TÜVRheinland®
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Annex to Solar Keymark Certificate		Licence Number	011-7S2822 F
		Date issued	2022-12-24
		Issued by	DIN CERTCO

Licence holder	**HEWALEX Sp. z o.o. Sp. k.**	**Country**	Poland	
Brand (optional)	–	**Web**	www.hewalex.pl	
Street, Number	Slowackiego 33	**E-mail**	hewalex@hewalex.pl	
Postcode, City	PL 43-502, Czechowice-Dziedzice	**Tel**	+48	32 214 17 10

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	82 K
	m²	mm	mm	mm	W	W	W	W	W	W
KS 2100F TP AC	2.06	2’022	1’019	90	1’550	1’482	1’332	1’162	972	849
KS 2200F TP AC	2.25	2’022	1’110	90	1’693	1’619	1’455	1’269	1’062	927
KS 2400F TP AC	2.43	2’022	1’202	90	1’829	1’749	1’571	1’371	1’147	1’001
KS 2600F TP AC	2.62	2’022	1’295	90	1’972	1’885	1’694	1’478	1’236	1’079
KS 2100F TLP AC	2.06	2’022	1’019	90	1’550	1’482	1’332	1’162	972	849
KS 2200F TLP AC	2.25	2’022	1’110	90	1’693	1’619	1’455	1’269	1’062	927
KS 2400F TLP AC	2.43	2’022	1’202	90	1’829	1’749	1’571	1’371	1’147	1’001
KS 2600F TLP AC	2.62	2’022	1’295	90	1’972	1’885	1’694	1’478	1’236	1’079
Power output per m² gross area					753	720	647	564	472	412

Performance parameters test method	Steady state - indoor									
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	0.764	3.17	0.012	0.000	0.00	4’243	0.000	0.00	0.0E+00	0.90

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	0.98	0.94	0.87	0.73	0.48	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	1.00	0.99	0.98	0.94	0.87	0.73	0.48	0.00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0.024	kg/(sm²)
Maximum temperature difference during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	52	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	210	°C
Maximum operating temperature	$\vartheta_{max\ op}$	250	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	SPF, CENER	www.spf.ch, www.cener.com	
Test report(s)	30.3139.1-1-1 / 30.3139.1-3-1 30.3566.0-2 / 30.3139.3 R C1910C1911CP	**Dated**	31.10.2017 / 11.12.2017 08.05.2019 / 10.05.2019 09.12.2022

Comments of testing laboratory — Draft Ver. 6.2 (22.09.2021)

The only difference between the TLP AC and TP AC collectors is the colour of the collector casing.

SPF INSTITUT FÜR SOLARTECHNIK

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Supplementary Information	Issued	2022-12-24

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
KS 2100F TP AC		2'485	1'835	1'255	1'927	1'383	917	1'410	959	611	1'530	1'037	650
KS 2200F TP AC		2'714	2'004	1'371	2'105	1'510	1'001	1'540	1'048	667	1'671	1'132	710
KS 2400F TP AC		2'931	2'164	1'481	2'273	1'631	1'082	1'663	1'131	721	1'804	1'223	767
KS 2600F TP AC		3'160	2'333	1'597	2'451	1'759	1'166	1'793	1'220	777	1'945	1'319	827
KS 2100F TLP AC		2'485	1'835	1'255	1'927	1'383	917	1'410	959	611	1'530	1'037	650
KS 2200F TLP AC		2'714	2'004	1'371	2'105	1'510	1'001	1'540	1'048	667	1'671	1'132	710
KS 2400F TLP AC		2'931	2'164	1'481	2'273	1'631	1'082	1'663	1'131	721	1'804	1'223	767
KS 2600F TLP AC		3'160	2'333	1'597	2'451	1'759	1'166	1'793	1'220	777	1'945	1'319	827
Gross Thermal Yield per m² gross area		1'206	891	609	936	671	445	684	466	297	743	503	316
Annual efficiency, η_a		68%	50%	35%	57%	41%	27%	59%	40%	25%	60%	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 Draft Ver. 6.2 (22.09.2021). 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				2400	Pa
Maximum tested negative load				2400	Pa
Hail resistance using ice balls (diameter)				45	mm

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)	Yes

Energy Labelling Information

	Reference Area, A_{sol} (m²)
KS 2100F TP AC	2.06
KS 2200F TP AC	2.25
KS 2400F TP AC	2.43
KS 2600F TP AC	2.62
KS 2100F TLP AC	2.06
KS 2200F TLP AC	2.25
KS 2400F TLP AC	2.43
KS 2600F TLP AC	2.62

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.

Additional Informative Technical Data

	Hydraulic Designation Code	Aperture Area, A_a (m²)
KS 2100F TP AC	11-V-1234S-5.2,1935-16.0,1052-D	1.93
KS 2200F TP AC	12-V-1234S-5.2,1935-16.0,1143-D	2.11
KS 2400F TP AC	13-V-1234S-5.2,1935-16.0,1235-D	2.29
KS 2600F TP AC	14-V-1234S-5.2,1935-16.0,1328-D	2.47
KS 2100F TLP AC	11-V-1234S-5.2,1935-16.0,1052-D	1.93
KS 2200F TLP AC	12-V-1234S-5.2,1935-16.0,1143-D	2.11
KS 2400F TLP AC	13-V-1234S-5.2,1935-16.0,1235-D	2.29
KS 2600F TLP AC	14-V-1234S-5.2,1935-16.0,1328-D	2.47

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

Zero-loss efficiency (η_0)	0.75	--
First-order coefficient (a_1)	3.17	W/(m²K)
Second-order coefficient (a_2)	0.012	W/(m²K²)
Incidence angle modifier IAM (50°)	0.95	--

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.

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