

SOLAR KEYMARK -HIGH QUALITATIVE TESTING OF SOLAR COLLECTORS

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Abstract – The Altener project Solar Keymark was initialized in 2001 with the aim to introduce the CEN/CENELEC Mark for solar thermal products as “Solar Keymark”, which will act as a common EU quality label. To be able to certify a product with a Keymark it must be tested according to an EN standard. The EN standard for solar collectors (EN 12975) was ready in 2000 but it was not harmonized. This meant that nearly no laboratories were performing the tests and that there was no mutual acceptance for the test results. It is necessary that several laboratories are accredited and experienced in performing the tests to get a fair market for testing and a large market access for the Solar Keymark.

One of the main tasks in the Solar Keymark project has therefore been to establish a network of test laboratories with the objectives to cooperate in order to get mutual acceptance of the test results, to implement the standard, to get accreditation and to improve the standard. The solar collector network has already reached substantial results with 13 laboratories that have implemented the standard’s test procedures and eight of them are already accredited for performing the tests. Several weaknesses in the standard have been identified and actions have been taken in order to improve the standards. The established network has promising qualifications for constructive competition and future cooperation in projects for increasing the market for solar thermal products thus contributing to a sustainable society.

1. INTRODUCTION

The European market for solar thermal products has until today been fairly closed. Each nation (and even region) has had its own regulations for testing and certifying solar thermal products, if they have had any regulations at all. The local certification is often used as compulsory to grant subsidy to the products. This has made it difficult for manufactures to gain ground in other country’s markets since it implies local tests and approvals. To cover the whole EU-market it could be necessary to have more than ten tests and certificates, which made it far too expensive to increase the export area. In the extension this would lead to expensive and/or low quality products that would eliminate the market for all solar thermal products.

To open the European market, ESTIF (the European Solar Thermal Industry Federation), in 2001 initialised the Altener project Solar Keymark. The overall objective with the project is to introduce the CEN/CENELEC (the European Committee for Standardisation) European Mark in the solar thermal area as the “Solar Keymark”, which will act as a common EU quality label. This was partly made within the project by establishing the specific CEN keymark scheme rules for solar thermal products (Nielsen, 2003).

However, the establishing of the scheme rules was not enough to reach the project’s overall objective. To be able to certify a product with a Keymark it must be tested according to an EN standard. The EN standard for solar collectors and factory made systems (EN 12975 and EN 12976) came into operation in 2000 but they were not harmonized. This meant that nearly no laboratories were performing the tests and that there was no mutual

acceptance for the test results. To get a powerful Solar Keymark it is necessary that several test laboratories are accredited and experienced to perform the test in order to get competitive quality, availability and prices of tests.

One of the main tasks in the Solar Keymark project has therefore been to establish a network of test laboratories with the objectives to cooperate in order to get mutual acceptance of the test results, to implement the standards, to get accreditation and to improve the standards. The Solar collectors network, which is coordinated by SP Swedish National Testing and Research Institute, has got high priority in the Solar Keymark project and thereby also reached substantial results.

More information about the whole project is given by Nielsen, 2003.

2. THE SOLAR COLLECTOR NETWORK

2.1 Objectives

The objectives with the solar collector network has been to:

- Establishing strong network cooperation between European test laboratories.
- Cooperation with experience exchange about implementing test procedures for the new EN 12975-1 and EN 12975-2 standards for solar collectors.
- Cooperation with experience exchange about implementing quality assurance system in order to reach accreditation for performing tests according to the EN 12975 standard. It is a basic criterion for the Keymark that an accredited lab performs the tests.

- Get mutual acceptance of the test results, i.e. the test results of a product tested by one of the accredited labs in the network will be accepted by all others.
- Cooperation to collect and use experienced gained to improve the virgin EN 12975-1 and EN 12975-2 standards. During the work of implementing the standards, writing operational procedures and trying out the test methods there will be comments to and suggestions for improvements of the new standards. The Network will be used for compiling these in a formal list of recommendations for revisions of standards.

2.2 The Keymark

The CEN/CENELEC European Mark - The Keymark - is a general voluntary mark, developed by the European Committee for Standardisation (CEN). The clear and simple message of The Keymark is that the product complies with the European Standard(s) covering the product. The basic elements in the certification scheme are:

- Type testing of products according to the EN standards
- Factory production control (ISO9000 level)

For the time being the Keymark is licensed for use in combination with a national mark. The form of The Keymark is illustrated in Figure 1.

