TÜVRheinland®
DIN CERTCO
Precisely Right.

Annex to Solar Keymark Certificate		Licence Number	011-7S2922 R
		Date issued	2019-04-17
		Issued by	DINCERTCO

Licence holder	FK Solartechnik GmbH	**Country**	Germany
Brand (optional)		**Web**	www.fksolar.de
Street, Number	Industriepark Kleinkoschen	**E-mail**	verkauf@fksolar.de
Postcode, City	D-01968 Senftenberg	**Tel**	+49 3573 806725

Collector Type	Evacuated tubular 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	119 K
	mm	m²	mm	mm	m²	W	W	W	W	W	W
FK Solinas 3 plus kurz	136	1.11	933	1'189	0.59	377	360	325	285	242	124
Power output per m² gross area						340	325	293	257	219	111

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	0.336	1.47	0.004	0.000	0.00	10'099	0.000	0.00	0.0E+00	1.08

Incidence angle modifier test method		Steady state - outdoor								
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$	1.01	1.06	1.16	1.30	1.40	1.38	1.10	0.60	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	1.00	0.99	0.96	0.92	0.84	0.69	0.44	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	$(\vartheta_m-\vartheta_a)_{max}$	89	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	230	°C
Maximum operating temperature	ϑ_{max_op}	217	°C
Maximum operating pressure	$p_{max,op}$	600	kPa

Testing laboratory	SPF Testing, CH-8640 Rapperswil, Switzerland	www.spf.ch	
Test report(s)	C1744ISO C1765ISO	**Dated**	16.03.2019 16.03.2019

Comments of testing laboratory

Datasheet version: 6.0, 2018-10-30

SPF INSTITUT FÜR SOLARTECHNIK

TÜVRheinland®
DIN CERTCO
Precisely Right.

Annex to Solar Keymark Certificate	Licence Number	011-7S2922 R
Supplementary Information	Issued	2019-04-17

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
FK Solinas 3 plus kurz		708	546	401	555	418	298	410	296	205	445	320	218
Annual output per m² gross area		639	493	362	500	377	269	370	267	185	401	289	197
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				1500	Pa
Maximum tested negative load				1500	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
- [ ] Wind and/or infrared sensitive collector(s) (WISC)
- [x] Façade collector(s)

Energy Labelling Information

	Reference Area, A_{sol} (m²)	Hydraulic Designation Code
FK Solinas 3 plus kurz	1.11	1-H-12S-C:19,1260
		1-H-12S-C:19,1260

Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}		Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}		
Collector efficiency (η_{col})	28%	Zero-loss efficiency (η_0)	0.34	--
		First-order coefficient (a_1)	1.47	W/(m²K)
		Second-order coefficient (a_2)	0.004	W/(m²K²)
		Incidence angle modifier IAM (50°)	1.22	--

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.

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.