Solar Thermal Quality Infrastructure in Cyprus

IRENA - CYPRUS EVENT ON RENEWABLE ENERGY APPLICATIONS FOR ISLAND TOURISM Intercontinental Hotel, Aphrodite Hills Paphos, Cyprus
29-30 May 2014

George Roditis
Head of the Applied Energy Laboratory

Applied Energy Laboratory

Energy Service, Ministry of Energy, Commerce, Industry and Tourism of the Cyprus Republic

The first test rig in Cyprus

Solar thermal quality infrastructure

- **Standards** *Set the methods for testing solar thermal components and systems in terms of performance, reliability and durability*
- **Certification schemes**
- **Solar thermal laboratories**

Standards

Solar thermal collectors :

- *EN 12975-1 Thermal solar systems and components – Solar collectors - Part 1: General Requirements*
- *ISO 9806:2013 Solar Energy – Solar thermal collectors – Test methods*

Solar thermal systems:

- *EN12976-1 Thermal solar systems and components – Factory made systems - Part 1: General Requirements*
- *EN12976-2 Thermal solar systems and components – Factory made systems - Part 2: Test methods*

The standards are precise; define procedures for testing solar thermal technologies in terms of performance, reliability, durability and safety under well-defined and repeatable conditions

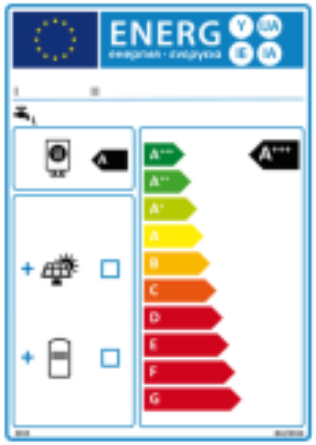
Thermal solar quality infrastructure

- **Standards** *Set the methods for testing solar thermal components and systems in terms of performance, reliability and durability*
- **Certification schemes** *Set out the procedures for certifying that products meet standards and other additional requirements*
- **Solar thermal laboratories**

Certification schemes in Cyprus labelling and marking (Voluntary)

- 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.
- The Solar Keymark was developed by the European Solar Thermal Industry Federation (ESTIF) and CEN (European Committee for Standardization) in close co-operation with leading European test labs and with the support of the European Commission. It is the main quality label for solar thermal products and is widely spread across the European market and beyond.
- The infrastructure in Cyprus for testing and certifying solar thermal products for "Solar Keymark" is accommodated by the Applied Energy Laboratory and the two local CEN empowered Certification Bodies for granting certification.
- **Today, the collectors of eight local manufactures are equipped with the Solar Keymark.**
- Currently, there are around 2 000 certified solar thermal products from over 700 companies in 40 countries, 27 European and 13 from the rest of the world.

Certification schemes in Cyprus
labelling and marking
(Compulsory)

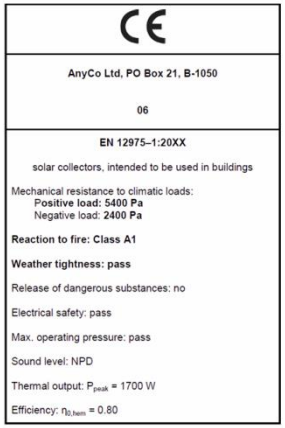


According to Regulations (EU) No 811/2013 and (EU) No 812/2013 on Energy Labelling , from the 26th of September 2015 any solar thermal system and component (solar tanks) marketed in the EU shall bare a Label indicating its energy class (efficiency).

The regulations cover solar water heaters , central heating systems for space heating and / or sanitary hot water supported by solar thermal systems and solar water tanks.

The regulations cover and the conventional systems: water heaters, central heating systems for space heating and / or sanitary hot water and hot water storage tanks.

Certification schemes in Cyprus labelling and marking (Compulsory)


CE

AnyCo Ltd, PO Box 21, B-1050

06

EN 12975–1:20XX

solar collectors, intended to be used in buildings

Mechanical resistance to climatic loads:
Positive load: 5400 Pa
Negative load: 2400 Pa

Reaction to fire: Class A1

Weather tightness: pass

Release of dangerous substances: no

Electrical safety: pass

Max. operating pressure: pass

Sound level: NPD

Thermal output: P_{peak} = 1700 W

Efficiency: $\eta_{0,hem}$ = 0.80

CE-marking of solar collectors related to Directive 89/106/EEC, Construction Product Directive (CPD) is under preparation.

The CE-marking will cover the following characteristics for solar thermal collectors:

- Thermal output
- Efficiency
- Mechanical resistance to climatic loads (wind, snow, ...)
- Weather tightness (rain penetration)
- Fire safety
- Release of dangerous substances

It is expected that this CE-marking will be in force in 2016.

