

Comparison between European and Arab SWH Quality Certification Schemes

Differences between SHAMCI and Solar Keymark according to Scheme Rules

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List of Abbreviations

AIDMO	Arab Industrial Development and Mining Organization
AMCE	Arab Ministerial Council of Electricity
CEN/CENELEC	European Committee for Standardization
EFTA	European Free Trade Association
EOS	Egyptian Organization for Standards and Quality
ESTIF	European Solar Thermal Industry Federation
EU	European Union
GSC	Global Solar Certification
GSCN	Global Solar Certification Network
GSWH	Global Solar Water Heating Market Transformation and Strengthening Initiative
IIIEE	International Institute for Industrial Environmental Economics at Lund University, Sweden
JSMO	Jordan Standards and Metrology Organization
LAS	League of Arab States
LCEC	Lebanese Center for Energy Conversation
MENA	Middle East and North Africa
NREA	New and Renewable Energy Authority of Egypt
PTB	Physikalisch-Technische Bundesanstalt
QI	Quality Infrastructure
RCREEE	Regional Center for Renewable Energy and Energy Efficiency
REEE II	Renewable Energy and Energy Efficiency Programme in Jordan
SCF	Solar Certification Fund
SHAMCI	Solar Heating Arab Marks and Certification Initiative
SK	Solar Keymark
SKN	Solar Keymark Network
SWH	Solar Water Heater
IAF	International Accreditation Forum

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1 Preface

This paper compares between the certification schemes and quality mark of solar water heaters (SWH) in Europe; represented by the Solar Keymark (SK) and the Solar Heating Arab Marks and Certification Initiative (SHAMCI). The paper also discusses the expected benefits of realizing a harmonization between the two previously mentioned schemes, highlighting current and possible future cooperation.

For more detailed information, please refer to the listed references or contact SHAMCI's Program Manager; Eng. Ashraf Kraidy¹.

2 Overview of Certification Schemes

2.1 Solar Keymark [1]

The Solar Keymark is a voluntary third-party certification mark for solar thermal products, demonstrating to end-users that a product conforms to the relevant European standards and fulfills additional requirements. The Solar Keymark is used in Europe and increasingly recognized worldwide.

2.2 Solar Heating Arab Marks and Certification Initiative (SHAMCI) [2]

The Solar Heating Arab Mark and Certification Initiative (SHAMCI) is the first quality certification scheme for the solar thermal products and services in the Arab region and developing countries.

SHAMCI is based on Solar Keymark, the regional European certification scheme, while tailored to fit developing countries' conditions. For a thorough introduction about SHAMCI and the latest updates about the project, please refer to **Appendix (1)**.

3 Cooperation between SHAMCI and Solar Keymark [3]

3.1 Cooperation with Solar Keymark Network (SKN)

In 2016, the SHAMCI team has presented a proposal to the Solar Certification Fund (SCF) 8th call; a financing project set up in 2009 by the Solar Keymark Network (SKN) in cooperation with the European Solar Thermal Industry Federation (ESTIF) to support activities concerning the development and promotion of the Solar Keymark certification scheme and related standards. The proposal was presented under the priority issue of *promotion*, discussing the impact of SHAMCI in promoting for SK in the Arab region on one hand and its

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eligibility for receiving SCF support as a partner quality certification scheme to SK in this regard.

The proposal was discussed on the 22nd Solar Keymark Network (SKN) meeting. Since the mentioned *promotion* priority issue is geographically limited to where SK applies, it was suggested that SHAMCI's proposal should reapply for SCF 9th call, under a new priority issue specially designed for supporting new international certification schemes, such as SHAMCI.

3.2 Harmonization between SHAMCI and Solar Keymark

In March 2017 on the 22nd SKN meeting in Freiburg, Germany and as a result of productive cooperation and communication efforts from the SHAMCI Secretariat side, coordinated by Eng. Ashraf Kraidy, the SKN has unanimously approved the following decision:

*"The Solar Keymark Network highly appreciates the activities performed by SHAMCI in order to strengthen the quality and reliability of solar thermal products in the Arab region. Furthermore, the Solar Keymark Network would be in favor of a **harmonization of the testing, inspection and certification procedures** of SHAMCI and Solar Keymark under the umbrella provided by the Global Solar Certification Network (GSCN). A working group composed of members of SHAMCI and SKN will study the impact of a collaboration between both parties and present its conclusions in the SKN meeting of October. If these conclusions are positive, it may be possible to enter a project related to the elaboration of the cooperation between SKN and SCHAMCI **as a priority issue in the 9th SCF call**, as well as it will be eligible for similar projects to submit future proposals according to specific criteria proposed by the SCF Steering Group and the SKN"*

The decision came as a strong statement in favor of SHAMCI. It also paves the road for applying further proposals to the SCF. The current members of the working group previously mentioned in the decision statement are:

- Ashraf Kraidy; SHAMCI Network Secretary and Chair of the Working Group
- Emmanuelle Legers; French Certification Body
- Harald Drucek; Chair of the Global Solar Certification Network (GSCN)
- Jaime Fernandez; Chairman of SKN, Spanish Certification Body
- Jan Erik Neilson; Manager of SKN and GSCN
- Jean Batiste; French Certification Body
- Katharina Meyer; DIN CERTCO (German Certification Body)
- Korbinian Kramer; Fraunhofer Institute
- Pedro Diaz; Secretary General of European Solar Thermal Industry Federation



3.3 Expected benefits of the harmonization between SK and SHAMCI

In case of establishing the previously proposed harmonization, this kind of cooperation between both schemes is expected to present mutual benefits in three major ways. Figure (...) represents main ideas of the expected benefits. The following subsections discuss these ideas in more detail.

