


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		011-7S1639 R							
					Date issued		2017-02-27							
					Issued by		DIN CERTCO							
Licence holder	ATTACK, s.r.o				Country	Slowakei								
Brand (optional)					Web	www.attack.sk								
Street, Number	Dielenska Kruzna 5020				E-mail	vitkovska@attack.sk								
Postcode, City	038 61 Vrutky				Tel	+421 434 003 130								
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 = 3 m/s ϑ _m - ϑ _a									
					0 K W	10 K W	30 K W	50 K W	70 K W	104 K W				
ATTACK VAKUUMTHERM VK 10	1.83	1 645	1 115	107	928	913	873	819	753	609				
Power output per m² gross area					507	499	477	448	411	333				
Performance parameters test method					Quasi dynamic									
Performance parameters (related to A_G)					η _{0,b}	c1	c2	c3	c4	c6	K _d			
Units					-	W/(m ² K)	W/(m ² K ²)	J/(m ³ K)	-	s/m	-			
Test results					0.501	0.739	0.009	0.000	0.000	0.000	1.081			
Incidence angle modifier test method					Quasi dynamic - outdoor									
Bi-directional incidence angle modifiers					Yes									
Incidence angle modifier					Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal					K _{θT, coll}	1.04	1.08	1.09	1.12	1.15	1.18	1.28	0.64	0.00
Longitudinal					K _{θL, coll}	1.00	1.00	0.99	0.97	0.92	0.84	0.70	0.35	0.00
Heat transfer medium for testing					Water									
Flow rate for testing (per gross area, A_G)					dm/dt	0.021	kg/(sm ²)							
Maximum temperature difference for thermal performance calculations					(ϑ _m -ϑ _a) _{max}	104	K							
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)					ϑ _{stg}	286	°C							
Effective thermal capacity, incl. fluid (per gross area, A_G)					C/m ²	39.915	kJ/(Km ²)							
Maximum operating temperature					ϑ _{max, op}	-	°C							
Maximum operating pressure					p _{max, op}	1000	kPa							
Testing laboratory	TZS, ITW University Stuttgart				www.itw.uni-stuttgart.de									
Test report(s)	04COL349/10EM14				Dated	19.07.2011								
Comments of testing laboratory					Datashet version: 5.01, 2016-03-01									
This data sheet replaces the data sheet issued on 19.07.2011					 Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 6, 70550 Stuttgart (Vaihingen)									
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S1639 R
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Annual collector output in kWh/collector at mean fluid temperature ϑ_m , based on ISO 9806:2013 test results													
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
ATTACK VAKUUMTHERM VK 10		1 720	1 531	1 292	1 475	1 265	1 032	1 070	902	719	1 152	975	778
Annual output per m ² gross area		940	837	706	806	691	564	585	493	393	630	533	425
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m ²			1714 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. 5.01 (March 2016). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc													

Additional Information		
Collector heat transfer medium	Water-Glycole	
Hybrid Thermal and Photo Voltaic collector	No	
The collector is deemed to be suitable for roof integration	No	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	C	--
Maximum tested positive load	-	Pa
Maximum tested negative load	2300	Pa
Hail resistance using ice balls (diameter)	-	mm

Energy Labelling Information				
	Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}		
ATTACK VAKUUMTHERM VK 10	1.83	Collector efficiency (η_{col})	46	%
		<i>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/m², 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 9806:2013.</i>		
		Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}		
		Zero-loss efficiency (η_0)	0.507	--
		First-order coefficient (a_1)	0.74	W/(m ² K)
		Second-order coefficient (a_2)	0.009	W/(m ² K ²)
		Incidence angle modifier IAM (50°)	1.08	--
		<i>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.</i>		