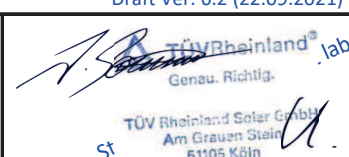


Annex to Solar Keymark Certificate					Licence Number		011-7S783 F							
					Date issued		2023-09-15							
					Issued by		DINCERTCO							
Licence holder		Wallnöfer GmbH srl			Country		Italy							
Brand (optional)		Wallnöfer			Web		www.wallnoefer.it							
Street, Number		Gewerbezone 110			E-mail		info@wallnoefer.it							
Postcode, City		39026 Prad am Stj.			Tel		+39 0473 61 63 61							
Collector Type					Flat plate collector									
Collector name					Power output per collector									
					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	100 K				
					m <sup>2</sup>	mm	mm	mm	mm	mm	mm			
KA88/2020 Standard					1.80	1 940	920	88	1 389	1 325	1 181	1 016	830	511
KA88/2020 Smart					2.04	1 940	1 050	88	1 574	1 501	1 339	1 152	941	579
KA88/2020 Comfort					2.47	2 350	1 050	88	1 905	1 818	1 621	1 394	1 139	701
KA88/2020 Inox					2.47	2 350	1 050	88	1 905	1 818	1 621	1 394	1 139	701
Power output per m <sup>2</sup> gross area					771	736	656	565	461	284				
Performance parameters test method		Steady state - indoor												
Performance parameters (related to A <sub>G</sub> )		$\eta_0, b$	a1	a2	a3	a4	a5	a6	a7	a8	Kd			
Units		-	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> )	-			
Test results		0.779	3.40	0.015	0.000	0.00	7 084	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 <sub>GT, coll</sub>	1.00	0.99	0.98	0.95	0.92	0.85	0.71	0.36	0.00			
Longitudinal		K <sub>GL, coll</sub>	1.00	0.99	0.98	0.95	0.92	0.85	0.71	0.36	0.00			
Heat transfer medium for testing					Water									
Flow rate for testing (per gross area, A <sub>G</sub> )					dm/dt	0.019	kg/(sm <sup>2</sup> )							
Maximum temperature difference during thermal performance test					( $\vartheta_m - \vartheta_a$ ) <sub>max</sub>	70	K							
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; $\vartheta_a = 30$ °C)					$\vartheta_{stg}$	210	°C							
Maximum operating temperature					$\vartheta_{max, op}$	n.n.	°C							
Maximum operating pressure					p <sub>max, op</sub>	600	kPa							
Testing laboratory		TÜV Rheinland Energy GmbH					www.tuv.com/solar							
Test report(s)		21242731.001rev1 21242731.002rev1					Dated		28.01.2019 28.01.2019					
Comments of testing laboratory					Draft Ver. 6.2 (22.09.2021)									
The values related to an aperture area of 2.28 m <sup>2</sup> are $\eta_{0, hem, a} = 0.831$ , $a1a = 3.687$ , $a2a = 0.016$					 Genau. Richtig. TÜV Rheinland Solar GmbH Am Grauen Stein 51105 Köln									
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														

Annex to Solar Keymark Certificate							Licence Number		011-7S783 F					
Supplementary Information							Issued		2023-09-15					
<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	
KA88/2020 Standard		2 213	1 602	1 055	1 696	1 180	742	1 246	825	500	1 358	894	534	
KA88/2020 Smart		2 508	1 816	1 195	1 922	1 338	841	1 413	935	567	1 539	1 013	605	
KA88/2020 Comfort		3 037	2 199	1 447	2 327	1 620	1 019	1 710	1 132	687	1 863	1 226	732	
KA88/2020 Inox		3 037	2 199	1 447	2 327	1 620	1 019	1 710	1 132	687	1 863	1 226	732	
Gross Thermal Yield per m <sup>2</sup> gross area		1 229	890	586	942	656	412	692	458	278	754	497	297	
Annual efficiency, $\eta_a$		70%	50%	33%	58%	40%	25%	59%	39%	24%	61%	40%	24%	
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 <a href="http://www.estif.org/solarkeymarknew/">http://www.estif.org/solarkeymarknew/</a>														
<b>Additional Information</b>														
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/m <sup>2</sup> ) >		1000		$\vartheta_a$ (°C) >		20		$H_x$ (MJ/m <sup>2</sup> ) >		600				
Maximum tested positive load										2750		Pa		
Maximum tested negative load										2400		Pa		
Hail resistance using ice balls (diameter)										35		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)				No		
<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> )			
KA88/2020 Standard						1.80		10-VH-1234S-A:4,1850-C:20,960			1.65			
KA88/2020 Smart						2.04		14-VH-1234S-A:4,1850-C:20,1090			1.88			
KA88/2020 Comfort						2.47		14-VH-1234S-A:4,2250-C:20,1090			2.28			
KA88/2020 Inox						2.47		14-VH-1234S-A:4,2250-C:20,1090			2.28			
<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 ( $\eta_{col}$ )						61%		Zero-loss efficiency ( $\eta_0$ )			0.77		--	
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 ( $a_1$ )			3.40			W/(m <sup>2</sup> K)		
						Second-order coefficient ( $a_2$ )			0.015			W/(m <sup>2</sup> K <sup>2</sup> )		
						Incidence angle modifier IAM (50°)			0.91			--		
						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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