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Annex to Solar Keymark Certificate

Licence Number	**063BN**
Date issued	**2021-03-18**
Issued by	**ICIM S.p.A.**

Licence holder	**Riello**	**Country**	Italy
Brand (optional)	--	**Web**	www.riello.it
Street, Number	Via Ing. Pliade Riello 7	**E-mail**	
Postcode, City	IT-37045, Legnago (VR)	**Tel**	

Collector Type	Evacuated tubular 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	122 K
	m²	mm	mm	mm	W	W	W	W	W	W
CSV 25 R	2,69	1.730	1.554	143	1.634	1.607	1.549	1.485	1.414	1.199
CSV 35 R	3,83	1.730	2.216	143	2.327	2.289	2.206	2.114	2.013	1.707
Power output per m² gross area					607	598	576	552	526	446

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	0,613	0,96	0,003	0,000	0,00	9.995	0,000	0,00	0,0E+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	0,99	1,00	1,03	1,09	1,15	0,96	0,54	0,00
Longitudinal	$K_{\theta L,coll}$	1,00	1,00	0,98	0,96	0,91	0,82	0,67	0,42	0,00

Heat transfer medium for testing	Water-Glycole		
Flow rate for testing (per gross area, A_G)	dm/dt	0,020	kg/(sm²)
Maximum temperature difference during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	92	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	280	°C
Maximum operating temperature	ϑ_{max_op}	270	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	SPF Institute for Solar Technology	www.spf.ch	
Test report(s)	C1844ISO C1845ISO	**Dated**	12/01/2021 12/01/2021

Comments of testing laboratory — Datasheet version: 6.1, 2019-09-26

first issue: 20/07/2010

SPF INSTITUT FÜR SOLARTECHNIK

Annex to Solar Keymark Certificate	Licence Number	063BN
Supplementary Information	Issued	2021-03-18

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
CSV 25 R	2.801	2.516	2.223	2.414	2.138	1.866	1.739	1.505	1.287	1.867	1.618	1.383
CSV 35 R	3.988	3.583	3.165	3.438	3.043	2.657	2.476	2.143	1.832	2.659	2.303	1.969
Annual output per m² gross area	1.041	935	826	898	795	694	647	560	478	694	601	514
Annual efficiency, η_a	59%	53%	47%	55%	49%	43%	55%	48%	41%	56%	48%	41%
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. 6.1 (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/m²) >	1000	ϑ_a (°C) >	20	H_x (MJ/m²) >		600
Maximum tested positive load					1000	Pa
Maximum tested negative load					0	Pa
Hail resistance using ice balls (diameter)					25	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
- ☐ Façade collector(s)

Energy Labelling Information

	Reference Area, A_{sol} (m²)
CSV 25 R	2,69
CSV 35 R	3,83

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

Collector efficiency (η_{col})	56%

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.

Additional Informative Technical Data

Hydraulic Designation Code	Aperture Area, A_a (m²)
14-V-12S-A:6,3200-C:16.4,1560	2,37
20-V-12S-A:6.3200-C:16.4,2216	3,39

Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}

Zero-loss efficiency (η_0)	0,61	--
First-order coefficient (a_1)	0,96	W/(m²K)
Second-order coefficient (a_2)	0,003	W/(m²K²)
Incidence angle modifier IAM (50°)	0,98	--

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.