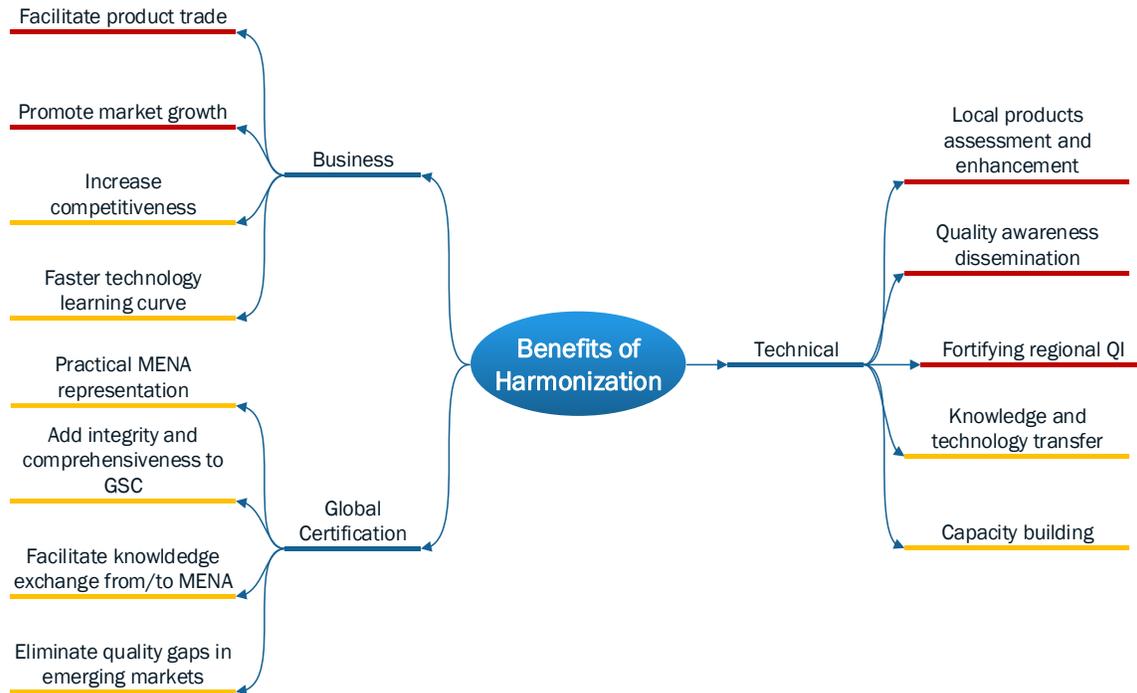


Figure 1 Mind map of harmonization benefits between SHAMCI and SK

(a) Technical Benefits

As the first quality certification scheme in the region, SHAMCI can be an effective tool of assessing local products and offering manufacturers the opportunity to enhance their quality. This will inevitably lead to local value chain development.

At the same time, SHAMCI requirements will ensure a benchmark to be met by the involved quality bodies. Hence, the process of SHAMCI implementation ensures fortifying the regional quality infrastructure. Also, SHAMCI will help to disseminate quality awareness among all stakeholders; including customers. Through capacity building and knowledge and technology transfer, SHAMCI – SK harmonization can thus accelerate and magnify the previously discussed technical benefits.

(b) Business Benefits

Due to the strong technical and conceptual ties between them, SHAMCI can be regarded as a new family member of SK. Thus, it can facilitate introducing SK (or globally) certified



SWH products to the region's emerging markets smoothly and widely. The foreseen expansion in product trade is due to that SHAMCI can act as the regional technical arm to SK in light of the proposed harmonization. Thus, providing manufacturers and suppliers in Europe with reliable information about technical challenges/requirements and regional market trends.

Accordingly, in the short run SHAMCI guarantees regional market growth and local value chain development, while in the medium and long run it can assist European manufacturers and suppliers to expand their market share and penetration of the new emerging markets with the right products. Furthermore, the new dynamic SHAMCI promotes for adds to the competitiveness of the international SWH market and hence, encourages a faster and better technology learning curve.

(c) Benefits concerned with Global Certification

By engaging the region of the Middle East and North Africa (MENA) into the current efforts towards a global solar thermal certification scheme, the success of the intended global scheme in terms of integrity and comprehensiveness is to be stronger. This is due to the fact that SHAMCI will be practically representing the region's specific technical characteristics, encountered challenges and needed resolutions to promote for solar thermal technologies and further develop the regional market.

