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IGTE

Annex to Solar Keymark Certificate		Licence Number	011-7S3139 R
		Date issued	2022-08-29
		Issued by	DIN CERTCO

Licence holder	**STELLA GROUP S.p.A.**	**Country**	Italy		
Brand (optional)		**Web**	www.stelbi.com		
Street, Number	Via Bellucci 16	**E-mail**	info@stelbi.com		
Postcode, City	31010 Farra di Soglio (TV)	**Tel**	+39	0438.906111	

Collector Type	Evacuated tubular 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	108 K
	m²	mm	mm	mm	W	W	W	W	W	W
SUNSTAR AV DF10	2.38	2040	1166	122	1525	1502	1449	1389	1321	1 171
Power output per m² gross area					641	631	609	584	555	492

Performance parameters test method	Quasi dynamic									
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	0.637	0.943	0.004	0.000	0.00	28 610	0.000	0.00	0.0	1.039

Incidence angle modifier test method		Quasi dynamic - 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	1.00	1.10	1.14	1.30	0.65	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	1.00	0.98	0.95	0.89	0.81	0.65	0.33	0.00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0.020	kg/(sm²)
Maximum temperature difference during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	78	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	310	°C
Maximum operating temperature	ϑ_{max_op}	-	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	Institut für Gebäudeenergetik, Thermotechnik und Energiespeicherung (IGTE)	http://www.igte.uni-stuttgart.de	
Test report(s)	16COL1355OEM02 16COL1356QOEM02	**Dated**	29.08.2022 29.08.2022

Comments of testing laboratory	Ver. 6.2 (13.01.2022)
Documented performance parameters are taken from 16COL1355OEM02	TZS Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 6, 70550 Stuttgart (Vaihingen)

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Supplementary Information	Issued	2022-08-29

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

Standard Locations	Athens			Davos			Stockholm			Würzburg		
Collector name ϑ_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
SUNSTAR AV DF10	2 704	2 446	2 167	2 328	2 068	1 803	1 688	1 469	1 257	1 818	1 585	1 357
Gross Thermal Yield per m² gross area	1 136	1 028	911	978	869	758	709	617	528	764	666	570
Annual efficiency, η_a	64%	58%	52%	60%	53%	46%	61%	53%	45%	61%	54%	46%
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	18.5°C			3.2°C			7.5°C			9.0°C		
Collector orientation or tracking	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	
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				1800	Pa
Maximum tested negative load				1650	Pa
Hail resistance using ice balls (diameter)				25	mm

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)
SUNSTAR AV DF10	2.38

Additional Informative Technical Data

	Hydraulic Designation Code	Aperture Area, A_a (m²)
SUNSTAR AV DF10	2-VH-1122S-A:-7,19350-C:20,1175	2.09

Data required for CDR (EU) No 811/2013 - Reference Area

Collector efficiency (η_{col})	60%

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)	0.64	--
First-order coefficient (a_1)	0.94	W/(m²K)
Second-order coefficient (a_2)	0.004	W/(m²K²)
Incidence angle modifier IAM (50°)	0.96	--

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.

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