Annex to Solar Keymark Certificate

Licence Number	**SKM 10135.1.3**
Date issued	**2025-12-31**
Issued by	**DQS Hellas**

Licence holder	**IDROTIRRENA COMMERCIALE S.R.L.**	**Country**	Italy
Brand (optional)		**Web**	
Street, Number	Via di Vorno, 4	**E-mail**	info@zenithsolare.it
Postcode, City	55060 Capannori (LU)	**Tel**	+390 0583 25028

Collector Type	Flat plate collector

Collector name	Gross area (A_G)	Gross length	Gross width	Gross height	Power output per collector Gb = 850 W/m2, Gd = 150 W/m2 & u = 1.3 m/s $\vartheta_m - \vartheta_a$					
					0 K	10 K	30 K	50 K	70 K	76 K
	m²	mm	mm	mm	W	W	W	W	W	W
STAR 1500	1,52	1.510	1.010	110	1.054	992	860	718	567	520
STAR 1500 HOR	1,52	1.010	1.510	110	1.054	992	860	718	567	520
STARCS 2000	2,03	2.010	1.010	110	1.408	1.325	1.148	959	757	694
STARCS 2000 HOR	2,03	1.010	2.010	110	1.408	1.325	1.148	959	757	694
STARCS 2600	2,53	2.010	1.270	110	1.755	1.651	1.431	1.196	944	865
STARCS 2600 HOR	2,53	1.270	2.010	110	1.755	1.651	1.431	1.196	944	865
Power output per m² gross area					694	653	566	473	373	342

Performance parameters test method	Steady state - outdoor									
Performance parameters (related to A_G)	η0, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd
Units	-	W/(m²K)	W/(m²K²)	J/(m³K)	-	J/(m²K)	s/m	W/(m²K⁴)	W/(m²K⁴)	-
Test results	0,704	4,02	0,008	0,000	0,00	7.860	0,000	0,00	0,0E+00	0,90

Incidence angle modifier test method		Steady state - outdoor								
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$	1,00	1,00	0,99	0,98	0,94	0,87	0,73	0,48	0,00
Longitudinal	$K_{\theta L,coll}$	1,00	1,00	0,99	0,98	0,94	0,87	0,73	0,48	0,00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0,022	kg/(sm²)
Maximum temperature difference during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	46	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	174	°C
Maximum operating temperature	$\vartheta_{max\ op}$	100	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	NCSR Demokritos	www.solar.demokritos.gr	
Test report(s)	4188DE1	**Dated**	27/7/2016
	4189DE1		27/7/2016
	4023DQ2, 4046DQ2		5/9/2013

Comments of testing laboratory	Ver. 6.2 (13.01.2022)

SCARICATO DAL SITO ZENITHSOLARE.IT

Annex to Solar Keymark Certificate	Licence Number	SKM 10135.1.3
Supplementary Information	Issued	2025-12-31

Gross Thermal Yield in kWh/collector at mean fluid temperature ϑ_m

Collector name	Standard Locations ϑ_m	Athens 25°C	Athens 50°C	Athens 75°C	Davos 25°C	Davos 50°C	Davos 75°C	Stockholm 25°C	Stockholm 50°C	Stockholm 75°C	Würzburg 25°C	Würzburg 50°C	Würzburg 75°C
STAR 1500		1.670	1.121	689	1.226	804	478	908	559	319	990	602	338
STAR 1500 HOR		1.670	1.121	689	1.226	804	478	908	559	319	990	602	338
STARCS 2000		2.230	1.497	920	1.638	1.074	638	1.213	746	426	1.322	804	452
STARCS 2000 HOR		2.230	1.497	920	1.638	1.074	638	1.213	746	426	1.322	804	452
STARCS 2600		2.779	1.866	1.147	2.041	1.339	796	1.511	930	531	1.648	1.002	563
STARCS 2600 HOR		2.779	1.866	1.147	2.041	1.339	796	1.511	930	531	1.648	1.002	563
Gross Thermal Yield per m² gross area		1.099	737	453	807	529	314	597	368	210	651	396	222
Annual efficiency, η_a		62%	42%	26%	49%	32%	19%	51%	32%	18%	52%	32%	18%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m²			1630 kWh/m²			1166 kWh/m²			1244 kWh/m²		
Mean annual ambient air temperature		18,5°C			3,2°C			7,5°C			9,0°C		
Collector orientation or tracking mode		South, 25°			South, 30°			South, 45°			South, 35°		

The collector is operated at constant temperature ϑm (mean of in- and outlet temperatures). The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool Scenocalc Ver. 6.2 (13.01.2022). A detailed description of the calculations is available at http://www.estif.org/solarkeymarknew/

Additional Information

Collector heat transfer medium				Water-Glycole	
The collector is deemed to be suitable for roof integration				No	
The collector was tested successfully under the following conditions:					
Climate class (A+, A, B or C)				A	--
G (W/m²) >	1000	ϑ_a (°C) >	20	H_x (MJ/m²) >	600
Maximum tested positive load				1000	Pa
Maximum tested negative load				1000	Pa
Hail resistance using steel ball (maximum drop height)					m

Additional collector attribute(s)

Using external power source(s) for normal operation	No	Active or passive measure(s) for self-protection	No
Co-generating thermal and electrical power	No	Façade collector(s)	No

Energy Labelling Information

	Reference Area, A_{sol} (m²)
STAR 1500	1,52
STAR 1500 HOR	2,52
STARCS 2000	2,03
STARCS 2000 HOR	2,03
STARCS 2600	2,53
STARCS 2600 HOR	2,53

Additional Informative Technical Data

	Hydraulic Designation Code	Aperture Area, A_a (m²)
STAR 1500	10-V-1234S-A:7.2,1342-C:20.6,1060-D	1,34
STAR 1500 HOR		1,34
STARCS 2000	10-V-1234S-A:7.2,1842-C:20.6,1060-D	1,81
STARCS 2000 HOR		1,81
STARCS 2600	13-V-1234S-A:7.2,1842-C:20.6,1320-D	2,32
STARCS 2600 HOR		2,32

Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}

Collector efficiency (η_{col})	52%

Remark: Collector efficiency (ηcol) is defined in CDR (EU) No 811/2013 as collector efficiency of the solar collector at a temperature difference between the solar collector and the surrounding air of 40 K and a global solar irradiance of 1000 W/m², expressed in % and rounded to the nearest integer. Deviating from the regulation ηcol is based on reference area (Asol) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.

Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}

Zero-loss efficiency (η_0)	0,69	--
First-order coefficient (a_1)	4,02	W/(m²K)
Second-order coefficient (a_2)	0,008	W/(m²K²)
Incidence angle modifier IAM (50°)	0,94	--

Remark: The data given in this section are related to collector reference area (A_{sol}) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806. Consistent data sets for either aperture or gross area can be used in calculations like in the regulation 811 and 812 and simulation programs.

Central Offices: Kalavriton 2, 145 64 kifisia, Athens, Tel: +30 210 6233493-4 , Fax: +30 210 6233495, http://www.dqsglobal.com, e-mail: i.alexiou@dqs.gr

SCARICATO DAL SITO ENERGYSOLARE.IT