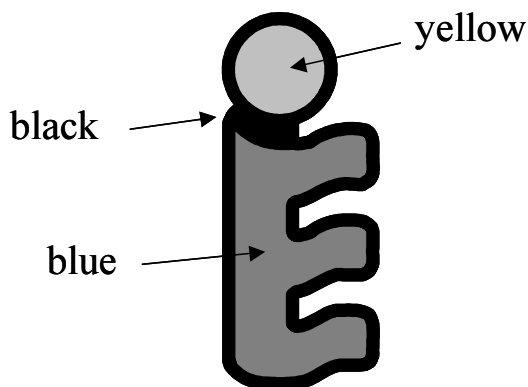


Figure 1: The form of the European Keymark.

More information about the Solar Keymark and the scheme rules is given by Nielsen, 2003.

2.3 The standards

The scheme rules for Solar Keymark are based on the European Standards “Thermal solar systems and components –Solar collectors” –Part 1: General requirements (EN 12975-1, 2000) and Part 2: Test methods (EN 12975-2, 2000). To label solar collectors

with the Solar Keymark test must have been performed according to EN12975-1, paragraph 5.2 Required tests a)-j):

- Internal pressure for absorber
- High temperature resistance
- Exposure
- External thermal shock
- Internal thermal shock
- Rain penetration
- Mechanical load
- Thermal performance
- Freeze resistance
- Final inspection

The optional test for impact resistance shall be carried out if requested. Test f) *rain penetration* is only required for glazed collectors. Test i) *Freeze resistance* is only required for collectors that are claiming to be freeze-resistant.

2.3 Work performed

During the implementation several weaknesses in the standards have been identified. Most of the weaknesses are only misprinting that has led to confusion that had to be clarified within the network. However, some of the weaknesses have been more complicated and small groups have been established in the network in order to solve the problems. This has been very successful both in strengthening the network and to get mutual acceptance with direct suggestions for improving the test procedures in order to get the tests equally performed at all test laboratories.

At the last two Solar Keymark meetings the network has had a direct and effective cooperation with the CEN TC/312 Working Group 1. This working group is responsible for preparing suggestions of revision of the EN 12975 standard to the CEN TC/312 Committee (CEN Technical Committee for solar thermal products). Suggestions for improvements could thereby directly be transferred, discussed and incorporated.

2.4 Recommendations for revisions of EN 12975

Within the network of test laboratories comments of the EN 12975 have been collected and frequently discussed by emails and during the meetings. Totally 51 comments for improving the EN 12975-1 and EN 12975-2 standards have been gathered in a document (Wahlström, 2003) and handed over to the convener of CEN TC/312 Working Group 1. The comments are of different status:

- Most of the comments are already prepared with suggestions of improvements and can be used for direct decisions for revision at the CEN TC/312 board.
- Some of the comments are for helping to interpret the standards in a correct and mutually accepted way. These comments have become the Solar-Keymark-network’s internal procedures for performing the tests.

- Three internal papers that address difficulties and make suggestions how to clearer define the rain penetration test have been written. One for each method of detecting rain penetration. The papers are added in Annex 1-3 of the document.
- Several comments point out areas for the CEN TC/312 Work Group 1 to work further with in order to prepare suggestions ready for the CEN TC/312 board.
- Several comments gives suggestions of further work needed within the Solar Keymark network.

2.5 Extra requirements

The purpose of the Keymark is that it should be possible to enter the whole European market with only one test and one certificate. However, at the moment it is compulsory to have a national mark on the solar collector, beside the Solar Keymark. This makes it possible to put extra criteria on top of the Keymark for national subsidy granting.

One of the most important results from the network is that all participants has agreed in act for eliminate the extra criteria, to accept other laboratory's tests of the extra criteria, or only supplement the extra criteria test. This is in accordance with the interest of the solar thermal industry that would prefer to have the same criteria valid in all European countries.

The extra requirements that are needed at the moment in each country are summarized together in a list (Solar Keymark, 2003).

2.6 Inter-comparison of test results

Two inter-comparisons for handling of measurement data have been performed within the project network. The first one was an inter laboratory comparison of parameter identification from a set of measurement data (Kovacs, 2003). The purpose with the benchmark was to compare if measurement values collected during a QDT test will be evaluated in the same way at different laboratories. The benchmark had the following results/conclusions:

- Several suggestions for improvements (revisions) of points in the standard in order to make the standard easier to interpret and to make sure that the calculations will give the same result independent of laboratory.
- Thanks to this inter-comparison some laboratories have changed their procedures. This will give a permanent improvement.
- This type of inter-comparisons should precede a physical inter-comparison with measurements (a so called "Round Robin") in order to separate calculation errors from measurement errors.

The second one was an inter-comparison of uncertainty calculations in collector efficiency parameters. The objectives with the inter-comparison was to share the already gained experience and to agree on a consolidated procedure to calculate the uncertainties in the collector efficiency parameters (Fisher, 2003).

