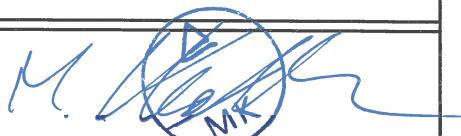




<b>Summary of EN 12975 Test Results,</b> <b>annex to Solar KEYMARK Certificate</b>						<b>Licence Number</b>		<b>011-7S2475 R</b>							
						<b>Issued</b>		<b>2016-08-08</b>							
<b>Company holding the</b>		SANTER SOLARPROFI GMBH				<b>Country</b>		Austria							
<b>Brand (optional)</b>		SSP				<b>Website</b>		www.ssp-products.at							
<b>Street, street number</b>		Industriestrasse 33				<b>E-mail</b>		h.santer@ssp-products.at							
<b>Postal Code / City, province</b>		6430	Ötztal-Bahnhof			<b>Tel/Fax</b>		43 5266 88004/5266 87688							
<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>									
						Gb = 850 W/m <sup>2</sup> ; Gd = 150 W/m <sup>2</sup>									
						Tm-Ta									
						0 K	10 K	30 K	50 K	70 K					
<b>Collector name</b>		<b>Aperture area (Aa)</b> m <sup>2</sup>	<b>Gross length</b> mm	<b>Gross width</b> mm	<b>Gross height</b> mm	<b>Gross area (AG)</b> m <sup>2</sup>	W	W	W	W					
VRK 15		1.41	2 010	1 310	159	2.63	887	841	748	654					
VRK 30		2.83	2 010	2 510	159	5.08	1 779	1 687	1 500	1 312					
<b>Performance test method</b>						Liquid heating collector - quasi-dynamic - outdoor									
<b>Performance parameters related to aperture</b>						$\eta_{0b}$	c1	c2	c3	c4	c6	K $\theta$ d			
<b>Units</b>						-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )	J/(m <sup>3</sup> K)	-	s/m	-			
<b>Test results - Flow rate and fluid see note 1</b>						0.627	3.257	0.001	0.000	0.000	0.000	1.023			
<b>Bi-directional incidence angle modifiers?</b>						Yes <i>K<math>\theta</math> values are obligatory for 50°.</i>									
<b>Incidence angle modifiers K<math>\theta</math>(<math>\theta</math>T) transversal direction</b>						Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
						K $\theta$ ( $\theta$ T)	1.00	1.00	0.99	0.98	0.97	0.94	0.88	0.00	0.00
<b>Incidence angle modifiers K<math>\theta</math>(<math>\theta</math>L) longitudinal direction</b>						Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
						K $\theta$ ( $\theta$ L)	1.02	1.08	1.18	1.33	1.52	1.48	1.43	1.10	0.00
<b>Stagnation temperature - Weather conditions see note 2</b>						Tstg	246	°C							
<b>Effective thermal capacity</b>						ceff = C/Ag	31.8	kJ/(m <sup>2</sup> K)							
<b>Max. intended operation temperature - see note 3</b>						Tmax,op	99	°C							
<b>Max. operation pressure - see note 3</b>						pmax,op	600	kPa							
<b>Pressure drop table - for a collector family, the values shall be for the module with highest <math>\Delta</math>P per m<sup>2</sup> aperture area</b>															
<b>Flow rate</b>	kg/(s m <sup>2</sup> )	-	-	-	-	-	-	-	-	-	-	-			
<b>Pressure drop, <math>\Delta</math>P</b>	Pa	-	-	-	-	-	-	-	-	-	-	-			
<b>Optional weather data</b>		Location			Link										
<b>Testing Laboratory</b>		TUV Rheinland (Shanghai) Co., Ltd.													
<b>Website</b>		www.tuv.com													
<b>Test report id. number</b>		154074819_EN_VRK10_Report_Ha n 20150204				<b>Date of test report</b>		2/4/2015							
		154074819_EN_VRK30_Report_Ha n 20150204													
During the test GDIF/GTOT was always between						0.06	and	0.36							
<b>Comments of testing laboratory:</b>															
Performance based on VRK10 report															
<b>Note 1</b>	<b>Flow rate</b>	0.020	kg/(s m <sup>2</sup> )	<b>Fluid</b>	Water										
<b>Note 2</b>	Irradiance, G = 1000 W/m <sup>2</sup> ; Ambient temperature, Ta=30 °C														
<b>Note 3</b>	Given by manufacturer														
						 Datasheet version: 4.06, 2014-01-15									



Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence Number	011-7S2475 R
	Issued	8/8/2016

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
VRK 15	1 558	1 142	813	1 214	889	630	857	585	388	949	647	425
VRK 30	3 117	2 285	1 626	2 428	1 778	1 261	1 715	1 169	776	1 898	1 294	850

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>.

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