

Annex to Solar Keymark Certificate					Licence Number		011-7S2979 R							
					Date issued		2020-11-20							
					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	mm			
AURON DF 10-2					1.61	2 157	745	128	764	749	711	665	610	538
AURON DF 15-2					2.41	2 157	1 115	128	1 143	1 120	1 064	995	912	806
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-Glycole												
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/B			Dated		17.11.2020							
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. At standard stagnation conditions a manifold temperature of 121 °C was determined at the empty collector.												
		Institut für Solarenergieforschung GmbH Am Ohrberg 1 D-31880 Emmerthal Tel.: 05151/999-100 Fax: 05151/999-500												
DIN CERTCO • Alboinstraße 56 • 12103 Berlin, Germany Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de														

Annex to Solar Keymark Certificate		Licence Number											
Supplementary Information		011-7S2979 R											
		Issued											
		2020-11-20											
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		1 915	1 656	1 365	1 626	1 364	1 097	1 171	959	749	1 256	1 030	801
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		2.41				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%				Zero-loss efficiency (η_0)				0.48		--	
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.						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.							
DIN CERTCO • Alboinstraße 56 • 12103 Berlin, Germany Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de													