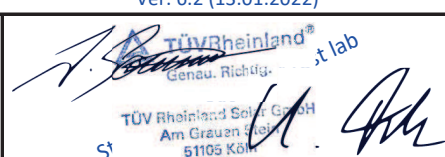


Annex to Solar Keymark Certificate					Licence Number		011-7S3167 P				
					Date issued		2023-06-14				
					Issued by		DINCERTCO				
Licence holder		DualSun SAS			Country		France				
Brand (optional)					Web		https://www.dualsun.com				
Street, Number		2 Rue Marc Donadille			E-mail		contact@dualsun.fr				
Postcode, City		13013 Marseille			Tel		+33 413415371				
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 θ _m - θ _a						
					0 K	10 K	30 K	50 K	70 K	50 K	
					W	W	W	W	W	W	
DSTN420M12-B320SBB7					2.08	1 899	1 096	30	834	508	0
DSTN425M12-B320SBB7					2.08	1 899	1 096	30	834	508	0
DSTN430M12-B320SBB7					2.08	1 899	1 096	30	834	508	0
DSTN435M12-B320SBB7					2.08	1 899	1 096	30	834	508	0
DSTN440M12-B320SBB7					2.08	1 899	1 096	30	834	508	0
Power output per m² gross area					401	244	0	0	--	0	
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		0.379	17.16	0.000	0.875	0.00	17 161	0.013	0.00	0.0E+00	1.00
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	0.99	0.98	0.97	0.94	0.90	0.80	0.40	0.00
Longitudinal		K _{θL, coll}	1.00	0.99	0.98	0.97	0.94	0.90	0.80	0.40	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					(θ _m -θ _a) _{max}	20	K				
Standard stagnation temperature (G = 1000 W/m²; θ_a = 30 °C)					θ _{stg}	70	°C				
Maximum operating temperature					θ _{max, op}	80	°C				
Maximum operating pressure					p _{max, op}	150	kPa				
Testing laboratory		TÜV Rheinland Solar GmbH				http://www.tuv.com/solar					
Test report(s)		DE23Q071.001 (Reliability) DE236OLO.001 (Performance)				Dated		05.05.2023 01.06.2023			
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 mode')					 TÜVRheinland® Genau. Richtig. ... lab TÜV Rheinland Solar GmbH Am Grauen Stein 51105 Köln						
The original PV module certificate of the used PV module DSxxxM12-B320SBB7 from DualSun SAS was issued by TÜV Nord (44 780 20 406749 – 219R1M1).											
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Annex to Solar Keymark Certificate		Licence Number		011-7S3167 P											
Supplementary Information		Issued		2023-06-14											
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		
DSTN420M12-B320SBB7		1 171	23		261	0		318	1		384	2			
DSTN425M12-B320SBB7		1 171	23		261	0		318	1		384	2			
DSTN430M12-B320SBB7		1 171	23		261	0		318	1		384	2			
DSTN435M12-B320SBB7		1 171	23		261	0		318	1		384	2			
DSTN440M12-B320SBB7		1 171	23		261	0		318	1		384	2			
Gross Thermal Yield per m ² gross area		563	11	--	125	0	--	153	0	--	185	1	--		
Annual efficiency, η_a		32%	1%	--	8%	0%	--	13%	0%	--	15%	0%	--		
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										Yes		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)			
DSTN420M12-B320SBB7						2.08		182-V-14S-A:4.9,1500-C:22x10,992				2.08			
DSTN425M12-B320SBB7						2.08		182-V-14S-A:4.9,1500-C:22x10,992				2.08			
DSTN430M12-B320SBB7						2.08		182-V-14S-A:4.9,1500-C:22x10,992				2.08			
DSTN435M12-B320SBB7						2.08		182-V-14S-A:4.9,1500-C:22x10,992				2.08			
DSTN440M12-B320SBB7						2.08		182-V-14S-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})						-23%		Zero-loss efficiency (η_0)				0.40		--	
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)				15.67				W/(m ² K)	
						Second-order coefficient (a_2)				0.000				W/(m ² K ²)	
						Incidence angle modifier IAM (50°)				0.95				--	
						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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