

Issued to

SunMotion GmbH

Am Fuhrenkamp 5, 29396 Gross Oesingen, Germany

Product name and description

Vacuum tube solar thermal collectors for water heating.
For technical information see Appendix (2 pages).

Models:	solarnorm VC10	solarnorm VC12	solarnorm VC15
	solarnorm VC18	solarnorm VC20	solarnorm VC22
	solarnorm VC24	solarnorm VC25	solarnorm VC30

Performance specification

The product is found to comply with the requirements in EN 12975-1:2006+A1:2010 Solar collectors, Part 1: General requirements and the Specific CEN Keymark Scheme Rules for Solar Thermal Products, and are based on test results according to EN 12975-2:2006 Solar collectors Part 2: Test methods.

Marking

Products conforming to this certificate shall be marked in accordance with the requirements in the Specific CEN Keymark Scheme Rules for Solar Thermal Products. The marking shall, together with the Keymark logo, show the identification code of the empowered certification body (RISE Research Institutes of Sweden AB, No. 012), also see CEN-CENELEC Internal Regulations Part 4 Certification, Annex A.

Validity

This certificate is valid until 2024-06-24 provided that the conditions in the Solar Keymark Rules are fulfilled and the standard or rules are not modified significantly. The validity of the certificate can be checked in the database, see Solar Keymark website <http://www.solarkeymark.org>.

Miscellaneous

The manufacturer's factory production control procedures are under surveillance by the responsibility of RISE. This certificate was first issued 2014-07-11. RISE certification rules SPCR 402 for Keymark – Solar Thermal Products applies.

Martin Tillander

Certificate SC0673-14 | issue 2 | 2020-12-21

RISE Research Institutes of Sweden AB | Certification


Box 857, SE-50115 Borås, Sweden

+46 10 516 50 00 | certifiering@ri.se | www.ri.se



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Annex to Solar Keymark Certificate					Licence Number		SC0673-14							
					Date issued		2020-12-21							
					Issued by		RISE							
Licence holder		SunMotion Gmbh			Country		Germany							
Brand (optional)		solarnorm			Web		www.sunmotion-gmbh.com							
Street, Number		Am Fuhrenkamp 5			E-mail		info@sunmotion-gmbh.com							
Postcode, City		29396 Gross Oesingen			Tel		+49 1639630044							
Collector Type					Evacuated tubular collector									
Collector name					Gross area (A _G) m ²	Gross length mm	Gross width mm	Gross height mm	Power output per collector G _b = 850 W/m ² , G _d = 150 W/m ² & u = 1.3 m/s $\vartheta_m - \vartheta_a$					
									0 K W	10 K W	30 K W	50 K W	70 K W	101 K W
solarnorm VC10					1,68	1 990	845	137	744	731	687	621	532	349
solarnorm VC12					2,17	1 990	1 090	137	961	944	888	802	687	450
solarnorm VC15					2,65	1 990	1 330	137	1 173	1 152	1 084	979	839	550
solarnorm VC18					3,12	1 990	1 570	137	1 381	1 357	1 276	1 153	988	647
solarnorm VC20					3,44	1 990	1 730	137	1 523	1 496	1 407	1 271	1 089	714
solarnorm VC22					3,76	1 990	1 890	137	1 664	1 635	1 538	1 390	1 190	780
solarnorm VC24					4,08	1 990	2 050	137	1 806	1 774	1 669	1 508	1 292	847
solarnorm VC25					4,24	1 990	2 130	137	1 877	1 844	1 734	1 567	1 342	880
solarnorm VC30					4,89	1 990	2 455	137	2 165	2 126	2 000	1 807	1 548	1 015
Power output per m ² gross area									443	435	409	370	317	208
Performance parameters test method		Steady state - outdoor												
Performance parameters (related to A _G)		η_0, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd			
Units		-	W/(m ² K)	W/(m ² K ²)	J/(m ³ K)	-	J/(m ² K)	s/m	W/(m ² K ⁴)	W/(m ² K ⁴)	-			
Test results		0,440	0,61	0,017	0,000	0,00	0	0,000	0,00	0,0E+00	1,04			
Incidence angle modifier test method		Quasi dynamic - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		K _{θT, coll}	1,03	1,06	1,12	1,18	1,33	1,47	0,98	0,49	0,00			
Longitudinal		K _{θL, coll}	1,00	0,99	0,98	0,96	0,92	0,86	0,72	0,31	0,00			
Heat transfer medium for testing					Water									
Flow rate for testing (per gross area, A _G)					dm/dt	0,011	kg/(sm ²)							
Maximum temperature difference during thermal performance test					($\vartheta_m - \vartheta_a$) _{max}	71	K							
Standard stagnation temperature (G = 1000 W/m ² ; $\vartheta_a = 30$ °C)					ϑ_{stg}	250	°C							
Maximum operating temperature					$\vartheta_{max, op}$	226	°C							
Maximum operating pressure					p _{max, op}	600	kPa							
Testing laboratory		Intertek Testing Services Shenzhen Ltd. Guangzhou					http://www.intertek.com							
Test report(s)		130628151GZU-001					Dated		2014-03-27					
Comments of testing laboratory					Datasheet version: 6.1, 2019-09-26									
The "negative pressure test of the collector" according to EN 12975-2:2006, 5.9.2 was not performed.														
Tests were performed based on EN 12975-2:2006.														
<p style="text-align: center;">RISE Research Institutes of Sweden AB Certification Box 857, SE-501 15 Borås, Sweden, Phone: +46 10-516 50 00, certifierng@ri.se www.ri.se</p>														

