



# Solar Heating Arab Mark and Certification Initiative (SHAMCI)

**CERTIFICATION SCHEME RULES**  
For solar collectors and solar water heaters

Prepared in 2013

By SHAMCI network, with the support of SWT (Stuttgart University)

Updated in 2016

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**RCREEE**

Regional Center for Renewable Energy and Energy Efficiency  
المركز الإقليمي للطاقة المتجددة وكفاءة الطاقة



SolarKey Int.

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## List of abbreviations

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**IAF:** International Accreditation Forum ([www.iaf.nu](http://www.iaf.nu))

**EN:** European Norm (European Standard)

**IEC:** International Electrotechnical Commission ([www.iec.ch](http://www.iec.ch))

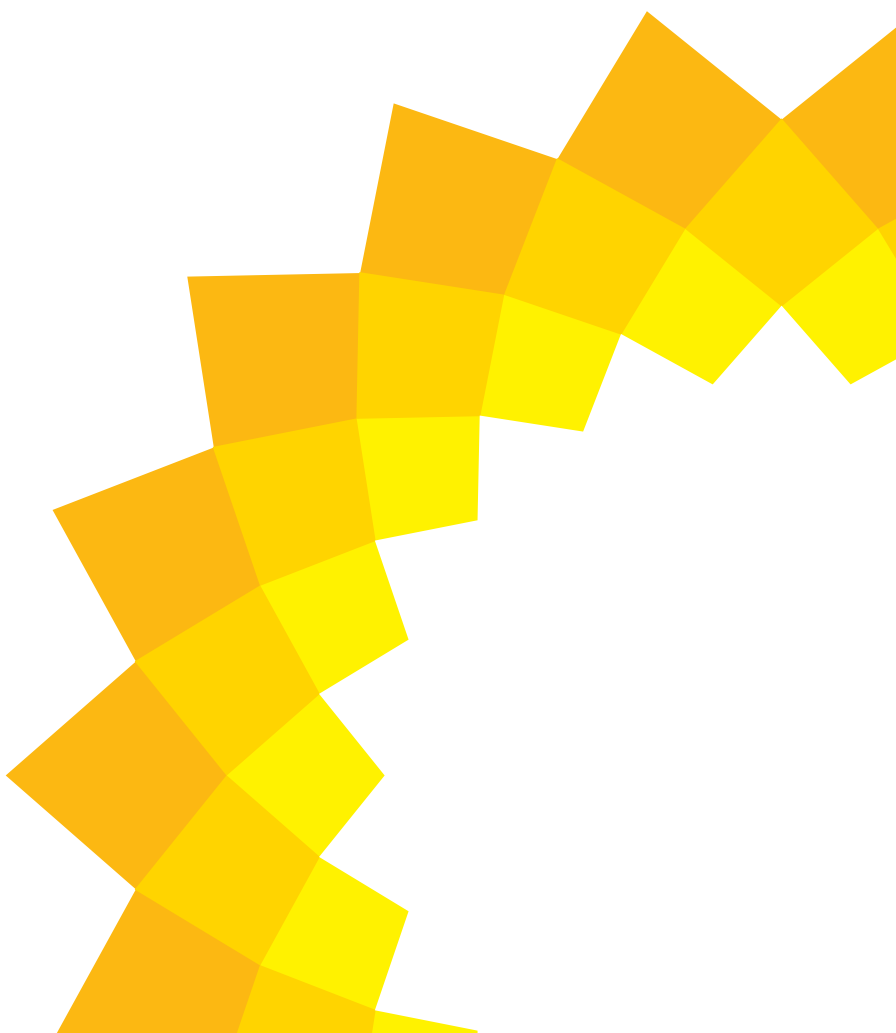
**ISO:** International Organization for Standardization ([www.iso.org](http://www.iso.org))

**QMS:** Quality Management System

**RCREEE:** Regional Center for Renewable Energy & Energy Efficiency ([www.recree.org](http://www.recree.org))

**SHAMCI:** Solar Heating Arab Mark and Certification Initiative ([www.shamci.net](http://www.shamci.net))

**SWT:** Solar- und Wärmetechnik Stuttgart ([www.swt-technologie.de](http://www.swt-technologie.de))



## I About SHAMCI

The Solar Heating Arab Mark and Certification Initiative (SHAMCI) is a quality certification scheme for the solar thermal products and services in the Arab region. The project provides a regional industrial and regulatory compliance framework for policy makers, industrial sector, and end-consumers. The project promotes adopting standard quality measures, accreditation systems and quality labels across the Arab region. This project was initiated by the Regional Center for Renewable Energy and Renewable Energy in cooperation with the League of Arab States and the Arab Industrial development and Mining Organization.



