Summary of	EN12977-2	SOLAR SYSTEM test results	Licence Number	011-7S2841 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	*011-7S089 R*

Collector name	Per module: Gross Area (AG)	Gross length	Gross width
	m²	mm	mm
Star 19/49	4.94	2033	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			Solar loop fluid		
Keymark lic.no. if available	*011-7S2852 S*		Recommended/required	Required	
Company	Ritter GmbH & Co. KG		Company	none	
Name	Systa Solar Aqua II		Name	water	
Solar loop pump - power range	0 W	to 37 W	Freezing point	0	°C

System family overview

Collector name	Number of collectors in each configuration for each store: Store name: Aqua Expresso III 800																																			
Star 19/49	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)

DIN CERTCO ● Alboinstraße 56 ● 12103 Berlin, Germany
Tel: +49 30 7562-1131 ● Fax: +49 30 7562-1141 ● E-Mail: info@dincertco.de ● www.dincertco.de

Summary of	EN12977-2	test results	Certification No.	011-7S2841 B
Annex to Solar KEYMARK Certificate			Issued	2018-08-17

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

System family overview

Collector name	For each storage and collector size, give number of collectors																													
	Aqua Expresso III 800																													
Star 19/49	2																													

Name of system konfiguration				AquaPaket EXPRESSO	
Collector name	Star 19/49	**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	51394	146	17.4	11056	54821	152	18.5	16585	58385	150	19.8
WürzburgDE	32724	5828	31198	132	23.7	10602	34074	140	25.4	15898	37253	144	26.9
Davos CH	42311	6599	31849	164	37.8	11995	35381	168	37.5	17993	39571	166	36.8
Athens GR	29210	4532	23771	150	34.1	8240	25398	161	36.1	12359	27212	172	38.0

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 %

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