The importance of certification labelling and marking

- Develops consumers confidence
- Enhances competition in favor to the consumers – more efficient products at lower prices
- Reduces trade barriers
- Promotes technological developments
- Promotes rational & defensible criteria for RES incentive programs
- Promotes the use of good quality solar thermal products in a newly emerged market, ensuring grounds of success

Thermal solar quality infrastructure

- **Standards** *Set the methods for testing solar thermal components and systems in terms of performance, reliability and durability*
- **Certification schemes** *Set out the procedures for certifying that products meet standards and other additional requirements*
- **Solar thermal laboratories** *perform the tests on solar thermal components and systems as specified by standards*

Solar thermal laboratories in EU

- In the European Union there are 22 accredited solar thermal laboratories recognized by CEN.
- The Applied Energy Laboratory of Cyprus is one of these accredited and CEN recognized laboratories in the EU and the only one of its kind in Cyprus.
- EU laboratories are called to meet the needs of about 700 companies in 40 countries.

The contribution of the local laboratory to the development of the solar thermal sector in Cyprus

- Assists the local industry in developing competitive products in the EU internal market
- Creates indigenous knowledge in solar thermal technologies for the benefit of the local industry
- Makes possible R&D projects on solar thermal technologies
- Assists the Government in rationalizing criteria for solar thermal incentive programs
- Contributes to the formation and optimization of the technical specifications of solar thermal systems manufactured and marketed in Cyprus

Facts and figures related to the local Laboratory

- The initial cost of deploying the test rigs is less than 300.000 Euro compared to 1.000.000 Euro for factory made test rigs.
- The cost of the tests needed to certify a family of solar collectors (the same collectors with different sizes) with the Solar Keymak amounts to about 4.500 Euro.
- The Applied Energy Laboratory meets all the needs of the local thermal industry for certification and testing
- From its accreditation date (November 2011) until now the Laboratory conducted more than 120 tests.
- Cyprus solar thermal industry consists of about 20 small and medium size enterprises, most of them family owned business.
- The production of solar collectors in Cyprus is 32.000 – 78.000 sq. meters/year.

Testing

The Applied Energy Laboratory is capable of conducting all tests related to the Solar Keymark

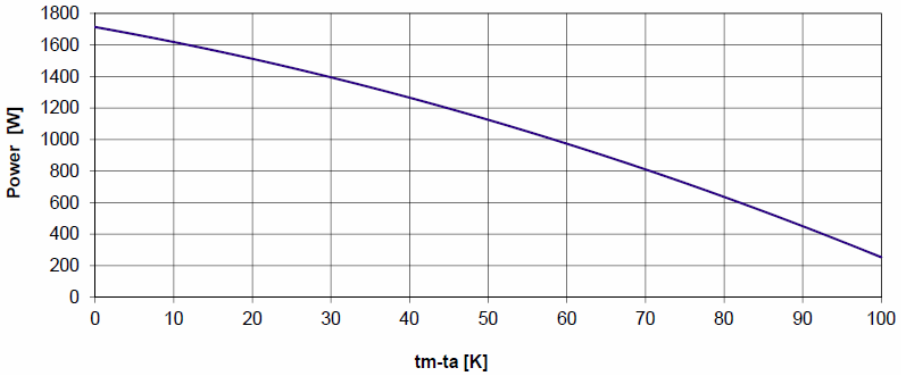
ISO 9806:2013	Liquid Solar Collectors		Thermal performance test
			Incident angle modifier
			Effective thermal capacity
			Time constant
			Pressure drop measurement
			High-temperature resistance
			Exposure test
			Internal pressure test
			Impact resistance test
			External thermal shock test
			Internal thermal shock test
			Rain penetration test
			Mechanical load test
EN 12976	Solar Water Heaters	ISO 9459-2	Thermal performance
			Degree of mixing
			Storage heat loss coefficient
			Storage heat loss coefficient Collector loop disconnected

Thermal performance test

Collector output as a function of the temperature difference between mean fluid and ambient temperature (t_m-t_a) when G=1000 W/m^2, using equation:

$$\dot{Q} = A_\alpha * G * (\eta_{0\alpha} - \alpha_{1\alpha}(t_m-t_a)/G - \alpha_{2\alpha}G((t_m-t_a)/G)^2)$$

Where $\dot{Q}$ = Power output per collector unit



Power output per collector unit at specific values of t_m-t_a and G:

$t_m - t_a$ [K]	400 W/m^2	700 W/m^2	1000 W/m^2
10	590	1104	1618
30	366	880	1394
50	97	611	1125

Rain penetration test

Collector weight before spraying:	39.850	g
Collector weight after spraying:	39.890	g
Water penetrated in the collector:	40	g

Mechanical load test

Positive pressure applied on the cover of the collector by using suction cups.

14.3 Test conditions

14.3.1 The collector was tested with mounting devices:

Yes [X] No [ ]

14.3.2 Maximum load pressure (F_{max}): 1000,7 Pa

14.4 Test results: No failures were observed.

14.4.1 Permissible positive pressure (F_{perm}): 667,1 Pa

Where:

$F_{perm} = F_{max} / SF$

SF = 1,5 (Safety factor)

15 Mechanical load test / Negative pressure test of the collector cover

15.1 Method used to apply pressure:

Negative pressure applied on the cover of the collector by using suction cups.

15.2 Test conditions

15.2.1 The collector was tested with mounting devices:

Yes [X] No [ ]

15.2.2 Maximum load pressure (F_{max}): 1000,5 Pa

15.3 Test results: No failures were observed.


Thank you for your attention