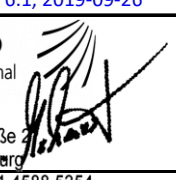




Annex to Solar Keymark Certificate					Licence Number		011-7S1852R							
					Date issued		2023-07-26							
					Issued by		DIN CERTCO							
Licence holder		Sunhybrid GmbH			Country		Deutschland							
Brand (optional)					Web		www.sunhybrid.eu							
Street, Number		Eisenbahnstr. 36			E-mail		info@heat.de							
Postcode, City		73235, Weilheim			Tel		+49 7023 94980							
Collector Type					Evacuated tubular collector									
Collector name					Power output per collector G _b = 850 W/m ² , G _d = 150 W/m ² & u = 1.3 m/s ϑ _m - ϑ _a									
					0 K	10 K	30 K	50 K	70 K	100 K				
					m ²	mm	mm	mm	W	W	W	W	W	W
WT-B58-30 VakuTherm 30					5,05	2.030	2.490	172	1.549	1.472	1.308	1.132	944	640
WT-B58-22 VakuTherm 22					3,76	2.030	1.850	172	1.151	1.094	972	841	702	475
WT-B58-10 VakuTherm 10-2					1,81	2.030	890	172	554	526	468	405	338	229
Power output per m ² gross area									307	291	259	224	187	127
Performance parameters test method		Steady state - outdoor												
Performance parameters (related to A _G)		η _{0, b}	a1	a2	a3	a4	a5	a6	a7	a8	Kd			
Units		-	W/(m ² K)	W/(m ² K ²)	J/(m ³ K)	-	J/(m ² K)	s/m	W/(m ² K ⁴)	W/(m ² K ⁴)	-			
Test results		0,302	1,50	0,003	0,000	0,00	4.860	0,000	0,00	0,0E+00	1,10			
Incidence angle modifier test method		Steady state - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		K _{θT, coll}	1,01	1,07	1,18	1,37	1,55	1,50	1,02	0,19	0,00			
Longitudinal		K _{θL, coll}	1,00	1,00	1,00	0,99	0,96	0,90	0,76	0,46	0,00			
Heat transfer medium for testing		Water												
Flow rate for testing (per gross area, A _G)		dm/dt	0,020		kg/(sm ²)									
Maximum temperature difference during thermal performance test		(ϑ _m -ϑ _a) _{max}	70		K									
Standard stagnation temperature (G = 1000 W/m ² ; ϑ _a = 30 °C)		ϑ _{stg}	190		°C									
Maximum operating temperature		ϑ _{max, op}	105		°C									
Maximum operating pressure		p _{max, op}	800		kPa									
Testing laboratory		TestLab Solar Thermal Systems, Fraunhofer ISE					http://www.collectortest.com							
Test report(s)		KTB-2021-02, KTB-2021-03					Dated		03.08.2021					
		KTB-2021-08							19.11.2021					
		KTB-2022-03-2021-02							19.12.2022					
Comments of testing laboratory		Datasheet version: 6.1, 2019-09-26												
		<p>TestLab Solar Thermal Systems</p> <p>Heidenhofstraße 2 D-79110 Freiburg</p> <p>Tel: +49 (0)761 4588 5354</p> 												
<p>DIN CERTCO • Alboinstraße 56 • 12103 Berlin, Germany</p> <p>Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de</p>														

Annex to Solar Keymark Certificate Supplementary Information		Licence Number		011-7S1852R										
		Issued		2023-07-26										
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	
WT-B58-30 VakuTherm 30		2.970	2.239	1.608	2.299	1.699	1.191	1.697	1.199	814	1.847	1.300	868	
WT-B58-22 VakuTherm 22		2.206	1.663	1.194	1.708	1.263	885	1.261	891	605	1.372	965	645	
WT-B58-10 VakuTherm 10-2		1.061	800	575	822	607	426	606	429	291	660	464	310	
Annual output per m ² gross area		588	443	318	455	336	236	336	237	161	365	257	172	
Annual efficiency, η_a		33%	25%	18%	28%	21%	14%	29%	20%	14%	29%	21%	14%	
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)												
Annual irradiation on collector plane		1765 kWh/m ²			1630 kWh/m ²			1166 kWh/m ²			1244 kWh/m ²			
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 ϑ_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. 6.1 (September 2019). 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											No			
The collector was tested successfully under the following conditions:														
Climate class (A+, A, B or C)											A		--	
G (W/m ²) >		1000		ϑ_a (°C) >		20		H _x (MJ/m ²) >				600		
Maximum tested positive load											2400		Pa	
Maximum tested negative load											1750		Pa	
Hail resistance using ice balls (diameter)											25		mm	
Additional collector attribute(s)														
<input type="checkbox"/> Using external power source(s) for normal operation				<input type="checkbox"/> Active or passive measure(s) for self-protection										
<input type="checkbox"/> Co-generating thermal and electrical power				<input type="checkbox"/> Façade collector(s)										
Energy Labelling Information						Additional Informative Technical Data								
	Reference Area, A _{sol} (m ²)					Hydraulic Designation Code			Aperture Area, A _a (m ²)					
WT-B58-30 VakuTherm 30	5,05					1-H-12S-C:20,2580			2,83					
WT-B58-22 VakuTherm 22	3,76					1-H-12S-C:20,1940			2,08					
WT-B58-10 VakuTherm 10-2	1,81					1-H-12S-C:20,1070			0,94					
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})						24%								
Remark: Collector efficiency (η_{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 ² , expressed in % and rounded to the nearest integer. Deviating from the regulation η_{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.						Zero-loss efficiency (η_0)			0,31			--		
						First-order coefficient (a_1)			1,50			W/(m ² K)		
						Second-order coefficient (a_2)			0,003			W/(m ² K ²)		
						Incidence angle modifier IAM (50°)			1,32			--		
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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