

	Licence	e Numb	er	SKM 10107.1											
Annex to Solar Keymark Certi	Date is	sued		2021-07-10											
							by		DQS Hellas						
Licence holder	Country BULGARIA														
							http://nobel.bg								
	48, VITOSHA BLV						Web http://nobel.bg E-mail info@nobel.bg								
								Tel +359 2 4210232							
i osteoue, eng	ZIUULL						1333	2 42102	52						
Collector Type						Flat plat	e collecto	r							
	1					Power output per collector									
		A ₆)				Gb = 850 W/m2, Gd = 150 W/m2 & u = 1.3 m/s									
Collector name	Gross area (,	Gross area (A _G)	Gross length	Gross width	Gross height			ზ _ო	, - ປີ _a						
		Gri are	Gr	Gra wia	Gross height	0 K	10 K	30 K	70 K 87						
		m²	mm	mm	mm	W	W	W	W	W	W				
Solfos CuS 2000		2.01	2,002	1,005	63	1,449	1,378	1,208	1,000	752	512				
Solfos CuS 2300		2.27	2,002	1,132	63	1,636	1,556	1,364	1,129	850	578				
Solfos CuS 2600	-	2.53	2,002	1,266	63	1,824	1,735	1,521	1,258	947	644				
561103 Cu3 2000		2.00	2,002	1,200	U.J.	1,024		LJULI	1,200	347	044				
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			-												
Power output per m ² gross area						721	686	601	497	374	255				
Performance parameters test meth	od	Steady s	tate - oul	tdoor											
Performance parameters (related t	o A _G)	η0, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd				
Units		2	W/(m²K)	$W/(m^2K^2)$	J/(m ³ K)	20	J/(m²K)	s/m	W/(m²K4)	W/(m²K4)	1				
Test results		0.741	3.27	0.024	0.000	0.00	0	0.000	0.00	0.0E+00	0.82				
Incidence angle modifier test meth	od		Quasi dy	namic - o	utdoor										
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°				
Transversal		K _{0T,coll}	1.00	0.99	0.96	0.92	0.85	0.74	0.58	0.35	0.00				
Longitudinal		K _{0L,coll}	1.00	0.99	0.96	0.92	0.85	0.74	0.58	0.35	0.00				
Heat transfer medium for testing							Water								
Flow rate for testing (per gross area, A _g)									0.021	0.021 kg/(sm ²)					
Maximum temperature difference during thermal performance test							dm/dt (භී _m -භී _a) _{max}			K	/				
Standard stagnation temperature (G = 1000 W/m²; ϑa = 30 °C)							ð _{stg}			°C					
Maximum operating temperature							ාස හ _{max_op}			°C					
Maximum operating pressure							p _{max,op}			kPa					
Testing laboratory	atory NCSR Demokritos						www.solar.demokritos.gr								
	4286 DQ3					Dated			06/07/21						
4291 DE3								06/07/21							
	4292 DE	3							06/07/2	1					
Comments of testing laboratory							Da	itasheet v	ersion: 6.1	, <mark>2</mark> 019-09-	26				
							SOLAF Tel: +21 P.O. BOX	R ENERGY 10 6503815 - F 1 60037, 15310 Ap	D K R I T O S LABORATOR ax: +210 65445 Paraskevi, Gree	Selle	The second				
Central Offices: Kalavriton 4, 1	L45 64 k	ifisia, At		: +301 62 exiou@d		Fax: +30	1 623349	5, http://	/www.do	s.gr, e-m	ail:				



Annex to Solar Keymark Certific		Licence Number					Page 2/2 SKM 10107.1								
