Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate		Licence Number	011-7S089 R
		Issued	2015-06-25

Company holding the	Ritter Energie- und Umwelttechnik		Country	Deutschland	
Brand (optional)			Website	www.ritter-gruppe.com	
Street, street number	Kuchenäcker 2		E-mail	T.Weidemann@ritter-gruppe.com	
Postal Code / City, province	72135	Dettenhausen	Tel/Fax	+49	7157 5359 1280 / 7157 5359 1289

Collector Type (flat plate glazed/un-glazed; evacuate tubular)	Evacuated tubular collector
Thermal / photo voltaic hybid collector? (PVT collector)	No
Integration in the roof possible ? (manufacturers declaration)	No

Collector name	Aperture area (Aa)	Gross length	Gross width	Gross height	Gross area (AG)	Power output per collector module G = 1000 W/m², Tm-Ta 0 K	10 K	30 K	50 K	70 K
	m²	mm	mm	mm	m²	W	W	W	W	W
CPC 14 STAR azzurro	2.33	1616*	1622*	122	**2.62***	1 501	1 482	1 438	1 384	1 321
CPC 21 STAR azzurro *	3.49	1 616	2 427	122	**3.92**	2 248	2 220	2 153	2 073	1 979
CPC 30 STAR azzurro *	3.00	2 033	1 622	122	**3.30**	1 932	1 908	1 851	1 782	1 701
CPC 45 STAR azzurro *	4.50	2 033	2 427	122	**4.93**	2 898	2 862	2 777	2 673	2 552
CPC 14 INOX RP *	2.33	1 616	1 627	122	**2.63**	1 501	1 482	1 438	1 384	1 321
CPC 21 INOX RP *	3.49	1 616	2 432	122	**3.93**	2 248	2 220	2 153	2 073	1 979
CPC 14 INOX mono *	2.33	1 616	1 627	122	**2.63**	1 501	1 482	1 438	1 384	1 321
CPC 21 INOX mono *	3.49	1 616	2 432	122	**3.93**	2 248	2 220	2 153	2 073	1 979
STAR 15/26 *	2.33	1 616	1 627	122	**2.63**	1 501	1 482	1 438	1 384	1 321
STAR 15/39 *	3.49	1 616	2 432	122	**3.93**	2 248	2 220	2 153	2 073	1 979
STAR 19/33 *	3.00	2 033	1 627	122	**3.31**	1 932	1 908	1 851	1 782	1 701
STAR 19/49 *	4.50	2 033	2 432	122	**4.94**	2 898	2 862	2 777	2 673	2 552

Performance test method	Glazed liquid heating collector - steady state - outdoor								
Performance parameters related to aperture	η0	a1	a2						
Units	-	W/(m²K)	W/(m²K²)						
Test results - Flow rate and fluid see note 1	0.644	0.749	0.005						

Bi-directional incidence angle modifiers?	Yes	*Kϑ values are obligatory for 50°.*								
Incidence angle modifiers Kθ(θT) transversal direction	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
	Kθ(θT)	1.01	1.01	1.02	1.02	0.98	1.05	1.14	0.57	0.00
Incidence angle modifiers Kθ(θL) longitudinal direction	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
	Kθ(θL)	1.00	1.00	0.99	0.98	0.95	0.89	0.76	0.38	0.00

Stagnation temperature - Weather conditions see note 2	Tstg	301	°C
Effective thermal capacity	ceff = C/Ag	9.18	kJ/(m²K)
Max. intende 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 m² aperture area											
Flow rate	kg/(s m²)	-	-	-	-	-	-	-	-	-	-
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	06COL456/7	Date of test report	2015.06.25

During the test GDIF/GTOT was always between	0	and	1

Comments of testing laboratory:

* dimensions according to manufacturer

Note 1	Flow rate	0.017	kg/(s m²)	Fluid	Water
Note 2	Irradiance, G = 1000 W/m²; Ambient temperature , Ta=30 °C				
Note 3	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	011-7S089 R
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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
CPC 14 STAR azzurro	2 591	2 375	2 124	2 267	2 038	1 790	1 628	1 436	1 240	1 747	1 545	1 334
CPC 21 STAR azzurro	3 881	3 558	3 182	3 396	3 053	2 682	2 438	2 151	1 857	2 616	2 315	1 999
CPC 30 STAR azzurro	3 336	3 058	2 735	2 919	2 624	2 305	2 096	1 849	1 596	2 249	1 990	1 718
CPC 45 STAR azzurro	5 004	4 588	4 103	4 379	3 937	3 458	3 143	2 774	2 394	3 373	2 984	2 577
CPC 14 INOX RP	2 591	2 375	2 124	2 267	2 038	1 790	1 628	1 436	1 240	1 747	1 545	1 334
CPC 21 INOX RP	3 881	3 558	3 182	3 396	3 053	2 682	2 438	2 151	1 857	2 616	2 315	1 999
CPC 14 INOX mono	2 591	2 375	2 124	2 267	2 038	1 790	1 628	1 436	1 240	1 747	1 545	1 334
CPC 21 INOX mono	3 881	3 558	3 182	3 396	3 053	2 682	2 438	2 151	1 857	2 616	2 315	1 999
STAR 15/26	2 591	2 375	2 124	2 267	2 038	1 790	1 628	1 436	1 240	1 747	1 545	1 334
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STAR 19/49	5 004	4 588	4 103	4 379	3 937	3 458	3 143	2 774	2 394	3 373	2 984	2 577

Collector mounting: Fixed or tracking	Fixed; slope = latitude - 15° (rounded to nearest 5°)

Overview of locations

Location	Latitude °	Gtot kWh/m²	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/m²
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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Datasheet version: 4.06, 2014-01-15

ScenoCalc version: Ver. 4.06 (Jan, 2014)