
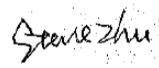


<b>Annex to Solar Keymark Certificate</b>					<b>Licence Number</b>		<b>011-7S3158 F</b>								
					<b>Date issued</b>		<b>2022-12-08</b>								
					<b>Issued by</b>		<b>DIN CERTCO</b>								
<b>Licence holder</b>		<b>ALMR GLOBAL CONSULTING</b>			<b>Country</b>		<b>FRANCE</b>								
<b>Brand (optional)</b>		<b>AMR</b>			<b>Web</b>		<b>NA</b>								
<b>Street, Number</b>		<b>42 BOULEVARD SAINTE CATHERINE</b>			<b>E-mail</b>		<b>direction@groupeamr.com</b>								
<b>Postcode, City</b>		<b>97200 FORT DE FRANCE, MARTINIQUE,</b>			<b>Tel</b>		<b>+33 695386486</b>								
<b>Collector Type</b>					<b>Flat plate collector</b>										
<b>Collector name</b>					<b>Power output per collector</b> $G_b = 850 \text{ W/m}^2$ , $G_d = 150 \text{ W/m}^2$ & $u = 1.3 \text{ m/s}$ $\vartheta_m - \vartheta_a$										
					<b>0 K</b>	<b>10 K</b>	<b>30 K</b>	<b>50 K</b>	<b>70 K</b>	<b>89 K</b>					
					<b>m<sup>2</sup></b>	<b>mm</b>	<b>mm</b>	<b>mm</b>	<b>W</b>	<b>W</b>	<b>W</b>	<b>W</b>	<b>W</b>	<b>W</b>	
<b>AMR200L</b>					<b>2.00</b>	<b>2,000</b>	<b>1,000</b>	<b>80</b>	<b>1,468</b>	<b>1,374</b>	<b>1,168</b>	<b>936</b>	<b>678</b>	<b>414</b>	
<b>AMR250L</b>					<b>2.50</b>	<b>2,000</b>	<b>1,250</b>	<b>80</b>	<b>1,835</b>	<b>1,718</b>	<b>1,460</b>	<b>1,170</b>	<b>848</b>	<b>518</b>	
<b>AMR270L</b>					<b>2.68</b>	<b>2,000</b>	<b>1,340</b>	<b>80</b>	<b>1,967</b>	<b>1,841</b>	<b>1,565</b>	<b>1,254</b>	<b>909</b>	<b>555</b>	
<b>AMR300L</b>					<b>3.00</b>	<b>2,000</b>	<b>1,500</b>	<b>80</b>	<b>2,202</b>	<b>2,061</b>	<b>1,752</b>	<b>1,404</b>	<b>1,018</b>	<b>621</b>	
<b>Power output per m<sup>2</sup> gross area</b>					<b>734</b>	<b>687</b>	<b>584</b>	<b>468</b>	<b>339</b>	<b>207</b>					
<b>Performance parameters test method</b>					<b>Steady state - outdoor</b>										
<b>Performance parameters (related to)</b>					$\eta_0$	$b$	$a_1$	$a_2$	$a_3$	$a_4$	$a_5$	$a_6$	$a_7$	$a_8$	$K_d$
<b>Units</b>					-	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> )	-	
<b>Test results</b>					<b>0.754</b>	<b>4.518</b>	<b>0.016</b>	<b>0.000</b>	<b>0.000</b>	<b>5.800</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.822</b>	
<b>Incidence angle modifier test method</b>					<b>Steady state - outdoor</b>										
<b>Incidence angle modifier</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>Transversal</b>					$K_{\theta T, coll}$	<b>1.00</b>	<b>0.99</b>	<b>0.96</b>	<b>0.94</b>	<b>0.85</b>	<b>0.75</b>	<b>0.59</b>	<b>0.36</b>	<b>0.00</b>	
<b>Longitudinal</b>					$K_{\theta L, coll}$	<b>1.00</b>	<b>0.99</b>	<b>0.96</b>	<b>0.94</b>	<b>0.85</b>	<b>0.75</b>	<b>0.59</b>	<b>0.36</b>	<b>0.00</b>	
<b>Heat transfer medium for testing</b>					<b>Water</b>										
<b>Flow rate for testing (per gross area, A<sub>G</sub>)</b>					$dm/dt$		<b>0.020</b>		<b>kg/(s m<sup>2</sup>)</b>						
<b>Maximum temperature difference during thermal performance test</b>					$(\vartheta_m - \vartheta_a)_{max}$		<b>58.72</b>		<b>K</b>						
<b>Standard stagnation temperature (G = 1000 W/m<sup>2</sup>; <math>\vartheta_a = 30^\circ \text{C}</math>)</b>					$\vartheta_{stg}$		<b>160</b>		<b>°C</b>						
<b>Maximum operating temperature</b>					$\vartheta_{max, op}$		<b>120</b>		<b>°C</b>						
<b>Maximum operating pressure</b>					$p_{max, op}$		<b>1200</b>		<b>kPa</b>						
<b>Testing laboratory</b>		<b>Intertek Testing Services Shenzhen Ltd. Guangzhou Branch</b>					<b>http://www.intertek.com</b>								
