

ANNEX WP1.A: Minutes concerning WP1.A Solar Collectors

The 3rd Solar Keymark meeting in Vienna, May 27-28, 2002

Minutes taken by Åsa Wahlström SP.

Implementation of test procedures and update of time schedule

To label solar collectors with the Solar Keymark test must have been performed according to EN12975-1, paragraph 5.2 *Required tests a)-j*).

- Five laboratories are accredited for all tests
- Five laboratories are planning to get accreditation during the project time
- Three laboratories will exclude test i) *Freeze resistance* test. This test is, however, 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.
- CSTB will be accredited only for test h) *Thermal performance* and TNO for the tests a) *Internal pressure for absorber*, i) *Freeze resistance*, h) *Thermal performance*, c) *Exposure* and e) *Internal thermal shock*. Additional tests must be performed at another laboratory.
- TNO and INTA will have the planned tests implemented in beginning of 2003 while the accreditation is planned to be in the end of 2003 for TNO and in May 2003 for INTA. Both laboratories are allowed to perform tests for Keymark labelling as soon as the tests are implemented (according to the Scheme rules) until end of 2003. After that they must be accredited.

The implementation and accreditation plans are shown in Table WP1.A.1 and Figure WP1.A.1.

Table WP1.A.1 Implementation and accreditation of test procedure. EN12975-1, 2 Solar Collectors

Laboratory	Accreditation	Tests planning for accreditation stated in EN 12975-1 § 5.2 a) – j)
Arsenal (Austria)	Ready	All
CSTB (France)	2003-03-30	h) Thermal performance
Demokritos (Greece)	Ready	Excluded test: i) Freeze resistance
DTI (Denmark)	2003-01-01	Excluded tests: i) Freeze resistance
ENEA (Italy)	2002-09-30	All
INETI (Portugal)	2002-09-01	Excluded test: i) Freeze resistance
INTA (Spain)	Implemented: 2003-03-01 Accredited: 2003-12-31	All
ITW (Germany)	2002-09-30	All
IZES (Germany)	Ready	All
SP (Sweden)	Ready	All
SPF (Switzerland)	Ready	All
TNO (The Netherlands)	Implemented: 2003-03-01 Accredited: 2003-12-31	a), c), e), h) and i)

