

Annex to Solar Keymark Certificate					Licence Number		011-7S3168 P							
					Date issued		2023-09-28							
					Issued by		DIN CERTCO							
Licence holder		DualSun SAS			Country		France							
Brand (optional)					Web		https://dualsun.com							
Street, Number		2 Rue Marc Donadille			E-mail		contact@dualsun.fr							
Postcode, City		F- 13463 Marseille			Tel		+33 423415371							
Collector Type					WISC (Wind and/or infrared sensitive 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	56 K				
					m ²	mm	mm	mm	mm	mm				
					W	W	W	W	W	W				
DSTI420M12-B320SBB7					2.08	1 899	1 096	30	720	541	184	0	--	0
DSTI425M12-B320SBB7					2.08	1 899	1 096	30	720	541	184	0	--	0
DSTI430M12-B320SBB7					2.08	1 899	1 096	30	720	541	184	0	--	0
DSTI435M12-B320SBB7					2.08	1 899	1 096	30	720	541	184	0	--	0
DSTI440M12-B320SBB7					2.08	1 899	1 096	30	720	541	184	0	--	0
Power output per m² gross area					346	260	88	0	--	0				
Performance parameters test method		Quasi dynamic												
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		0.363	10.50	0.000	1.126	0.41	29 220	0.016	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 _{θT, coll}	1.00	1.00	0.99	0.99	0.97	0.96	0.91	0.79	0.00			
Longitudinal		K _{θL, coll}	1.00	1.00	0.99	0.99	0.97	0.96	0.91	0.79	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}	26	K							
Standard stagnation temperature (G = 1000 W/m²; $\vartheta_a = 30$ °C)					ϑ_{stg}	70	°C							
Maximum operating temperature					$\vartheta_{max, op}$	80	°C							
Maximum operating pressure					p _{max, op}	150	kPa							
Testing laboratory		ISFH CalTeC					https://isfh.de/							
Test report(s)		075-23/KT (origin of given performance parameters) DE23Q071.001 (TÜV Rheinland Solar GmbH)					Dated		27.09.2023 05.05.2023					
Comments of testing laboratory					Ver. 6.2 (13.01.2022)									
Thermal performance parameters are given for the PV-module working with max. electrical power output (MPP).					Institut für Solarenergieforschung GmbH Am Ohrberg 1, D-51890 Emmersthal Tel.: 05151/999-100 Fax: 05151/999-500									
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Supplementary Information				Issued		2023-09-28								
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	
DSTI420M12-B320SBB7		873	85		341	12		320	22		375	33		
DSTI425M12-B320SBB7		873	85		341	12		320	22		375	33		
DSTI430M12-B320SBB7		873	85		341	12		320	22		375	33		
DSTI435M12-B320SBB7		873	85		341	12		320	22		375	33		
DSTI440M12-B320SBB7		873	85		341	12		320	22		375	33		
Gross Thermal Yield per m ² gross area		420	41	--	164	6	--	154	10	--	180	16	--	
Annual efficiency, η_a		24%	2%	--	10%	0%	--	13%	1%	--	14%	1%	--	
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										6600		Pa		
Maximum tested negative load										3600		Pa		
Hail resistance using ice balls (diameter)										45		mm		
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)				
DSTI420M12-B320SBB7		2.08				182-V-23R-A:4.9,1500-C:22x10,992				2.08				
DSTI425M12-B320SBB7		2.08				182-V-23R-A:4.9,1500-C:22x10,992				2.08				
DSTI430M12-B320SBB7		2.08				182-V-23R-A:4.9,1500-C:22x10,992				2.08				
DSTI435M12-B320SBB7		2.08				182-V-23R-A:4.9,1500-C:22x10,992				2.08				
DSTI440M12-B320SBB7		2.08				182-V-23R-A:4.9,1500-C:22x10,992				2.08				
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})		0.3%				Zero-loss efficiency (η_0)				0.35		--		
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)				8.59		W/(m ² K)		
						Second-order coefficient (a ₂)				0.000		W/(m ² K ²)		
						Incidence angle modifier IAM (50°)				0.97		--		
						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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