


Annex to Solar Keymark Certificate					Licence Number		011-7S2003 F							
					Date issued		2022-12-05							
					Issued by		DIN CERTCO							
Licence holder		GREENoneTEC Solarindustrie GmbH			Country		Austria							
Brand (optional)					Web		www.greenonetec.com							
Street, Number		Industriepark St. Veit, Energieplatz 1			E-mail		info@greenonetec.com							
Postcode, City		A - 9300 St. Veit/Glan			Tel		+43 (0) 4212 28136-0							
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	112 K				
					m <sup>2</sup>	mm	mm	mm	mm	mm	mm			
					W	W	W	W	W	W				
GK3502 M/PR					5.04	2 065	2 443	113	3 729	3 546	3 144	2 693	2 194	988
GK3102 M/PR					10.06	2 065	4 871	113	7 444	7 079	6 275	5 376	4 379	1 973
Power output per m <sup>2</sup> gross area					740	704	624	534	435	196				
Performance parameters test method		Quasi dynamic												
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		0.746	3.51	0.012	0.000	0.00	8 799	0.000	0.00	0.0E+00	0.95			
Incidence angle modifier test method		Quasi dynamic - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		K <sub>θT, coll</sub>	1.00	0.99	0.98	0.97	0.91	0.76	0.55	0.28	0.00			
Longitudinal		K <sub>θL, coll</sub>	1.00	0.99	0.98	0.97	0.91	0.76	0.55	0.28	0.00			
Heat transfer medium for testing					Water									
Flow rate for testing (per gross area, A <sub>G</sub> )					dm/dt	0.020	kg/(sm <sup>2</sup> )							
Maximum temperature difference during thermal performance test					( $\vartheta_m - \vartheta_a$ ) <sub>max</sub>	82	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.sp.	°C							
Maximum operating pressure					$p_{max, op}$	1000	kPa							
Testing laboratory		Institut für Gebäudeenergetik, Thermotechnik und Energiespeicherung (IGTE)					http://www.igte.uni-stuttgart.de							
Test report(s)		22COL1661 22COL1661Q					Dated		05.12.2022 05.12.2022					
Comments of testing laboratory					Ver. 6.2 (13.01.2022)									
Documented performance parameters are taken from 22COL1661 (GK3502 M/PR) This data sheet replaces the data sheet issued on 05.10.2017.					 Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 6, 70569 Stuttgart (Vaihingen)									
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														

<b>Annex to Solar Keymark Certificate</b> <b>Supplementary Information</b>	<b>Licence Number</b>	<b>011-7S2003 F</b>
	<b>Issued</b>	<b>2022-12-05</b>

<b>Gross Thermal Yield in kWh/collector at mean fluid temperature <math>\vartheta_m</math></b>													
Collector name	Standard Locations	Athens			Davos			Stockholm			Würzburg		
	$\vartheta_m$	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
GK3502 M/PR		5 909	4 200	2 735	4 489	3 092	1 941	3 288	2 144	1 297	3 593	2 326	1 383
GK3102 M/PR		11 795	8 383	5 458	8 961	6 172	3 875	6 563	4 279	2 588	7 173	4 643	2 760
Gross Thermal Yield per m <sup>2</sup> gross area		1 172	833	543	891	613	385	652	425	257	713	462	274
Annual efficiency, $\eta_a$		66%	47%	31%	55%	38%	24%	56%	36%	22%	57%	37%	22%
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 Ver. 6.2 (13.01.2022). 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	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	3000		Pa		
Maximum tested negative load	2400		Pa		
Hail resistance using steel ball (maximum drop height)	2		m		
<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> )
GK3502 M/PR	5.04	2-H-1234S-7.2,22555-26,2469-D	6.64
GK3102 M/PR	10.06	4-H-1234S-7.2,22555-26,4896-D	9.28

<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 ( $\eta_{col}$ )	58%	Zero-loss efficiency ( $\eta_0$ )	0.74
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 ( $a_1$ )	3.51
		Second-order coefficient ( $a_2$ )	0.012
		Incidence angle modifier IAM (50°)	0.94
		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.	