## 2 Preface

This document defines the SHAMCI certification scheme, and gives the rules for certification of solar collectors and solar water heaters for the Arab States.

The SHAMCI Certification Scheme Rules are elaborated by the SHAMCI Network and any changes in the scheme rules shall be approved by the SHAMCI Network.

A network has been formed with the name of SHAMCI Network to prepare the certification rules for SWHs in the Arab region, the rules are developed in cooperation with SWT, Stuttgart University and SolarKey International. Latest versions of the SHAMCI Certification Scheme Rules and annexes are available from [www.shamci.net](http://www.shamci.net)

## 3 Introduction

The SHAMCI Certification Scheme Rules gives the requirements for SHAMCI certification of solar collectors and solar water heaters - and define the test methods to be used to check if requirements are fulfilled. Using same test methods and same conformity attestation, it is possible to compare certified test results and products on the same basis.

## 4 Definition of Selected Terms

### 4.1 SHAMCI Network

The SHAMCI Network is the framework for development, implementation and maintenance of the Solar Heating Arab Mark and Certification Initiative (SHAMCI). The Network consists of a group of regional and international experts, working under the umbrella of the Arab Ministerial Council for Electricity according to decree 217 of the twenty-eighth session of the Executive Office of the Ministerial Council of the Arab Electricity dated 8/1/2013. The Network includes representatives from certification bodies and testing laboratories and other relevant institutions from the Arab countries as well as observers from the private sector.

### 4.2 SHAMCI Secretariat

The SHAMCI Secretariat is managing and supporting the SHAMCI Network. It is hosted by the Regional Center for Renewable Energy & Energy Efficiency (RCREEE). RCREEE is acting as the legal body for the SHAMCI Network. The SHAMCI Secretariat in coordination with the Chairman of the Network is representing the Network and sign agreements at regional Arab and international level. The SHAMCI Secretariat manages the budget of the Network and the SHAMCI Secretariat in terms of revenues and expenses, and prepares the financial and technical reports to be presented to the network in the periodic meetings.

### 4.3 Conformity Body

The term of conformity body in this document denotes all relevant bodies responsible for the procedures to grant SHAMCI mark: Certification bodies, inspection bodies and testing laboratories.

### 4.4 Certification Body

The certification body is the body authorized for granting SHAMCI mark for solar collectors and solar water heaters. Certification bodies are specialized in quality control and conformity attestation.

### 4.5 Inspection Body

The inspection body (or the inspector) inspects the manufacturer's production lines and quality management systems. He is responsible for the initial inspection and periodic inspection and he select samples of the product for the testing labs.



## 4.6 Initial inspection

An initial physical inspection of the manufacturer's production line and the allocated quality management system and procedures. The initial inspection is done by the inspection body, who is then checking if the manufacturer and the production meets the requirements in the certification scheme.

## 4.7 Periodic Inspection

Inspection of production line is done periodically to check if the manufacturer always fulfils requirements in the certification scheme.

## 4.8 Quality Management System (QMS)

The procedures applied in an industrial facility on the production lines according to a specific quality management system in order to achieve continuously a certain quality level.

## 4.9 Test Labs

Test labs do the testing of collectors and solar water heaters according to the standards mentioned in this set of rules.

## 4.10 Conformity

The solar collectors and solar water heaters shall be in conformity with the requirements of the certification scheme rules and concerned standard specifications – meaning that they shall fulfil all the requirements.

### 4.11 SHAMCI mark

The SHAMCI (Solar Heating Arab Mark and Certification Initiative) mark is an attestation by the certification body, that the product fulfils requirements in the certification scheme and the relevant standards – a conformity attestation. The certification body gives the conformity attestation based on the inspection bodies' inspections of the production line and of the applied quality management system plus the test labs' testing of the product.

### 4.12 Solar Collector

A solar collector is a device designed to absorb solar radiation and to transfer the thermal energy so produced to a fluid passing through it [ISO 9488].

