



<b>Annex to Solar Keymark Certificate</b>					<b>Licence Number</b>		<b>011-7S2823 F</b>							
					<b>Date issued</b>		<b>2022-12-24</b>							
					<b>Issued by</b>		<b>DIN CERTCO</b>							
<b>Licence holder</b>		<b>HEWALEX Sp. z o.o. Sp. k.</b>			<b>Country</b>		Poland							
<b>Brand (optional)</b>		-			<b>Web</b>		www.hewalex.pl							
<b>Street, Number</b>		Slowackiego 33			<b>E-mail</b>		hewalex@hewalex.pl							
<b>Postcode, City</b>		PL 43-502, Czechowice-Dziedzice			<b>Tel</b>		+48 32 214 17 10							
<b>Collector Type</b>					Flat plate collector									
<b>Collector name</b>					<b>Power output per collector</b>									
					Gb = 850 W/m <sup>2</sup> , Gd = 150 W/m <sup>2</sup> & u = 1.3 m/s $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	81 K				
					m <sup>2</sup>	mm	mm	mm	mm	mm	mm			
					W	W	W	W	W	W				
<b>KS 2100F TP ACR</b>					2.06	2'022	1'019	90	1'630	1'558	1'397	1'214	1'007	883
<b>KS 2200F TP ACR</b>					2.25	2'022	1'110	90	1'780	1'702	1'526	1'326	1'100	965
<b>KS 2400F TP ACR</b>					2.43	2'022	1'202	90	1'923	1'838	1'648	1'432	1'188	1'042
<b>KS 2600F TP ACR</b>					2.62	2'022	1'295	90	2'073	1'982	1'777	1'544	1'281	1'123
<b>KS 2100F TLP ACR</b>					2.06	2'022	1'019	90	1'630	1'558	1'397	1'214	1'007	883
<b>KS 2200F TLP ACR</b>					2.25	2'022	1'110	90	1'780	1'702	1'526	1'326	1'100	965
<b>KS 2400F TLP ACR</b>					2.43	2'022	1'202	90	1'923	1'838	1'648	1'432	1'188	1'042
<b>KS 2600F TLP ACR</b>					2.62	2'022	1'295	90	2'073	1'982	1'777	1'544	1'281	1'123
<b>Power output per m<sup>2</sup> gross area</b>					<b>791</b>	<b>756</b>	<b>678</b>	<b>589</b>	<b>489</b>	<b>429</b>				
<b>Performance parameters test method</b>		Steady state - indoor												
<b>Performance parameters (related to A<sub>G</sub>)</b>		$\eta_0, b$	a1	a2	a3	a4	a5	a6	a7	a8	Kd			
<b>Units</b>		-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )	J/(m <sup>3</sup> K)	-	J/(m <sup>2</sup> K)	s/m	W/(m <sup>2</sup> K <sup>4</sup> )	W/(m <sup>2</sup> K <sup>4</sup> )	-			
<b>Test results</b>		0.802	3.34	0.014	0.000	0.00	4'486	0.000	0.00	0.0E+00	0.91			
<b>Incidence angle modifier test method</b>		Steady state - outdoor												
<b>Incidence angle modifier</b>		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
<b>Transversal</b>		K <sub>θT, coll</sub>	1.00	1.00	0.99	0.98	0.95	0.88	0.75	0.50	0.00			
<b>Longitudinal</b>		K <sub>θL, coll</sub>	1.00	1.00	0.99	0.98	0.95	0.88	0.75	0.50	0.00			
<b>Heat transfer medium for testing</b>					Water									
<b>Flow rate for testing (per gross area, A<sub>G</sub>)</b>					dm/dt		0.020	kg/(sm <sup>2</sup> )						
<b>Maximum temperature difference during thermal performance test</b>					$(\vartheta_m - \vartheta_a)_{max}$		51	K						
<b>Standard stagnation temperature (G = 1000 W/m<sup>2</sup>; <math>\vartheta_a = 30</math> °C)</b>					$\vartheta_{stg}$		200	°C						
<b>Maximum operating temperature</b>					$\vartheta_{max, op}$		250	°C						
<b>Maximum operating pressure</b>					$p_{max, op}$		1000	kPa						
<b>Testing laboratory</b>		SPF, CENER			www.spf.ch, www.cener.com									
<b>Test report(s)</b>		30.3139.1-4-1 / 30.3139.1-5-1 30.3566.0-1 / 30.3139.2 R C1912C1913CP			<b>Dated</b>		31.10.2017 / 11.12.2017 08.05.2019 / 10.05.2019 09.12.2022							
<b>Comments of testing laboratory</b>					Draft Ver. 6.2 (22.09.2021)									
The only difference between the TLP ACR and TP ACR collectors is the colour of the collector casing.					 INSTITUT FÜR SOLARTECHNIK 									
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<b>Annex to Solar Keymark Certificate</b> <b>Supplementary Information</b>	<b>Licence Number</b>	<b>011-7S2823 F</b>
	<b>Issued</b>	<b>2022-12-24</b>

