


Annex to Solar Keymark Certificate					Licence Number		011-7S2905 R							
					Date issued		2021-05-17							
					Issued by		DIN CERTCO							
Licence holder		KLOBEN Industries s.r.l			Country		Italy							
Brand (optional)		-			Web		www.kloben.it							
Street, Number		Via Pier Luigi Da Palestrina, 2			E-mail		info@klobenindustries.it							
Postcode, City		20124 Milano			Tel		+39 045 4743243							
Collector Type					Evacuated tubular collector									
Collector name					Power output per collector G _b = 850 W/m ² , G _d = 150 W/m ² & u = 1.3 m/s $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	106 K				
					m ²	mm	mm	mm	W	W	W	W	W	W
ATON-S 10					1.82	1 625	1 122	127	1072	1048	997	940	877	749
ATON-S 12					2.18	1 625	1 342	127	1284	1256	1194	1126	1050	897
ATON-S 14					2.53	1 625	1 562	127	1490	1457	1386	1306	1219	1041
ATON-S 16					2.89	1 625	1 782	127	1702	1665	1583	1492	1392	1189
ATON-S 18					3.25	1 625	2 002	127	1914	1872	1780	1678	1566	1337
ATON-S 20					3.61	1 625	2 222	127	2126	2079	1978	1864	1739	1485
Power output per m ² gross area									589	576	548	516	482	411
Performance parameters test method		Quasi dynamic												
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		0.575	1.250	0.004	0.000	0.00	35660	0.000	0.00	0.0	1.161			
Incidence angle modifier test method		Quasi dynamic - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		K _{θT, coll}	1.00	0.99	1.00	1.00	1.11	1.15	1.41	0.71	0.00			
Longitudinal		K _{θL, coll}	0.99	0.98	0.96	0.93	0.91	0.79	0.73	0.37	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}	76	K										
Standard stagnation temperature (G = 1000 W/m ² ; $\vartheta_a = 30$ °C)		ϑ_{stg}	280	°C										
Maximum operating temperature		$\vartheta_{max, op}$	150	°C										
Maximum operating pressure		p _{max, op}	600	kPa										
Testing laboratory		Institut für Gebäudeenergetik, Thermotechnik und Energiespeicherung (IGTE)					http://www.igte.uni-stuttgart.de							
Test report(s)		18COL1441 18COL1442 18COL1442Q					Dated		12.02.2019 12.02.2019 12.02.2019					
Comments of testing laboratory		Datashet version: 6.1, 2019-09-26												
Documented performance parameters are taken from test report 18COL1441 (ATON-S 10)		 Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 6, 70560 Stuttgart (Vaihingen)												
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S2905 R
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Annual collector output in kWh/collector at mean fluid temperature ϑ_m													
Collector name	Standard Locations	Athens			Davos			Stockholm			Würzburg		
	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		1 941	1 692	1 438	1 624	1 385	1 154	1 188	988	803	1 291	1 076	875
ATON-S 12		2 325	2 027	1 722	1 946	1 659	1 383	1 424	1 183	961	1 546	1 288	1 048
ATON-S 14		2 699	2 352	1 999	2 258	1 925	1 605	1 652	1 373	1 116	1 794	1 495	1 217
ATON-S 16		3 083	2 687	2 283	2 579	2 199	1 833	1 887	1 569	1 275	2 049	1 708	1 390
ATON-S 18		3 467	3 021	2 567	2 901	2 473	2 062	2 122	1 764	1 433	2 305	1 921	1 563
ATON-S 20		3 851	3 356	2 852	3 222	2 747	2 290	2 357	1 960	1 592	2 560	2 134	1 736
Annual output per m ² gross area		1 067	930	790	892	761	634	653	543	441	709	591	481
Annual efficiency, η_a		60%	53%	45%	55%	47%	39%	56%	47%	38%	57%	48%	39%
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 (September 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	2500		Pa
Maximum tested negative load	1250		Pa
Hail resistance using steel ball (maximum drop height)	0.5		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)
ATON-S 10	1.82	10-V-1122S-A:6;3517-C:16.2;1125	1.57
ATON-S 12	2.18	12-V-1122S-A:6;3517-C:16.2;1345	1.89
ATON-S 14	2.53	14-V-1122S-A65;3517-C:16.2;1565	2.21
ATON-S 16	2.89	16-V-1122S-A65;3517-C:16.2;1785	2.52
ATON-S 18	3.25	18-V-1122S-A65;3517-C:16.2;2005	2.84
ATON-S 20	3.61	20-V-1122S-A65;3517-C:16.2;2225	3.16

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})	53%	Zero-loss efficiency (η_0)	0.59
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)	1.25
		Second-order coefficient (a_2)	0.004
		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.			