## 5 Products Covered by the Scheme

The scheme covers the following products:

- Solar thermal collectors as defined in scope of ISO 9806. ISO 9806 covers liquid heating collectors as well as air heating collectors, including concentrating collectors (tracking – as well as non-tracking).
- Solar water heating systems as defined in scopes of ISO 9459-2 and ISO 9459-5

### 5.1 List of Standards Concerned

The test methods from the following standards are available for the SHAMCI certification scheme:

#### 5.1.1 Solar collectors

- ISO 9806 “Solar energy — Solar thermal collectors — Test methods”

#### 5.1.2 Solar water heaters

The following two test methods are available for performance testing of solar water heaters. No other test methods for characteristics covered by these test methods shall be used.

- ISO 9459-2 - Solar heating -- Domestic water heating systems -- Part 2: Outdoor test methods for system performance characterization and yearly performance prediction of solar-only systems
- ISO 9459-5 - Solar heating -- Domestic water heating systems -- Part 5: System performance characterization by means of whole-system tests and computer simulation

The following test methods are available for testing of other characteristics than performance of solar water heaters. No other test methods for characteristics covered by the test methods below shall be used.

- EN 12976-2 - Thermal solar systems and components - Factory made systems - Part 2: Test methods

The standards are available for purchase from national standardization bodies and ISO standards are available as well from the ISO web page: [www.iso.org](http://www.iso.org)

## 6 Attestation of Conformity

The conformity attestation is based on 3rd party (independent) testing and inspection - see table 1.

| Attestation of Conformity  |  |              |                       |
|----------------------------|--|--------------|-----------------------|
| Activity group             | Activity   | Actor        |                       |
|                            |  | Manufacturer | 3 <sup>rd</sup> party |
| Testing / Inspection       | Initial type testing                             |              | X                     |
|                            | Sampling for initial type testing                |              | X                     |
|                            | Biannual detailed product inspection             |              | X                     |
| Factory production control | Factory production control (QMS)                 | X            |                       |
|                            | Initial inspection of factory production control |              | X                     |
|                            | Annual inspection of factory production control  |              | X                     |

Table.1: SHAMCI attestation of conformity is based on 3rd party testing and inspection.

QMS: Quality management system. X indicates the required activity and actor

## 7 Requirements for Involved Bodies

The bodies that can be engaged in the SHAMCI certification scheme are:

- Certification bodies
- Test labs
- Inspection bodies

The requirements for the bodies are defined in two steps/periods:

- An implementation period until end 2020
- The time after implementation – from beginning 2021

The requirements after implementation (from beginning 2021) will be accreditation of all involved bodies:

- Certification bodies according to: ISO/IEC 17065:2012. Conformity assessment -- Requirements for bodies certifying products, processes and services
- Inspection bodies according to: ISO/IEC 17020:2012. Conformity assessment -- Requirements for the operation of various types of bodies performing inspection
- Test laboratories according to: ISO/IEC 17025:2005. General requirements for the competence of testing and calibration laboratories

In the implementation period until end 2020, the requirements will be based on the requirements given in the above listed standards, but somehow relaxed – and without requirement for accreditation.

If a body has achieved the relevant accreditation already before the end of the implementation period, such accreditation will of course, give the body access to SHAMCI certification / testing / inspection.

### 7.1 General Requirements all Bodies

The general requirements are that:

- Certification bodies shall be authorized for SHAMCI certification by the SHAMCI Network
- Test labs and inspection bodies shall be recognized by one or more certification bodies which are authorized for SHAMCI certification by the SHAMCI Network.

### 7.2 Requirements for Certification Bodies

Annex I “Readiness Criteria for SHAMCI” describes the requirements for certification bodies.