<b>Gross Thermal Yield in kWh/collector at mean fluid temperature <math>\vartheta_m</math></b>													
Standard Locations		Athens			Davos			Stockholm			Würzburg		
Collector name	$\vartheta_m$	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 ACR		2'621	1'932	1'309	2'032	1'448	945	1'488	1'006	632	1'616	1'089	673
KS 2200F TP ACR		2'863	2'110	1'430	2'219	1'581	1'032	1'625	1'099	690	1'765	1'189	735
KS 2400F TP ACR		3'092	2'279	1'544	2'397	1'708	1'115	1'755	1'187	745	1'906	1'284	794
KS 2600F TP ACR		3'334	2'457	1'665	2'584	1'841	1'202	1'893	1'280	804	2'055	1'385	856
KS 2100F TLP ACR		2'621	1'932	1'309	2'032	1'448	945	1'488	1'006	632	1'616	1'089	673
KS 2200F TLP ACR		2'863	2'110	1'430	2'219	1'581	1'032	1'625	1'099	690	1'765	1'189	735
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Gross Thermal Yield per m <sup>2</sup> gross area		1'273	938	635	986	703	459	722	488	307	784	529	327
Annual efficiency, $\eta_a$		72%	53%	36%	61%	43%	28%	62%	42%	26%	63%	42%	26%
Fixed or tracking collector	Fixed (slope = latitude - 15°; rounded to nearest 5°)												
Annual irradiation on collector plane	1765 kWh/m <sup>2</sup>			1630 kWh/m <sup>2</sup>			1166 kWh/m <sup>2</sup>			1244 kWh/m <sup>2</sup>			
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  $\vartheta_m$  (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/>

<b>Additional Information</b>					
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/m <sup>2</sup> ) >	1000	$\vartheta_a$ (°C) >	20	$H_x$ (MJ/m <sup>2</sup> ) >	600
Maximum tested positive load			2400	Pa	
Maximum tested negative load			2400	Pa	
Hail resistance using ice balls (diameter)			45	mm	
<b>Additional collector attribute(s)</b>					
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		

<b>Energy Labelling Information</b>		<b>Additional Informative Technical Data</b>	
	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Hydraulic Designation Code	Aperture Area, $A_a$ (m <sup>2</sup> )
KS 2100F TP ACR	2.06	11-V-1234S-5.2,1935-16.0,1052-D	1.93
KS 2200F TP ACR	2.25	12-V-1234S-5.2,1935-16.0,1143-D	2.11
KS 2400F TP ACR	2.43	13-V-1234S-5.2,1935-16.0,1235-D	2.29
KS 2600F TP ACR	2.62	14-V-1234S-5.2,1935-16.0,1328-D	2.47
KS 2100F TLP ACR	2.06	11-V-1234S-5.2,1935-16.0,1052-D	1.93
KS 2200F TLP ACR	2.25	12-V-1234S-5.2,1935-16.0,1143-D	2.11
KS 2400F TLP ACR	2.43	13-V-1234S-5.2,1935-16.0,1235-D	2.29
KS 2600F TLP ACR	2.62	14-V-1234S-5.2,1935-16.0,1328-D	2.47

<b>Data required for CDR (EU) No 811/2013 - Reference Area <math>A_{sol}</math></b>		<b>Data required for CDR (EU) No 812/2013 - Reference Area <math>A_{sol}</math></b>	
Collector efficiency ( $\eta_{col}$ )	64%	Zero-loss efficiency ( $\eta_0$ )	0.79
Remark: Collector efficiency ( $\eta_{col}$ ) 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/m <sup>2</sup> , expressed in % and rounded to the nearest integer. Deviating from the regulation $\eta_{col}$ is based on reference area ( $A_{sol}$ ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.		First-order coefficient ( $a_1$ )	3.34
		Second-order coefficient ( $a_2$ )	0.014
		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.	