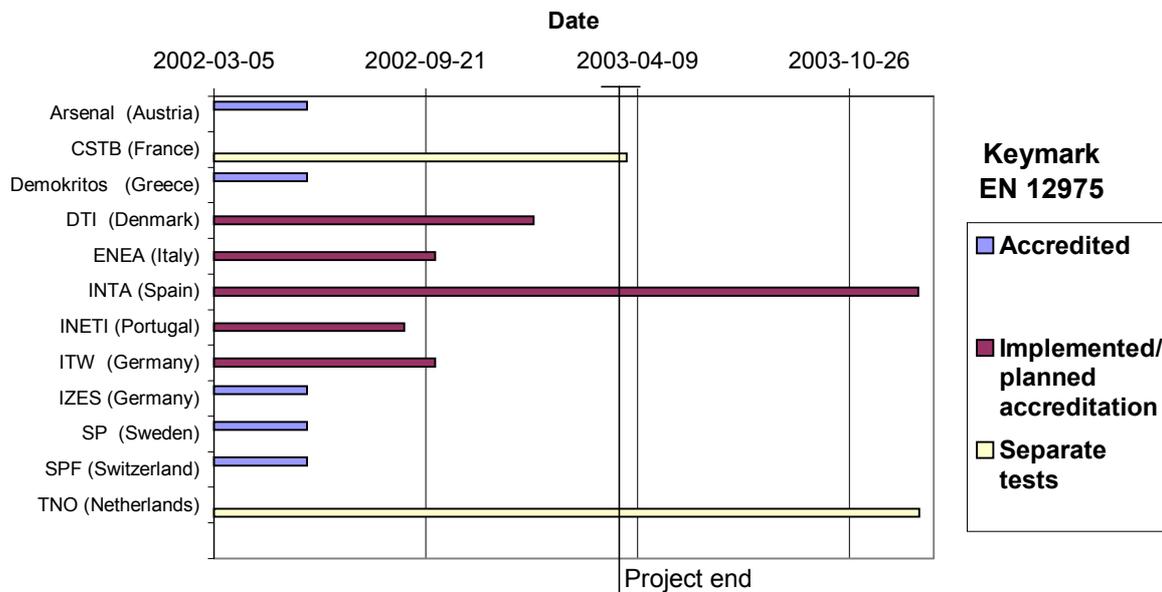


Figure WP1.A.1 Accreditation of test procedure according to EN12975-1, Solar Collectors

Lessons learned and Comments on the EN12975-1&2

After the Keymark Athens meeting AAW has received comments to the standards from Amelie Veenstra (Ric Slappendel) and Christian Müller-Schöll. These comments are added in Annex WP1.A.A. Some of the comments given to AAW were just small editing corrections of the standards. Below are the comments that were brought up for discussion with decisions for action:

Comments and problems EN 12975-2, TNO, the Netherlands.

Author: Amelie Veenstra and Ric Slappendel

Comment 1: Calibrating pyranometers.

Problem: There is a problem with calibrating pyranometers at labs that are accredited and states uncertainty calculations.

Action: Åsa Wahlström will check if SP is accredited to do the calibration and if they can calculate the uncertainty in a proper way. Carmen Granados Casals will do the same with a company.

Follow up: SP performs calibration of pyranometers and is the Swedish National Laboratory for photometry and radiometry. SP states the uncertainty in the calibration certificate. Due to the weather situation in Borås (Sweden) does SP not use ISO 9846 directly since the standard requires outdoor calibration. Instead SP will get a connection to ISO 9846 by cooperation with SMHI (Swedish Metrological and Hydrological Institute) and their reference pyrhelimeter. SMHI's absolute pyrhelimeter and SP's absolute pyrhelimeter are regularly compared.

Comment 2: The standard is not well structured.

Problem: Required conditions (figures etc.) are often not in a table. This makes it not easy to work with. Also the chapters could be better structured, for instance a new chapter on a new page etc.

Discussion: All agree to the comment. AAW pointed out that it is difficult for the Solar Keymark to give a proper suggestion for improvements in Formats.

Comment 3: Test sequence for Exposure test.

Problem: Is there an option skipping the exposure test, or allowing it as last test, or allowing the exposure test to be performed on a second similar collector.

Discussion: This is a problem for factory made systems standard EN 12976.

Action: Amelie Veenstra will include in the EN 12976 that a different collector can be used for exposure test for the factory made systems.

Comment 4: Mechanical load test

Problem: The maximum pressure level is too low.

Discussion: Amelie Veenstra pointed out that in EN 12976, Clause 4.3.2 it stands that national requirements must be considered. Here prevails an inconsistency. The standards should be in consistency.

For EN 12975-2 the following subscriptions are valid:

For “Positive pressure test of the collector cover” (5.9.1.3) the maximum pressure load should be at least 1000 Pa up to the value as specified by the manufacturer.

For “Negative pressure test of fixing between the cover and the collector box” (5.9.2.3) the maximum pressure test pressure may be specified to suit particular climate conditions. For “Negative pressure test of collector mounting” (5.9.3.3) the maximum test pressure may be specified by the manufacturer to suit particular climatic conditions but shall be at least 1000 Pa.

SP certifies collectors with a P-mark and the test pressure for that is 1200 Pa negative load and 2000 Pa positive load.

Action: **Pierre Richard** will distribute some calculations that he has made for how high the pressure should be, for discussion on the next meeting. Åsa Wahlström will check if a mechanical load test for windows is in agreement.

Follow up: Wind load tests for windows (EN 12211) consist of three parts: deflection test (p1), repeated pressure test (p2) and safety test (p3). The classification standard EN 12210 specifies five classes with the following maximum test pressures:

Test	Class 1	Class 2	Class 3	Class 4	Class 5
p1:	400	800	1200	1600	2000 Pa
p2:	200	400	600	800	1000 Pa
p3:	600	1200	1800	2400	3000 Pa

For P-marking the requirement is class 3 or better.

