

# AENOR

## Keymark Certificate Solar thermal energy



**078/000281**

AENOR certifies that the organization

**SUNEX, S.A.**

registered office UL. PIASKOWA, 7 47-400 RACIBÓRZ (Polonia)

supplies Solar collectors

in compliance with UNE-EN 12975-1:2006+A1:2011 (EN 12975-1:2006+A1:2010)

Trade Mark AMP AR 2.0  
Technical information Specified in Annexes to the Certificate

Production site UL. PIASKOWA, 7 47-400 RACIBÓRZ (Polonia)

Certification scheme In order to grant this Certificate, AENOR has tested the product and has verified the quality system implemented for its manufacture. AENOR performs these tasks periodically while the Certificate has not been cancelled, in accordance with Specific Rules RP 078.01.

This certificate supersedes 078/000281, dated 2017-11-23

First issued on 2016-10-07  
Modified on 2020-03-10  
Validity date 2021-10-07

Rafael GARCÍA MEIRO  
Chief Executive Officer

Original Electronic Certificate

AENOR INTERNACIONAL S.A.U.  
Génova, 6. 28004 Madrid. España  
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Product certification body accredited by ENAC, number 1/C-PR271



Annex to Solar Keymark Certificate					Licence Number		078/000281							
					Date issued		2020-03-10							
					Issued by		AENOR							
Licence holder		SUNEX, S.A.			Country		Poland							
Brand (optional)		SX AL			Web		www.sunex.pl							
Street, Number		Ul. Piaskowa 7			E-mail		piotrfelinski@sunex.pl							
Postcode, City		47-400 Racibórz, Śląskie			Tel		+48 32 414 92 13							
Collector Type					Flat plate collector									
Collector name					Power output per collector $G_b = 850 \text{ W/m}^2, G_d = 150 \text{ W/m}^2 \text{ \& } u = 1.3 \text{ m/s}$ $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	130 K				
					m <sup>2</sup>	mm	mm	mm	W	W	W	W	W	W
AMP AR 2.0					2,02	1.900	1.062	99	1.440	1.356	1.181	999	808	187
Power output per m <sup>2</sup> gross area					713	671	585	494	400	93				
Performance parameters test method		Steady state - outdoor												
Performance parameters (related to A <sub>G</sub> )		$\eta_0, b$	a1	a2	a3	a4	a5	a6	a7	a8	Kd			
Units		-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )	J/(m <sup>3</sup> K)	-	J/(m <sup>2</sup> K)	s/m	W/(m <sup>2</sup> K <sup>4</sup> )	W/(m <sup>2</sup> K <sup>4</sup> )	-			
Test results		0,728	4,12	0,005	0,000	0,00	5.200	0,000	0,00	0,0E+00	0,86			
Incidence angle modifier test method		Steady state - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		K <sub>GT, coll</sub>	1,00	0,99	0,98	0,95	0,90	0,81	0,66	0,41	0,00			
Longitudinal		K <sub>GL, coll</sub>	1,00	0,99	0,98	0,95	0,90	0,81	0,66	0,41	0,00			
Heat transfer medium for testing		Water												
Flow rate for testing (per gross area, A <sub>G</sub> )		dm/dt	0,020		kg/(sm <sup>2</sup> )									
Maximum temperature difference during thermal performance test		( $\vartheta_m - \vartheta_a$ ) <sub>max</sub>	100		K									
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; $\vartheta_a = 30 \text{ }^\circ\text{C}$ )		$\vartheta_{stg}$	210		°C									
Maximum operating temperature		$\vartheta_{max, op}$	240		°C									
Maximum operating pressure		p <sub>max, op</sub>	1000		kPa									
Testing laboratory		INTA					www.inta.es							
Test report(s)		CA/RPT/7611/003/INTA/16 Ed. 02 CA/RPT/4451/002/INTA/15 Ed. 01					Dated		04/10/2016 21/07/2015					
Comments		Datashet version: 6.1, 2019-09-26												
Based on the test report(s) from INTA and the former data sheet (issued 2016-10-07) the data sheet was updated to the newest version. The data sheet update was done at the TestLab Solar Thermal Systems, Fraunhofer ISE, Freiburg, Germany (collectortest.com).														
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	078/000281
	Issued	2020-03-10

Annual collector output in kWh/collector at mean fluid temperature $\vartheta_m$													
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
AMP AR 2.0		2.219	1.491	937	1.632	1.084	670	1.206	750	445	1.312	804	468
Annual output per m <sup>2</sup> gross area		1.098	738	464	808	537	331	597	371	220	649	398	232
Annual efficiency, $\eta_a$		62%	42%	26%	50%	33%	20%	51%	32%	19%	52%	32%	19%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1630 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. 6.1 (September 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)				B	--
G (W/m <sup>2</sup> ) >	900	$\vartheta_a$ (°C) >	15	$H_x$ (MJ/m <sup>2</sup> ) >	540
Maximum tested positive load				2400	Pa
Maximum tested negative load				2400	Pa
Hail resistance using steel ball (maximum drop height)				1	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		Additional Informative Technical Data	
	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Hydraulic Designation Code	Aperture Area, $A_a$ (m <sup>2</sup> )
AMP AR 2.0	2,02	10-VH-1234S-A:7.5,1798-C:21,1124-D	1,84

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 ( $\eta_{col}$ )	54%	Zero-loss efficiency ( $\eta_0$ )	0,71
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 9806:2017.		First-order coefficient ( $a_1$ )	4,12
		Second-order coefficient ( $a_2$ )	0,005
		Incidence angle modifier IAM (50°)	0,90
		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.	