AENOR

Keymark Certificate
Solar thermal energy

078/000246

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 Technical information	AMP 2.0, AMP 2.19, AMP 2.38, AMP 2.51, AMP 2.85 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.
First issued on Last issued on Validity date	2015-09-11 2020-09-11 2025-09-11

Rafael GARCÍA MEIRO
Chief Executive Officer

Original Electronic Certificate

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Product certification body accredited by ENAC, number 1/C-PR271

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Annex to Solar Keymark Certificate		Licence Number	078/000246
		Date issued	2020-09-11
		Issued by	AENOR

Licence holder	**SUNEX, S.A.**	**Country**	Poland
Brand (optional)	AMP	**Web**	www.sunex.pl
Street, Number	Ul. Piaskowa 7	**E-mail**	+48 32 414 92 12
Postcode, City	47-400 Racibórz, Śląskie	**Tel**	+48 32 414 92 13

Collector Type	Flat plate collector

Collector name	Gross area (A_G)	Gross length	Gross width	Gross height	Power output per collector Gb = 850 W/m2, Gd = 150 W/m2 & u = 1.3 m/s $\vartheta_m - \vartheta_a$					
					0 K	10 K	30 K	50 K	70 K	90 K
	m²	mm	mm	mm	W	W	W	W	W	W
AMP 2.0	2,01	1.900	1.060	99	1.410	1.322	1.145	965	783	597
AMP 2.19	2,19	2.060	1.060	99	1.536	1.441	1.248	1.052	853	650
AMP 2.38	2,38	2.240	1.060	99	1.669	1.566	1.356	1.143	927	707
AMP 2.51	2,51	2.240	1.120	99	1.759	1.650	1.430	1.205	977	745
AMP 2.85	2,85	2.240	1.270	99	1.999	1.875	1.624	1.369	1.110	846
Power output per m² gross area					701	658	570	480	389	297

Performance parameters test method	Steady state - outdoor									
Performance parameters (related to A_G)	η0, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd
Units	-	W/(m²K)	W/(m²K²)	J/(m³K)	-	J/(m²K)	s/m	W/(m²K⁴)	W/(m²K⁴)	-
Test results	0,715	4,33	0,002	0,000	0,00	7.900	0,000	0,00	0,0E+00	0,87

Incidence angle modifier test method		Steady state - outdoor							
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$	1,00	1,00	0,98	0,96	0,91	0,82	0,68	0,43	0,00
Longitudinal	$K_{\theta L,coll}$	1,00	1,00	0,98	0,96	0,91	0,82	0,68	0,43	0,00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0,020	kg/(sm²)
Maximum temperature difference during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	60	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	210	°C
Maximum operating temperature	ϑ_{max_op}	240	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	INTA	www.inta.es	
Test report(s)	CA/RPT/4451/002/INTA/15 Ed. 01	**Dated**	21/07/2015

Comments Datasheet version: 6.1, 2019-09-26

Based on the test report(s) from INTA and the former data sheet issued (2017-11-23) 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).

Annex to Solar Keymark Certificate	Licence Number	078/000246
Supplementary Information	Issued	2020-09-11

Annual collector output 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
AMP 2.0		2.182	1.444	903	1.588	1.047	649	1.176	723	428	1.281	775	451
AMP 2.19		2.377	1.574	984	1.730	1.140	707	1.281	787	466	1.396	844	491
AMP 2.38		2.584	1.710	1.069	1.881	1.239	768	1.392	856	507	1.517	917	534
AMP 2.51		2.723	1.803	1.127	1.982	1.306	809	1.468	902	534	1.599	967	562
AMP 2.85		3.094	2.048	1.280	2.252	1.484	920	1.667	1.024	607	1.817	1.098	639
Annual output per m² gross area		1.086	719	449	790	521	323	585	359	213	637	385	224
Annual efficiency, η_a		62%	41%	25%	48%	32%	20%	50%	31%	18%	51%	31%	18%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m²			1630 kWh/m²			1166 kWh/m²			1244 kWh/m²		
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 ϑm (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/m²) >	900	ϑ_a (°C) >	15	H_x (MJ/m²) >	540
Maximum tested positive load				2460	Pa
Maximum tested negative load				2460	Pa
Hail resistance using steel ball (maximum drop height)				2	m

Additional collector attribute(s)

- ☐ Using external power source(s) for normal operation
- ☐ Active or passive measure(s) for self-protection
- ☐ Co-generating thermal and electrical power
- ☐ Façade collector(s)

Energy Labelling Information

	Reference Area, A_{sol} (m²)
AMP 2.0	2,01
AMP 2.19	2,19
AMP 2.38	2,38
AMP 2.51	2,51
AMP 2.85	2,85

Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}

Collector efficiency (η_{col})	53%

Remark: Collector efficiency (ηcol) 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/m², expressed in % and rounded to the nearest integer. Deviating from the regulation ηcol is based on reference area (Asol) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.

Additional Informative Technical Data

Hydraulic Designation Code	Aperature Area, A_a (m²)
10-VH-1234S-A:7,1790-C:20,1120-D	1,84
10-VH-1234S-A:7,1995-C:20,1120-D	2,00
10-VH-1234S-A:7,2135-C:20,1120-D	2,18
10-VH-1234S-A:7,2135-C:20,1180-D	2,31
12-VH-1234S-A:7,2135-C:20,1330-D	2,63

Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}

Zero-loss efficiency (η_0)	0,70	--
First-order coefficient (a_1)	4,33	W/(m²K)
Second-order coefficient (a_2)	0,002	W/(m²K²)
Incidence angle modifier IAM (50°)	0,91	--

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.