



# CERTIFICATION LICENCE TO USE KEYMARK

Certificate No OEM 9999.2.8

*DQS Hellas grants the present certificate to the enterprise:*

**UNICAL AG S.p.A.**  
Via Roma 123, 46033 Casteldario (MN), Italy

*for the product:*

**Flat plate Solar Collectors with type**  
E SUN 2.72, E SUN 2.72H

*which is produced in conformity with the normative document:*

**EN 12975-1:2011**  
**EN ISO 9806:2013**

*at the following location:*

**1o Km Inofyta – St. Thomas, Viotia**



**E 31**



*The present certificate is granted in accordance with:*

- *the DQS Hellas General Rules for the Certification of Products,*
- *the Specific Rule for Certification EKIII.001 «Specific Rule for Certification of Solar Collectors, and Thermal Solar Heating Systems for Domestic Hot Water»,*
- *the Specific CEN Keymark Scheme Rules for Solar Thermal Products,*

*and is ruled by the terms of the relevant contract between DQS Hellas and the enterprise.*

*Date of issue:* **2024-05-30**

*Date of valid:* **2025-05-30**

***Ioannis Alexiou***  
*Head of Products Certification*

***Panagiotis Giannoutsos***  
*Director of Certification*



Annex to Solar Keymark Certificate		Licence Number		OEM 9999.2.8							
		Date issued		2023-04-20							
		Issued by		DQS Hellas							
Licence holder	UNICAL AG S.p.A.			Country	Italy						
Brand (optional)				Web	www.unical.eu						
Street, Number	Via Roma 123			E-mail	r.dalo@unical-ag.com						
Postcode, City	46033 Casteldario (MN)			Tel	+39 0376 57001						
Collector Type	Flat plate collector										
Collector name	Gross area ( $A_G$ ) m <sup>2</sup>	Gross length mm	Gross width mm	Gross height mm	Power output per collector G <sub>b</sub> = 850 W/m <sup>2</sup> , G <sub>d</sub> = 150 W/m <sup>2</sup> & u = 1.3 m/s $\vartheta_m - \vartheta_a$						
					0 K	10 K	30 K	50 K	70 K	89 K	
					W	W	W	W	W	W	
E SUN 2.72	2,72	2.160	1.260	86	2.107	2.018	1.821	1.597	1.348	1.093	
E SUN 2.72H	2,72	1.260	2.160	86	2.107	2.018	1.821	1.597	1.348	1.093	
Power output per m <sup>2</sup> gross area					775	742	669	587	495	402	
Performance parameters test method		Steady state - outdoor									
Performance parameters (related to $A_G$ )		$\eta_0, b$	a1	a2	a3	a4	a5	a6	a7	a8	Kd
Units		-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )	J/(m <sup>3</sup> K)	-	J/(m <sup>2</sup> K)	s/m	W/(m <sup>2</sup> K <sup>4</sup> )	W/(m <sup>2</sup> K <sup>4</sup> )	-
Test results		0,784	3,15	0,012	0,000	0,00	9.720	0,000	0,00	0,0E+00	0,92
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	1,00	0,99	0,96	0,90	0,78	0,52	0,00
Longitudinal		$K_{\theta L, coll}$	1,00	1,00	1,00	0,99	0,96	0,90	0,78	0,52	0,00
Heat transfer medium for testing		Water									
Flow rate for testing (per gross area, $A_G$ )		dm/dt	0,022	kg/(sm <sup>2</sup> )							
Maximum temperature difference during thermal performance test		$(\vartheta_m - \vartheta_a)_{max}$	58,5	K							
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; $\vartheta_a = 30$ °C)		$\vartheta_{stg}$	190,5	°C							
Maximum operating temperature		$\vartheta_{max, op}$	200	°C							
Maximum operating pressure		$p_{max, op}$	1000	kPa							
Testing laboratory	NCSR Demokritos / Solar & other Energy System			www.solar.demokritos.gr							
Test report(s)	4196DE2 4197DQ3			Dated	16/11/2016 2-6-20217						
Comments of testing laboratory		Ver. 6.2 (13.01.2022)									
<p style="text-align: center;">Central Offices: Kalavriton 4, 145 64 kifisia, Athens, Tel: +30 210 6233493-4 , Fax: +30 210 6233495, http://www.dqs.gr, e-mail: i.alexio@dqs.gr</p>											



Annex to Solar Keymark Certificate		Licence Number		OEM 9999.2.8									
Supplementary Information		Issued		2023-04-20									
<b>Gross Thermal Yield in kWh/collector at mean fluid temperature <math>\vartheta_m</math></b>													
	Standard Locations	Athens			Davos		Stockholm		Würzburg				
Collector name	$\vartheta_m$	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
E SUN 2.72		3.422	2.564	1.786	2.673	1.943	1.310	1.954	1.349	874	2.121	1.461	932
E SUN 2.72H		3.422	2.564	1.786	2.673	1.943	1.310	1.954	1.349	874	2.121	1.461	932
Gross Thermal Yield per m <sup>2</sup> gross area		1.258	942	657	983	714	482	718	496	321	780	537	343
Annual efficiency, $\eta_a$		71%	53%	37%	60%	44%	30%	62%	43%	28%	63%	43%	28%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1630 kWh/m <sup>2</sup>			1166 kWh/m <sup>2</sup>			1244 kWh/m <sup>2</sup>		
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 $\vartheta_m$ (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 <a href="http://www.estif.org/solarkeymarknew/">http://www.estif.org/solarkeymarknew/</a>													
<b>Additional Information</b>													
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/m <sup>2</sup> ) >		1000		$\vartheta_a$ (°C) >		20		$H_x$ (MJ/m <sup>2</sup> ) >		600			
Maximum tested positive load										3000		Pa	
Maximum tested negative load										3000		Pa	
Hail resistance using steel ball (maximum drop height)										2		m	
<b>Additional collector attribute(s)</b>													
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			
<b>Energy Labelling Information</b>						<b>Additional Informative Technical Data</b>							
	Reference Area, $A_{sol}$ (m <sup>2</sup> )		Hydraulic Designation Code			Aperture Area, $A_a$ (m <sup>2</sup> )							
E SUN 2.72	2,72		11-V-12345-A:7.2,2060-C:20.6,1320-			2,57							
E SUN 2.72H	2,72		18-V-12345-A:7.2,1158-C:20.6,2240-			2,57							
Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$						Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$							
Collector efficiency ( $\eta_{col}$ )		63%				Zero-loss efficiency ( $\eta_0$ )		0,77		--			
Remark: Collector efficiency ( $\eta_{col}$ ) 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/m <sup>2</sup> , expressed in % and rounded to the nearest integer. Deviating from the regulation $\eta_{col}$ is based on reference area ( $A_{sol}$ ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.		First-order coefficient ( $a_1$ )		3,15		Second-order coefficient ( $a_2$ )		0,012		W/(m <sup>2</sup> K)			
		Incidence angle modifier IAM (50°)		0,96						W/(m <sup>2</sup> K <sup>2</sup> )			
										--			
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 4, 145 64 kifisia, Athens, Tel: +30 210 6233493-4, Fax: +30 210 6233495, <a href="http://www.dqs.gr">http://www.dqs.gr</a> , e-mail: <a href="mailto:i.alexiou@dqs.gr">i.alexiou@dqs.gr</a>													