<b>Test report(s)</b>		<b>221123025GZU-001</b>					<b>Dated</b>		<b>2022/11/27</b>						
<b>Comments of testing laboratory</b>					<b>Draft Ver. 6.2 (22.09.2021)</b>										
<b>None</b>					 										
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Annex to Solar Keymark Certificate		Licence Number			011-7S3158 F									
Supplementary Information		Issued			2022-12-08									
<b>Gross Thermal Yield in kWh/collector at mean fluid temperature <math>\vartheta_m</math></b>														
Collector name	Standard Locations	Athens			Davos			Stockholm			Würzburg			
	$\vartheta_m$	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	
AMR200L		2,185	1,375	750	1,564	949	482	1,165	666	334	1,269	711	351	
AMR250L		2,732	1,719	938	1,955	1,187	603	1,456	833	418	1,586	889	439	
AMR270L		2,928	1,843	1,005	2,096	1,272	646	1,561	893	448	1,700	953	470	
AMR300L		3,278	2,063	1,125	2,347	1,424	724	1,748	999	502	1,903	1,067	526	
Gross Thermal Yield per m <sup>2</sup> gross area		1,093	688	375	782	475	241	583	333	167	634	356	175	
Annual efficiency, $\eta_a$		62%	39%	21%	48%	29%	15%	50%	29%	14%	51%	29%	14%	
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 Draft Ver. 6.2 (22.09.2021). A detailed description of the calculations is available at <a href="http://www.estif.org/solarkeymarknew/">http://www.estif.org/solarkeymarknew/</a>														
<b>Additional Information</b>														
Collector heat transfer medium										Water				
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)										B		--		
G (W/m <sup>2</sup> ) >		900		$\vartheta_a$ (°C) >		15		H <sub>x</sub> (MJ/m <sup>2</sup> ) >		540				
Maximum tested positive load										5900		Pa		
Maximum tested negative load										3000		Pa		
Hail resistance using steel ball (maximum drop height)										2		m		
<b>Additional collector attribute(s)</b>														
Using external power source(s) for normal operation				No		Active or passive measure(s) for self-protection				No				
Co-generating thermal and electrical power				No		Façade collector(s)				No				
<b>Energy Labelling Information</b>						<b>Additional Informative Technical Data</b>								
		Reference Area, A <sub>sol</sub> (m <sup>2</sup> )				Hydraulic Designation Code			Aperture Area, A <sub>a</sub> (m <sup>2</sup> )					
AMR200L		2.00				8-VH-1234S-A:9,1885-C22,1060-D			1.85					
AMR250L		2.50				8-VH-1234S-A:9,1885-C22,1310-D			2.34					
AMR270L		2.68				8-VH-1234S-A:9,1885-C22,1400-D			2.52					
AMR300L		3.00				8-VH-1234S-A:9,1885-C22,1560-D			2.83					
<b>Data required for CDR (EU) No 811/2013 - Reference Area A<sub>sol</sub></b>						<b>Data required for CDR (EU) No 812/2013 - Reference Area A<sub>sol</sub></b>								
Collector efficiency ( $\eta_{col}$ )		53%				Zero-loss efficiency ( $\eta_0$ )			0.73		--			
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 <sub>sol</sub> ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.		First-order coefficient (a <sub>1</sub> )			4.52		W/(m <sup>2</sup> K)							
		Second-order coefficient (a <sub>2</sub> )			0.016		W/(m <sup>2</sup> K <sup>2</sup> )							
		Incidence angle modifier IAM (50°)			0.87		--							
		Remark: The data given in this section are related to collector reference area (A <sub>sol</sub> ) 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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