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Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results		Licence Number	011-7S2905 R
		Date issued	2019-02-25
		Issued by	DIN CERTCO

Licence holder	**Kloben Industries S.r.l**	**Country**	Italien
Brand (optional)		**Web**	www.klobenindustries.it
Street, Number	Via Pier Luigi Da Palestrina,2	**E-mail**	ufficio.tecnico@klobenindustries.it
Postcode, City	20124 Milano	**Tel**	+39 454 743 243

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 = 3 m/s ϑm - ϑa: 0 K	10 K	30 K	50 K	70 K	118 K
	m²	mm	mm	mm	W	W	W	W	W	W
ATON S 10 -O	**1.82**	1 625	1 122	116	1 138	1 121	1 081	1 036	985	838
ATON S 12 -O	**2.18**	1 625	1 342	116	1 363	1 342	1 295	1 241	1 180	1 004
ATON S 14 -O	**2.54**	1 625	1 562	116	1 589	1 564	1 509	1 446	1 374	1 170
ATON S 16 -O	**2.90**	1 625	1 782	116	1 814	1 786	1 723	1 651	1 569	1 336
ATON S 18 -O	**3.26**	1 625	2 002	116	2 039	2 007	1 937	1 856	1 764	1 502
ATON S 20 -O	**3.62**	1 625	2 226	116	2 264	2 229	2 151	2 060	1 959	1 667
Power output per m² gross area					625	616	594	569	541	461

Performance parameters test method	Quasi dynamic								
Performance parameters (related to AG)	η0,b	c1	c2	c3	c4	c6	Kd		
Units	-	W/(m²K)	W/(m²K²)	J/(m³K)	-	s/m	-		
Test results	0.623	0.925	0.004	0.000	0.000	0.000	1.026		

Incidence angle modifier test method	Quasi dynamic - outdoor								
Bi-directional incidence angle modifiers	Yes								
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$	1.02	0.99	1.00	1.01	1.09	1.10	1.29	0.65	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	0.99	0.97	0.95	0.89	0.80	0.64	0.32	0.00

Heat transfer medium for testing	Water-Glycole		
Flow rate for testing (per gross area, A_G)	dm/dt	0.017	kg/(sm²)
Maximum temperature difference for thermal performance calculations	$(\vartheta_m-\vartheta_a)_{max}$	118	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	259	°C
Effective thermal capacity, incl. fluid (per gross area, A_G)	C/m²	34.75	kJ/(Km²)
Maximum operating temperature	$\vartheta_{max\ op}$	n.b	°C
Maximum operating pressure	$p_{max,op}$	600	kPa

Testing laboratory	TZS, ITW University Stuttgart	www.itw.uni-stuttgart.de	
Test report(s)	10COL945/2OEM05 10COL945Q/2OEM05	**Dated**	11.02.2019 11.02.2019

Comments of testing laboratory	Datasheet version: 5.01, 2016-03-01
Documented performance parameters are taken from test report 10COL945/2OEM05 (ATON S 20 - O)	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	2019-02-25

Annual collector output in kWh/collector at mean fluid temperature ϑ_m, based on ISO 9806:2013 test results

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
ATON S 10 -O		2 005	1 812	1 602	1 727	1 532	1 333	1 252	1 088	929	1 347	1 173	1 002
ATON S 12 -O		2 402	2 170	1 919	2 069	1 835	1 597	1 500	1 303	1 112	1 614	1 405	1 200
ATON S 14 -O		2 798	2 528	2 236	2 410	2 138	1 860	1 747	1 518	1 296	1 880	1 637	1 398
ATON S 16 -O		3 195	2 887	2 553	2 752	2 441	2 124	1 995	1 733	1 480	2 147	1 869	1 596
ATON S 18 -O		3 592	3 245	2 870	3 094	2 744	2 388	2 243	1 949	1 663	2 413	2 101	1 794
ATON S 20 -O		3 988	3 603	3 187	3 435	3 047	2 651	2 490	2 164	1 847	2 679	2 333	1 993
Annual output per m² gross area		1 102	995	880	949	842	732	688	598	510	740	644	550
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m²			1714 kWh/m²			1166 kWh/m²			1244 kWh/m²		
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 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. 5.01 (March 2016). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc

Additional Information

Collector heat transfer medium	Water-Glycole	
Hybrid Thermal and Photo Voltaic collector	No	
The collector is deemed to be suitable for roof integration	No	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	B	--
Maximum tested positive load	2000	Pa
Maximum tested negative load	n.a.	Pa
Hail resistance using steel ball (maximum drop height)	n.a.	m

Energy Labelling Information

	Reference Area, A_{sol} (m^2)
ATON S 10 -O	1.82
ATON S 12 -O	2.18
ATON S 14 -O	2.54
ATON S 16 -O	2.90
ATON S 18 -O	3.26
ATON S 20 -O	3.62

Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}

Collector efficiency (η_{col})	58	%

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/m², 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 9806:2013.

Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}

Zero-loss efficiency (η_0)	0.625	--
First-order coefficient (a_1)	0.93	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.