An overview of the requirements for certification bodies is given in table 1 – and more details are given below in 7.2.1 and 7.2.2.

| Field of requirement                        | Until end of 2020  | From beginning of 2021  |
|---|--|---|
| Internal staff requirements                 | Specific requirements given in from Part 1 of annex I                                | Requirements as given in ISO/IEC 17065 – accredited by accreditation body member of IAF |
| External resources requirements: Testing    | Specific requirements given in Annex I of SHAMCI Certification Scheme Rules          |   |
| External resources requirements: Inspection | Specific requirements given in Annex I of SHAMCI Certification Scheme Rules          |   |
| All others requirements                     | Requirements as given in ISO/IEC 17065 – declared by signature of certification body |   |

Table 1. Overview of requirements for certification bodies

## 7.2.1 Requirements until end of 2020

Until end of 2020 some specific requirements are defined for experience of internal staff and use of external resources for testing and inspection:

- In the interim period until 31st of December 2020, it is a requirement that the person in charge of certification (signature on certificate/license) shall document at least 5 years' experience with accredited product certification. The documentation of experience is done by filling in table 2 shown below.
- Specific requirements until end of 2020 for external resources related to testing and inspection are given in SHAMCI Certification Scheme Rules Annex I.

| Name and present position: |                            |                          |
|----------------------------|----------------------------|--------------------------|
| Period                     | Certification Body         | Products                 |
| yyyy-mm-dd to yyyy-mm-dd   | Name of certification body | Product 1, Product 2, .. |
|                            |                            |                          |
|                            |                            |                          |
|                            |                            |                          |

Table 2. Documentation of experience with certification for the person in charge of certification

Apart from this, all other requirements given in ISO/IEC 17065 [1] shall be fulfilled – and shall be declared by signature of the certification body (accreditation is not required).

Part 1 in Annex I describes main parts of the ISO/IEC 17065:2012. Conformity assessment -- Requirements for bodies certifying products, processes and services.

## 7.2.2 Requirements from beginning of 2021

From beginning of 2021 accreditation according to ISO/IEC 17065 by accreditation body member of IAF will be required including in the scope:

- Testing of collectors according to ISO 9806 [2]
- Testing of solar water heaters according to ISO 9459-2 [3] and/or ISO 9459-5 [4] and EN 12976-2 [5]
- Inspection of production lines for solar collectors
- Inspection of production lines for solar water heaters

See also Annex I "Readiness Criteria for SHAMCI".

## 7.3.1 Requirements until end of 2020

Annex I "Readiness Criteria for SHAMCI" describes the requirements for test labs.

Until end of 2020 some specific requirements are defined SHAMCI test labs with respect to:

- Required tests: See Part 2 of Annex I
- Technical equipment: See Part 2 of Annex I
- Quality management system and staff qualifications at test labs: See Part 2 of Annex I

## 7.3.2 Requirements from beginning of 2021

From beginning of 2021 accreditation according to ISO/IEC 17025 [7] by accreditation body which is member of IAF will be required including in the scope:

- Testing of collectors according to ISO 9806 [2]
- Testing of solar water heaters according to ISO 9459-2 [3] and/or ISO 9459-5 [4] and EN 12976-2 [5]

## 7.4 Requirements for Inspection Bodies

### 7.4.1 Requirements until end of 2020

In the interim period until 31st of December 2020, it is a requirement that the person in charge of inspection (signature on inspection reports) shall be able to document at least five ISO 9001 inspections of at least three different production lines for different products. The documentation of experience is done by filling in table 3 shown below.

| Name and present position: |                            |                          |
|----------------------------|----------------------------|--------------------------|
| Period                     | Certification Body         | Products                 |
| yyyy-mm-dd to yyyy-mm-dd   | Name of certification body | Product 1, Product 2, .. |
|                            |                            |                          |
|                            |                            |                          |
|                            |                            |                          |
|                            |                            |                          |

Table 3. Documentation of experience for the person in charge of inspection

NB: The inspection could be done under the responsibility and direct control of the certification body.

### 7.4.2 Requirements from beginning of 2021

From beginning of 2021, accreditation by accreditation body which is member of IAF (International Accreditation Forum) will be required according to:

- For independent inspection bodies: ISO/IEC 17020 [1]
- For certification bodies with in-house inspectors: ISO/IEC 17065 [2]

The following shall be including in the scope of the accreditation:

- Inspection of production lines for solar collectors
- Inspection of production lines for solar water heaters

## 8 Requirements for Products

Collectors and solar water heaters shall fulfil requirements given in ANNEX - A.

- Requirements for collectors are given in ANNEX A1.
- Requirements for the solar water heaters are given in ANNEX A2.

