Summary of	**EN12977-2**	**SOLAR SYSTEM test results**	**Licence Number**	**011-7S2840 B**
Annex to Solar KEYMARK Certificate			**Issued**	2018-08-17

Company	Ritter Energie- u. Umwelttechnik GmbH & Co. KG		**Country**	Germany	
Brand (optional)			**Website**	www.ritter-gruppe.de	
Street	Kuchenäcker 2		**E-mail**	info@ritter-gruppe.de	
Postal Code	72135	Dettenhausen	**Tel. / Fax**	+49	715753591200 / 1289

System classification

Application(s)	Hot water + space heating (combi)
Solar loop, circulation principle	Pumped
Direct solar loop / heat exchanger	Direct
Open, vented or closed solar loop	Closed
Drain back/down	Always filled (no drain)
Store location	Indoor
Store orientation (of main axis)	Vertical
Type of auxiliary heating (internal back-up heat)	Other
If other auxiliary/internal back-up heating, please specifiy:	Direct
Solar+supplementary OR Solar-only / Solar pre-heat	Solar + supplementary

Collector(s)

Company	Ritter GmbH & Co. KG
Keymark lic.no. if available	*011-7S1889 R*

Collector name	Per module: Gross Area (Ag)	Gross length	Gross width
	m²	mm	mm
AQUA PLASMA 19/50	5.01	2058	2432

Heat store(s)

Company	Ritter GmbH & Co. KG
Keymark lic.no. if available	*011-7S2853 H*

Store name	Total nominal volume	Gross height	Gross width	Gross depth	Auxiliary heated volume	Electrical aux. heating power
	litres	mm	mm	mm	litres	kW
Aqua Expresso III	815	1980	1000	1000	422	---

Solar loop controller

Keymark lic.no. if available	*011-7S2852 S*			
Company	Ritter GmbH & Co. KG			
Name	Systa Solar Aqua II			
Solar loop pump - power range	0 W	to	37 W	

Solar loop fluid

Recommended/required	Required	
Company	none	
Name	water	
Freezing point	0	°C

System family overview

Collector name	Number of collectors in each configuration for each store — Store name: Aqua Expresso III 800
AQUA PLASMA 19/50	2

Testing Laboratory	TZS, ITW University Stuttgart
Website	www.itw.uni-stuttgart.de
Test report id. number	18SIM165
Date of test report	2018-07-24

Comments of test lab

no Comments

TZS Forschungs- und Testzentrum für Solaranlagen
Institut für Thermodynamik und Wärmetechnik
Universität Stuttgart
Pfaffenwaldring 6, 70550 Stuttgart (Vaihingen)

Version 3.4, 2014-05-05

Summary of	EN12977-2	test results	Certification No.	011-7S2840 B
Annex to Solar KEYMARK Certificate			Issued	2018-08-17

Company	Ritter Energie- u. Umwelttechnik GmbH & Co. KG		**Country**	Germany	
Brand (optional)			**Website**	www.ritter-gruppe.de	
Street	Kuchenäcker 2		**E-mail**	info@ritter-gruppe.de	
Postal Code	72135	Dettenhausen	**Tel. / Fax**	+49	715753591200 / 1289

System family overview

	For each storage and collector size, give number of collectors			
Collector name	Aqua Expresso III 800			
AQUA PLASMA 19/50	2			

Name of system konfiguration			AquaPaket PLASMA	
Collector name	AQUA PLASMA	**No. Collectors** 2	**Storage name**	Aqua Expresso III

Calculated annual results for "solar plus supplementary system"

Location	Qd,sh	Daily drawoff 110 l				Daily drawoff 200 l				Daily drawoff 300 l			
		Qd,hw	Qauxnet	Qpar	fsav	Qd,hw	Qauxnet	Qpar	fsav	Qd,hw	Qauxnet	Qpar	fsav
	MJ/y	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%
Stockholm SE	53856	6080	50328	146	19.2	11056	53701	154	20.1	16585	57236	157	21.3
WürzburgDE	32724	5828	30337	132	25.8	10602	33145	142	27.4	15898	36198	148	28.9
Davos CH	42311	6599	30067	170	41.3	11995	33361	175	41.1	17993	37400	178	40.3
Athens GR	29210	4532	22928	148	36.4	8240	24534	159	38.3	12359	26298	170	40.1

Perf. indicators for the table above

Qd,sh	MJ/y	**Annual heat demand for space heating**
Qd	MJ/y	**Annual heat demand for domestic hot water**
Qaux,net	MJ/y	**Annual net auxilliary heat demand (back-up heat supplied)**
Qpar	MJ/y	**Annual parasitic energy: (electricity for pumps/controllers)**
f_{sav}	-	**Fractional energy savings (savings due to the solar system), fsav = (Qconv-Qaux)/Qconv**

Ref. conditions	Stockholm SE	Würzburg DE	Davos CH	Athens GR
G	1 157	1 230	1 684	1 736
Ta,ave	7.5	9.0	3.2	18.5
Tc,ave	8.5	10.0	5.4	17.8
± ΔTc	6.4	3.0	0.8	7.4

G	kWh/m²	**Annual irradiation South, 45°**
Ta,ave	°C	**Annual average outdoor air temperature**
Tc,ave	°C	**Annual average mains cold water temp.**
ΔTc	K	**Seasonal variation of Tc**
Th	45 °C	**Desired hot water temperature (mixing valve temperature).**

Max. operating press. - collector side	1 000	kPa	**Max. operating press. - tank side**	300	kPa

Testing Laboratory	ITW/TZS University of Stuttgart
Website	www.itw.uni-stuttgart.de
Test report id. number	18SIM165
Date of test report	2018-07-24
Test method	EN 12977-2 (CTSS)

Comments of test lab

No comments

Stamp & signature of test lab

All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %

Version 3.4, 2014-05-05