


Annex to Solar Keymark Certificate					Licence Number		011-7S3281 F							
					Date issued		2025-01-13							
					Issued by		DINCERTCO							
Licence holder		ASOTEC GmbH			Country		Deutschland							
Brand (optional)					Web		https://www.asotec.de							
Street, Number		Mittelstandspark 22			E-mail		e.wolf@asotec.de							
Postcode, City		57627 Hachenburg			Tel		+49 (0)2662-94470-0							
Collector Type					Flat plate 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	103 K				
					m ²	mm	mm	mm	W	W	W	W	W	W
Blackline 2.02 quer					2.02	1 168	1 728	83	1 433	1 369	1 215	1 026	801	352
Blackline 2.51. quer					2.51	1 168	2 148	83	1 780	1 701	1 510	1 275	995	438
Blackline 2.02					2.02	1 728	1 168	83	1 433	1 369	1 215	1 026	801	352
Blackline 2.51					2.51	2 148	1 168	83	1 780	1 701	1 510	1 275	995	438
Power output per m² gross area					709	678	602	508	397	174				
Performance parameters test method		Quasi dynamic												
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		0.713	2.93	0.022	0.000	0.00	12 510	0.000	0.00	0.0	0.97			
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}	1.00	1.00	0.99	0.98	0.96	0.88	0.69	0.35	0.00			
Longitudinal		K _{θL, coll}	1.00	1.00	0.99	0.98	0.96	0.88	0.69	0.35	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		($\vartheta_m - \vartheta_a$) _{max}	73		K									
Standard stagnation temperature (G = 1000 W/m²; $\vartheta_a = 30$ °C)		ϑ_{stg}	200		°C									
Maximum operating temperature		$\vartheta_{max, op}$	200		°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)		23COL1699OEM02 23COL1700OEM02 23COL1700Q/1OEM02						Dated		07.01.2025 07.01.2025 07.01.2025				
Comments of testing laboratory		Ver. 6.2 (13.01.2022)												
Documented performance parameters are taken from 23COL1699OEM02 (Blackline 2.02 quer)		 Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 6, 70560 Stuttgart (Vaihingen)												
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Supplementary Information		011-7S3281 F											
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		2025-01-13											
Gross Thermal Yield 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
Blackline 2.02 quer		2 338	1 692	1 070	1 799	1 228	720	1 321	862	492	1 441	938	528
Blackline 2.51. quer		2 905	2 103	1 330	2 235	1 525	895	1 641	1 071	612	1 790	1 165	656
Blackline 2.02		2 338	1 692	1 070	1 799	1 228	720	1 321	862	492	1 441	938	528
Blackline 2.51		2 905	2 103	1 330	2 235	1 525	895	1 641	1 071	612	1 790	1 165	656
Gross Thermal Yield per m ² gross area		1 157	838	530	890	608	357	654	427	244	713	464	261
Annual efficiency, η_a		66%	47%	30%	55%	37%	22%	56%	37%	21%	57%	37%	21%
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. 6.2 (13.01.2022). 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											Yes		
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											3000		Pa
Maximum tested negative load											3000		Pa
Hail resistance using steel ball (maximum drop height)											2		m
Additional collector attribute(s)													
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	
Energy Labelling Information							Additional Informative Technical Data						
		Reference Area, A _{sol} (m ²)			Hydraulic Designation Code			Aperture Area, A _a (m ²)					
Blackline 2.02 quer		2.02			11-H-12S-7.2,1574-20.4,1153			1.88					
Blackline 2.51. quer		2.51			11-H-12S-7.2,2010-20.4,1153			2.35					
Blackline 2.02		2.02			12-V-12S-7.2,1590-20.4,1207			1.88					
Blackline 2.51		2.51			12-V-12S-7.2,2010-20.4,1207			2.35					
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})		56%					Zero-loss efficiency (η_0)		0.71		--		
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.				First-order coefficient (a ₁)			2.93		W/(m ² K)				
				Second-order coefficient (a ₂)			0.022		W/(m ² K ²)				
				Incidence angle modifier IAM (50°)			0.96		--				
		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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