Comment 5: Rain test

Problem: Does test result really predict the behaviour in daily practice.

Discussion: Åsa Wahlström informed that since the last meeting in Athens we have three new drafts that describe the procedure better. (The draft is added in Annex WP1.A.B). At the Athens meeting we agreed that all three methods are needed.

Harald Drucek suggested that the sequence of the test could be changed and then we skip the check of how much water is left. If the rain test is made directly before the thermal performance test the collectors that do not hold for the rain test will have disadvantages for the thermal performance test. This was not considered as a good idea since these tests will be performed by different persons and also sometimes at different departments. It will be difficult to plan for the tests.

Action: We will stick with the three new suggestions.

Comments and problems EN 12975-1, 2, SPF, Switzerland.**Author: Christian Müller-Schöll****Comment 6 and 7: Uncertainty of test results**

Problem: There is a mix-up with “accuracy” and “uncertainty” in the standard. A procedure of deciding the uncertainty of the end result of the testing is missing in the standard.

ISO 17025 clause 5.4.6.2 says that calculation of uncertainty of the end result can be omitted if the standard limits the uncertainty for each measurement that is a major source for the end result uncertainty. Thereby will the standards need required limits for those measurements.

Information: Åsa Wahlström informed about the discussion on the last meeting in Athens. In EN 17025 there are two ways on how to give the uncertainty.

- 1 Calculation of the total result overall uncertainty with strict, metrological and statistical acceptable methods.
- 2 To identify all components that contribute to the uncertainty and make a reasonable estimation based on the performance and range of measurements.

Furthermore EN 17025 says that in the case that approved testing methods gives limits for the main uncertainty sources and specifies how the account of the calculated result should be done, the laboratory will fulfil the demands for uncertainty account if the method is followed.

The conclusion at the Athens meeting was that for thermal performance tests it is difficult to directly follow the first suggestion of uncertainty calculation and for the second suggestion it is not clear whether the standards gives all required limits.

It was decided at the Athens meeting that the Solar Keymark laboratories would try to investigate if a harmonised procedure of how to calculate the uncertainty can be created as an informative Annex. Two papers about how to calculate the uncertainty have been supplied to AAW (The papers are added in Annex WP1.A.D):

- “Assessment of Uncertainty in Solar Collector Modelling and Testing” by E. Mathioulakis, K. Voropoulos and V. Belessiotis. *Solar Energy* Vol 66, No. 5 pp 337-347, 1999.
- “Uncertainty Analyses in Solar Collector Measurement” by Christian Müller-Schöll and Ueli Frei.

Discussion: It was a discussion about that the standard is probably in accordance with the EN 17025 but we still need a clarification.

Action: **Pierre Richard** and **Christian Müller-Schöll** will make a suggestion on how to calculate the uncertainty for the thermal performance. The suggestion will be based on the two incoming papers of uncertainty calculation. The result will either be included in the Scheme rules or a suggestion for revising the standard. Maybe it can be helped with a common excel spreadsheet.

Comment 8: Clause 6.3.5.2

Problem: It is not clear, for how long or for how many data points the value should exceed 0.005 K/s.

Action: **Hubert Fechner** will give a suggestion for the next meeting.

Comment 9: Clause 6.3.4.8.3

Discussion: There were no rejections or conclusions about this clause.

Comment 10: Clause 6.1.4.4

Discussion: There were no rejections about this comment.

Comment 11: Clause 5.2.2.2

Problem: Which method described in clauses 5.2.2.2.2. through 5.2.2.2.4 should be used.

Discussion: It is a choice. It can be seen on page 26, where it should be written which method you have used.

Comment 12: Clause 6.2.6.2

Discussion: All agreed with the comment.

Comment 13: Clause 6.1.5.2

Problem: How to apply the corrections in 6.1.5.2 to the test data.

