

Annex to Solar Keymark Certificate					Licence Number		011-7S524 R							
					Date issued		2020-10-12							
					Issued by		DIN CERTCO							
Licence holder		Oventrop GmbH \& Co. KG			Country		Deutschland							
Brand (optional)					Web		https://www.oventrop.com/							
Street, Number		Paul-Oventrop-Straße 1			E-mail		A.Beser@oventrop.de							
Postcode, City		59939, Olsberg			Tel		029628-2210							
Collector Type					Evacuated tubular collector									
Collector name					Power output per collector									
					Gb = 850 W/m ² , Gd = 150 W/m ² & u = 1.3 m/s $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	114 K				
					m ²	mm	mm	mm	mm	mm	mm			
OKP-20					3,26	1.500	900	50	1.163	1.126	1.049	966	878	666
OKP-10					2,15	2.150	1.000	50	767	743	692	637	579	439
Power output per m² gross area					357	345	322	296	269	204				
Performance parameters test method		Steady state - outdoor												
Performance parameters (related to A_G)		$\eta_{0, b}$	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		0,352	1,11	0,002	0,000	0,00	0	0,000	0,00	0,0E+00	1,09			
Incidence angle modifier test method		Steady state - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		$K_{\theta T, coll}$	1,00	1,04	1,13	1,27	1,42	1,44	1,20	0,66	0,00			
Longitudinal		$K_{\theta L, coll}$	1,00	1,00	0,99	0,98	0,95	0,88	0,74	0,49	0,00			
Heat transfer medium for testing					Water-Glycole									
Flow rate for testing (per gross area, A_G)					dm/dt	0,011	kg/(sm ²)							
Maximum temperature difference during thermal performance test					$(\vartheta_m - \vartheta_a)_{max}$	84	K							
Standard stagnation temperature (G = 1000 W/m²; $\vartheta_a = 30$ °C)					ϑ_{stg}	220	°C							
Maximum operating temperature					$\vartheta_{max, op}$	100	°C							
Maximum operating pressure					$p_{max, op}$	1000	kPa							
Testing laboratory		TestLab Solar Thermal Systems, Fraunhofer ISE					http://www.collectortest.com							
Test report(s)		KTB: 2020-09 KTB: 2020-01					Dated		05.10.2020 05.10.2020					
Comments of testing laboratory					Datasheet version: 6.1, 2019-09-26									
					TestLab Solar Thermal Systems Heidenhofstraße 2 D-79119 Freiburg Tel: +49 (0)761 4588 5354									
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S524 R
	Issued	2020-10-12

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
OKP-20		1.429	1.134	880	1.429	1.134	880	1.429	1.134	880	1.429	1.134	880
OKP-10		1.457	1.214	989	1.191	976	785	871	691	538	943	748	581
Annual output per m ² gross area		677	565	460	554	454	365	405	321	250	438	348	270
Annual efficiency, η_a		38%	32%	26%	34%	28%	22%	35%	28%	21%	35%	28%	22%
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)	A	
G (W/m ²) >	1000	ϑ_a (°C) >
		20
		H_x (MJ/m ²) >
		600
Maximum tested positive load	750	Pa
Maximum tested negative load	0	Pa
Hail resistance using ice balls (diameter)	25	mm
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)
OKP-20	3,26	{1}-{H}-{12S}-{39,1700}	"[Aa]"
OKP-10	2,15	{1}-{H}-{12S}-{39,920}	"[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})	31%	Zero-loss efficiency (η_0)	0,36
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)	1,11
		Second-order coefficient (a_2)	0,002
		Incidence angle modifier IAM (50°)	1,22
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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.	