Harmonization and support from SKN (and GSCN) can help SHAMCI in its initial phases to overcome hindering factors of its development. Thus, guaranteeing that SHAMCI offers its expected contribution towards global certification in a shorter time. Once implemented and stabilized SHAMCI can actively contribute to the knowledge exchange to and from the MENA region.

Moreover, through supporting SHAMCI, eliminating product quality gaps between regions with already existing certification schemes and emerging markets can be faster, more effective and systematic. Therefore, supporting SHAMCI can be regarded as a regional pre-step for global harmonization under the umbrella of GSC.

4 Comparison between SHAMCI and Solar Keymark [4] [5]

4.1 Basic Differences

Table 1 below gives an overview of the core differences in which SHAMCI and SK differ, where the basic aspects can be categorized into:

A. Non-technical:

- (1) Stakeholders involved in each scheme



(2) Differences regarding the interaction among stakeholders and conformity bodies² of each scheme

B. Technical:

(1) Scope of the scheme; consequently, the international standards concerned

(2) Accreditation requirements

(3) Detailed specifications of some processes; e.g. surveillance (conditions for product complete re-testing), methods of sample selection, frequency of database updating, ... etc.

The following sections elaborate on these differences in more details.

Table 1 Basic Differences between SHAMCI and SK

	SHAMCI	SOLAR KEYMARK
Key Stakeholders	RCREEE, AIDMO and SHAMCI network	ESTIF, CEN and SKN
Scope (Products covered)	<ul style="list-style-type: none"> • Solar thermal collectors (ISO 9806) • Solar water heating systems (ISO 9459-2 and -5) 	<ul style="list-style-type: none"> • Solar thermal collectors (ISO 9806) • Factory made³ solar thermal systems (EN 12796) • Custom built systems (EN 12977-1 and -2) • Solar water heater stores (EN 12977-3) • Solar combistores (EN 12977-4) • Control equipment (EN 12977-5)
Concerned Standards	<ul style="list-style-type: none"> • ISO 9806 for solar collectors • ISO 9459-2 and -5 for solar domestic water heating systems • EN 12796-2 for test methods of factory made systems, other than performance testing 	<ul style="list-style-type: none"> • EN 12975 and EN ISO 9806 for solar collectors • EN 12976 (ISO 9459-2 and -5) for factory made systems • EN 12977 for custom built systems

² Conformity bodies are relevant entities participating in the certification, testing and inspection processes to grant the quality mark (SHAMCI Certification Scheme Rules; 4.3. Conformity Body)

³ Factory made systems are as designed by the manufacturer, with no customized modifications



	<ul style="list-style-type: none"> • Or equivalent <i>national standards</i> 	<ul style="list-style-type: none"> • EN 15316-4-3 for heating systems in buildings, method for calculation of system energy requirements and system efficiencies
<p>Accreditation⁴</p>	<ul style="list-style-type: none"> • During the interim period (until 31st Dec 2020): <u>NO ACCREDITATION REQUIRED</u> • Starting 1st Jan 2021: <u>ACCREDITATION REQUIRED</u> 	<ul style="list-style-type: none"> • <u>ACCREDITATION REQUIRED</u>

4.2 Non-technical Differences

4.2.1 Stakeholders

Due to the nature of the scheme and the region of focus, the interested parties in SHAMCI and SK differ accordingly. Figure 1 distinguishes the stakeholders of SHAMCI and their respective role in the scheme, while Figure 2 refers to the SK stakeholders.

Two core differences between both SHAMCI and SK are:

(a) SK is industry-based, while SHAMCI is national-based;

In the purpose of unifying the testing of solar thermal products and facilitating their trade across Europe, ESTIF has formulated the scheme rules of the SK under the framework of an EU co-financed project from 2000 to 2003: Solar Keymark I, where CEN/CENELEC is the owner of the SK Mark [6].

As for SHAMCI, under the delegation of the Arab Ministerial Electricity Council and in cooperation with AIDMO, RCREEE has initiated the SHAMCI project. The aim is to leverage opportunities on a regional scale for achieving production economies of scale, facilitating trade barriers and promoting industrial quality standards compliance. As the first standardization and certification program for SWHs, SHAMCI aims at providing a base for promoting regional compliance, improving and expanding SWH markets through offering better quality standards and consumer confidence and integrating national SWH markets in the regional market via adopting common standards [7].

