



Annex to Solar Keymark Certificate					Licence Number		011-7S2625-R									
Summary of EN 12975-2 Test Results					Issued		2015-12-21									
Collector test standard			EN 12975-2													
Licence holder		S.A.S. Lacaze Energies			Country		France									
Brand (optional)		-			Web		www.lacaze-energies.com									
Street, Number		Zone industrielle -BP 2			E-mail		info.lacaze-energies@groupe-cahors.com									
Postcode, City		F-46120 Leyme			Tel		+33 (0)5 65 40 39 39									
Collector Type					Evacuated tubular collector											
					Power output per collector $G = 1000 \text{ W/m}^2$ $\vartheta_m - \vartheta_a$											
											0 K	10 K	30 K	50 K	70 K	88 K
Collector name					Aperture area (Aa) m <sup>2</sup>	Gross length mm	Gross width mm	Gross height mm	W	W	W	W	W	W		
SUN 401.20					2.15	1 954	1 416	93	1 651	1 621	1 553	1 477	1 391	1 306		
SUN 401.30					3.22	1 954	2 125	93	2 473	2 427	2 326	2 211	2 083	1 955		
Power output per m <sup>2</sup> aperture area. For aperture area, see page 2					768	754	722	687	647	607						
Performance parameters test method					Steady state - indoor											
Performance parameters (aperture area)					$\eta_0$	a1	a2									
Units					-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )									
Test results					0.768	1.360	0.005									
Incidence angle modifier test method					Quasi dynamic - outdoor											
Bi-directional incidence angle modifiers					Yes											
Incidence angle modifier					Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°		
Transversal					$K_{\theta T, coll}$	1.00	1.02	1.04	1.05	0.99	0.85	0.60	0.19	0.00		
Longitudinal					$K_{\theta L, coll}$	1.00	0.99	0.98	0.96	0.92	0.86	0.73	0.33	0.00		
Fluid for testing					Water											
Flow rate for testing (per Aa)					dm/dt	0.019		kg/(sm <sup>2</sup> )								
Maximum temperature difference for thermal performance calculations					$(\vartheta_m - \vartheta_a)_{max}$	88		K								
Standard stagnation temperature ( $G = 1000 \text{ W/m}^2$ ; $\vartheta_a = 30 \text{ °C}$ )					$\vartheta_{stg}$	313		°C								
Effective thermal capacity (per Aa)					C/m <sup>2</sup>	7.8		kJ/(Km <sup>2</sup> )								
Maximum operating temperature					$\vartheta_{max, op}$	-		°C								
Maximum operating pressure					$p_{max, op}$	800		kPa								
Testing laboratory					Institut für Solarenergieforschung GmbH					www.isfh.de						
Test report(s)					54-15/KB					Dated		21.12.2015				
Comments of testing laboratory					1) The collector efficiency parameter and incidence angle modifiers are related to $G(DIF)/G(TOT)=0.15$ .					Institut für Solarenergieforschung GmbH Am Ohrberg 1 D-31860 Emmerthal Tel.: 05151/999-100 Fax: 05151/999-500						



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Annual collector output in kWh/collector at mean fluid temperature $\vartheta_m$ , based on EN 12975-2 Test													
Collector name	Standard Locations $\vartheta_m$	Athens			Davos			Stockholm			Würzburg		
		25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
SUN 401.20		2 724	2 399	2 066	2 343	2 030	1 728	1 670	1 410	1 169	1 796	1 517	1 254
SUN 401.30		4 079	3 594	3 094	3 510	3 041	2 588	2 502	2 111	1 751	2 689	2 272	1 878
Annual output per m <sup>2</sup> aperture area		1 267	1 116	961	1 090	944	804	777	656	544	835	706	583
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1714 kWh/m <sup>2</sup>			1166 kWh/m <sup>2</sup>			1244 kWh/m <sup>2</sup>		
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 $\vartheta_m$ (mean of in- and outlet temperatures). The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool Scenocalc Ver. 5.01 (July 2015). A detailed description of the calculations is available at <a href="http://www.solarkeymark.org/scenocalc">www.solarkeymark.org/scenocalc</a>													

Additional Information		
Collector heat transfer medium		Liquid
Hybrid Thermal and Photo Voltaic collector		No
The collector is deemed to be suitable for roof integration		No
The collector was tested successfully according to EN 12975-2 under the following conditions:		
No valid climate reference class		
Positive Mechanical Load	3000	Pa
Negative Mechanical Load	n.a.	Pa
Hail resistance using steel ball (maximum drop height)	0.8	m

Energy Labelling Information			
	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$	
SUN 401.20	2.15	Collector efficiency ( $\eta_{col}$ )	71 %
SUN 401.30	3.22	Remark: Collector efficiency ( $\eta_{col}$ ) 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 <sup>2</sup> , expressed in % and rounded to the nearest integer. Deviating from the regulation $\eta_{col}$ is based on reference area ( $A_{sol}$ ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806.	
		Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$	
		Zero-loss efficiency ( $\eta_0$ )	0.768 --
		First-order coefficient ( $a_1$ )	1.36 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0.005 W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	1.01 --
		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.	