ICIM S.p.A.
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Capitale Soc EUR. 260.000,00 int. versato ed esistente
C.F./P. IVA e Iscriz. Reg. Imprese di Milano n. 12908230159 - R.E.A. n. 1596292

Annex to Solar Keymark Certificate

Licence Number	**ICIM-CLS-000157-00**
Date issued	**2019-01-10**
Issued by	**ICIM S.p.A.**

Licence holder	**Ariston Thermo S.p.A**	**Country**	Italy
Brand (optional)	-	**Web**	www.aristonthermo.com
Street, Number	Viale A. Nerloni 45	**E-mail**	info@aristonthermo.com
Postcode, City	IT-60044 Fabriano	**Tel**	+39 0732 6011

Collector Type	Flat plate collector

Collector name	**Gross height**	**Gross area (A_G)**	**Gross length**	**Gross width**	**Aperture area (A_a)**	**Power output per collector** Gb = 850 W/m2, Gd = 150 W/m2 & u = 1.3 m/s $\vartheta_m - \vartheta_a$					
						0 K	10 K	30 K	50 K	70 K	120 K
	mm	m²	mm	mm	m²	W	W	W	W	W	W
CF 2.0-2	78	1,96	1.990	985	1,77	1.358	1.284	1.126	956	775	272
Power output per m² gross area						693	655	574	488	396	139

Performance parameters test method	Steady state - outdoor									
Performance parameters (related to A_G)	η0, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd
Units	-	W/(m²K)	W/(m²K²)	J/(m³K)	-	J/(m²K)	s/m	W/(m²K⁴)	W/(m²K⁴)	-
Test results	0,710	3,73	0,007	0,000	0,00	7.026	0,000	0,00	0,0E+00	0,84

Incidence angle modifier test method	Steady state - outdoor								
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$	1,00	1,00	0,99	0,93	0,86	0,76	0,66	0,39	0,00
Longitudinal	$K_{\theta L,coll}$	1,00	1,00	0,99	0,93	0,86	0,76	0,66	0,39	0,00

Heat transfer medium for testing	Water-Glycole		
Flow rate for testing (per gross area, A_G)	dm/dt	0,021	kg/(sm²)
Maximum temperature difference during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	90	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	210	°C
Maximum operating temperature	ϑ_{max_op}	105	°C
Maximum operating pressure	$p_{max,op}$	600	kPa

Testing laboratory	SPF Testing, CH-8640 Rapperswil, Switzerland	www.spf.ch	
Test report(s)	C1790ISO	**Dated**	09/01/2019

Comments of testing laboratory

Datasheet version: 6.0, 2018-10-30

SPF INSTITUT FÜR SOLARTECHNIK

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Supplementary Information	**Issued**	**2019-01-10**

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
CF 2.0-2		2.073	1.416	898	1.540	1.035	643	1.136	717	428	1.233	768	450
Annual output per m² gross area		1.057	722	458	786	528	328	579	366	218	629	392	229
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. 6.0 (October 2018). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc

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/m²) >	1000	ϑ_a (°C) >	20	H_X (MJ/m²) >	600
Maximum tested positive load				1800	Pa
Maximum tested negative load				1800	Pa
Hail resistance using ice balls (diameter)				35	mm

Additional collector attribute(s)

- ☐ Using external power source(s) for normal operation
- ☐ Active or passive measure(s) for self-protection
- ☐ Co-generating thermal and electrical power
- ☐ Wind and/or infrared sensitive collector(s) (WISC)
- ☐ Façade collector(s)

Energy Labelling Information

	Reference Area, A_{sol} (m²)	Hydraulic Designation Code
CF 2.0-2	1,96	7-V-1234S-A:7.2,1865-C:16.4,1000-D

Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}	
Collector efficiency (η_{col})	53%

Remark: Collector efficiency (ηcol) 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 ηcol is based on reference area (Asol) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.

Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}		
Zero-loss efficiency (η_0)	0,69	--
First-order coefficient (a_1)	3,73	W/(m²K)
Second-order coefficient (a_2)	0,007	W/(m²K²)
Incidence angle modifier IAM (50°)	0,86	--

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.