

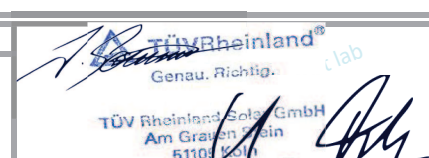
Version 4.5. 2017-10-24

Summary of	EN12976-2	test results	Certification No.	011-7S 2816 A														
Annex to Solar KEYMARK Certificate			Issued	2023-05-16														
Company	Bosch Solarthermie GmbH		Country	Germany														
Brand (optional)	Bosch, Buderus, Vulcano		Website	www.bosch-thermotechnology.com														
Street	Prozessionsweg 10		E-mail	solarthermie@de.bosch.com														
Postal Code	48493	Wettringen	Tel. / Fax	-														
Parameters for systems extrapolation (Annex D)																		
Collector of measured system		Storage tank of measured system																
$A_{ref} [m^2]$	1.94	Volume [l]	145															
η_0	0.761	$A_{hx} [m^2]$	0.814															
$a_1 [W/Km^2]$	4.083	Piping																
$a_2 [W/Km^2]$	0.012																	
IAM (50°)	0.094	$U_{loop,p}$	1.11															
System parameters																		
Name of System Configuration	Tested/Extrapol	A_c^* [m²]	u_c^* [W/Km²]	U_s [W/K]	C_s [MJ/K]	S_c [-]	D_L [-]	f_{aux} [-]										
TSS150-2E/FCC-2 Bosch		1.32	7.32	1.75	0.50	0.08	0.74	-										
TSS200-2E/FCC-2 Bosch		1.34	7.51	2.06	0.67	0.08	0.74	-										
TSS300-2E/FCC-2 Bosch		2.64	6.95	2.65	0.95	0.08	0.74	-										
<table border="1"> <tr> <td>Testing Laboratory</td> <td>TÜV Rheinland Energy GmbH</td> </tr> <tr> <td>Website</td> <td>www.tuv.com/st</td> </tr> <tr> <td>Test report id. number</td> <td>21237826.002Rev01</td> </tr> <tr> <td>Date of test report</td> <td>2020-11-12</td> </tr> <tr> <td>Test method</td> <td>ISO 9459-5 (DST)</td> </tr> </table>									Testing Laboratory	TÜV Rheinland Energy GmbH	Website	www.tuv.com/st	Test report id. number	21237826.002Rev01	Date of test report	2020-11-12	Test method	ISO 9459-5 (DST)
Testing Laboratory	TÜV Rheinland Energy GmbH																	
Website	www.tuv.com/st																	
Test report id. number	21237826.002Rev01																	
Date of test report	2020-11-12																	
Test method	ISO 9459-5 (DST)																	
<table border="1"> <tr> <td>Comments of test lab</td> <td rowspan="2">  </td> </tr> <tr> <td>The system configuration TSS150-2E/FCC-2 Bosch was used for testing and as basis for scalling.</td> </tr> </table>									Comments of test lab		The system configuration TSS150-2E/FCC-2 Bosch was used for testing and as basis for scalling.							
Comments of test lab																		
The system configuration TSS150-2E/FCC-2 Bosch was used for testing and as basis for scalling.																		

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

Version 4.5, 2017-10-24

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Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de

Summary of	EN12976-2	test results	Certification No.	011-7S 2816 A									
Annex to Solar KEYMARK Certificate			Issued	2023-05-16									
Company	Bosch Solarthermie GmbH		Country	Germany									
Brand (optional)	Bosch, Buderus, Vulcano		Website	www.bosch-thermotechnology.com									
Street	Prozessionsweg 10		E-mail	solarthermie@de.bosch.com									
Postal Code	48493	Wettingen	Tel. / Fax	-									
System family overview													
For each storage and collector size, give number of collectors													
Collector name	TS150-2E	TS200-2E	TS300-2E										
Bosch FCC220-2V	1	1	2										
Buderus CKN 2.0-s	1	1	2										
Vulcano FCC-2S	1	1	2										
Name of system configuration													
			TSS150-2E/FCC-2 Bosch										
Collector name	Bosch FCC220-2V	No. Collectors	1	Storage name									
TS150-2E													
Calculated annual results for "solar-only / preheat system"													
Location	Q _{d,sh} MJ/y	Daily drawoff 110 l				Daily drawoff 140 l				Daily drawoff 170 l			
		Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %
Stockholm SE	0	6150	2933	-	48	7821	3248	-	42	9492	3469	-	37
Würzburg DE	0	5897	3002	-	51	7506	3437	-	46	9114	3721	-	41
Davos CH	0	6654	4352	-	65	8483	4857	-	57	10281	5172	-	50
Athens GR	0	4573	3690	-	81	5834	4384	-	75	7064	4920	-	70
Rabat MA	0	5046	4857	-	97	6433	5960	-	93	7789	6749	-	86
Perf. indicators for the table above													
Q _{d,sh}	MJ/y	Not relevant for solar domestic hot water system											
Q _d	MJ/y	Annual heat demand for domestic hot water											
Q _L	MJ/y	Annual heat energy delivered by the solar system											
Q _{par}	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)											
f _{sol} =Q _L /Q _d	-	Solar fraction											
Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR	Rabat MA							
	G	1 157	1 230	1 684	1 736	2 170							
	T _{a,ave}	7.5	9.0	3.2	18.5	17.4							
	T _{c,ave}	8.5	10.0	5.4	17.8	15.0							
	± ΔT _c	6.4	3.0	0.8	7.4	-							
G	kWh/m²	Annual irradiation South, 45°											
T _{a,ave}	°C	Annual average outdoor air temperature											
T _{c,ave}	°C	Annual average mains cold water temp.											
ΔT _c	K	Seasonal variation of T _c											
Th	45 °C	Desired hot water temperature (mixing valve temperature).											
Max. operating press. - collector side		250	kPa	Max. operating press. - tank side		800	kPa						
Testing Laboratory		TÜV Rheinland Energy GmbH											
Website		www.tuv.com/st											
Test report id. number		21237826.002Rev01											
Date of test report		2020-11-12											
Test method		ISO 9459-5 (DST)											
Comments of test lab													
													

