

Annex to Solar Keymark Certificate					Licence Number		011-7S660 R							
					Date issued		2021-06-24							
					Issued by		ISFH CalTeC							
Licence holder		AKOTEC Produktionsgesellschaft			Country		Germany							
Brand (optional)					Web		http://www.akotec.eu							
Street, Number		Grundmühlenweg 3			E-mail		info@akotec.eu							
Postcode, City		D- 16278 Angermünde			Tel		+49 33 312 571 640							
Collector Type					Evacuated tubular collector									
Collector name					Power output per collector									
					Gb = 850 W/m ² , Gd = 150 W/m ² & u = 1.3 m/s $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	90 K				
					W	W	W	W	W	W				
Weiser Protect 1000¹⁾					1.61	2 159	745	128	811	787	736	680	618	480
Weiser Protect 2000¹⁾					3.23	2 159	1 495	128	1 627	1 580	1 477	1 364	1 241	847
Weiser Protect 3000¹⁾					4.85	2 159	2 245	128	2 443	2 372	2 218	2 048	1 863	1 448
lowest switching temperature²⁾:														
Weiser Protect 1000²⁾					1.61	2 159	745	128	811	787	736	539	321	103
Weiser Protect 2000²⁾					3.23	2 159	1 495	128	1 627	1 580	1 477	1 083	645	207
Weiser Protect 3000²⁾					4.85	2 159	2 245	128	2 443	2 372	2 218	1 626	968	310
per m² lowest switching temp.²⁾					1.00				504	489	458	335	200	64
Power output per m² gross area									504	489	458	423	384	299
Performance parameters test method		Steady state - indoor												
Performance parameters (related to A_G)		$\eta_{0,b}$	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		0.511	1.43	0.004			2 724				0.91			
Incidence angle modifier test method		Quasi dynamic - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		K _{θT, coll}	1.04	1.06	1.08	1.07	1.07	1.03	0.69	0.34	0.00			
Longitudinal		K _{θL, coll}	1.00	1.00	0.99	0.98	0.96	0.93	0.86	0.64	0.00			
Heat transfer medium for testing		Water												
Flow rate for testing (per gross area, A_G)		dm/dt	0.021		kg/(sm ²)									
Maximum temperature difference during thermal performance test		($\vartheta_m - \vartheta_a$) _{max}	132		K									
Standard stagnation temperature (G = 1000 W/m²; $\vartheta_a = 30$ °C)		ϑ_{stg}	170/130		°C (comments)									
Maximum operating temperature		$\vartheta_{max, op}$	100		°C									
Maximum operating pressure		p _{max, op}	1000		kPa									
Testing laboratory		ISFH CalTeC		http://www.isfh.de										
Test report(s)		006-20/K1		Dated		21.06.2021								
		007-20/KT1 (origin of given performance parameters)				21.06.2021								
		008-20/KT1				21.06.2021								
Comments of testing laboratory		Datashet version: 6.1, 2019-07-11												
The collector shows a thermal switching behaviour caused. It is offered with different switching temperatures, ¹⁾ the highest results in a standard stag. tempaure of 170 °C for temperatures above the switching temperature of 100 °C (at standard conditions) the following parameters apply: $\eta_{0,hem}^* = 0.830$, $a_1^* = 6.64$ W/m ² K (Report 007-20/KT1)					Institut für Solarenergieforschung GmbH Am Ohrberg 1 D-31800 Emmertal Tel.: 05151/999-100 Fax: 05151/999-500									
²⁾ the lowest results in a standard stag. temperature of 130 °C and for temperatures above the switching temperature of 52 °C (at standard conditions) the following parameters apply: $\eta_{0,hem}^* = 0.648$, $a_1^* = 6.78$ W/m ² K (report 008-20/KT1)														
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Supplementary Information											Issued			2021-06-24													
Annual collector output in kWh/collector at mean fluid temperature ϑ_m³⁾																											
³⁾ the calculation tool does not consider the switching behaviour of collectors, what might lead to minor annual annual collector output at high mean fluid temperatures for the collector with the lower switching temperature.																											
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														
Weiser Protect 1000		1 378	1 141	917	1 140	929	739	820	644	496	883	693	528														
Weiser Protect 2000		2 765	2 289	1 841	2 288	1 865	1 483	1 646	1 293	995	1 773	1 391	1 060														
Weiser Protect 3000		4 152	3 437	2 764	3 436	2 801	2 227	2 472	1 941	1 494	2 662	2 089	1 591														
Annual output per m ² gross area		857	709	570	709	578	460	510	401	308	549	431	328														
Annual efficiency, η_a		49%	40%	32%	43%	35%	28%	44%	34%	26%	44%	35%	26%														
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 (July 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											4500		Pa														
Maximum tested negative load											3250		Pa														
Hail resistance using steel ball (maximum drop height)											2		m														
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																											
		Reference Area, A _{sol} (m ²)			Hydraulic Designation Code				Aperture Area, A _a (m ²)																		
Weiser Protect 1000		1.61			1-H-12S-C:33,745-D				1.44																		
Weiser Protect 2000		3.23			1-H-12S-C:33,1495-D				2.89																		
Weiser Protect 3000		4.85			1-H-12S-C:33,2245-D				4.33																		
Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}																											
Collector efficiency (η_{col})		44%																									
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)		0.50											
														First-order coefficient (a_1)		1.43											
														Second-order coefficient (a_2)		0.004											
Incidence angle modifier IAM (50°)		1.03																									
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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