


Annex to Solar Keymark Certificate					Licence Number		011-7S2868 F						
					Date issued		2021-08-12						
					Issued by		DIN CERTCO						
Licence holder		OKU Obermaier GmbH			Country		Germany						
Brand (optional)					Web		http://www.okuonline.com						
Street, Number		Dieselweg 14			E-mail		info@okuonline.com						
Postcode, City		82538 Geretsried			Tel		+49 (0)8171 9352-0						
Collector Type					WISC (Wind and/or infrared sensitive collector)								
Collector name					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		49 K						
					W		W		W		W		
Typ 1000					747		545		142		--		
Typ 1001					726		530		138		--		
Typ 1002					774		565		147		--		
Power output per m² gross area					691		505		131		--		
Performance parameters test method					Quasi dynamic								
Performance parameters (related to A_G)		η_0, b		a1		a2		a3		a4		a5	
Units		-		W/(m²K)		W/(m²K²)		J/(m³K)		-		J/(m²K)	
Test results		0.678		30.26		0.000		6.813		0.82		44 890	
0.059		0.00		0.0		0.96							
Incidence angle modifier test method					Quasi dynamic - outdoor								
Incidence angle modifier		Angle		10°		20°		30°		40°		50°	
Transversal		K_{θT, coll}		1.00		1.00		1.00		1.00		0.99	
Longitudinal		K_{θL, coll}		1.00		1.00		1.00		1.00		0.99	
0.96		0.48		0.00		0.00		0.00		0.00		0.00	
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}		19		K							
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)		ϑ_{stg}		76		°C							
Maximum operating temperature		$\vartheta_{max, op}$		40		°C							
Maximum operating pressure		p_{max, op}		120		kPa							
Testing laboratory		Institut für Gebäudeenergetik, Thermotechnik und Energiespeicherung (IGTE)					http://www.igte.uni-stuttgart.de						
Test report(s)		18COL1423 18COL1423Q					Dated		30.07.2018 30.07.2018				
Comments of testing laboratory					Datasheet version: 6.1, 2019-09-26								
					 Forschungs- und Testzentrum für Solarsysteme Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 8, 70569 Stuttgart (Vaihingen)								
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S2868 F
	Issued	2021-08-12

Annual collector output in kWh/collector at mean fluid temperature ϑ_m													
Collector name	Standard Locations	Athens			Davos			Stockholm			Würzburg		
	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
Typ 1000		890			319			307			374		
Typ 1001		865			311			298			364		
Typ 1002		923			331			318			388		
Annual output per m ² gross area		824	--	--	296	--	--	284	--	--	346	--	--
Annual efficiency, η_a		47%	--	--	18%	--	--	24%	--	--	28%	--	--
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		
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/m ²) >	1000	ϑ_a (°C) >	20
		H_x (MJ/m ²) >	600
Maximum tested positive load	3000		Pa
Maximum tested negative load	3000		Pa
Hail resistance using steel ball (maximum drop height)	2		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)
Typ 1000	1.08	X-VH-14V23S-A:X-C:X-D	"[Aa]"
Typ 1001	1.05	X-VH-1234S-A:X-C:X-D	"[Aa]"
Typ 1002	1.12	X-VH-1234V-A:X-C:X-D	"[Aa]"

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})	-6%	Zero-loss efficiency (η_0)	0.69	
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)	18.68	
		Second-order coefficient (a_2)	0.000	
		Incidence angle modifier IAM (50°)	0.99	--
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.				