Action: We suggested Christian Müller-Schöll to come up with a suggestion for this for the next meeting.

Comment 14: Clause 6.2.4.8.1

Discussion: All agreed with the comment.

Comment 15: Clause all

Problem: Inconsistence between 12975-1 and 12975-2. Tests for all requirements are missing.

Discussion: We had a long discussion of this because it also is other things in the standard that are subjective with no test method.

Action: **Hoang Liauw** will check with TC if this is formal problem that have to be changed or if it is allowed to have it this way. **Åsa Wahlström** will try to collect the different points that are subjective and we will have a discussion next time.

Comment 16: Clause 6.1.5.2

Problem: Big value.

Action: **Christian Müller-Schöll** will have a look on this problem until the next meeting.

All points above were discussed during the meeting. These points and the rest of the points are added in Annex WP1.A.A.

What to do with all comments of EN 12975

Åsa Wahlström asked what to do with all the collected comments. She wonder if she should give a suggestions for which points Solar Keymark will propose for revision of the standard, and thereby make sure that we are heading somewhere. In this way we are able to discuss the points during the Rome meeting and a final suggestion can be ready for the Portugal meeting.

A discussion started about how to proceed with this since it is only possible to give proposals for revision by the Format distributed by Christian Müller-Schöll or a similar format. AAW pointed out that it is very likely that the revised standard will get a lot of editorial errors again.

Action: **Åsa Wahlström** will contact Emmanouil Mathioulakis at Demokritis that is the convenor of WG1 and ask how to proceed with this thing (**done 31/6 2002**).

Inter-comparison of test results

The following points were discussed for inter-comparison of test results:

- Benchmark test for parameter identification for QDT
- Round Robin
- Comparison of SS with QDT

Benchmark test for parameter identification for QDT

Peter Kovacs has distributed a set of measurement data where all laboratories were invited to perform a parameter identification. The aim was to compare if measurement values collected during a QDT test will be evaluated in the same way at the different laboratories. In total seven laboratories took part in the comparison. A draft report is added in Annex WP1.A.C.

It was discussed that the results are not really satisfying since the efficiency curve will not be the same for all laboratories. Also the conclusions in the report were discussed. Maria Carvalho thought it would be interesting to see the other laboratories' uncertainty signs to compare if the thermal performance is within the uncertainty limits.

Action: **Peter Kovacs** will come up with a suggestion on how to structure the standard better. This will help the laboratories to make a better selection of data points. A new version of the report will be presented at the next meeting.

Round Robin

The Round Robin on thermal performance performed by the EA (European Accreditation) has been cancelled due to that only five test laboratories were interested.

Action: **Harald Drucek** informed that it might be a German Round Robin and he promised to check with EA if it is still possible for more laboratories to participate. **Peter Kovacs/Åsa Wahlström** will check if it is some possibility for making a Round Robin with support from NordTest.

Comparison of SS with QDT

Arsenal will do some comparison between SS and QDT and **Hubert Fechner** will provide it then it is finished. SP have made measurements both with SS indoor and QDT for one glazed and one unglazed collector and the results will be compared and evaluated, **Åsa Wahlström** will provide it then it is finished.

Peter Kovacs has sent out a paper that are comparing the methods (The paper is added in Annex WP1.A.D):

“Collector test method under quasi-dynamic conditions according to the European Standard EN 12975-2” by S. Fischer, H. Müller-Steinhagen, B. Perers and P. Bergquist, *ISES 2001 Solar World Congress*.

Solar Keymark decided not do any more with this subject right now.

ANNEX WP1A.A:

List of incoming comments concerning EN12975

ANNEX WP1.A.B:

Rain Penetration Test

ANNEX WP1.A.C:

QDT Inter Laboratory Comparison

ANNEX WP1.A.D:

Assessment of Uncertainty in Solar Collector Modelling and Testing

Uncertainty Analyses in Solar Collector Measurement

Collector test method under quasi-dynamic conditions according to the European Standard EN 12975-2