The network has identified that a physical Round Robin might be of advantage for improving the test reliability. A German Round Robin of solar collectors has just started and will be finished in September 2003 and thereafter other countries are free to participate. The network will observe how the Round Robin will be performed and how the results will be presented. This might be the opportunity for a continuation of a European Round Robin.

3. RESULTS

3.1 Accredited laboratories

Two of the main tasks of the laboratories in the network were to implement the European standards EN 12975 and obtain accreditation for performing the tests required in these standards. An overview of the status at the end of the project is given in Table 1.

The solar collector network has already reached substantial results with ready implementations of the EN 12975 test procedures at all 13 laboratories in the network. Eight laboratories are already accredited for performing the tests and three more are planning to be accredited before the end of this year.

3.2 Established network

The project has created *the* platform for European test laboratories to meet and exchange experience within an established network. The network has succeeded in speeding up the process of implementing the new European standards.

3.3 The Solar Keymark

The Solar Keymark is the result of a voluntary certification scheme supported by ESTIF and the European Commission. The project was finalised in March 2003 and we can soon expect to see the first solar thermal products marked with "Solar Keymark" on the market.

The Solar Keymark will assist users/buyers to select quality solar collectors conforming to the European standards, which means that the product has reliable quality and reliable performance information. Thereby the Solar Keymark will at the same time help the manufacturers in their marketing.

The Solar Keymark will also assist manufacturers with an open market all over Europe. It will not be necessary to do the same tests in different countries. The tests will in several cases fulfill the requirements for obtaining national/regional subsidy.

Table 1: Accreditation of test procedure for different laboratories.

Laboratory	Accreditation	Specification of accreditation according to EN 12975-1 § 5.2 a) – j)
Arsenal (Austria)	Ready	All tests
CSTB (France)	2003-12-31	h) Thermal performance
Demokritos (Greece)	Ready	All tests except: i) Freeze resistance*
DTI (Denmark)	In consideration	All tests except: i) Freeze resistance*
ENEA (Italy)	Ready	All tests except: i) Freeze resistance*
INETI (Portugal)	2003-12-31	All tests except: i) Freeze resistance*
INTA (Spain)	2003-12-31	All tests
ITW (Germany)	Ready	All tests
ITC (Spain)	Ready	All tests except: i) Freeze resistance*
IZES (Germany)	Ready	All tests
SP (Sweden)	Ready	All tests
SPF (Switzerland)	Ready	All tests
TNO (The Netherlands)	In consideration	b), c), d), e), f), g) and j)

* This test is only for collectors that are claiming to be freeze-resistant. The laboratories therefore can offer complete tests for Solar Keymark for all other collectors while collectors that are claiming that they are freeze resistant must do test i) at another laboratory.

4. CONCLUSIONS

The objectives with establishing of the network for high qualitative testing of solar collectors has been reached with the following conclusions:

- The standard EN 12975 has successfully been widely implemented in Europe with eight accredited test laboratories today and three more to come in the near future. Totally 13 laboratories

have implemented the test procedures. This is important since testing by an accredited test laboratory is a basic criterion for the Solar Keymark.

- Comments from the network will be a base for a constructive improvement of the EN 12975 standards.
- A solid network has been established with good cooperation and constructive competition between test laboratories. The created network has promising qualifications for future cooperation in projects for increasing the market for solar thermal products and the potential for a sustainable society in the future.

The following points have been identified, as areas where further work is needed for example in future projects within the Solar Keymark network:

- Improvement of impact resistance test.
- Further specify the maximum load pressure in the mechanical load test and/or to investigate if the standard can be harmonized with the “Eurocode”.
- Develop an indoor exposure test.
- Develop a procedure for calculating the uncertainty of the efficiency test.
- Investigate if it is possible to change the test sequence in the standard and to test with measurements how the change might influence result of the efficiency test.
- To make a physical European Round Robin when the standards have been revised.

The purpose with the Solar Keymark is to overcome the present weak market situation. The Keymark cannot be obligatory to the solar products, but since ESTIF, CEN and 13 test laboratories are behind it, it is expected to be indeed very widespread. The Solar Keymark will be valid for the whole of Europe and in the future this certificate will be the only certificate necessary to enter the whole European market.

For the time being it will be possible for each nation to put extra criteria on top of the Keymark for the national subsidy granting. But it is in the interest of the industry and a goal for the network of test laboratories to work for harmonisation of these criteria, to overcome barriers, allow fair market access to all and to eliminate the extra national depending criteria.

5. ACKNOWLEDGEMENTS

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