Supplementary Information						Issue	2021-07-10								
Annual collector output in kWh/col	llector	at maa	n fluid	tomno	raturo	9									
Standard Locations		Athens		tempe	Davos	Um	6	tockholr	~	V	Vürzbur	.a			
Standard Locations Collector name	25°C 50°C 75°C			25°C 50°C		75°C 25°C 50°C			" 75°C	Würzburg		ธ 75°(
Solfos CuS 2000		1,483	868		1,052	569	1,201	742	397	1,302	795	416			
Solfos CuS 2300		1,675	981		1,188		1,357	838	448	1,470	897	470			
Solfos CuS 2600		1,867	1,093	2,047	1,324	716	1,512	934	499	1,638		523			
Annual output per m ² gross area	1,077	738	432	809	524	283	598	369	197	648	395	207			
Annual efficiency, η_a	61%	42%	24%	50%	32%	17%	51%	32%	17%	52%	32%	17%			
Fixed or tracking collector	170	65 kWh					5°; roun			. ·	14 LWh	/m2			
Annual irradiation on collector plane Mean annual ambient air temperature	1/6	18.5°C	m-	10:	30 kWh, 3.2°C	/m-	110	56 kWh/ 7.5°C	m-	124	14 kWh/ 9.0°C	m-			
Collector orientation or tracking mode	S	outh, 25	5°	S	outh, 30	0°	S	outh, 45)°						
The collector is operated at constant ter															
collector performance is performed wit	h the of	ficial So	lar Keyr	nark sp	eadshe	et tool	Scenoca	lc Ver. 6	5.1 (Sep	tember	2019). /	Ą			
detailed description of the calculations i	is availa	ble at h	ttp://ww	ww.esti	.org/so	larkeyn	narknew	/							
		Ade	ditiona	al Info	matio	n									
Collector heat transfer medium										Water-	Glycole				
The collector is deemed to be suitable for	or roof i	integrat	ion							N	0				
The collector was tested successfully un	dor tho	followir	ng condi	tions											
Climate class (A+, A, B or C)		10110 1011								A	-	-			
$G(W/m^2) > 1000$		ϑ _a (°C) >			20			H _x (MJ/		/m²) >		00			
Maximum tested positive load							3000		Р	a					
Maximum tested negative load									30	000	Р	a			
Hail resistance using steel ball (maximur										2	n	n			
		dditio													
Using external power source(s) fo			ition			-		ire(s) fo	r self-p	rotectio	n				
Co-generating thermal and electr						collecto	\		Teek						
Energy Lehelling Info	Reference Area, A _{sol} (m ²)					Additional Informative Hydraulic Designation Code						Aperature Area, A _a (m ²)			
Energy Labelling Infor			• (2)	11.				-				(m ²)			
		ce Area,	A _{sol} (m²)		draulic	Designa	ation Co	de		rature A	vrea, A _a	(m²)			
Solfos CuS 2000		ce Area, 2.01	A _{sol} (m ²)	7-VH-1	draulic 234S-A	Design a :7.2,184	ation Co 12-C:20.	de 6,1060-		erature A 1.8	vrea, A _a 85	(m²)			
Solfos CuS 2000 Solfos CuS 2300		ce Area, 2.01 2.27	A _{sol} (m ²)	7-VH-1 9-VH-1	draulic 234S-A 234S-A	Design a :7.2,184 :7.2,184	ation Co 12-C:20. 12-C:20.	de 6,1060- 6,1190-		erature A 1.8 2.2	area, A _a 85 10	(m ²)			
Solfos CuS 2000 Solfos CuS 2300		ce Area, 2.01	A _{sol} (m ²)	7-VH-1 9-VH-1	draulic 234S-A 234S-A	Design a :7.2,184 :7.2,184	ation Co 12-C:20.	de 6,1060- 6,1190-		erature A 1.8	area, A _a 85 10	(m ²)			
