



**Institute for Building Energetics,
Thermotechnology and Energy Storage**
Research and Testing Center for Thermal Solar
Systems (TZS)
University of Stuttgart



Test Report
Solar Water Heater
Determination of energy efficiency
according to SASO 2884:2017

(This test report substitutes test report no. 24SU161 of July 4th, 2024)

Test Report No.: 24SU161/1

Stuttgart, September 20th, 2024

Claimant: Cosmosolar S.A.
12, Areopoleos Str.
NEA KHFISIA | 14564
Greece

Manufacturer: Cosmosolar S.A.

System: EGLK 150/2,00

Construction Year: 2023

Revision history:

Test Report No.:	Date:	Remarks:
24SU161/1	20.09.2024	Frequency of electric heater changed (Appendix A)
24SU161	04.07.2024	Issue of test report

Contents

	Page
1 Technical data of store	4
2 Technical data of collector	5
3 Dimensions of whole system.....	5
4. Calculation of the water heating energy efficiency η_{WH}	6
4.1 Parameters of the store	6
4.2 Parameters of the solar collector	6
4.3 Further parameters.....	6
4.4 Results	7
5 Test occurrences	8
6 General	8
Appendix A: Summary rated and tested values	9

1 Technical data of store¹			
Manufacturer:		Product type:	
Cosmosolar S.A.		GLD 150	
Model year:	Serial No.:	Rated capacity:	Design:
2023	B231015752	140 liters	Horizontal Thermosiphon Store
Country of manufacture:	Length ² :	Diameter ² :	Weight (empty):
Greece	1.27 m	0.50 m	64.0 kg
Water volume:			
Corrosion protection:		Enamel, Magnesium Anode	
Max operation pressure:		10 bar	
Max operation temperature:		99 °C	
Thermal insulation:		Polyurethane: 50 mm	
Mantle Heat exchanger			
Max operation pressure [bar]:		2.0 bar	
Max operation temperature [°C]:		99 °C	
Volume of heat exchanger [liters]:		11.2 liters	
Area [m ²]:		1.036 m ²	

¹ as stated by the manufacturer

² with insulation

2 Technical data of collector³			
Manufacturer: Cosmosolar S.A.			Type: EPI 25 NV
Year: 2023	Serial No.: S231019137	Weight (empty): 26.6 kg	Design: Flat plate collector
Gross area			2.00 m ²
Aperture area			1.83 m ²
Length			2.00 m
Width			1.00 m
Height			0.085 m
Max. operating pressure			10 bar
Absorber volume			1.43 liters
Stagnation temperature			146 °C

3 Dimensions of whole system⁴	
Length	1.000 m
Width	1.865 m
Height	2.020 m

³ as stated by the manufacturer

⁴ as stated by the manufacturer

4. Calculation of the water heating energy efficiency η_{WH}

The water heating energy efficiency η_{WH} of the solar water heater is determined according to SASO 2884:2017, chapter C3.2.

4.1 Parameters of the store

Type:	GLD 150
Rated capacity:	140 l
Tested capacity:	135.8 l
Back-up capacity $V_{sto, bu}$:	67.9 l
Heat loss rate of the whole store $H_{sto, los, tot}$:	1.35 W/K
Rated thermal losses Q_{PR} :	1.46 kWh/24h
For further details see:	Test report: 23STO458, dated 06.11.2023 Test Institute: IGTE Universität Stuttgart

4.2 Parameters of the solar collector

Type:	EPI 25 NV
Gross area A_G :	2.00 m ²
Zero-loss efficiency η_0 :	0.635
First-order coefficient a_1 :	3.708
Second-order coefficient a_2 :	0.006
Incidence angle modifier $K_{hem}(50^\circ)$:	0.837
For further details see:	Test report: 23COL1719, 14.06.2024 Test Institute: IGTE Universität Stuttgart

4.3 Further parameters

Daily hot water load (tapping profile) Q_{ref} : "M"	5.85 kWh
Conversion coefficient CC according to SASO 2884:2017:	1
Auxiliary electric consumption Q_{aux} (no controller):	0 kWh
Heat generator water heating energy efficiency $\eta_{WH, nonsol}$ (electric heating element):	1
Power of electrical heat generator	1500 W
Monthly average cold water temperature $\vartheta_{w, low}$ according to EN 15316-4-3:2017:	10 °C
Hot water temperature $\vartheta_{w, high}$ according to EN 15316-4-3:2017:	40 °C
Power collector loop pump $P_{sol; pmp}$ (no pump, thermosiphon system):	0 W
Number of collectors	1
Correction coefficient for the orientation of the collector f_{col} : according to table B.10, EN 15316-4-3:2017	1.0
Type of system according to EN 15316-4-3:2017 (SOL_TYPE):	parallel