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Summary of	EN12976-2	test results	Certification No.	011-7S 2816 A
Annex to Solar KEYMARK Certificate			Issued	2023-05-16
Company	Bosch Solarthermie GmbH		Country	Germany
Brand (optional)	Bosch, Buderus, Vulcano		Website	www.bosch-thermotechnology.com
Street	Prozessionsweg 10		E-mail	solarthermie@de.bosch.com
Postal Code	48493	Wettringen	Tel. / Fax	-

System family overview															
Collector name	For each storage and collector size, give number of collectors														
	TS150-2E					TS200-2E					TS300-2E				
Bosch FCC220-2V	1					1					2				
Buderus CKN 2.0-s	1					1					2				
Vulcano FCC-2S	1					1					2				

Name of system configuration			TSS150-2E/CKN 2.0 Buderus												
Collector name	Buderus CKN 2.0-s	No. Collectors	1								Storage name	TS150-2E			

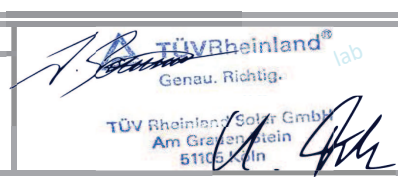
Calculated annual results for "solar-only / preheat system"																
Location	Q _{d,sh} MJ/y	Daily drawoff 110 l					Daily drawoff 140 l					Daily drawoff 170 l				
		Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %			
Stockholm SE	0	6150	2933	-	48	7821	3248	-	42	9492	3469	-	37			
Würzburg DE	0	5897	3002	-	51	7506	3437	-	46	9114	3721	-	41			
Davos CH	0	6654	4352	-	65	8483	4857	-	57	10281	5172	-	50			
Athens GR	0	4573	3690	-	81	5834	4384	-	75	7064	4920	-	70			
Rabat MA	0	5046	4857	-	97	6433	5960	-	93	7789	6749	-	86			

Perf. indicators for the table above	
Q _{d,sh}	MJ/y
Q _d	MJ/y
Q _L	MJ/y
Q _{par}	MJ/y
f _{sol} =Q _L /Q _d	-

Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR	Rabat MA		
	G	1 157	1 230	1 684	1 736	2 170		
	T _{a,ave}	7.5	9.0	3.2	18.5	17.4		
	T _{c,ave}	8.5	10.0	5.4	17.8	15.0		
	± ΔT _c	6.4	3.0	0.8	7.4	-		
G	kWh/m²	Annual irradiation South, 45°						
T _{a,ave}	°C	Annual average outdoor air temperature						
T _{c,ave}	°C	Annual average mains cold water temp.						
ΔT _c	K	Seasonal variation of T_c						
Th	45 °C	Desired hot water temperature (mixing valve temperature).						

Max. operating press. - collector side	250	kPa	Max. operating press. - tank side	800	kPa
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Testing Laboratory	TÜV Rheinland Energy GmbH
Website	www.tuv.com/st
Test report id. number	21237826.002Rev01
Date of test report	2020-11-12
Test method	ISO 9459-5 (DST)

Comments of test lab	
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Summary of	EN12976-2	test results	Certification No.	011-7S 2816 A
Annex to Solar KEYMARK Certificate			Issued	2023-05-16
Company	Bosch Solarthermie GmbH		Country	Germany
Brand (optional)	#BEZUG!		Website	www.bosch-thermotechnology.com
Street	Prozessionsweg 10		E-mail	solarthermie@de.bosch.com
Postal Code	48493	Wettingen	Tel. / Fax	-

System family overview															
Collector name	For each storage and collector size, give number of collectors														
	TS150-2E					TS200-2E					TS300-2E				
Bosch FCC220-2V	1					1					2				
Buderus CKN 2.0-s	1					1					2				
Vulcano FCC-2S	1					1					2				

