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Annex to Solar Keymark Certificate		Licence Number	011-7S3264 F
		Date issued	2025-02-02
		Issued by	DIN CERTCO

Licence holder	ARYA GROUP S.P.A.	**Country**	Italy
Brand (optional)	ARYA	**Web**	-
Street, Number	VIA TROPEA 40	**E-mail**	arya@aryagroupspa.com
Postcode, City	00178, ROMA	**Tel**	+39 067180000

Collector Type	Flat plate 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 = 1.3 m/s $\vartheta_m - \vartheta_a$					
					0 K	10 K	30 K	50 K	70 K	100 K
	m²	mm	mm	mm	W	W	W	W	W	W
AR1.82CF	2.00	2 000	1 000	95	1 552	1 476	1 313	1 135	943	629
AR2.80CF	3.00	2 000	1 500	95	2 328	2 214	1 969	1 703	1 415	943
Power output per m² gross area					776	738	656	568	472	314

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	0.783	3.72	0.009	0.000	0.00	12 180	0.000	0.00	0.00	0.94

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	1.00	0.98	0.96	0.93	0.88	0.77	0.00	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	1.00	0.98	0.96	0.93	0.88	0.77	0.00	0.00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0.020	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}	190	°C
Maximum operating temperature	$\vartheta_{max\ op}$	99	°C
Maximum operating pressure	$p_{max,op}$	800	kPa

Testing laboratory	TÜV Rheinland (Guangdong) Ltd.	http://www.tuv.com	
Test report(s)	CN24NIKU 001	**Dated**	2024-09-09

Comments of testing laboratory Ver. 6.2 (13.01.2022)

No comment

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Supplementary Information	Issued	2025-02-02

Gross Thermal Yield 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
AR1.82CF		2 486	1 786	1 197	1 894	1 328	865	1 390	925	577	1 517	1 000	615
AR2.80CF		3 730	2 679	1 796	2 842	1 992	1 297	2 084	1 387	866	2 275	1 499	922
Gross Thermal Yield per m² gross area		1 243	893	599	947	664	432	695	462	289	758	500	307
Annual efficiency, η_a		70%	51%	34%	58%	41%	27%	60%	40%	25%	61%	40%	25%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m²			1630 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. 6.2 (13.01.2022). 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)				C	--
G (W/m²) >	800	ϑ_a (°C) >	10	H_X (MJ/m²) >	600
Maximum tested positive load				2760	Pa
Maximum tested negative load				1888	Pa
Hail resistance using steel ball (maximum drop height)				2	m

Additional collector attribute(s)

Using external power source(s) for normal operation	No	Active or passive measure(s) for self-protection	No
Co-generating thermal and electrical power	No	Façade collector(s)	No

Energy Labelling Information

	Reference Area, A_{sol} (m²)
AR1.82CF	2.00
AR2.80CF	3.00

Additional Informative Technical Data

	Hydraulic Designation Code	Aperture Area, A_a (m²)
AR1.82CF	9-VH-1234S-A:8,1874-C:20,1050-D	1.85
AR2.80CF	14-VH-1234S-A:8,1874-C:20,1550-D	2.83

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

Collector efficiency (η_{col})	61%

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)	0.78	--
First-order coefficient (a_1)	3.72	W/(m²K)
Second-order coefficient (a_2)	0.009	W/(m²K²)
Incidence angle modifier IAM (50°)	0.92	--

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.