



Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate	Certificate No.	011-7S2102 R
	Date of issue	30.01.2013

Company	Odörfer Haustechnik GmbH	Country	Österreich
Brand (optional)		Website	www.odoerfer.com
Street, number	Plabutscher Straße 42	E-mail	johannes.wiener@odoerfer.com
Postal Code	8051	Tel.	+43 162772 2284
City	Graz	Fax	+43 162772 2299

Collector Type (flat plate / evacuate tubular / un-glazed)	Evacuated tubular collector
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Integration in the roof possible ?	No
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Collector name	Aperture area (Aa) [m²]	Gross length [mm]	Gross width [mm]	Gross height [mm]	Gross area (Ac) [m²]	Power output per collector unit G = 1000 W/m² Tm-Ta :				
						0 K	10 K	30 K	50 K	70 K
						[W]	[W]	[W]	[W]	[W]
PlusLine Vakuumröhrenkollektor VRK10	1.59	1645	1115	107	1.83	962	947	907	855	789

Collector efficiency parameters related to aperture area (Aa) Type of fluid and flow rate see note 1	η_{0a}	0.605	-
	a_{1a}	0.850	W/(m²K)
	a_{2a}	0.010	W/(m²K²)

Stagnation temperature - Weather conditions see note 2	t_{stg}	286	°C
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Effective thermal capacity	$C_{eff} = C/A_a$	45.94	kJ/(m²K)
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Max. operation pressure - see note 3	p_{max}	1000	kPa
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Incidence angle modifiers $K_0(\theta)$	G_{DIF}/G_{TOT}		θ_T / θ_L	50°	10°	20°	30°	40°	60°	70°
	min	max								
	G_{DIF}/G_{TOT} : min&max - while measuring	-	-	$K_0(\theta_L)$	0.92	1.04	1.08	1.09	1.12	1.18
					1.00	1.00	0.99	0.97	0.84	0.70

Optional values

Testing Laboratory	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number	04COL349/10EM17
Date of test report	30.01.2013
Perf. test method	EN 12975-2 6.1.4 (outdoor)

Comments of testing laboratory :

Note 1	Fluid	Water	Flow rate	0.024	kg/s per m²
Note 2	Irradiance, $G_s=1000 W/m^2$				
	Ambient temperature, $T_a=30 °C$				
Note 3	Given by manufacturer				





Annual collector output based on EN 12975 Test Results,
annex to Solar KEYMARK Certificate

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Annual collector output kWh

Location and collector temperature (T_m)

Collector name	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	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C			
PlusLine	1756	1569	1334	1617	1411	1169	1095	929	749	1175	1000	806						

Collector mounting: Fixed or tracking

Fixed; slope = latitude - 15° (rounded to nearest 5°)

Overview of locations

Location	Latitude °	Gtot kWh/m ²	Ta °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°

Gtot	Annual total irradiation on collector plane	kWh/m ²
Ta	Mean annual ambient air temperature	°C
Tm	Constant collector operating temperature (mean of in- and outlet temperatures)	°C

Calculation of the annual collector performance is done by the official Solar Keymark spreadsheet tool. Hour by hour the collector output is calculated according to the efficiency parameters from the Keymark test using constant collector operating temperature (T_m). Detailed description with all equations used is available from the Solar Keymark web site (direct link: <http://www.estif.org/solarkeymark/annexb1.php>)

DIN CERTCO • Alboinstraße 56 • 12103 Berlin Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de		Datasheet version:
		VERSION 3.6, 2012.01.13
		Calculation program version:
		3.07, October 2011 (SP)