## 9 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.

There is nothing preventing each certification body to design their application form according to their own requirements under the condition that this information must include the following documentation required in:

- Solar collectors: ANNEX B1
- Solar water heaters: ANNEX B2

## 10 Factory Production Control and Initial Inspection of Manufacturing Site

Initial inspection of the manufacturing site shall be done by a factory inspector fulfilling requirements mentioned in section 7. With this initial inspection, it is checked whether the manufacturing site fulfils the following requirements:

- The manufacturer shall operate a quality system covering the production line of the product for which the license to use the SHAMCI is granted and which should be based on the quality standards, which are at least of the level of the ISO 9000 series of standards.
- In granting the license, the 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 International Accreditation Forum (IAF).
- The quality management system shall cover the production line according to inspector's criteria.
- The inspection procedure and checklist given in Annex D shall be used.



In case the manufacturer is ISO 9001 certified by a certifier accredited by a national accreditation body being a member of IAF (International Accreditation Forum) ([www.iaf.nu](http://www.iaf.nu)), a SHAMCI factory inspection is only required every second year provided the ISO 9001 report is made available to the certifier.

Based on conclusions of previous audits, interim inspections can be requested by the certifier.

## 11 Selection of Type Test Samples

Selection of products for initial type testing according to concerned standard(s) (see section 5) is made by the factory inspector under the responsibility of the certification body.

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.

A series production exists when at least 10 collectors or systems are produced with the same materials and the same manufacturing technologies in the same way and all major production processes are performed in presence of the inspector.

At least 10 collectors or systems of the same type more than the number of test samples picked must be available in the stock for picking the sample(s) to be tested.

## 12 Surveillance

The required surveillance procedures are:

- The factory inspections/assessments shall include the checking of the documentation of the related FPC at least once a year
- Selecting samples for surveillance tests at least every second year. The surveillance test is a detailed physical inspection of the product and a comparison with the specifications of the original type tested sample. The procedure for the detailed physical inspection given in Annex D shall be used. The surveillance test shall be done at least every second year. 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.

## 13 Collector Families

### 13.1 Collector Families

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 subtype (within the same collector “family”). In this case, only one sample of the smallest and one sample of the largest module shall be taken and tested. The largest module shall be subject to all the tests required, and the smallest shall be subject to a thermal performance test. 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 temperature from 0 – 0.1 K/(W/m<sup>2</sup>). In other words, the efficiency curve used for this subtype shall be the one embracing the smallest area in this interval.

Durability and reliability tests shall be carried out on collectors representing the major features of the collector family. E.g. collector families with collectors having several glass covers separated by bars. If the largest size of the collector - the test laboratory can test - is smaller than the smallest size of the family representing the weakest point, another testing laboratory shall carry out the respective tests.

Note: Custom built collectors (collectors built on site) are so far not dealt with in the SHAMCI certification scheme rules - but may be included at any time when decided by the SHAMCI Network.

### 13.2 Use of different collector components with same characteristics

Absorber coatings listed at the SHAMCI website as interchangeable may be used.

Collector glazing listed at the SHAMCI website as interchangeable may be used.

## 14 Changes in products – re-testing

The SHAMCI license for marking the product is not valid if the 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 certified 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.

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 documentation and the possible required testing and inspection, the manufacturer can mark the modified products.

## 15 Complaints

Complaints concerning the conformity of a certified product are handled by the certification body according to its normal procedures. Serious complaints shall be reported to the SHAMCI Network by the responsible certification body. In connection with a complaint, a “Special test or inspection” can be performed - see ANNEX F.

## 16 Harmonized reporting format for SHAMCI reports and certificates

Results from type testing shall be given in the format specified in the SHAMCI annexes C1 (Collector datasheet) and C2 (Solar Water Heater datasheet).

The report format for inspection reports given in SHAMCI scheme rules Annex E shall be followed.

A template for a SHAMCI certificate is given in Annex I of SHAMCI Certification Scheme Rules.

## 17 Authorization of Bodies

### 17.1 Authorization of Certification Bodies for SHAMCI certification

Until 31<sup>st</sup> December 2020 the SHAMCI Network, based on the signed declaration from the certification body (see Part 1 of Annex I), finally authorizes the certification body for SHAMCI certification.

After 1<sup>st</sup> January 2021 the SHAMCI Network, based on the accreditation certificate, finally authorizes the certification body for SHAMCI certification. The accreditation certificate shall be published at the SHAMCI website.