⁴ For more details about differences regarding accreditation requirements, please refer to **subsection 4.3.3**

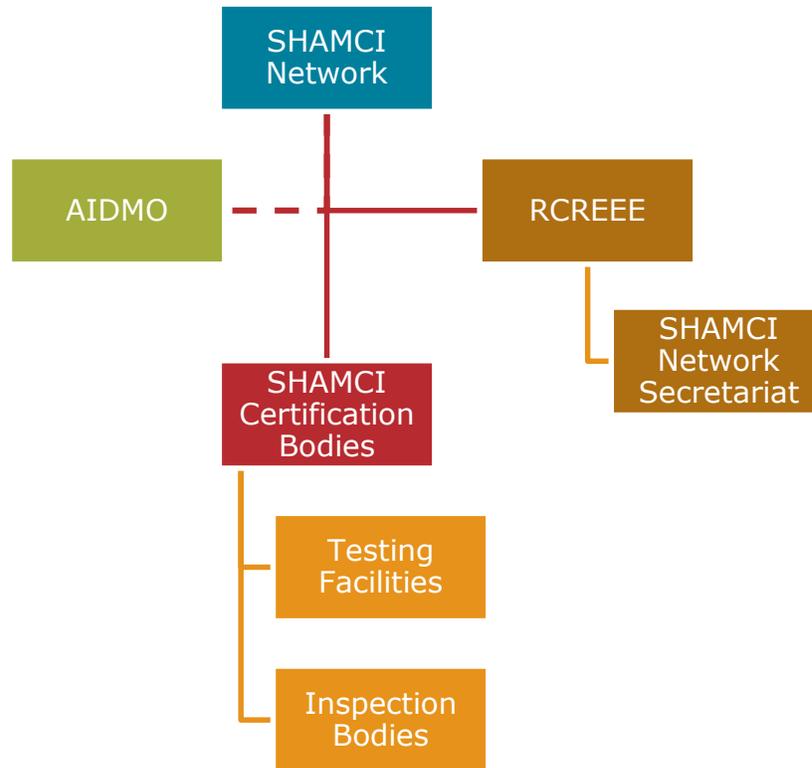


Figure 2 SHAMCI Stakeholders

(b) The interrelation among stakeholders are stronger in SK;

Since the certification bodies are active participants of the CEN under the umbrella of EU, EFTA and ESTIF, the harmonization of SK scheme among all European countries was facilitated. On the other hand, SHAMCI scheme requires accordance and compliance of different national certification bodies [3].

4.3 Technical Differences

4.3.1 Scope

As a newborn scheme, SHAMCI is only concerned with the main components/systems of solar thermal, which are: Solar Collectors (as defined in ISO 9806) and Solar Water Heating Systems (as defined in ISO 9459-2 and ISO 9459-5) [4]. Future scope extension/modification is possible based upon relevant decisions by the SHAMCI network.

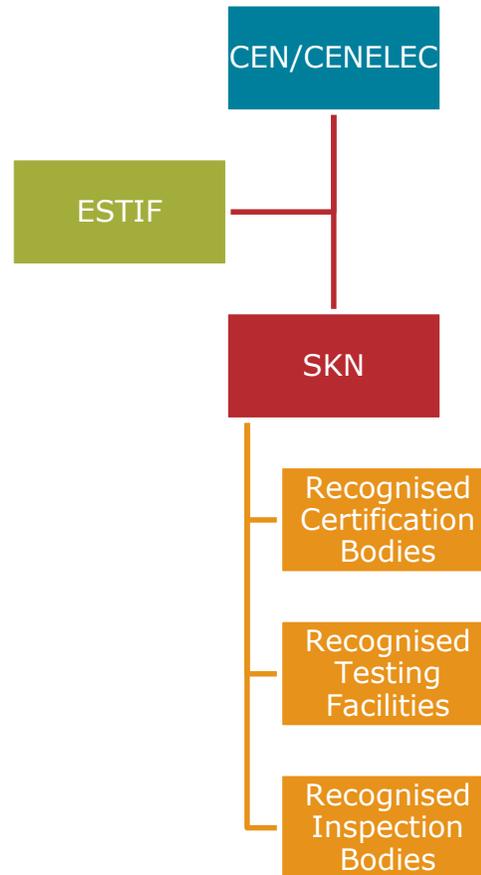


Figure 3 SK Stakeholders

On the other hand, SK includes the same products in the SHAMCI scope in addition to custom-made systems and combisystems. Examples of custom-made systems are roof integrated collectors that do not utilize factory made modules and are assembled directly on the place of installation, while the combistores are solar heating systems for combined space and water heating. The latter is mainly used in European countries with space heating demand. The list of products included in the SK scope are mentioned previously in Table 1.

4.3.2 Concerned Standards

Due to the difference in scope, SK is concerned with two additional standards compared to SHAMCI. These two standards are [5]:

(1) EN 12977 for custom built systems:

- a. EN 12977-1: Thermal solar systems and components - Custom built systems — Part 1: General requirements for solar water heaters and combisystems
- b. EN 12977-2: Thermal solar systems and components - Custom built systems — Part 2: Test methods for solar water heaters and combisystems
- c. EN 12977-3: Thermal solar systems and components - Custom built systems — Part 3: Performance test methods for solar water heater stores



- d. EN 12977-4: Thermal solar systems and components - Custom built systems – Part 4: Performance test methods for solar combistores
- e. EN 12977-5: Thermal solar systems and components - Custom built systems – Part 5: Performance test methods for control equipment

(2) The scheme also refers to the procedure for calculating the output of a solar water heating system given in:

EN 15316-4-3: Heating systems in buildings – Method for calculation of system energy requirements and system efficiencies – Part 4-3: Heat generation systems, thermal solar systems.

