

<b>Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate</b>						<b>Licence Number</b>		<b>011-7S305 R</b>							
						<b>Issued</b>		<b>2015-10-26</b>							
<b>Company holding the</b>			Rivosol BV			<b>Country</b>		Netherlands							
<b>Brand (optional)</b>						<b>Website</b>		www.rivosol.com							
<b>Street, street number</b>			Bouwmeesterplein 1			<b>E-mail</b>		info@rivosol.com							
<b>Postal Code / City, province</b>			2801 BX		Gouda	<b>Tel/Fax</b>		+31 40 292 8488							
<b>Collector Type (flat plate glazed/un-glazed; evacuate tubular)</b>						Evacuated tubular collector									
Thermal / photo voltaic hybrid collector? (PVT collector)						No									
Integration in the roof possible? (manufacturers declaration)						No									
						<b>Power output per collector module</b>									
						G = 1000 W/m <sup>2</sup>									
						T <sub>m</sub> -T <sub>a</sub>									
						0 K	10 K	30 K	50 K	70 K					
<b>Collector name</b>						W	W	W	W	W					
RC 58/1800/ 10 T						0,94	1.950	852	189	1,66	687	671	631	578	513
RC 58/1800/ 12 T						1,12	1.950	1.008	189	1,97	822	803	754	691	614
RC 58/1800/ 14 T						1,31	1.950	1.164	189	2,27	959	937	880	807	717
RC 58/1800/ 15 T						1,40	1.950	1.242	189	2,42	1.027	1.004	943	864	768
RC 58/1800/ 16 T						1,49	1.950	1.320	189	2,57	1.096	1.070	1.006	922	819
RC 58/1800/ 18 T						1,68	1.950	1.476	189	2,88	1.233	1.204	1.131	1.037	921
RC 58/1800/ 20 T						1,87	1.950	1.632	189	3,18	1.370	1.338	1.257	1.152	1.024
RC 58/1800/ 24 T						2,24	1.950	1.944	189	3,79	1.644	1.606	1.509	1.383	1.228
RC 58/1800/ 25 T						2,33	1.950	2.022	189	3,94	1.712	1.673	1.571	1.440	1.279
RC 58/1800/ 28 T						2,61	1.950	2.256	189	4,40	1.917	1.873	1.760	1.613	1.433
RC 58/1800/ 30 T						2,79	1.950	2.412	189	4,70	2.048	2.001	1.880	1.723	1.531
<b>Performance test method</b>						Glazed liquid heating collector - steady state - outdoor									
<b>Performance parameters related to aperture area</b>						η <sub>0</sub>	a <sub>1</sub>	a <sub>2</sub>							
<b>Units</b>						-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )							
<b>Test results - Flow rate and fluid see note 1</b>						0,734	1,529	0,016							
<b>Bi-directional incidence angle modifiers?</b>						Yes					<i>Kθ values are obligatory for 50°.</i>				
<b>Incidence angle modifiers Kθ(θT) transversal direction</b>						Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
						Kθ(θT)	1,00	1,03	1,11	1,25	1,37	1,36	1,11	0,70	0,05
<b>Incidence angle modifiers Kθ(θL) longitudinal direction</b>						Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
						Kθ(θL)	1,00	1,00	0,99	0,96	0,92	0,84	0,69	0,44	0,00
<b>Stagnation temperature - Weather conditions see note 2</b>						T <sub>stg</sub>		200		°C					
<b>Effective thermal capacity</b>						ceff = C/Ag		15,6		kJ/(m <sup>2</sup> K)					
<b>Max. intended operation temperature - see note 3</b>						T <sub>max,op</sub>		200		°C					
<b>Max. operation pressure - see note 3</b>						p <sub>max,op</sub>		1000		kPa					
<b>Pressure drop table - for a collector family, the values shall be for the module with highest ΔP per m<sup>2</sup> aperture area</b>															
<b>Flow rate</b>		kg/(s m <sup>2</sup> )	-	-	-	-	-	-	-	-	-	-	-		
<b>Pressure drop, ΔP</b>		Pa	-	-	-	-	-	-	-	-	-	-	-		
<b>Testing Laboratory</b>						TestLab Solar Thermal Systems, Fraunhofer ISE									
<b>Website</b>						www.collectortest.com									
<b>Test report id. number</b>						ktb-2007-07-p-en			<b>Date of test report</b>		2007.03.23				
During the test GDIF/GTOT was always between						0,08	and	0,14							
<b>Comments of testing laboratory:</b>															
The pressure drop was not determined.															
<b>Note 1</b>						Flow rate	0,020	kg/(s m <sup>2</sup> )	Fluid	Water					
<b>Note 2</b>						Irradiance, G = 1000 W/m <sup>2</sup> ; Ambient temperature, T <sub>a</sub> =30 °C									
<b>Note 3</b>						Given by manufacturer									
						TestLab Solar Thermal Systems Heidenhofstraße 2 D-79110 Fraunhof version: 4.06, 2014-01-15 Tel: +49 (0)761 4588 5354									
DIN CERTCO • Alboinstraße 56 • 12103 Berlin Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de															



Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence Number	011-7S305 R
	Issued	26.10.2015

Annual collector output kWh/module														
Collector name	Location and collector temperature (Tm)													
	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		
RC 58/1800/ 10 T	1.282	1.096	876	1.072	877	674	783	627	469	844	678	506		
RC 58/1800/ 12 T	1.534	1.311	1.048	1.282	1.049	806	936	750	561	1.009	811	605		
RC 58/1800/ 14 T	1.789	1.530	1.223	1.495	1.224	941	1.092	875	655	1.177	946	706		
RC 58/1800/ 15 T	1.917	1.639	1.310	1.602	1.312	1.008	1.170	938	702	1.261	1.014	756		
RC 58/1800/ 16 T	2.045	1.748	1.397	1.709	1.399	1.075	1.248	1.001	748	1.345	1.081	806		
RC 58/1800/ 18 T	2.300	1.967	1.572	1.923	1.574	1.210	1.404	1.126	842	1.513	1.217	907		
RC 58/1800/ 20 T	2.556	2.185	1.747	2.136	1.749	1.344	1.560	1.251	935	1.682	1.352	1.008		
RC 58/1800/ 24 T	3.067	2.622	2.096	2.563	2.099	1.613	1.873	1.501	1.123	2.018	1.622	1.210		
RC 58/1800/ 25 T	3.195	2.731	2.183	2.670	2.186	1.680	1.951	1.563	1.169	2.102	1.690	1.260		
RC 58/1800/ 28 T	3.578	3.059	2.445	2.991	2.449	1.882	2.185	1.751	1.310	2.354	1.892	1.411		
RC 58/1800/ 30 T	3.823	3.268	2.612	3.195	2.616	2.010	2.334	1.871	1.399	2.515	2.022	1.508		

Collector mounting: Fixed or tracking	Fixed; slope = latitude - 15° (rounded to nearest 5°)
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Overview of locations				
Location	Latitude °	Gtot kWh/m <sup>2</sup>	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 <sup>2</sup>
Ta	Mean annual ambient air temperature	°C
Tm	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 (Tm). A detailed description of the calculations is available at <http://www.sp.se/en/index/services/solar/ScenoCalc/Sidor/default.aspx>.

<b>DIN CERTCO • Alboinstraße 56 • 12103 Berlin</b> <b>Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de •</b> <b>www.dincertco.de</b>	Datasheet version: 4.06, 2014-01-15
	ScenoCalc version: Ver. 4.06 (Jan, 2014)