Name of system configuration			TSS150-2E/FCC-2 Vulcano												
Collector name	Vulcano FCC-2S	No. Collectors	1								Storage name	TS150-2E			

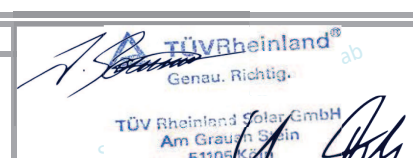
Calculated annual results for "solar-only / preheat system"																
Location	Q _{d,sh} MJ/y	Daily drawoff 110 l					Daily drawoff 140 l					Daily drawoff 170 l				
		Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %			
Stockholm SE	0	6150	2933	-	48	7821	3248	-	42	9492	3469	-	37			
Würzburg DE	0	5897	3002	-	51	7506	3437	-	46	9114	3721	-	41			
Davos CH	0	6654	4352	-	65	8483	4857	-	57	10281	5172	-	50			
Athens GR	0	4573	3690	-	81	5834	4384	-	75	7064	4920	-	70			
Rabat MA	0	5046	4857	-	97	6433	5960	-	93	7789	6749	-	86			

Perf. indicators for the table above														
Q _{d,sh}	MJ/y	Not relevant for solar domestic hot water system												
Q _d	MJ/y	Annual heat demand for domestic hot water												
Q _L	MJ/y	Annual heat energy delivered by the solar system												
Q _{par}	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)												
f _{sol} =Q _L /Q _d	-	Solar fraction												

Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR	Rabat MA	
	G	1 157	1 230	1 684	1 736	2 170	
	T _{a,ave}	7.5	9.0	3.2	18.5	17.4	
	T _{c,ave}	8.5	10.0	5.4	17.8	15.0	
	± ΔT _c	6.4	3.0	0.8	7.4	-	
G	kWh/m²	Annual irradiation South, 45°					
T _{a,ave}	°C	Annual average outdoor air temperature					
T _{c,ave}	°C	Annual average mains cold water temp.					
ΔT _c	K	Seasonal variation of T _c					
Th	45 °C	Desired hot water temperature (mixing valve temperature).					

Max. operating press. - collector side		250	kPa	Max. operating press. - tank side		800	kPa
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Testing Laboratory	TÜV Rheinland Energy GmbH
Website	www.tuv.com/st
Test report id. number	21237826.002Rev01
Date of test report	2020-11-12
Test method	ISO 9459-5 (DST)

Comments of test lab	 TÜV Rheinland® Genau. Richtig. TÜV Rheinland Solar GmbH Am Grauen Stein 51105 Köln
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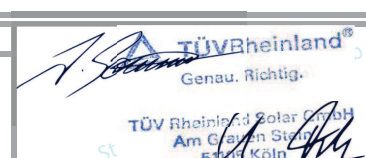
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Company	Bosch Solarthermie GmbH		Country	Germany
Brand (optional)	Bosch, Buderus, Vulcano		Website	www.bosch-thermotechnology.com
Street	Prozessionsweg 10		E-mail	solarthermie@de.bosch.com
Postal Code	48493	Wettingen	Tel. / Fax	-

System family overview														
Collector name	For each storage and collector size, give number of collectors													
	TS150-2E					TS200-2E					TS300-2E			
Bosch FCC220-2V	1				1					2				
Buderus CKN 2.0-s	1				1					2				
Vulcano FCC-2S	1				1					2				

Name of system configuration			TSS200-2E/FCC-2 Bosch													
Collector name	Bosch FCC220-2V	No. Collectors	1								Storage name	TS200-2E				
Calculated annual results for "solar-only / preheat system"																
Location	Q _{d,sh} MJ/y	Daily drawoff 170 l					Daily drawoff 200 l					Daily drawoff 250 l				
		Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %			
Stockholm SE	0	9492	3532	-	37	11164	3721	-	33	13939	3942	-	28			
WürzburgDE	0	9114	3784	-	42	10691	4037	-	38	13371	4194	-	31			
Davos CH	0	10281	5235	-	51	12110	5519	-	46	15137	5676	-	38			
Athens GR	0	7064	4983	-	70	8326	5456	-	66	10407	5897	-	57			
Rabat MA	0	7789	6843	-	88	9177	7411	-	81	11479	7758	-	68			

Perf. indicators for the table above		
Q _{d,sh}	MJ/y	Not relevant for solar domestic hot water system
Q _d	MJ/y	Annual heat demand for domestic hot water
Q _L	MJ/y	Annual heat energy delivered by the solar system
Q _{par}	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)
f _{sol} =Q _L /Q _d	-	Solar fraction

Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR	Rabat MA	
	G	1 157	1 230	1 684	1 736	2 170	
	T _{a,ave}	7.5	9.0	3.2	18.5	17.4	
	T _{c,ave}	8.5	10.0	5.4	17.8	15.0	
	± ΔT _c	6.4	3.0	0.8	7.4	-	
G	kWh/m²	Annual irradiation South, 45°					
T _{a,ave}	°C	Annual average outdoor air temperature					
T _{c,ave}	°C	Annual average mains cold water temp.					
ΔT _c	K	Seasonal variation of T _c					
Th	45 °C	Desired hot water temperature (mixing valve temperature).					

