

Precisely Right.

<b>Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate</b>				<b>Licence Number</b>	<b>011-7S2103 F</b>						
				<b>Issued</b>	2015-03-27						
Company holding the licence		varmeco GmbH Co. KG		Country	Germany						
Brand (optional)				Website	www.varmeco.de						
Street, street number		Johann-Georg-Weinhart-Str. 1		E-mail	andreas.wimmer@varmeco.de						
Postal Code / City, province		87600	Kaufbeuren	Tel/Fax	+49 (0) 8341-9022-0						
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)				Yes							
Collector name	Aperture area (Aa) m <sup>2</sup>	Gross length mm	Gross width mm	Gross height mm	Gross area (AG) m <sup>2</sup>	Power output per collector module					
						G = 1000 W/m <sup>2</sup>					
						Tm-Ta					
						0 K	10 K	30 K	50 K	70 K	
						W	W	W	W	W	
VARICollect E 2x2 *	3,69	2.000	2.014	128	4,03	2.857	2.719	2.419	2.090	1.731	
VARICollect E 8x3 *	22,50	3.000	7.955	128	23,87	17.434	16.588	14.760	12.752	10.564	
Performance test method						Glazed liquid heating collector - steady state - indoor					
Performance parameters related to aperture area		$\eta_0$	a1	a2							
Units		-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )							
Test results - Flow rate and fluid see note 1		0,775	3,663	0,010							
Bi-directional incidence angle modifiers?		No <i>K<math>\theta</math> values are obligatory for 50°.</i>									
Incidence angle modifiers K $\theta$ ( $\theta$ )		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Incidence angle modifier not bi-directional - leave fields blank		K $\theta$ ( $\theta$ )					0,97				0,00
Stagnation temperature - Weather conditions see note 2						Tstg	190	°C			
Effective thermal capacity						ceff = C/Ag	6,3	kJ/(m <sup>2</sup> 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 $\Delta P$ per m <sup>2</sup> aperture area											
Flow rate	kg/(s m <sup>2</sup> )										
Pressure drop, $\Delta P$	Pa										
Optional weather data		Location		Link							
Testing Laboratory		AIT Austrian Institute of Technology GmbH									
Website		www.ait.ac.at									
Test report id. number		2.04.00780.1.0-1-LT(1) / 2.04.00780.1.0-1-QT(1)				Date of test report	06.02.2013				
During the test GDF/GTOT was always between		0,1	and	0,2							
Comments of testing laboratory:											
* This collector type is being offered in customer-specific dimensions. / Dieser Kollektortyp wird in kundenspezifischen Baugrößen angeboten.											
Note 1	Flow rate	0,020	kg/(s m <sup>2</sup> )	Fluid	Water			AIT Austrian Institute of Technology GmbH			
Note 2	Irradiance, G = 1000 W/m <sup>2</sup> ; Ambient temperature , Ta=30 °C				Donau-City-Straße 1   1220 Wien, Austria						
Note 3	Given by manufacturer				T +43 (0) 60550-0   F +43 (0) 50550-0 office@ait.ac.at   www.ait.ac.at Datasheet version: 4.06, 2014-01-15						
<b>DIN CERTCO • Alboinstraße 56 • 12103 Berlin, Germany</b>											
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Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence Number	011-7S2103 F
	Issued	27.03.2015

Annual collector output kWh/module													
Collector name	Location and collector temperature (T <sub>m</sub> )												
	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	
VARIOcollect E 2x2 *	4.694	3.394	2.283	3.573	2.511	1.629	2.640	1.750	1.089	2.871	1.899	1.161	
VARIOcollect E 8x3 *	28.643	20.708	13.927	21.798	15.318	9.940	16.106	10.677	6.644	17.517	11.586	7.082	

Collector mounting: Fixed or tracking	Fixed; slope = latitude - 15° (rounded to nearest 5°)
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Overview of locations				
Location	Latitude °	G <sub>tot</sub> kWh/m <sup>2</sup>	T <sub>a</sub> °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 <sub>tot</sub>	Annual total irradiation on collector plane	kWh/m <sup>2</sup>
T <sub>a</sub>	Mean annual ambient air temperature	°C
T <sub>m</sub>	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<sub>m</sub>). 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)