Annex to Solar Keymark Certificate	Licence Number	SC0673-14
Supplementary Information	Issued	2020-12-21

Annual collector output in kWh/collector at mean fluid temperature ϑ_m													
Collector name	Standard Locations ϑ_m	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
solarnorm VC10		1 385	1 196	921	1 173	944	680	855	679	479	921	736	516
solarnorm VC12		1 790	1 544	1 189	1 516	1 220	878	1 104	877	619	1 189	950	667
solarnorm VC15		2 185	1 886	1 452	1 851	1 489	1 073	1 348	1 071	756	1 452	1 160	814
solarnorm VC18		2 573	2 220	1 710	2 179	1 753	1 263	1 588	1 261	890	1 710	1 366	958
solarnorm VC20		2 837	2 448	1 885	2 403	1 933	1 392	1 750	1 390	981	1 885	1 506	1 057
solarnorm VC22		3 101	2 676	2 060	2 626	2 113	1 522	1 913	1 520	1 072	2 060	1 646	1 155
solarnorm VC24		3 365	2 903	2 236	2 850	2 293	1 651	2 076	1 649	1 164	2 236	1 786	1 253
solarnorm VC25		3 497	3 017	2 323	2 961	2 383	1 716	2 157	1 714	1 209	2 323	1 856	1 302
solarnorm VC30		4 033	3 480	2 680	3 415	2 748	1 979	2 488	1 976	1 395	2 679	2 141	1 502
Annual output per m ² gross area		825	712	548	698	562	405	509	404	285	548	438	307
Annual efficiency, η_a		47%	40%	31%	43%	34%	25%	44%	35%	24%	44%	35%	25%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m ²			1630 kWh/m ²			1166 kWh/m ²			1244 kWh/m ²		
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 ϑ_m (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)			C
G (W/m ²) >	800	ϑ_a (°C) >	10
		H_x (MJ/m ²) >	420
Maximum tested positive load			3100 Pa
Maximum tested negative load			- Pa
Hail resistance using steel ball (maximum drop height)			1,0 m

Additional collector attribute(s)	
<input type="checkbox"/> Using external power source(s) for normal operation	<input type="checkbox"/> Active or passive measure(s) for self-protection
<input type="checkbox"/> Co-generating thermal and electrical power	<input type="checkbox"/> Façade collector(s)

Energy Labelling Information		Additional Informative Technical Data	
	Reference Area, A_{sol} (m ²)	Hydraulic Designation Code	Aperture Area, A_a (m ²)
solarnorm VC10	1,68	1-H-12S-C:22,930-D	0,94
solarnorm VC12	2,17	1-H-12S-C:22,1090-D	1,13
solarnorm VC15	2,65	1-H-12S-C:22,1330-D	1,41
solarnorm VC18	3,12	1-H-12S-C:22,1570-D	1,70
solarnorm VC20	3,44	1-H-12S-C:22,1730-D	1,89
solarnorm VC22	3,76	1-H-12S-C:22,1890-D	2,07
solarnorm VC24	4,08	1-H-12S-C:22,2050-D	2,26
solarnorm VC25	4,24	1-H-12S-C:22,2130-D	2,36
solarnorm VC30	4,89	1-H-12S-C:22,2530-D	2,83

Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}		Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}	
Collector efficiency (η_{col})	39%	Zero-loss efficiency (η_0)	0,44
Remark: Collector efficiency (η_{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 ² , expressed in % and rounded to the nearest integer. Deviating from the regulation η_{col} is based on reference area (A_{sol}) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.		First-order coefficient (a_1)	0,61
		Second-order coefficient (a_2)	0,017
		Incidence angle modifier IAM (50°)	1,12
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		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.	