

# Keymark Certificate

## Solar thermal energy



078/000246

AENOR, Spanish Association for Standardization and Certification, 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 (EN 12975-1:2006)
Trade Mark	AMP 2.0, AMP 2.19, AMP 2.38, AMP 2.51, AMP 2.85
Technical information	Specified in Annexs 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 78.01
	This certificate supersedes 078/000246, dated 2015-10-16
First issued on	2015-09-11
Modified on	2015-11-16
Validity date	2020-09-11

**AENOR** Asociación Española de Normalización y Certificación

Avelino BRITO  
Chief Executive Officer

**AENOR** Asociación Española de Normalización y Certificación

Génova, 6. 28004 Madrid. España  
Tel. 902 102 201 – www.aenor.es



<b>Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate</b>						<b>Licence Number</b>		<b>078/000246</b>			
						<b>Issued</b>		<b>2015-11-16</b>			
<b>Company holding the</b>		<b>SUNEX S.A.</b>				<b>Country</b>		<b>POLAND</b>			
<b>Brand (optional)</b>						<b>Website</b>		<b>www.sunex.pl</b>			
<b>Street, street number</b>		<b>UL. PIASKOWA, 7</b>				<b>E-mail</b>		<b>joannagasiorkiewicz@sunex.pl</b>			
<b>Postal Code / City, province</b>		<b>47-400</b>	<b>RACIBORZ</b>			<b>Tel/Fax</b>		<b>+48 324149213</b>			
<b>Collector Type (flat plate glazed/un-glazed; evacuate tubular)</b>						<b>Flat plate collector - glazed</b>					
<b>Thermal / photo voltaic hybrid collector? (PVT collector)</b>						<b>No</b>					
<b>Integration in the roof possible ? (manufacturers declaration)</b>						<b>Yes</b>					
	<b>Collector name</b>	<b>Aperture area (Aa)</b> m <sup>2</sup>	<b>Gross length</b> mm	<b>Gross width</b> mm	<b>Gross height</b> mm	<b>Gross area (AG)</b> m <sup>2</sup>	<b>Power output per collector module</b>				
							<b>G = 1000 W/m<sup>2</sup></b>				
							<b>Tm-Ta</b>				
							<b>0 K</b>	<b>10 K</b>	<b>30 K</b>	<b>50 K</b>	<b>70 K</b>
							<b>W</b>	<b>W</b>	<b>W</b>	<b>W</b>	<b>W</b>
	<b>AMP 2.0</b>	<b>1,84</b>	<b>1.900</b>	<b>1.060</b>	<b>99</b>	<b>2,01</b>	<b>1.455</b>	<b>1.369</b>	<b>1.193</b>	<b>1.015</b>	<b>833</b>
	<b>AMP 2.19</b>	<b>2,00</b>	<b>2.060</b>	<b>1.060</b>	<b>99</b>	<b>2,19</b>	<b>1.582</b>	<b>1.488</b>	<b>1.297</b>	<b>1.103</b>	<b>906</b>
	<b>AMP 2.38</b>	<b>2,18</b>	<b>2.240</b>	<b>1.060</b>	<b>99</b>	<b>2,38</b>	<b>1.724</b>	<b>1.622</b>	<b>1.414</b>	<b>1.202</b>	<b>987</b>
	<b>AMP 2.51</b>	<b>2,31</b>	<b>2.240</b>	<b>1.120</b>	<b>99</b>	<b>2,51</b>	<b>1.827</b>	<b>1.718</b>	<b>1.498</b>	<b>1.274</b>	<b>1.046</b>
	<b>AMP 2.85</b>	<b>2,63</b>	<b>2.240</b>	<b>1.270</b>	<b>99</b>	<b>2,85</b>	<b>2.080</b>	<b>1.956</b>	<b>1.706</b>	<b>1.450</b>	<b>1.191</b>
<b>Performance test method</b>						<b>Glazed liquid heating collector - steady state - outdoor</b>					
<b>Performance parameters related to aperture</b>						<b>η<sub>0</sub></b>	<b>a<sub>1</sub></b>	<b>a<sub>2</sub></b>			
<b>Units</b>						-	<b>W/(m<sup>2</sup>K)</b>	<b>W/(m<sup>2</sup>K<sup>2</sup>)</b>			
<b>Test results - Flow rate and fluid see note 1</b>						<b>0,791</b>	<b>4,690</b>	<b>0,002</b>			
<b>Bi-directional incidence angle</b>		<b>Yes</b>									
<b>Incidence angle modifiers K<sub>θ</sub>(θT) transversal direction</b>		<b>K<sub>θ</sub> values are obligatory for 50°.</b>									
		<b>Angle</b>	<b>10°</b>	<b>20°</b>	<b>30°</b>	<b>40°</b>	<b>50°</b>	<b>60°</b>	<b>70°</b>	<b>80°</b>	<b>90°</b>
		<b>K<sub>θ</sub>(θT)</b>					<b>0,91</b>				<b>0,00</b>
<b>Incidence angle modifiers K<sub>θ</sub>(θL) longitudinal direction</b>		<b>K<sub>θ</sub> values are obligatory for 50°.</b>									
		<b>Angle</b>	<b>10°</b>	<b>20°</b>	<b>30°</b>	<b>40°</b>	<b>50°</b>	<b>60°</b>	<b>70°</b>	<b>80°</b>	<b>90°</b>
		<b>K<sub>θ</sub>(θL)</b>					<b>0,91</b>				<b>0,00</b>
<b>Stagnation temperature - Weather conditions see note 2</b>						<b>T<sub>stg</sub></b>	<b>210</b>	<b>°C</b>			
<b>Effective thermal capacity</b>						<b>ceff = C/Ag</b>	<b>7,9</b>	<b>kJ/(m<sup>2</sup>K)</b>			
<b>Max. intende operation temperature - see note 3</b>						<b>T<sub>max,op</sub></b>	<b>240</b>	<b>°C</b>			
<b>Max. operation pressure - see note 3</b>						<b>p<sub>max,op</sub></b>	<b>1000</b>	<b>kPa</b>			
<b>Pressure drop table - for a collector family, the values shall be for the module with highest ΔP per m<sup>2</sup> aperture area</b>											
<b>Flow rate</b>	<b>kg/(s m<sup>2</sup>)</b>	<b>0,000</b>	<b>0,005</b>	<b>0,011</b>	<b>0,018</b>	<b>0,024</b>	<b>0,030</b>				
<b>Pressure drop, ΔP</b>	<b>Pa</b>	<b>0</b>	<b>2133</b>	<b>6133</b>	<b>12798</b>	<b>21198</b>	<b>32131</b>				
<b>Optional weather data</b>		<b>Location</b>				<b>Link</b>					
<b>Testing Laboratory</b>		<b>INTA</b>									
<b>Website</b>		<b>www.inta.es</b>									
<b>Test report id. number</b>		<b>CA/RPT/4451/002/INTA/15 Ed. 01</b>				<b>Date of test report</b>		<b>2015/07/21</b>			
<b>During the test GDIF/GTOT was always between</b>		<b>0,11</b>	<b>and</b>		<b>0,12</b>						
<b>Comments of testing laboratory:</b>											
Although the collectors were tested according to ISO 9806:2013, the results included in this datasheet have been calculated in accordance with EN 12975-2:2006 (the reference area is the aperture area). AMP 2.85 is the representative collector for the family.											
<b>Note 1</b>	<b>Flow rate</b>	<b>0,020</b>	<b>kg/(s m<sup>2</sup>)</b>	<b>Fluid</b>	<b>Water</b>						
<b>Note 2</b>	<b>Irradiance, G = 1000 W/m<sup>2</sup>; Ambient temperature, Ta=30 °C</b>										
<b>Note 3</b>	<b>Given by manufacturer</b>										
Datasheet version: 4.06, 2014-01-15											
AENOR - Génova, 6. - 28004 - Madrid, España - Tel. 902 102 201 - www.aenor.es											
Product certification body accredited by ENAC, number 01/C-PR002.078											



Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence Number	078/000246
	Issued	16/11/2015

Annual collector output kWh/module													
Collector name	Location and collector temperature (Tm)												
	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 2.0	2.105	1.383	864	1.537	1.016	632	1.131	697	420	1.230	744	436	
AMP 2.19	2.288	1.503	939	1.671	1.105	687	1.230	758	456	1.337	809	474	
AMP 2.38	2.494	1.639	1.024	1.821	1.204	749	1.340	826	497	1.457	882	516	
AMP 2.51	2.642	1.736	1.085	1.930	1.276	794	1.420	876	527	1.544	934	547	
AMP 2.85	3.008	1.977	1.235	2.197	1.453	904	1.617	997	600	1.758	1.064	623	

Collector mounting: Fixed or tracking Fixed; slope = latitude - 15° (rounded to nearest 5°)

Overview of locations				
Location	Latitude °	Gtot kWh/m <sup>2</sup>	Ta °C	Collector orientation or tracking mode
Athens	38	1.765	18,5	South, 25°
Davos	47	1.714	3,2	South, 30°
Stockholm	59	1.166	7,5	South, 45°
Würzburg	50	1.244	9,0	South, 35°

Gtot	Annual total irradiation on collector plane	kWh/m <sup>2</sup>
Ta	Mean annual ambient air temperature	°C
Tm	Constant collector operating temperature (mean of in- and outlet temperatures)	°C

The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool ScenoCalc. The collector output is calculated hour by hour according to the efficiency parameters from the Keymark test using constant collector operating temperature (Tm). A detailed description of the calculations is available at <http://www.sp.se/en/index/services/solar/ScenoCalc/Sidor/default.aspx>.