It is important as well to consider that in SK, all standards are harmonized in all participating countries under the umbrella of the EU regulations (EN ISO standards). In SHAMCI, participating countries have the right to apply the applied national standards that equate the required ISO standards.

4.3.3 Accreditation Requirements

In contrast to the current SK requirements, SHAMCI has a time-based approach concerning accreditation requirements of the conformity bodies. SHAMCI Certification Scheme Rules identifies until 31st December 2020 as a starting transition period, the “**interim period**”, in which no *international* accreditation is required. However, fulfilling the specific minimum requirements stated in Annex I (Readiness Criteria) of the SHAMCI certification scheme rules is a must.

After the end of the interim period and starting **1st January 2021**, accreditation requirements with relevance to the bodies (certification, testing or inspection) shall be implemented as given in ISO/IEC 17065. The accreditation shall be fulfilled by an accreditation body member of IAF member [4].

As for SK, the Solar Keymark – Specific Scheme Rules [5], under the section concerned with the requirements and assessment procedures of engaged bodies (**2.1. Requirements for certification, testing and inspection bodies**), state that:

*“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...”*

4.3.4 Specific Technical Differences

(a) Surveillance Procedure:

Surveillance is a monitoring process to assess the conformity of licensed products with the requirements of the quality mark. The first major difference between the surveillance process of SHAMCI and of SK, is that in SHAMCI surveillance requires



complete retesting. This may be due to the fact that the process of inspection and testing in the Arab countries is less expensive than in Europe [3].

In both schemes, SHAMCI and SK, periodic surveillance is conducted by the empowered certification body at the same frequency. The surveillance process consists of checking the documentation of the related factory production control at least once every year, as well as selecting samples for testing at least every second year. However, the procedure differs between SHAMCI and SK as shown in briefly in Table 2 below.

Table 2 Differences in Surveillance Procedure [4] [5]

	SHAMCI	SOLAR KEYMARK
1. Procedure of surveillance test referred to <i>Annex D</i> of SHAMCI Scheme Rules – Factory Production Control	... referred to <i>Annex A2</i> of SK Specific Scheme Rule – Surveillance Test
2. Complete re-testing at least every second year.	... if the initial date of SK certification or the last complete re-testing was more than 10 years ago.
3. Selection of samples for testing from <i>current production</i> or from <i>the stock</i> of the manufacturer.	... from <i>current production</i> or from <i>the market</i> .

The first major difference between surveillance in SHAMCI and that in SK is the annex – hence the procedure – upon which the surveillance relies. In SHAMCI, surveillance follows the procedure prescribed in **Annex D**, which is in fact *identical* to the case of SHAMCI initial inspection. However, complete re-inspection is not necessary for surveillance. The relevant certification body decides, based on inspection audits and reports of the two years prior to surveillance, whether complete re-inspection is needed or not. For more details concerning the specific differences between both annexes of surveillance, please refer to **Appendix (3)** of this document.

The second major difference is the flexibility SHAMCI permits to the responsible national certification body in the implementation of the surveillance procedure. Hence, due to the differences in national and internal regulations, some countries may have tougher surveillance procedures. Yet, the baseline of the minimum surveillance requirements is as prescribed in SHAMCI Scheme Rules and Annexes.

**(b) Complaints and special tests:**

Complaints can be categorized into two major groups: *complaints against the conformity of a certified product*, and *complaints against bodies engaged in the certification scheme*.

In case of complaints about certified products, there are no major differences between the procedure followed in SHAMCI and in SK. In the SK scheme, the procedure follows the regulations mentioned in section (**10.5 Complaints**) and section (**7.4 Appeal Procedures**) of the CEN/CENELEC internal regulations – Part 4 [8]. While in SHAMCI, according to section (**15 Complaints**) in SHAMCI certification scheme rules [4], each relevant certification body is entitled the responsibility of receiving and handling a complaint concerning non-conformity of a certified product. The procedure follows the internal regulations and complaint procedures of the concerned certification body. Additionally, as it is the case in SK, a special test (as indicated in **Annex F** of SHAMCI certification scheme rules) can be requested referring to the received complaint. In case of serious complaints, the SHAMCI network shall be informed and the complaints shall be reported [4]. It has been requested to discuss the criteria defining complaints *seriousness* in the next SHAMCI Network meeting [9]. The flowchart represented by Figure 3 outlines the process of complaining against product conformity within SHAMCI.

In case of complaints against conformity bodies engaged in the certification process, only SK has a concrete procedure for complaints against testing and inspection bodies referred to in section (**2.2 Handling complaints on bodies engaged in testing and inspection**) [5]. Thus, the procedure of effectively handling complaints against engaged bodies within the SK scheme is harmonized. The procedure is also expected to include certification bodies as well in the near future. Complaints follow the details explained in **Annex Ia** (which offers the complaint form) and **Annex Ib** (displaying explanatory diagrams of the complaint undertaken steps).

Inspired by the procedures discussed in SK **Annex Ia** and **Ib**, the following Figures 4 and 5 offer proposed procedures for complaints against engaged bodies that may be adapted by SHAMCI⁵.