Max. operating press. - collector side	250	kPa	Max. operating press. - tank side	800	kPa
Testing Laboratory	TÜV Rheinland Energy GmbH				
Website	www.tuv.com/st				
Test report id. number	21237826.002Rev01				
Date of test report	2020-11-12				
Test method	ISO 9459-5 (DST)				
Comments of test lab					
					

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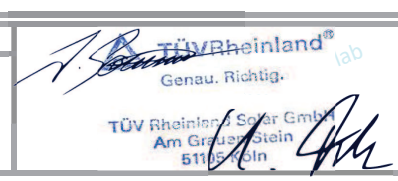
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Street	Prozessionsweg 10		E-mail	solarthermie@de.bosch.com
Postal Code	48493	Wettingen	Tel. / Fax	-

System family overview															
Collector name	For each storage and collector size, give number of collectors														
	TS150-2E					TS200-2E					TS300-2E				
Bosch FCC220-2V	1					1					2				
Buderus CKN 2.0-s	1					1					2				
Vulcano FCC-2S	1					1					2				

Name of system configuration			TSS200-2E/CKN 2.0 Buderus													
Collector name	Buderus CKN 2.0-s	No. Collectors	1								Storage name	TS200-2E				
Calculated annual results for "solar-only / preheat system"																
Location	Q _{d,sh} MJ/y	Daily drawoff 170 l					Daily drawoff 200 l					Daily drawoff 250 l				
		Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %			
Stockholm SE	0	9492	3532	-	37	11164	3721	-	33	13939	3942	-	28			
Würzburg DE	0	9114	3784	-	42	10691	4037	-	38	13371	4194	-	31			
Davos CH	0	10281	5235	-	51	12110	5519	-	46	15137	5676	-	38			
Athens GR	0	7064	4983	-	70	8326	5456	-	66	10407	5897	-	57			
Rabat MA	0	7789	6843	-	88	9177	7411	-	81	11479	7758	-	68			

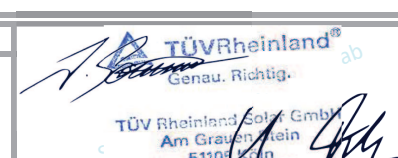
Perf. indicators for the table above		
Q _{d,sh}	MJ/y	Not relevant for solar domestic hot water system
Q _d	MJ/y	Annual heat demand for domestic hot water
Q _L	MJ/y	Annual heat energy delivered by the solar system
Q _{par}	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)
f _{sol} =Q _L /Q _d	-	Solar fraction

Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR	Rabat MA	
	G	1 157	1 230	1 684	1 736	2 170	
	T _{a,ave}	7.5	9.0	3.2	18.5	17.4	
	T _{c,ave}	8.5	10.0	5.4	17.8	15.0	
	± ΔT _c	6.4	3.0	0.8	7.4	-	
G	kWh/m²	Annual irradiation South, 45°					
T _{a,ave}	°C	Annual average outdoor air temperature					
T _{c,ave}	°C	Annual average mains cold water temp.					
ΔT _c	K	Seasonal variation of T _c					
Th	45 °C	Desired hot water temperature (mixing valve temperature).					

Max. operating press. - collector side	250	kPa	Max. operating press. - tank side	800	kPa
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Website	www.tuv.com/st				
Test report id. number	21237826.002Rev01				
Date of test report	2020-11-12				
Test method	ISO 9459-5 (DST)				
Comments of test lab					

