

Annex to Solar Keymark Certificate					Licence Number		011-7S2979 R							
					Date issued		2021-06-24							
					Issued by		DIN CERTCO							
Licence holder		ELCO GmbH			Country		Germany							
Brand (optional)					Web		http://www.elco.de							
Street, Number		Hohenzollernstraße 31			E-mail		info@de.elco.net							
Postcode, City		D- 72379 Hechingen			Tel		+49 7471 18 70							
Collector Type					Evacuated tubular collector									
Collector name					Power output per collector									
					$G_b = 850 \text{ W/m}^2, G_d = 150 \text{ W/m}^2 \text{ \& } u = 1.3 \text{ m/s}$ $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	92 K				
					m ²	mm	mm	mm	mm	mm				
					W	W	W	W	W	W				
AURON DF 10-2					1.61	2 157	745	128	764	749	711	665	610	538
AURON DF 15-2					2.42	2 157	1 120	128	1 148	1 125	1 069	1 000	917	809
AURON DF 20-2					3.22	2 157	1 495	128	1 533	1 502	1 427	1 334	1 223	1 081
AURON DF 30-2					4.84	2 157	2 245	128	2 302	2 256	2 143	2 004	1 837	1 623
Power output per m² gross area					475	466	443	414	379	335				
Performance parameters test method		Steady state - outdoor												
Performance parameters (related to A_G)		η_0, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd			
Units		-	W/(m ² K)	W/(m ² K ²)	J/(m ³ K)	-	J/(m ² K)	s/m	W/(m ² K ⁴)	W/(m ² K ⁴)	-			
Test results		0.484	0.88	0.007			3 970				0.88			
Incidence angle modifier test method		Quasi dynamic - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		$K_{\theta T, coll}$	1.01	1.02	1.03	1.04	1.07	1.08	0.83	0.42	0.00			
Longitudinal		$K_{\theta L, coll}$	1.00	0.99	0.98	0.96	0.93	0.87	0.75	0.38	0.00			
Heat transfer medium for testing					Water									
Flow rate for testing (per gross area, A_G)					dm/dt		0.020		kg/(sm ²)					
Maximum temperature difference during thermal performance test					$(\vartheta_m - \vartheta_a)_{max}$		62		K					
Standard stagnation temperature (G = 1000 W/m²; $\vartheta_a = 30 \text{ }^\circ\text{C}$)					ϑ_{stg}		280		°C					
Maximum operating temperature					$\vartheta_{max, op}$		100		°C					
Maximum operating pressure					$p_{max, op}$		1000		kPa					
Testing laboratory		ISFH CalTeC			http://www.isfh.de									
Test report(s)		082-20/B1			Dated		21.06.2021							
Comments of testing laboratory					Datasheet version: 6.1, 2019-07-11									
The given collector efficiency parameters were determined at the collector type AURON DF 30-2. The power output for each subtype was calculated with the collector efficiency parameters from the AURON DF 30-2.					Institut für Solarenergieforschung GmbH Am Ohrberg 1 D-31860 Emmertal Tel.: 05151/999-100 Fax: 05151/999-500									
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Supplementary Information		011-7S2979 R														
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Annual collector output 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			
AURON DF 10-2		1 280	1 107	912	1 087	912	733	782	640	501	839	688	535			
AURON DF 15-2		1 924	1 664	1 371	1 634	1 370	1 102	1 176	963	753	1 262	1 034	805			
AURON DF 20-2		2 568	2 221	1 830	2 181	1 829	1 471	1 570	1 285	1 005	1 684	1 381	1 074			
AURON DF 30-2		3 856	3 335	2 748	3 275	2 747	2 208	2 358	1 930	1 509	2 529	2 073	1 613			
Annual output per m ² gross area		796	689	567	676	567	456	487	399	312	522	428	333			
Annual efficiency, η_a		45%	39%	32%	41%	35%	28%	42%	34%	27%	42%	34%	27%			
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)														
Annual irradiation on collector plane		1765 kWh/m ²			1630 kWh/m ²			1166 kWh/m ²			1244 kWh/m ²					
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 ϑ_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. 6.1 (July 2019). 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/m ²) >		1000		ϑ_a (°C) >		20		H _x (MJ/m ²) >			600					
Maximum tested positive load											4500		Pa			
Maximum tested negative load											3250		Pa			
Hail resistance using steel ball (maximum drop height)											2		m			
Additional collector attribute(s)																
<input type="checkbox"/> Using external power source(s) for normal operation <input type="checkbox"/> Active or passive measure(s) for self-protection <input type="checkbox"/> Co-generating thermal and electrical power <input type="checkbox"/> Façade collector(s)																
Energy Labelling Information							Additional Informative Technical Data									
	Reference Area, A _{sol} (m ²)						Hydraulic Designation Code				Aperture Area, A _a (m ²)					
AURON DF 10-2	1.61						10-VH-12S-A:5,3880-C:13,745				1.01					
AURON DF 15-2	2.42						15-VH-12S-A:5,3880-C:13,1115				1.52					
AURON DF 20-2	3.22						20-VH-12S-A:5,3880-C:13,1495				2.03					
AURON DF 30-2	4.84						30-VH-12S-A:5,3880-C:13,2245				3.04					
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 (η_{col})							43%									
Remark: Collector efficiency (η_{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 ² , expressed in % and rounded to the nearest integer. Deviating from the regulation η_{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.							Zero-loss efficiency (η_0)				0.48			--		
							First-order coefficient (a ₁)				0.88			W/(m ² K)		
							Second-order coefficient (a ₂)				0.007			W/(m ² K ²)		
							Incidence angle modifier IAM (50°)				0.98			--		
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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