⁵ As discussed with Eng. Ashraf Kraidy, 07.08.2017



Comparison between SHAMCI and Solar Keymark

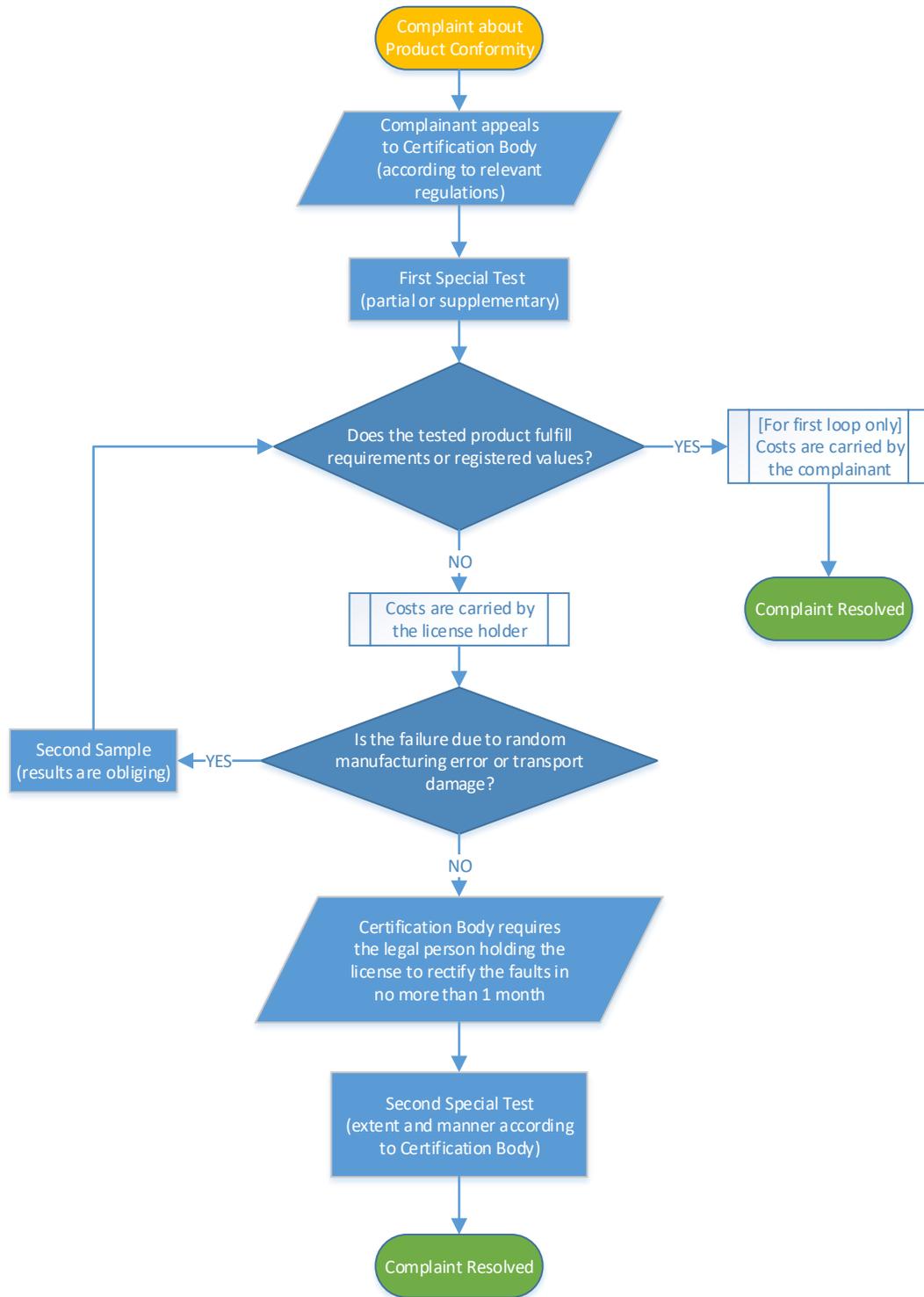


Figure 4 Flowchart of Complaint Procedure