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Street	Prozessionsweg 10				E-mail	solarthermie@de.bosch.com							
Postal Code	48493	Wettingen			Tel. / Fax	- -							
System family overview													
For each storage and collector size, give number of collectors													
Collector name	TS150-2E		TS200-2E		TS300-2E								
Bosch FCC220-2V	1		1		2								
Buderus CKN 2.0-s	1		1		2								
Vulcano FCC-2S	1		1		2								
Name of system configuration					TSS200-2E/FCC-2 Vulcano								
Collector name	Vulcano FCC-2S		No. Collectors	1		Storage name	TS200-2E						
Calculated annual results for "solar-only / preheat system"													
Location	Q _{d,sh} MJ/y	Daily drawoff 170 l				Daily drawoff 200 l				Daily drawoff 250 l			
		Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %
Stockholm SE	0	9492	3532	-	37	11164	3721	-	33	13939	3942	-	28
Würzburg DE	0	9114	3784	-	42	10691	4037	-	38	13371	4194	-	31
Davos CH	0	10281	5235	-	51	12110	5519	-	46	15137	5676	-	38
Athens GR	0	7064	4983	-	70	8326	5456	-	66	10407	5897	-	57
Rabat MA	0	7789	6843	-	88	9177	7411	-	81	11479	7758	-	68
Perf. indicators for the table above													
Q _{d,sh}	MJ/y	Not relevant for solar domestic hot water system											
Q _d	MJ/y	Annual heat demand for domestic hot water											
Q _L	MJ/y	Annual heat energy delivered by the solar system											
Q _{par}	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)											
f _{sol} =Q _L /Q _d	-	Solar fraction											
Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR	Rabat MA							
	G	1 157	1 230	1 684	1 736	2 170							
	T _{a,ave}	7.5	9.0	3.2	18.5	17.4							
	T _{c,ave}	8.5	10.0	5.4	17.8	15.0							
	± ΔT _c	6.4	3.0	0.8	7.4	-							
G	kWh/m²	Annual irradiation South, 45°											
T _{a,ave}	°C	Annual average outdoor air temperature											
T _{c,ave}	°C	Annual average mains cold water temp.											
ΔT _c	K	Seasonal variation of T _c											
Th	45 °C	Desired hot water temperature (mixing valve temperature).											
Max. operating press. - collector side		250 kPa		Max. operating press. - tank side		800 kPa							
Testing Laboratory		TÜV Rheinland Energy GmbH											
Website		www.tuv.com/st											
Test report id. number		21237826.002Rev01											
Date of test report		2020-11-12											
Test method		ISO 9459-5 (DST)											
Comments 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 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	011-7S 2816 A
Annex to Solar KEYMARK Certificate			Issued	2023-05-16
Company	Bosch Solarthermie GmbH		Country	Germany
Brand (optional)	Bosch, Buderus, Vulcano		Website	www.bosch-thermotechnology.com
Street	Prozessionsweg 10		E-mail	solarthermie@de.bosch.com
Postal Code	48493	Wettingen	Tel. / Fax	-

System family overview															
Collector name	For each storage and collector size, give number of collectors														
	TS150-2E					TS200-2E					TS300-2E				
Bosch FCC220-2V	1					1					2				
Buderus CKN 2.0-s	1					1					2				
Vulcano FCC-2S	1					1					2				

Name of system configuration			TSS300-2E/FCC-2 Bosch												
Collector name	Bosch FCC220-2V	No. Collectors	2								Storage name	TS300-2E			

Calculated annual results for "solar-only / preheat system"																
Location	Q _{d,sh} MJ/y	Daily drawoff 250 l					Daily drawoff 300 l					Daily drawoff 400 l				
		Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %			
Stockholm SE	0	13939	6276	-	45	16746	6812	-	41	22327	7474	-	34			
Würzburg DE	0	13371	6686	-	50	16052	7316	-	46	21413	7852	-	37			
Davos CH	0	15137	9587	-	63	18165	10281	-	57	24220	10785	-	45			
Athens GR	0	10407	8262	-	80	12488	9335	-	75	16651	10565	-	64			
Rabat MA	0	11479	10975	-	96	13750	12457	-	91	18354	14002	-	76			

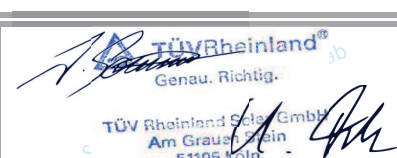
Perf. indicators for the table above		
Q _{d,sh}	MJ/y	Not relevant for solar domestic hot water system
Q _d	MJ/y	Annual heat demand for domestic hot water
Q _L	MJ/y	Annual heat energy delivered by the solar system
Q _{par}	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)
f _{sol} = Q _L /Q _d	-	Solar fraction

Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR	Rabat MA
	G	1 157	1 230	1 684	1 736	2 170
	T _{a,ave}	7.5	9.0	3.2	18.5	17.4
	T _{c,ave}	8.5	10.0	5.4	17.8	15.0
	± ΔT _c	6.4	3.0	0.8	7.4	-

G	kWh/m²	Annual irradiation South, 45°
T _{a,ave}	°C	Annual average outdoor air temperature
T _{c,ave}	°C	Annual average mains cold water temp.
ΔT _c	K	Seasonal variation of T _c
Th	45 °C	Desired hot water temperature (mixing valve temperature).

Max. operating press. - collector side	250 kPa	Max. operating press. - tank side	800 kPa
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Testing Laboratory	TÜV Rheinland Energy GmbH
Website	www.tuv.com/st
Test report id. number	21237826.002Rev01
Date of test report	2020-11-12
Test method	ISO 9459-5 (DST)

Comments of test lab	
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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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Summary of	EN12976-2	test results	Certification No.	011-7S 2816 A
Annex to Solar KEYMARK Certificate			Issued	2023-05-16
Company	Bosch Solarthermie GmbH		Country	Germany
Brand (optional)	#BEZUG!		Website	www.bosch-thermotechnology.com
Street	Prozessionsweg 10		E-mail	solarthermie@de.bosch.com
Postal Code	48493	Wettringen	Tel. / Fax	-

