

# AENOR

## Keymark Certificate Solar thermal energy



078/000205

AENOR certifies that the organization

### SOLAR-EXPERT Sp. z.o.o.

registered office UL. ROMANOWICZA 11/4 30-702 KRAKÓW (Polonia)

supplies Solar collectors

in compliance with UNE-EN 12975-1:2006 (EN 12975-1:2006)

Trade Mark S-EX 219, S-EX 232, S-EX 267  
Technical information Specified in Annexes to the Certificate

Production site 550574-550577

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 2013-10-11

Last issued on 2018-10-11

Validity date 2023-10-11

Rafael GARCÍA MEIRO  
Chief Executive Officer

Original Electronic Certificate

AENOR INTERNACIONAL S.A.U.  
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Product certification body accredited by ENAC, number 01/C-PR002.078



<b>Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate</b>		<b>Licence number</b>	<b>078/000205</b>
		Date of issue	2018-10-11
Company holding the licence	SOLAR-EXPERT Sp. z.o.o.	Country	Poland
Brand (optional)	S-Ex	Website	www.solar-expert.pl
Street, number	UL. Romanowicza 11/4	E-mail	biuro@solar-expert.pl
Postal Code	30-702 Kraków	Tel.	
City		Fax	
Collector Type (flat plate / evacuate tubular / un-glazed)		Flat plate collector	
Integration in the roof possible ?		Yes	

Collector name	Aperture area (A <sub>a</sub> ) [m <sup>2</sup> ]	Gross length [mm]	Gross width [mm]	Gross height [mm]	Gross area (A <sub>G</sub> ) [m <sup>2</sup> ]	Power output per collector unit G = 1000 W/m <sup>2</sup> T <sub>m</sub> -T <sub>a</sub> :				
						0 K	10 K	30 K	50 K	70 K
						[W]	[W]	[W]	[W]	[W]
S-EX 267	2,67	2.246	1.277	90	2,87	2.176	2.082	1.857	1.584	1.262
S-EX 232	2,32	2.246	1.126	90	2,53	1.891	1.809	1.614	1.376	1.096
S-EX 219	2,19	2.246	1.066	90	2,39	1.785	1.708	1.523	1.299	1.035

Collector efficiency parameters related to <u>aperture area (A<sub>a</sub>)</u> Type of fluid and flow rate see note 1	η <sub>0a</sub>	0,82	-							
	a <sub>1a</sub>	3,29	W/(m <sup>2</sup> K)							
	a <sub>2a</sub>	0,023	W/(m <sup>2</sup> K <sup>2</sup> )							
Stagnation temperature - Weather conditions see note 2	t <sub>stg</sub>	143	°C							
Effective thermal capacity	C <sub>eff</sub> = C/A <sub>a</sub>	8,9	kJ/(m <sup>2</sup> K)							
Max. operation pressure - see note 3	p <sub>max</sub>	1000	kPa							
Incidence angle modifiers K <sub>θ</sub> (θ)	G <sub>DIF</sub> /G <sub>TOT</sub>		θ <sub>r</sub> / θ <sub>l</sub>	50°	10°	20°	30°	40°	60°	70°
	min	max	K <sub>θ</sub> (θ <sub>r</sub> )	0,94	1,00	0,99	0,98	0,97	0,90	0,81
	0,1		0,11	K <sub>θ</sub> (θ <sub>l</sub> )	0,94	1,00	0,99	0,98	0,97	0,90
G <sub>DIF</sub> /G <sub>TOT</sub> : min&max - while measuring					<i>Optional values</i>					

Testing Laboratory	INTA
Website	www.inta.es
Test report id. number	CA/RPT/4451/006/INTA/13 Ed.01
Date of test report	25/04/2013
Perf. test method	EN 12975-2 6.1.4 (outdoor)

Comments of testing laboratory :  
 Example data sheet - page 1 and page 2

Note 1	Fluid	Water	Flow rate	0,020 kg/s per m <sup>2</sup>
Note 2	Irradiance, G <sub>s</sub> =1000 W/m <sup>2</sup> ; Ambient temperature, T <sub>a</sub> =30 °C			
Note 3	Given by manufacturer			



Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence number	078/000205
	Issued	2018-10-11

Annual collector output kWh															
Collector name	Location and collector temperature (T <sub>m</sub> )														
	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			
S-EX 267	3.486	2.538	1.635	2.884	1.985	1.181	1.978	1.304	763	2.146	1.412	812			
S-EX 232	3.029	2.206	1.421	2.506	1.725	1.026	1.719	1.133	663	1.865	1.227	706			
S-EX 219	2.859	2.082	1.341	2.366	1.628	968	1.623	1.070	626	1.760	1.158	666			

Collector mounting: Fixed or tracking	No tracking; Slope = latitude - 15° (rounded to nearest 5°)
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Overview of locations				
Location	Latitude °	G <sub>tot</sub> kWh/m <sup>2</sup>	T <sub>a</sub> °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°

G <sub>tot</sub>	Annual total irradiation on collector plane	kWh/m <sup>2</sup>
T <sub>a</sub>	Mean annual ambient air temperature	°C
T <sub>m</sub>	Constant collector operating temperature (mean of in- and outlet temperatures)	°C

Calculation of the annual collector performance is done by the official Solar Keymark spreadsheet tool. Hour by hour the collector output is calculated according to the efficiency parameters from the Keymark test using constant collector operating temperature (T<sub>m</sub>). Detailed description with all equations used is available from the Solar Keymark web site (direct link: <http://www.estif.org/solarkeymark/annexb1.php>)

<b>AENOR INTERNACIONAL, S.A.U.</b> - Génova, 6.-28004 -Madrid, España-Tel. 91 432 60 00- <a href="http://www.aenor.com">www.aenor.com</a>  Product certification body accredited by ENAC, number 01/C-PR002.078	Datasheet version:
	VERSION 3.7, 2012.03.22
	Calculation program version:
	3.07, October 2011 (SP)