against Product Conformity in SHAMCI

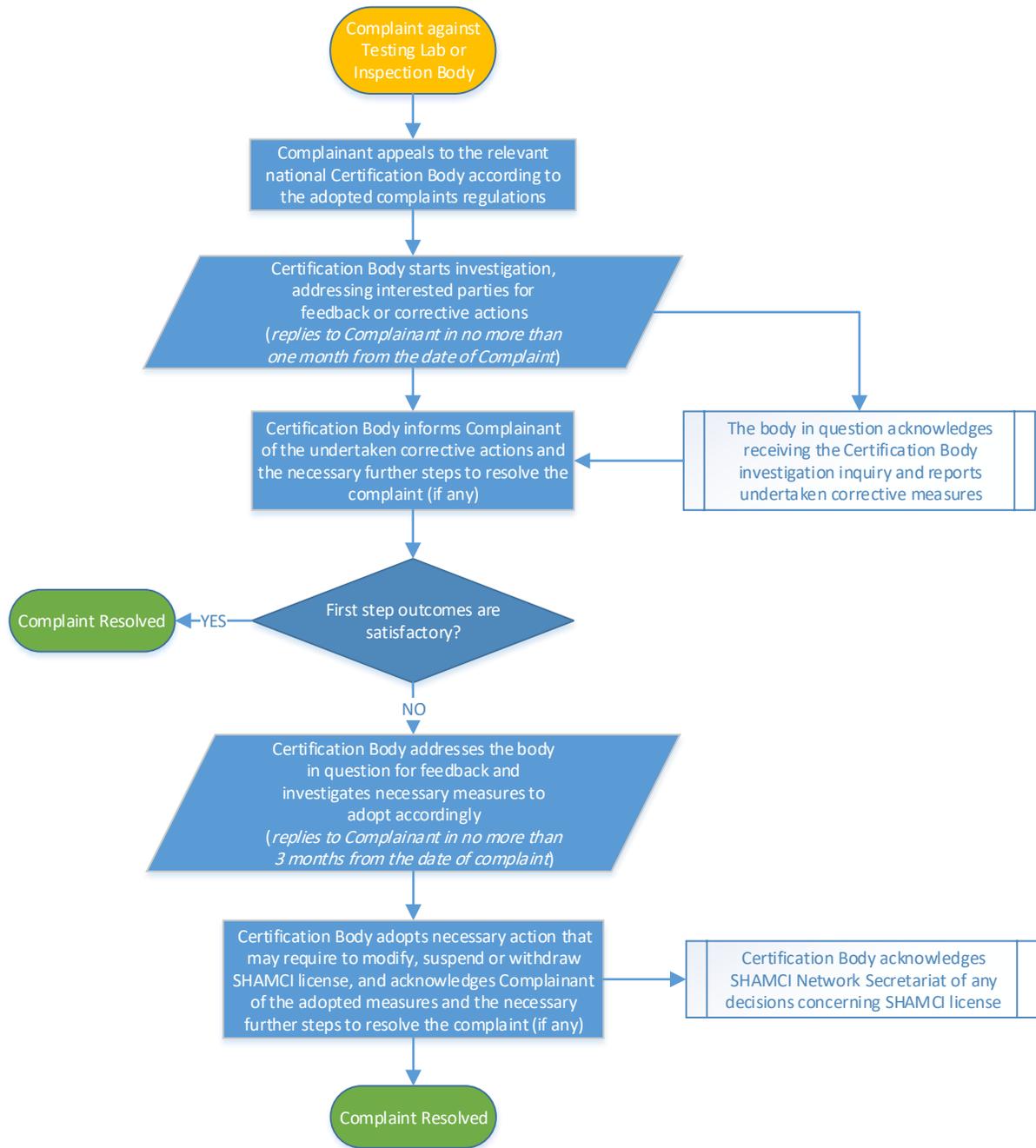


Figure 5 Flowchart of Proposed Procedure for Complaints against Testing Labs and Inspection Bodies in SHAMCI