System family overview															
Collector name	For each storage and collector size, give number of collectors														
	TS150-2E					TS200-2E					TS300-2E				
Bosch FCC220-2V	1					1					2				
Buderus CKN 2.0-s	1					1					2				
Vulcano FCC-2S	1					1					2				

Name of system configuration			TSS300-2E/CKN 2.0 Buderus												
Collector name	Buderus CKN 2.0-s	No. Collectors	2								Storage name	TS300-2E			

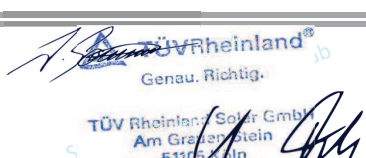
Calculated annual results for "solar-only / preheat system"																
Location	Q _{d,sh} MJ/y	Daily drawoff 250 l					Daily drawoff 300 l					Daily drawoff 400 l				
		Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %			
Stockholm SE	0	13939	6276	-	45	16746	6812	-	41	22327	7474	-	34			
Würzburg DE	0	13371	6686	-	50	16052	7316	-	46	21413	7852	-	37			
Davos CH	0	15137	9587	-	63	18165	10281	-	57	24220	10785	-	45			
Athens GR	0	10407	8262	-	80	12488	9335	-	75	16651	10565	-	64			
Rabat MA	0	11479	10975	-	96	13750	12457	-	91	18354	14002	-	76			

Perf. indicators for the table above														
Q _{d,sh}	MJ/y	Not relevant for solar domestic hot water system												
Q _d	MJ/y	Annual heat demand for domestic hot water												
Q _L	MJ/y	Annual heat energy delivered by the solar system												
Q _{par}	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)												
f _{sol} =Q _L /Q _d	-	Solar fraction												

Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR	Rabat MA		
	G	1 157	1 230	1 684	1 736	2 170		
	T _{a,ave}	7.5	9.0	3.2	18.5	17.4		
	T _{c,ave}	8.5	10.0	5.4	17.8	15.0		
	± ΔT _c	6.4	3.0	0.8	7.4	-		
G	kWh/m²	Annual irradiation South, 45°						
T _{a,ave}	°C	Annual average outdoor air temperature						
T _{c,ave}	°C	Annual average mains cold water temp.						
ΔT _c	K	Seasonal variation of T _c						
Th	45 °C	Desired hot water temperature (mixing valve temperature).						

Max. operating press. - collector side	250	kPa	Max. operating press. - tank side	800	kPa
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Testing Laboratory	TÜV Rheinland Energy GmbH
Website	www.tuv.com/st
Test report id. number	21237826.002Rev01
Date of test report	2020-11-12
Test method	ISO 9459-5 (DST)

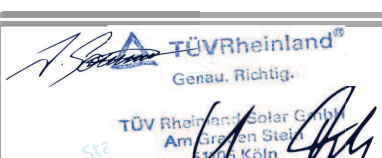
Comments of test lab	 TÜV Rheinland® Genau. Richtig. TÜV Rheinland Solar GmbH Am Gräfenstein 51105 Köln
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All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %

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Summary of		EN12976-2		test results		Certification No.		011-7S 2816 A					
Annex to Solar KEYMARK Certificate						Issued		2023-05-16					
Company		Bosch Solarthermie GmbH				Country		Germany					
Brand (optional)		Bosch, Buderus, Vulcano				Website		www.bosch-thermotechnology.com					
Street		Prozessionsweg 10				E-mail		solarthermie@de.bosch.com					
Postal Code		48493		Wettringen		Tel. / Fax		- -					
System family overview													
For each storage and collector size, give number of collectors													
Collector name	TS150-2E		TS200-2E		TS300-2E								
Bosch FCC220-2V	1		1		2								
Buderus CKN 2.0-s	1		1		2								
Vulcano FCC-2S	1		1		2								
Name of system configuration						TSS300-2E/FCC-2 Vulcano							
Collector name		Vulcano FCC-2S		No. Collectors		2		Storage name		TS300-2E			
Calculated annual results for "solar-only / preheat system"													
Location	Q _{d,sh}	Daily drawoff 250 l				Daily drawoff 300 l				Daily drawoff 400 l			
		Q _{d,hw}	Q _L	Q _{par}	f _{sol}	Q _{d,hw}	Q _L	Q _{par}	f _{sol}	Q _{d,hw}	Q _L	Q _{par}	f _{sol}
	MJ/y	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%
Stockholm SE	0	13939	6276	-	45	16746	6812	-	41	22327	7474	-	34
Würzburg DE	0	13371	6686	-	50	16052	7316	-	46	21413	7852	-	37
Davos CH	0	15137	9587	-	63	18165	10281	-	57	24220	10785	-	45
Athens GR	0	10407	8262	-	80	12488	9335	-	75	16651	10565	-	64
Rabat MA	0	11479	10975	-	96	13750	12457	-	91	18354	14002	-	76
Perf. indicators for the table above													
Q _{d,sh}	MJ/y	Not relevant for solar domestic hot water system											
Q _d	MJ/y	Annual heat demand for domestic hot water											
Q _L	MJ/y	Annual heat energy delivered by the solar system											
Q _{par}	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)											
f _{sol} =Q _L /Q _d	-	Solar fraction											
Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR	Rabat MA							
	G	1 157	1 230	1 684	1 736	2 170							
	T _{a,ave}	7.5	9.0	3.2	18.5	17.4							
	T _{c,ave}	8.5	10.0	5.4	17.8	15.0							
	± ΔT _c	6.4	3.0	0.8	7.4	-							
G	kWh/m ²	Annual irradiation South, 45°											
T _{a,ave}	°C	Annual average outdoor air temperature											
T _{c,ave}	°C	Annual average mains cold water temp.											
ΔT _c	K	Seasonal variation of T _c											
Th	45 °C	Desired hot water temperature (mixing valve temperature).											
Max. operating press. - collector side		250		kPa		Max. operating press. - tank side		800		kPa			
Testing Laboratory		TÜV Rheinland Energy GmbH											
Website		www.tuv.com/st											
Test report id. number		21237826.002Rev01											
Date of test report		2020-11-12											
Test method		ISO 9459-5 (DST)											
Comments 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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Summary of	EN12976-2	test results	Certification No.	011-7S 2816 A
Annex to Solar KEYMARK Certificate			Issued	2023-05-16
Company	Bosch Solarthermie GmbH		Country	Germany
Brand (optional)	Bosch, Buderus, Vulcano		Website	www.bosch-thermotechnology.com
Street	Prozessionsweg 10		E-mail	solarthermie@de.bosch.com
Postal Code	48493	Wettingen	Tel. / Fax	-