Efficiency factor of the collector loop η_{loop} according to EN 15316-4-3:2017, F.2	0.9
Correction coefficient f_{app} according to EN 15316-4-3:2017, table A.18	1.08
Correlation factor a according to EN 15316-4-3:2017, table A.18	1.029
Correlation factor b according to EN 15316-4-3:2017, table A.18	-0.065
Correlation factor c according to EN 15316-4-3:2017, table A.18	-0.245
Correlation factor d according to EN 15316-4-3:2017, table A.18	0.0018
Correlation factor e according to EN 15316-4-3:2017, table A.18	0.0215
Correlation factor f according to EN 15316-4-3:2017, table A.18	0
Factor describing the effect of insulation of the auxiliary heating loop $f_{bu;ins}$ according to EN 15316-4-3:2017, table B.14	0.02
recoverable heat losses of the solar system $Q_{x;sol;ls;rbl,m}$ (without solar space heating system):	0 kWh
Annual operation time for solar loop pump t_{aux} according to EN 15316-4-3:2017, table B.13	2000 h
Auxiliary energy consumption of the auxiliary heat generator $W_{x;bu;aux;nom,m}$:	0 kWh
Heat losses of the auxiliary heat generator $Q_{x;bu;ls;nom,m}$:	0 kWh

4.4 Results

Table 1: Monthly Contribution of the auxiliary heater to the heat demand $Q_{w;bu;out,m}$ [kWh]

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
149.3	116.2	96.6	66.4	49.7	41.4	36.8	40.3	64.4	98.8	133.8	158.1

The annual non-solar heat contribution $Q_{non,sol}$ is calculated according to equation 1:

$$Q_{non,sol} = \sum_{m=1}^{12} Q_{w,bu,out,m} = 1051.8 \text{ kWh} \quad (1)$$

The annual energy consumption Q_{tota} is calculated according to equation 2:

$$Q_{tota} = \frac{Q_{non,sol}}{1.1 \times \eta_{WH,nonsol} - 0.1} + Q_{aux} \times CC = 1051.8 \text{ kWh} \quad (2)$$

The water heating energy efficiency η_{WH} is calculated according to equation 3:

$$\eta_{WH} = \frac{220 \times Q_{ref}}{Q_{tota}} = 122.3 \% \quad (3)$$

Table 2: Energy efficiency classification for load profile "M" according to SASO 2884:2017:

Energy class	A	B	C	D	E	F	G
η_{WH} [%]	210	140	93	87	80	73	65

5 Test occurrences

No special incidents

6 General

The determined results are only valid for the tested versions of the test samples.
The reproduction of **single pages** of this test report is not allowed without permission of IGTE.
The nomenclature of SASO 2884:2017 and EN 15316-4-3:2014/2017 was used.

Arrival of test samples:	31.10.2023
Testing period:	30.04. – 11.05.2024 (collector), 02.11. - 06.11.2023 (store)
Test location:	Stuttgart, Pfaffenwaldring 10
Identification of test samples:	Adhesive label: 23STO458, 23COL1719
Test engineer:	Dipl.-Ing. S. Bachmann, Dipl.-Ing. (FH) Claus Twerdy

Stuttgart, September 20th, 2024



Dr.-Ing. Harald Drück

- Head Solar Testing –

Authentication: Test report available by the following [link](#)

Appendix A: Summary rated and tested values

1	QR code for the laboratory	substituted by authentication link
2	voltage and the frequency values	230 V~, 50 Hz and 60 Hz
3	number of phases	1
4	type of water heater	separated
5	back-up storage	yes
6	solar load profile	SASO 2884:2017, table B2
7	surface collector	2.00 m ²
8	zero loss coefficient	0.635
9	rated a1 coefficient	3.708 W/(m ² K)
10	rated a2 coefficient	0.006 W/(m ² K ²)
11	incidence angle modifier (IAM)	0.837
12	back-up capacity (back-up volume)	67.9 l
13	rated solar standby power	1.46 kWh/24 h
14	rated solar pump power	0 W (no solar pump)
15	rated standby thermal loss power	1.46 kWh/24 h
16	rated heating element power	1500 W
17	efficiency non solar	1.0
18	reference energy for load profile (Qref)	5.85 kWh
19	annual energy consumption (Qtota_KSA)	1051.8 kWh
20	annual electricity consumption (AEC)	1051.8 kWh
21	solar energy auxiliary (Qaux_rated)	0 kWh (no solar pump)
22	rated non-solar (Qnonsol_rated)	1000.0 kWh
23	energy efficiency index (η_{WH})	122.3 %