### 17.2 Authorization of Test Labs for SHAMCI Testing

A test lab shall have recognition from a SHAMCI certification body for SHAMCI testing. The certification body shall check if the test lab fulfils the requirements in the SHAMCI Certification Scheme Rules including Annex I – based on an application documenting that the requirements are fulfilled.

The test lab is finally authorized for SHAMCI testing by the SHAMCI Network, based on a recommendation from at least one SHAMCI certification body – documentation from the test lab shall be available to all SHAMCI certification bodies upon request.

After 1<sup>st</sup> January 2021, the accreditation certificate of the test lab shall be published at the SHAMCI website.

### 17.3 Authorization of Inspection Body for SHAMCI Inspection

An inspection body shall have recognition from a SHAMCI certification body for SHAMCI inspection. The certification body shall check if the inspection body fulfils the requirements in the SHAMCI Certification Scheme Rules including Annex I – based on an application documenting that the requirements are fulfilled.

The inspection body is finally authorized for SHAMCI inspection by the SHAMCI Network, based on a recommendation from at least one SHAMCI certification body – documentation from the inspection body shall be available to all SHAMCI certification bodies upon request.

After 1<sup>st</sup> of January 2021, the accreditation certificate of the inspection body shall be published at the SHAMCI website.

## 18 List of SHAMCI Operating Bodies

An updated list of authorized certification bodies and recognized inspection bodies and testing laboratories shall be available at the SHAMCI website: [www.shamci.net](http://www.shamci.net)  
The SHAMCI Secretariat shall update the list when required.

## 19 List of Certified Products

An updated list of certified products giving information on product characteristics and performance in a fixed format (see Annex C) shall be available at the SHAMCI website: [www.shamci.net](http://www.shamci.net)

The SHAMCI Secretariat shall update the list when required based on inputs from the SHAMCI certification bodies.

## 20 Owner of the SHAMCI Trade Mark

The owner of the SHAMCI mark is the SHAMCI Network. The network is legally represented by RCREEE as its secretariat.

## 21 Updating the SHAMCI Certification Scheme Rules

The SHAMCI scheme rules should be updated - if necessary - once every 2 years taking into account the decisions made in the meantime.

## 22 Disclaimer

The SHAMCI Network does not take responsibility for any damage, accident or loss of money or honour, which may be caused by implementation of these scheme rules or caused by use or handling of certified products.

## 23 References

- [1] ISO/IEC 17065:2012. Conformity assessment -- Requirements for bodies certifying products, processes and services.
- [2] ISO 9806:2013 Solar energy — Solar thermal collectors — Test methods
- [3] ISO 9459-2 :1995 Solar heating -- Domestic water heating systems -- Part 2: Outdoor test methods for system performance characterization and yearly performance prediction of solar-only systems
- [4] ISO 9459-5:2007 Solar heating -- Domestic water heating systems -- Part 5: System performance characterization by means of whole-system tests and computer simulation
- [5] EN 12976-2:2006. Thermal solar systems components. Factory made systems. Test methods
- [6] ISO/IEC 17020:2012. Conformity assessment -- Requirements for the operation of various types of bodies performing inspection
- [7] ISO/IEC 17025:2005. General requirements for the competence of testing and calibration laboratories

## 24 List of ANNEXES

SHAMCI annexes are available in a separate document. All annexes are available from [www.shamci.net](http://www.shamci.net)

|          |  |
|----------|--|
| ANNEX A1 | Requirements - collectors  |
| ANNEX A2 | Requirements - solar water heaters   |
| ANNEX B1 | DOCUMENTATION OF THE SOLAR COLLECTOR   |
| ANNEX B2 | DOCUMENTATION OF THE SOLAR WATER HEATER  |
| ANNEX C1 | COLLECTOR DATA SHEET   |
| ANNEX C2 | SOLAR WATER HEATER DATA SHEET  |
| ANNEX D  | FACTORY PRODUCTION CONTROL   |
| ANNEX E  | INSPECTION REPORTS   |
| ANNEX F  | SPECIAL TEST   |
| ANNEX G  | International standards adopted in AIDMO for SWH                                 |
| ANNEX H  | Checklist for test labs concerning availability of standards and competence      |
| ANNEX I  | Readiness Criteria for SHAMCI,<br>Certification Body-Testing Facility-Inspectors |



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