System family overview

Collector name	For each storage and collector size, give number of collectors															
	TS150-2E//TS150-2				TS200-2E//TS200-2				TS300-2E//TS300-2							
Bosch FCC220-2V	1				1				2							
Buderus CKN 2.0-s	1				1				2							
Vulcano FCC-2S	1				1				2							

Annual performance parameters in the frame of the EU regulation CDR 811, 812 and 813 dated 2013

Name of system configuration			TSS150-2E/FCC-2 Bosch		
Collector name	Bosch FCC220-2V	No. Collectors	1	Storage name	TS150-2E

Annual performance parameters in the frame of the EU regulation CDR 811, 812 and 813 dated 2013

Load profile	M	L	XL	XXL	
Annual heat demand (kWh)	1523	2799	4427	5626	
Auxiliary heat contribution	Q _{nonsol}				section 5.9.3.6, see note 1
Average climate (kWh)	565	1560	3004	4150	Strasbourg
Cold climate (kWh)	-	-	-	-	Helsinki
Hot climate (kWh)	-	-	-	-	Athens
Q _{aux} (kWh)	-	-	-	-	section 5.9.3.4, see note 1
Comply to the load profile (Yes/No)	-	-	-	-	section 5.10.6, see note 1
η _{wh_nonsol} (%)	-	-	-	-	section 5.9.3.5, see note 1
Q _{elec} (kWh)	-	-	-	-	section 5.9.3.5, see note 1
Q _{fuel} (kWh)	-	-	-	-	section 5.9.3.5, see note 1
V40, measured (l)	-	-	-	-	section 5.10.7, see note 1

Auxiliary thermostat setting	-	°C	Effective power of auxiliary heater	-	kW
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Note 1: Clause of EN 12976-2:2017

Testing Laboratory	TÜV Rheinland Energy GmbH
Website	www.tuv.com/st
Test report id. number	21237826.002Rev01
Date of test report	2020-11-12
Test method	ISO 9459-5 (DST)

Comments of test lab	
Results are also valid for the following Brands and their nomenclature: TSS150-2E/CKN 2.0 Buderus; TSS150-2E/FCC-2 Vulcano; TSS150-2E/FCC-2 Junkers; TSS150-2/FCC-2 Junkers;	

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Summary of	EN12976-2	test results	Certification No.	011-7S 2816 A
Annex to Solar KEYMARK Certificate			Issued	2023-05-16
Company	Bosch Solarthermie GmbH		Country	Germany
Brand (optional)	Bosch, Buderus, Vulcano		Website	www.bosch-thermotechnology.com
Street	Prozessionsweg 10		E-mail	solarthermie@de.bosch.com
Postal Code	48493	Wettingen	Tel. / Fax	-

System family overview

Collector name	For each storage and collector size, give number of collectors															
	TS150-2E//TS150-2				TS200-2E//TS200-2				TS300-2E//TS300-2							
Bosch FCC220-2V	1				1				2							
Buderus CKN 2.0-s	1				1				2							
Vulcano FCC-2S	1				1				2							

Annual performance parameters in the frame of the EU regulation CDR 811, 812 and 813 dated 2013

Name of system configuration			TSS200-2E/FCC-2 Bosch		
Collector name	Bosch FCC220-2V	No. Collectors	1	Storage name	TS200-2E

