preheat systems: The calculated f_{sol} based on the special test shall be more than 90% of the originally calculated f_{sol} . f_{sol} is defined in EN 12976-2, paragraph 5.9.3.3. The calculations to be compared shall be based on the Würzburg climate data and the design load already given by the manufacturer (see EN 12976-2 Annex B, table B.1).
 - **Tanks:**
 - All test results according to EN12977-3 part 8.3 concerning dimensions, volumes, heat capacities and sensor locations shall be within +/- 5%. These are the parameters given in 8.3 a), 8.3 b); first two parameters in 8.3 c) and 8.3d)
 - All other test results according to EN12977-3 part 8.3 shall be within +/- 20%. These are the last 4 parameters give 8. c).
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10. Additional requirements for obtaining the license

Some large solar collectors have to be CE-marked, further information at:

<http://www.solarkeymark.org>

11. References

- [1] CEN/CENELEC INTERNAL REGULATIONS – Part 4: Certification – The Keymark System, CEN/CENELEC, 2006-8 2006-8
- [2] EN ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories
- [3] EN 45011, General criteria for certification bodies operating product certification
- [4] CEN Internal Regulations: Part 3 Terms of reference of the CEN Certification Board, CEN, 2006-9

How to get the references:

[1] is available from www.solarkeymark.org.

[2] and [3] are available from the national standardisation bodies.

Annex A (informative)

Determination of store parameters by means of “up-scaling” and “down-scaling”

A.1 General

Annex A describes a method for the determination of store parameters by means of “up-scaling” and “down-scaling”. The method allows for the determination of store parameters without complete testing the store. In order to apply the procedure it is required that the store of which the parameters should be determined is part of a series of store. A series of stores is defined as follows:

Series of stores

Different stores are considered to be part of a series of stores if they are identical with regard to their construction and only differ in their volume, their diameter and the area of their heat exchangers.

Being identical with regard to the construction means that all stores

- have the similar set-up (either vertical or horizontal);
- have a similar insulation concept: same material, same thickness;
- have the same number of hydraulic connections;
- are equipped with the same type of immersed heat exchangers: plane pipe or finned tube, same diameter of tubes, same wall thickness of tubes.

NOTE 1 The definition of identical is still under elaboration.

NOTE 2 Further information about the determination of store parameters by means of up-scaling and down-scaling is given in CEN/TC 312/WG 3 N 0096.

A.2 Requirements

It is required that the series is based on a minimum of three stores with different volumes. The volume of all stores being part of the series shall be in the range from 200 l to 600 l.

Note: In general it can be assumed that the method described in this annex can also be applied on a series of stores if the volume of some stores of the series is less than 200 l or larger than 600 l. Due to the fact that the method is for the time being only validated for stores with a volume in the range from 200 l to 600 l the application is restricted to stores within this volume range.

The largest store of a store series shall be tested completely according to chapter 6. The heat transfer capacity rates of the immersed heat exchangers of the smallest store shall also be determined by thermal testing.

Based on the results derived from measurements the parameters for stores which are in their size between the two measured ones can be calculated as follows:

A.3 Determination of store parameters

A.3.1 Thermal capacity of store

The determination of the thermal capacity of the store shall be derived from the store volume. It can be calculated by the following equation A1:×

$$C_{sto} = 4,149 \times V_{sto} \quad (A1)$$

with

C_{sto} = thermal capacity of the store in kJ/K

V_{sto} = whole volume of the store in litres

The volume of the stores that were not completely tested is based on the manufacturer's information.

A.3.2 Height of store

The height of the store shall be calculated based on the store volume and the diameter of the store (based on manufacturer's information) for a cylindrical geometry.

A.3.3 Determination of heat loss capacity rate

The heat loss capacity rate shall be calculated by equation (A.2):

$$(UA)_{s,a} = a \times \sqrt{V} \quad (A.2)$$

where

$(UA)_{s,a}$ is the heat loss capacity rate of the store in W/K;

V is the volume of the store in litre;

a is the constant.

The constant "a" is determined on the basis of the measured heat loss capacity rate of the largest store by using equation (A.2).

A.3.4 Relative heights of the connections and the temperature sensors

These parameters shall be calculated based on the determined store height (see A.3.2) and the design drawing provided by the manufacturer.

A.3.5 Heat exchangers

The heat transfer capacity rate of the heat exchangers shall be calculated by means of a linear interpolation based on the area and the heat transfer capacity rate. The values required for the linear interpolation shall be based on measurements.

If the dependency of the heat transfer capacity rate on the operating conditions (e. g. temperature level, flow rate through the heat exchanger) is taken into account, average values for these dependencies shall be used. The determination of the average values shall be based on the values derived from measurements.

A.3.6 Parameter describing the degradation of thermal stratification during stand-by

The value determined from the test of the largest store (the one which is completely tested) of a series shall be used.

A.3.7 Parameter describing the quality of thermal stratification during direct discharge

The value determined from the test of the largest store (the one which is completely tested) of a series shall be used.