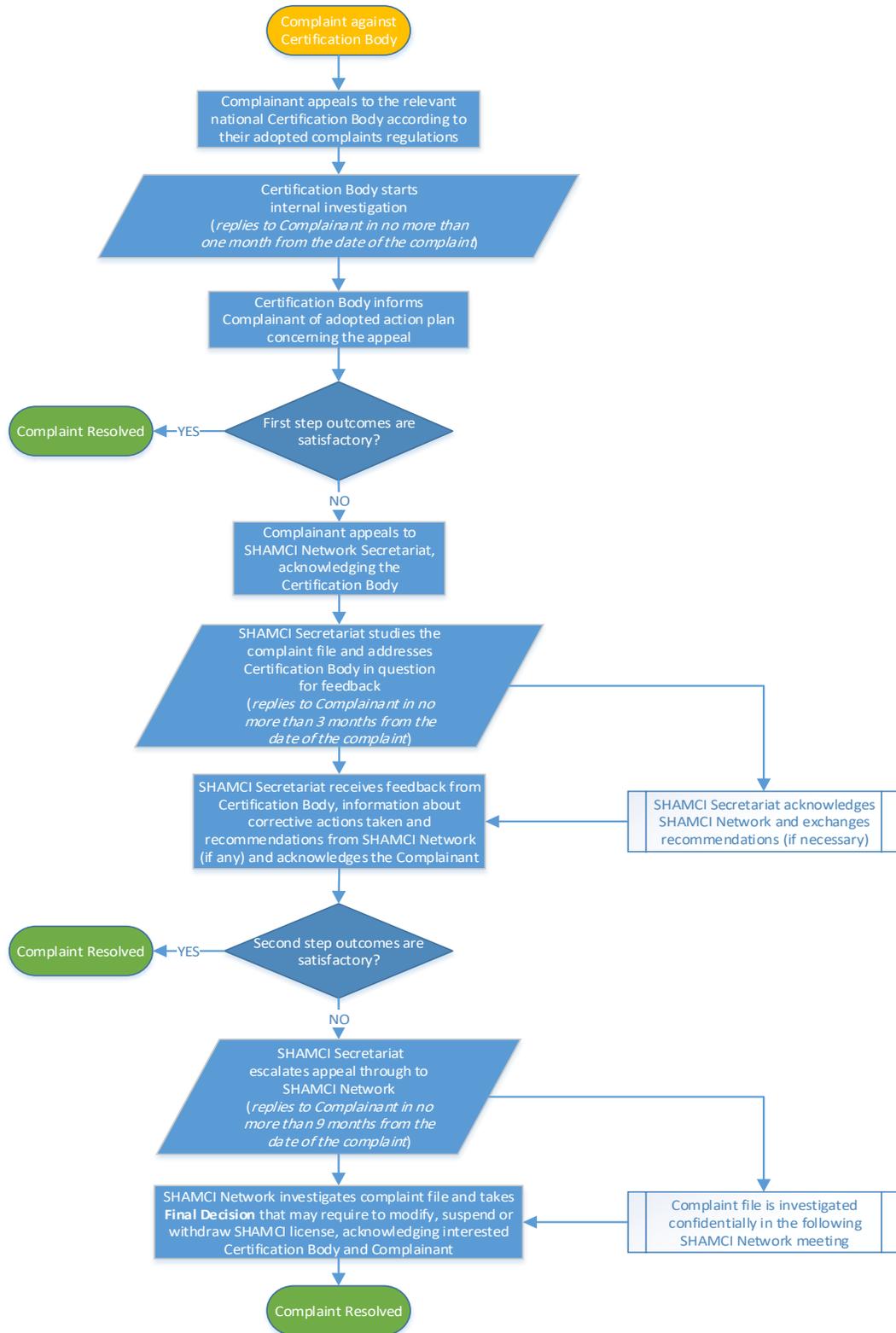


Figure 6 Flowchart of Proposed Procedure for Complaints against Certification Bodies in SHAMCI



(c) **Methods of Sample Selection:**

Selecting test samples is a very important process, since it is the initial step to start the product testing whether for initial type testing, surveillance or special test. According to both scheme rules of SHAMCI and SK, the responsibility of the sample testing lies upon the certification body. An empowered inspector by the certification body conducts the selection process of the sample(s), either from the manufacturer's current production line or from stock. In case of selecting from stock, at least *10 products* of the same type more than the number of test samples picked for testing must be available in the stock. The inspector records the test sample(s) and their serial numbers upon selection.

The only difference between SHAMCI and SK regarding sample selection, is the types of methods applied for selecting samples. Apart from the ordinary physical selection applied in both schemes, remote random sampling procedures are also available and utilized in SK. Section (**4.1.1. Remote Random Sampling Procedure**) in SK Specific Scheme Rules states the following three additional methods to be used [5]:

- Internationally operating inspection companies
- Videosampling
- Photosampling

Further documents by the SKN: (SKN_N0126R1) and (SKN_N0127R0), provide specific instructions, detailed procedures and requirements for the aforementioned selection methods.

(d) **Additional Requirements:**

In case of SK, additional technical requirements may be required for specific systems. Section (**10 Additional Requirements for obtaining the License**) in SK Specific Scheme Rules refers that some large solar collectors have to be CE-marked⁶. This is a result of the wide scope of products that SK has, including custom-built systems.

(e) **Frequency of Updating Databases:**

Updating and modifying the specific scheme rules are the responsibility of the quality mark network; SHAMCI network for SHAMCI and SKN for SK. Also for maintaining credibility and transparency, a database of all licensed products is to

⁶ The difference between SK and CE-mark: SK is a quality label, while CE-mark is a legal attestation of minimum legal requirements according to specific European directives regulating specific industrial goods (Website: The Solar Keymark, CEN Keymark Scheme; Certified Products: What is the CE marking of solar collectors? Retrieved 27.04.2017)



be available on the website of each scheme. This database of products/licenses is to be updated by the network secretary of the respective scheme [4] [5].

The following table (Table 3) shows how often the scheme rules and licensed product database are updated for each scheme, based on sections (**19 list of Certified Products**) and (**21 Updating the SHMACI Certification Scheme Rules**) of SHAMCI Certification Scheme Rules, and sections (**16 Updating Solar Keymark scheme rules**) and (**17 Updating Solar Keymark database**) of SK Specific Scheme Rules.

Table 3 Scheme Rules and Database Updating

	SHAMCI	SOLAR KEYMARK
Scheme Rules	Updated <i>-if necessary-</i> once every 2 years .	Updated once every year .
Product/Li- censes Database	Updated when required according to inputs from SHAMCI certification bodies.	Updated every 2 weeks according to information from certification bodies about issued and withdrawn certificates.

(f) Comparison between Annexes:

Due to the technical overlap between SHAMCI and SK schemes, some annexes of relevant quality assurance procedures are either common or similar – for example annexes for inspection reports. **Appendix (2)** of this paper provides an overview of common, similar and different annexes of both SHAMCI and SK.

Also as mentioned earlier in part (a), **Appendix (3)** compares surveillance procedures in SHAMCI and SK, based on the differences in the relevant scheme rules annexes.



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