Annual performance parameters in the frame of the EU regulation CDR 811, 812 and 813 dated 2013

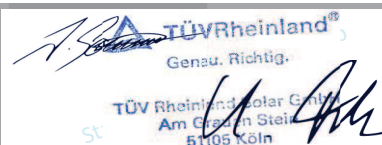
Load profile	M	L	XL	XXL	
Annual heat demand (kWh)	1523	2799	4427	5626	
Auxiliary heat contribution	Q _{nonsol}				section 5.9.3.6, see note 1
Average climate (kWh)	565	1516	2951	4080	Strasbourg
Cold climate (kWh)	-	-	-	-	Helsinki
Hot climate (kWh)	-	-	-	-	Athens
Q _{aux} (kWh)	-	-	-	-	section 5.9.3.4, see note 1
Comply to the load profile (Yes/No)	-	-	-	-	section 5.10.6, see note 1
η _{wh_nonsol} (%)	-	-	-	-	section 5.9.3.5, see note 1
Q _{elec} (kWh)	-	-	-	-	section 5.9.3.5, see note 1
Q _{fuel} (kWh)	-	-	-	-	section 5.9.3.5, see note 1
V40, measured (l)	-	-	-	-	section 5.10.7, see note 1

Auxiliary thermostat setting	-	°C	Effective power of auxiliary heater	-	kW
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Note 1: Clause of EN 12976-2:2017

Testing Laboratory	TÜV Rheinland Energy GmbH
Website	www.tuv.com/st
Test report id. number	21237826.002Rev01
Date of test report	2020-11-12
Test method	ISO 9459-5 (DST)

Comments of test lab	Results are also valid for the following Brands and their nomenclature: TSS200-2E/CKN 2.0 Buderus; TSS200-2E/FCC-2 Vulcano; TSS200-2E/FCC-2 Junkers; TSS200-2/FCC-2 Junkers;
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 Genau. Richtig.

TÜV Rheinland Solar GmbH
Am Grauen Stein
51105 Köln

Version 4.5, 2017-10-24

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Summary of	EN12976-2	test results	Certification No.	011-7S 2816 A
Annex to Solar KEYMARK Certificate			Issued	2023-05-16
Company	Bosch Solarthermie GmbH		Country	Germany
Brand (optional)	Bosch, Buderus, Vulcano		Website	www.bosch-thermotechnology.com
Street	Prozessionsweg 10		E-mail	solarthermie@de.bosch.com
Postal Code	48493	Wettingen	Tel. / Fax	- -

System family overview

Collector name	For each storage and collector size, give number of collectors															
	TS150-2E//TS150-2				TS200-2E//TS200-2				TS300-2E//TS300-2							
Bosch FCC220-2V	1				1				2							
Buderus CKN 2.0-s	1				1				2							
Vulcano FCC-2S	1				1				2							

Annual performance parameters in the frame of the EU regulation CDR 811, 812 and 813 dated 2013

Name of system configuration			TSS300-2E/FCC-2 Bosch		
Collector name	Bosch FCC220-2V	No. Collectors	2	Storage name	TS300-2E

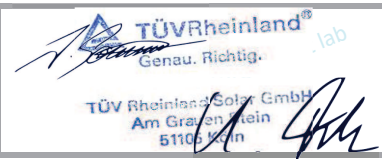
Annual performance parameters in the frame of the EU regulation CDR 811, 812 and 813 dated 2013

Load profile	M	L	XL	XXL	
Annual heat demand (kWh)	1523	2799	4427	5626	
Auxiliary heat contribution			Q _{nonsol}		section 5.9.3.6, see note 1
Average climate (kWh)	349	968	2053	3068	Strasbourg
Cold climate (kWh)	-	-	-	-	Helsinki
Hot climate (kWh)	-	-	-	-	Athens
Q _{aux} (kWh)	-	-	-	-	section 5.9.3.4, see note 1
Comply to the load profile (Yes/No)	-	-	-	-	section 5.10.6, see note 1
η _{wh_nonsol} (%)	-	-	-	-	section 5.9.3.5, see note 1
Q _{elec} (kWh)	-	-	-	-	section 5.9.3.5, see note 1
Q _{fuel} (kWh)	-	-	-	-	section 5.9.3.5, see note 1
V40, measured (l)	-	-	-	-	section 5.10.7, see note 1

Auxiliary thermostat setting	-	°C	Effective power of auxiliary heater	-	kW
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Note 1: Clause of EN 12976-2:2017

Testing Laboratory	TÜV Rheinland Energy GmbH
Website	www.tuv.com/st
Test report id. number	21237826.002Rev01
Date of test report	2020-11-12
Test method	ISO 9459-5 (DST)

Comments of test lab	
Results are also valid for the following Brands and their nomenclature: TSS300-2E/CKN 2.0 Buderus; TSS300-2E/FCC-2 Vulcano; TSS300-2E/FCC-2 Junkers; TSS300-2/FCC-2 Junkers;	

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