


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results						Licence Number		<b>011-7S2904 R</b>						
						Date issued		<b>2019-02-25</b>						
						Issued by		<b>DIN CERTCO</b>						
Licence holder		<b>Kloben Industries S.r.l</b>				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					Power output per collector G <sub>b</sub> = 850 W/m <sup>2</sup> ; G <sub>d</sub> = 150 W/m <sup>2</sup> ; u = 3 m/s ϑ <sub>m</sub> - ϑ <sub>a</sub>									
					Gross area (A <sub>G</sub> )	Gross length	Gross width	Gross height	0 K	10 K	30 K	50 K	70 K	118 K
					m <sup>2</sup>	mm	mm	mm	W	W	W	W	W	W
ATON G 10 - O					2.17	1 925	1 127	127	1 385	1 364	1 316	1 262	1 201	1 025
ATON G 12 - O					2.59	1 927	1 342	127	1 653	1 628	1 571	1 506	1 433	1 223
ATON G 14 - O					3.01	1 927	1 562	126	1 921	1 892	1 826	1 750	1 665	1 422
ATON G 16 - O					3.43	1 927	1 782	126	2 189	2 156	2 081	1 995	1 898	1 620
ATON G 18 - O					3.86	1 927	2 002	126	2 464	2 426	2 342	2 245	2 136	1 823
ATON G 20 - O					4.28	1 927	2 222	126	2 732	2 690	2 596	2 489	2 368	2 021
ATON G 22 - O					4.71	1 925	2 446	127	3 006	2 961	2 857	2 739	2 606	2 224
NATURAL ATON 12 - 200 - O					2.59	1 927	1 342	116	1 653	1 628	1 571	1 506	1 433	1 223
NATURAL ATON 16 - 300 - O					3.43	1 927	1 782	116	2 189	2 156	2 081	1 995	1 898	1 620
Power output per m <sup>2</sup> gross area									638	629	607	582	553	472
Performance parameters test method		Quasi dynamic												
Performance parameters (related to AG)		η <sub>0,b</sub>	c <sub>1</sub>	c <sub>2</sub>	c <sub>3</sub>	c <sub>4</sub>	c <sub>6</sub>	K <sub>d</sub>						
Units		-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )	J/(m <sup>3</sup> K)	-	s/m	-						
Test results		0.641	0.935	0.004	0.000	0.000	0.000	0.972						
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 <sub>θT, coll</sub>	1.00	0.99	1.00	1.01	1.09	1.10	1.29	0.65	0.00			
Longitudinal		K <sub>θL, coll</sub>	1.00	0.99	0.97	0.95	0.90	0.81	0.66	0.33	0.00			
Heat transfer medium for testing		Water-Glycole												
Flow rate for testing (per gross area, A <sub>G</sub> )		dm/dt		0.017	kg/(sm <sup>2</sup> )									
Maximum temperature difference for thermal performance calculations		(ϑ <sub>m</sub> -ϑ <sub>a</sub> ) <sub>max</sub>		118	K									
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; ϑ <sub>a</sub> = 30 °C)		ϑ <sub>stg</sub>		259	°C									
Effective thermal capacity, incl. fluid (per gross area, A <sub>G</sub> )		C/m <sup>2</sup>		37.99	kJ/(Km <sup>2</sup> )									
Maximum operating temperature		ϑ <sub>max, op</sub>		n.b	°C									
Maximum operating pressure		p <sub>max, op</sub>		600	kPa									
Testing laboratory		TZS, ITW University Stuttgart				www.itw.uni-stuttgart.de								
Test report(s)		10COL943/2OEM02 10COL942/2OEM02 10COL943Q/3OEM02				Dated		11.02.2019 11.02.2019 11.02.2019						
Comments of testing laboratory		Datashet version: 5.01, 2016-03-01												
Documented performance parameters are taken from test report 10COL943/2OEM02 (ATON G 22 - O)		 Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 6, 70560 Stuttgart (Vaihingen)												
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<b>Annex to Solar Keymark Certificate</b> <b>Supplementary Information</b>	<b>Licence Number</b>	<b>011-7S2904 R</b>
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**Annual collector output in kWh/collector at mean fluid temperature  $\vartheta_m$ , based on ISO 9806:2013 test results**

Collector name	Standard Locations $\vartheta_m$	Athens			Davos			Stockholm			Würzburg		
		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 G 10 -O		2 401	2 168	1 917	2 070	1 836	1 599	1 499	1 303	1 113	1 609	1 401	1 197
ATON G 12 -O		2 865	2 588	2 289	2 470	2 192	1 909	1 789	1 555	1 328	1 921	1 672	1 429
ATON G 14 -O		3 330	3 008	2 660	2 871	2 547	2 218	2 079	1 807	1 544	2 232	1 943	1 660
ATON G 16 -O		3 795	3 427	3 031	3 271	2 903	2 528	2 369	2 059	1 759	2 543	2 214	1 892
ATON G 18 -O		4 270	3 857	3 411	3 682	3 267	2 845	2 666	2 318	1 980	2 862	2 492	2 129
ATON G 20 -O		4 735	4 277	3 782	4 082	3 622	3 154	2 956	2 570	2 195	3 174	2 763	2 361
ATON G 22 -O		5 211	4 706	4 162	4 492	3 986	3 471	3 253	2 828	2 416	3 493	3 041	2 598
NATURAL ATON 12 - 200 - O		2 865	2 588	2 289	2 470	2 192	1 909	1 789	1 555	1 328	1 921	1 672	1 429
NATURAL ATON 16 - 300 - O		3 795	3 427	3 031	3 271	2 903	2 528	2 369	2 059	1 759	2 543	2 214	1 892
Annual output per m <sup>2</sup> gross area		1 106	999	884	954	846	737	691	600	513	742	646	552
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1714 kWh/m <sup>2</sup>			1166 kWh/m <sup>2</sup>			1244 kWh/m <sup>2</sup>		
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  $\vartheta_m$  (mean of in- and outlet temperatures). The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool Scenocalc Ver. 5.01 (March 2016). A detailed description of the calculations is available at [www.solarkeymark.org/scenocalc](http://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 <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$	
ATON G 10 -O	2.17	Collector efficiency ( $\eta_{col}$ )	59 %
ATON G 12 -O	2.59	Remark: Collector efficiency ( $\eta_{col}$ ) 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 <sup>2</sup> , expressed in % and rounded to the nearest integer. Deviating from the regulation $\eta_{col}$ 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.	
ATON G 14 -O	3.01		
ATON G 16 -O	3.43		
ATON G 18 -O	3.86		
ATON G 20 -O	4.28		
ATON G 22 -O	4.71		
NATURAL ATON 12 - 200 - O	2.59		
NATURAL ATON 16 - 300 - O	3.43	Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$	
		Zero-loss efficiency ( $\eta_0$ )	0.638 --
		First-order coefficient ( $a_1$ )	0.94 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0.004 W/(m <sup>2</sup> K <sup>2</sup> )
		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.			