


Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate							Licence Number		011-7S2588 F							
							Issued		2015-10-21							
Company holding the			Membro Energietechnik GmbH & Co. KG				Country	Deutschland								
Brand (optional)							Website	www.membro.de								
Street, street number			Julius-Kronenberg-Str. 11				E-mail	info@membro.de								
Postal Code / City, province			42799	Leichlingen			Tel/Fax	+49 2175 895000 / 2175 895 0020								
Collector Type (flat plate glazed/un-glazed; evacuate tubular)							Flat plate collector - glazed									
Thermal / photo voltaic hybrid collector? (PVT collector)							No									
Integration in the roof possible ? (manufacturers declaration)							No									
Collector name	Aperture area (Aa) m ²	Gross length mm	Gross width mm	Gross height mm	Gross area (AG) m ²	Power output per collector module										
						Gb = 850 W/m ² ; Gd = 150 W/m ² Tm-Ta										
						0 K	10 K	30 K	50 K	70 K						
						W	W	W	W	W						
FK-2.1	1.88	1951	1051	80	2.05	1547	1468	1297	1108	901						
Performance test method							Liquid heating collector - quasi-dynamic - outdoor									
Performance parameters related to aperture area							η_{0b}	c1	c2	c3	c4	c6	$K_{\theta d}$			
Units							-	W/(m ² K)	W/(m ² K ²)	J/(m ³ K)	-	s/m	-			
Test results - Flow rate and fluid see note 1							0.826	4.068	0.012	0.000	0.000	0.000	0.973			
Bi-directional incidence angle modifiers?							No					<i>Kθ values are obligatory for 50°.</i>				
Incidence angle modifiers K θ (θ)							Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
							K θ (θ)	1.00	0.99	0.98	0.97	0.94	0.89	0.80	0.50	0.00
Incidence angle modifier not bi-directional - leave fields blank																
Stagnation temperature - Weather conditions see note 2							Tstg	198		°C						
Effective thermal capacity							ceff = C/Ag	15.2		kJ/(m ² K)						
Max. intended operation temperature - see note 3							Tmax,op	-		°C						
Max. operation pressure - see note 3							pmax,op	1000		kPa						
Pressure drop table - for a collector family, the values shall be for the module with highest ΔP per m ² aperture area																
Flow rate	kg/(s m ²)	-	-	-	-	-	-	-	-	-	-					
Pressure drop, ΔP	Pa	-	-	-	-	-	-	-	-	-	-					
Optional weather data		Location	-			Link	-									
Testing Laboratory			TZS, ITW University Stuttgart													
Website			http://www.itw.uni-stuttgart.de													
Test report id. number			10COL870/1OEM04			Date of test report			2015.10.21							
During the test GDIF/GTOT was always between			0	and	1											
Comments of testing laboratory:																
none																
Note 1	Flow rate	0.020	kg/(s m ²)	Fluid	Water											
Note 2	Irradiance, G = 1000 W/m ² ; Ambient temperature, Ta=30 °C															
Note 3	Given by manufacturer															
						 Forschungs- und Testzentrum für Solaranlagen Institut für Thermische Energieanlagen Universität Stuttgart Postfach 806360, 70569 Stuttgart (Vollring)										
						Datasheet version: 4.06, 2014-01-15										
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Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence Number	011-7S2588 F
	Issued	21.10.2015

Annual collector output kWh/module													
Collector name	Location and collector temperature (T _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	
FK-2.1	2 509	1 776	1 155	1 890	1 294	806	1 396	903	541	1 525	982	578	

Collector mounting: Fixed or tracking	Fixed; slope = latitude - 15° (rounded to nearest 5°)
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Overview of locations				
Location	Latitude °	G _{tot} kWh/m ²	T _a °C	Collector orientation or tracking mode
Athens	38	1 765	18.5	South, 25°
Davos	47	1 714	3.2	South, 30°
Stockholm	59	1 166	7.5	South, 45°
Würzburg	50	1 244	9.0	South, 35°

G _{tot}	Annual total irradiation on collector plane	kWh/m ²
T _a	Mean annual ambient air temperature	°C
T _m	Constant collector operating temperature (mean of in- and outlet temperatures)	°C

The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool ScenoCalc. The collector output is calculated hour by hour according to the efficiency parameters from the Keymark test using constant collector operating temperature (T_m). A detailed description of the calculations is available at <http://www.sp.se/en/index/services/solar/ScenoCalc/Sidor/default.aspx>.

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	4.06, 2014-01-15
	ScenoCalc version:
	Ver. 4.06 (Jan, 2014)