TÜVRheinland®
DIN CERTCO
Precisely Right.

Annex to Solar Keymark Certificate		Licence Number	011-7S2996 F
		Date issued	2020-12-22
		Issued by	DIN CERTCO

Licence holder	**Tancredi S.r.l**	**Country**	Italy	
Brand (optional)	–	**Web**	www.tancredisolarsystem.com	
Street, Number	Cda Canale	**E-mail**	info@tancredisolarsystem.com	
Postcode, City	PZ 85100 - Sn Potenza	**Tel**	+39	0971 471176

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	120 K
	m²	mm	mm	mm	W	W	W	W	W	W
TAN 2004	2.11	2’037	1’036	90	1’481	1’397	1’219	1’030	828	274
TAN 2304	2.31	2’037	1’136	90	1’622	1’529	1’335	1’127	907	299
TAN 2504	2.52	2’037	1’235	90	1’769	1’668	1’456	1’230	989	327
Power output per m² gross area					702	662	578	488	393	130

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	0.716	3.93	0.007	0.000	0.00	5'260	0.000	0.00	0.0E+00	0.87

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	0.97	0.91	0.78	0.63	0.36	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	1.00	0.99	0.97	0.91	0.78	0.63	0.36	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	$(\vartheta_m-\vartheta_a)_{max}$	90	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	200	°C
Maximum operating temperature	$\vartheta_{max\ op}$	110	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	SPF Testing, CH-8640 Rapperswil, Switzerland	www.spf.ch	
Test report(s)	C1702LPEN	**Dated**	02.11.2016
	C1703LPEN, C1703QPEN		02.11.2016
	C1857EN		22.12.2020

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

SPF INSTITUT FÜR SOLARTECHNIK

Annex to Solar Keymark Certificate	Licence Number	011-7S2996 F
Supplementary Information	Issued	2020-12-22

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
TAN 2004	2'300	1'560	982	1'705	1'138	701	1'255	786	464	1'366	844	490
TAN 2304	2'518	1'708	1'075	1'866	1'246	767	1'374	860	508	1'496	924	536
TAN 2504	2'747	1'863	1'172	2'036	1'359	837	1'498	938	555	1'632	1'008	585
Annual output per m² gross area	1'090	739	465	808	539	332	595	372	220	648	400	232
Annual efficiency, η_a	62%	42%	26%	50%	33%	20%	51%	32%	19%	52%	32%	19%
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					Yes	
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					3000	Pa
Maximum tested negative load					3000	Pa
Hail resistance using ice balls (diameter)					45	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)
TAN 2004	2.11
TAN 2304	2.31
TAN 2504	2.52

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.

Additional Informative Technical Data

	Hydraulic Designation Code	Aperature Area, A_a (m²)
TAN 2004	9-V-1234S-A:7,1900-C:20.6,1050-D	1.91
TAN 2304	10-V-1234S-A:7,1900-C:20.6,1155-D	2.10
TAN 2504	11-V-1234S-A:7,1900-C:20.6,1260-D	2.30

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

Zero-loss efficiency (η_0)	0.70	--
First-order coefficient (a_1)	3.93	W/(m²K)
Second-order coefficient (a_2)	0.007	W/(m²K²)
Incidence angle modifier IAM (50°)	0.93	--

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