TÜVRheinland®
DIN CERTCO
Precisely Right.

Annex to Solar Keymark Certificate

Licence Number	**011-7S2909 F**
Date issued	**2019-01-25**
Issued by	**TÜV Rheinland Energy GmbH**

Licence holder	**Ariston Thermo S.p.A.**	**Country**	Italy
Brand (optional)	CHAFFOTEAUX	**Web**	http://www.aristonthermo.com
Street, Number	Via A. Merloni 45	**E-mail**	public.relations@aristonthermo.com
Postcode, City	60044 Fabriano	**Tel**	+39 02763209 -1 / -40

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	100 K
	mm	m²	mm	mm	m²	W	W	W	W	W	W
ZELIOS DR 2.0-2 N	75	1.92	1 985	967	1.77	1 228	1 150	978	785	570	207
Power output per m² gross area						639	599	509	409	297	108

Performance parameters test method	Quasi dynamic									
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	0.642	3.92	0.014	0.000	0.00	11 317	0.000	0.00	0.0E+00	0.97

Incidence angle modifier test method		Quasi dynamic - outdoor								
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$	1.00	0.99	0.97	0.94	0.90	0.81	0.64	0.32	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	0.99	0.97	0.94	0.90	0.81	0.64	0.32	0.00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0.059	kg/(sm²)
Maximum temperature difference during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	70	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	180	°C
Maximum operating temperature	$\vartheta_{max\ op}$	n.n.	°C
Maximum operating pressure	$p_{max,op}$	800	kPa

Testing laboratory	TÜV Rheinland Energy GmbH	www.tuv.com/solarpower	
Test report(s)	21244208.002	**Dated**	24.01.2019

Comments of testing laboratory — Datasheet version: 6.0, 2018-10-30

TÜVRheinland®
Genau. Richtig.
TÜV Rheinland Energy GmbH
Am Grauen Stein
51105 Köln

TÜVRheinland®
DIN CERTCO
Precisely Right.

Annex to Solar Keymark Certificate	Licence Number	011-7S2909 F
Supplementary Information	Issued	2019-01-25

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
ZELIOS DR 2.0-2 N	1 938	1 243	689	1 388	846	430	1 038	598	300	1 140	648	318
Annual output per m² gross area	1 009	647	359	723	441	224	540	312	156	594	338	166
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) >	1100	ϑ_a (°C) >	40	H_x (MJ/m²) >		700
Maximum tested positive load					2400	Pa
Maximum tested negative load					2250	Pa
Hail resistance using steel ball (maximum drop height)					35	m

Additional collector attribute(s)

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

Energy Labelling Information

	Reference Area, A_{sol} (m²)	Hydraulic Designation Code
ZELIOS DR 2.0-2 N	1.92	6-VH-1234S-A:11.2,1863-C:20.6,996

Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}	
Collector efficiency (η_{col})	46%

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)	0.64	--
First-order coefficient (a_1)	3.92	W/(m²K)
Second-order coefficient (a_2)	0.014	W/(m²K²)
Incidence angle modifier IAM (50°)	0.90	--

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