AENOR

Keymark Certificate
Solar thermal energy

078/000341

AENOR certifies that the organization

THERMAL COOLING TECNOLOGY, S.L.

registered office	CL PRÍNCIPE DE VERGARA, 33 28001 MADRID *(España)*
supplies	Solar collectors
in compliance with	UNE-EN 12975-1:2006+A1:2011 *(EN 12975-1:2006+A1:2010)*
Trade Mark	TCT RED R01
Technical information	Specified in Annexes to the Certificate
Production site	CL ARGENTINA, 19 28806 ALCALÁ DE HENARES *(Madrid - España)*
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 078/000341, dated 2019-09-13
First issued on	2019-09-13
Modified on	2019-10-03
Validity date	2024-09-13

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-PR271

Annex to Solar Keymark Certificate		Licence Number	078/000341
		Date issued	2019-10-03
		Issued by	AENOR

Licence holder	Thermal Cooling Technology S.L.	Country	ESPAÑA
Brand (optional)	TCT	Web	http://www.truesolarpower.com
Street, Number	Calle Principe de Vergara 33	E-mail	jaime@truesolarpower.com
Postcode, City	28001 – Madrid - España	Tel	+34 638 92 40 92

Collector Type	Concentrating 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	93 K
	m²	mm	mm	mm	W	W	W	W	W	W
TCT RED R01	5,13	2.265	2.265	3.142	3.249	3.216	3.131	3.020	2.883	2.693
Power output per m² gross area					633	627	610	589	562	525

Performance parameters test method	Quasi dynamic									
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	0,745	0,58	0,006	0,000	0,00	5.274	0,000	0,00	0,0E+00	0,00

Incidence angle modifier test method	Quasi dynamic - outdoor								
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$	-	-	-	-	-	-	-	-	-
Longitudinal	$K_{\theta L,coll}$	-	-	-	-	-	-	-	-	-

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	$(\vartheta_m-\vartheta_a)_{max}$	63	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	--	°C
Maximum operating temperature	ϑ_{max_op}	99	°C
Maximum operating pressure	$p_{max,op}$	400	kPa

Testing laboratory	FUNDACIÓN CENER	http://www.cener.com	
Test report(s)	30.3512.0-001 30.3512.0-002	Dated	10/09/2019

Comments of testing laboratory	Datasheet version: 6.1, 2019-07-11
The IAM was not determined because it is a concentrating collector with 2-axis tracking. The stagnation temperature was not determined because it is a concentrating collector with protection mechanism which avoids high temperatures through active management of the required working temperature.	CENER

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Supplementary Information	Issued	2019-10-03

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
TCT RED R01		5.687	5.355	4.929	4.920	4.553	4.126	4.036	3.729	3.352	3.765	3.480	3.141
Annual output per m² gross area		1.109	1.044	961	959	887	804	787	727	653	734	678	612
Annual efficiency, η_a		42%	40%	37%	47%	43%	39%	48%	44%	40%	45%	42%	38%
Fixed or tracking collector		2-axis tracking											
Annual irradiation on collector plane		2609 kWh/m²			2052 kWh/m²			1634 kWh/m²			1625 kWh/m²		
Mean annual ambient air temperature		18,5°C			3,2°C			7,5°C			9,0°C		
Collector orientation or tracking mode		Tracking			Tracking			Tracking			Tracking		

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 (July 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)					A	--
G (W/m²) >	1000	ϑ_a (°C) >	20	H_X (MJ/m²) >		600
Maximum tested positive load					1000	Pa
Maximum tested negative load					1000	Pa
Hail resistance using ice balls (diameter)					25	mm

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)
TCT RED R01	5,13

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

Collector efficiency (η_{col})	60%

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)
X-X-LRS-AC:24,4003-D	4,47

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

Zero-loss efficiency (η_0)	0,63	--
First-order coefficient (a_1)	0,58	W/(m²K)
Second-order coefficient (a_2)	0,006	W/(m²K²)
Incidence angle modifier IAM (50°)	--	--

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.