Solfos CuS 2000 Solfos CuS 2300		ce Area, 2.01 2.27	A _{sol} (m ²)	7-VH-1 9-VH-1	draulic 234S-A 234S-A	Design a :7.2,184 :7.2,184	ation Co 12-C:20. 12-C:20.	de 6,1060- 6,1190-		erature A 1.8 2.2	area, A _a 85 10	(m ²)			
Solfos CuS 2000 Solfos CuS 2300		ce Area, 2.01 2.27	A _{sol} (m ²)	7-VH-1 9-VH-1	draulic 234S-A 234S-A	Design a :7.2,184 :7.2,184	ation Co 12-C:20. 12-C:20.	de 6,1060- 6,1190-		erature A 1.8 2.2	area, A _a 85 10	(m ²)			
Energy Labelling Infor Solfos CuS 2000 Solfos CuS 2300 Solfos CuS 2600		ce Area, 2.01 2.27	A _{sol} (m ²)	7-VH-1 9-VH-1	draulic 234S-A 234S-A	Design a :7.2,184 :7.2,184	ation Co 12-C:20. 12-C:20.	de 6,1060- 6,1190-		erature A 1.8 2.2	area, A _a 85 10	(m ²)			
Solfos CuS 2000 Solfos CuS 2300		ce Area, 2.01 2.27	A _{sol} (m ²)	7-VH-1 9-VH-1	draulic 234S-A 234S-A	Design a :7.2,184 :7.2,184	ation Co 12-C:20. 12-C:20.	de 6,1060- 6,1190-		erature A 1.8 2.2	area, A _a 85 10	(m ²)			
Solfos CuS 2000 Solfos CuS 2300	Referen	ce Area, 2.01 2.27 2.53		7-VH-1 9-VH-1 1	draulic 234S-A 234S-A 0-VH-12	Designa :7.2,184 :7.2,184 234S-A:	ation Cc 42-C:20. 12-C:20. 7.2,1842	de 6,1060- 6,1190- 2-	Ape	erature A 1.8 2.2 2.2	nrea, A _a 85 10 36				
Solfos CuS 2000 Solfos CuS 2300 Solfos CuS 2600 Data required for CDR (EU) No 811/20	Referen	ce Area, 2.01 2.27 2.53		7-VH-1 9-VH-1 1 Data re	draulic 234S-A 234S-A 0-VH-12	Designa :7.2,184 :7.2,184 234S-A:	ation Co 42-C:20. 12-C:20. 7.2,1842 7.2,1842	de 6,1060- 6,1190- 2-	Ape 013 - R	erature A 1.8 2.2	nrea, A _a 85 10 36				
Solfos CuS 2000 Solfos CuS 2300 Solfos CuS 2600 Data required for CDR (EU) No 811/20 Collector efficiency (η _{col})	Referen	ce Area, 2.01 2.27 2.53 erence A 55%		7-VH-1 9-VH-1 1 Data re Zero-lo First-or	draulic 234S-A 234S-A 0-VH-12 0-VH-12 equired ss effici der coe	Designa :7.2,184 :7.2,184 234S-A: 234S-A: for CDI ency (η. fficient	ation Cd 12-C:20. 12-C:20.	de 6,1060- 6,1190- 2-	Ape 013 - R 0.	erature A 1.8 2.3 2.3	e Area / W/(r	A _{sol} - m²K)			
Solfos CuS 2000 Solfos CuS 2300 Solfos CuS 2600	Referen	ce Area, 2.01 2.27 2.53 erence a 55% (EU) No		7-VH-1 9-VH-1 1 Data re Zero-lo First-or Second	draulic 234S-A 234S-A 0-VH-12 0-VH-12 equired ss effici der coe -order c	Designa :7.2,184 :7.2,184 234S-A: 234S-A: for CDI ency (η :fficient coefficie	Ation Cd 12-C:20. 12-C:20.	de 6,1060- 6,1190- 2- 0 812/2	Ape 013 - R 0. 3. 0.0	1.3 2.1 2.1 2.1 2.1 2.1 2.1 2.1 2.2 2.3 2.4	e Area /	A _{sol} - m²K)			
Solfos CuS 2000 Solfos CuS 2300 Solfos CuS 2600 Data required for CDR (EU) No 811/20 Collector efficiency (η _{col}) Remark: Collector efficiency (η _{col}) is define 811/2013 as collector efficiency of the solar remperature difference between the solar co	Referen	ce Area, 2.01 2.27 2.53 erence 4 55% (EU) No r at a and the	Area	7-VH-1 9-VH-1 1 Data re Zero-lo First-or Second Inciden	draulic 234S-A 234S-A 0-VH-12 0-VH-12 equired ss effici der coe -order co ce angle	Designa :7.2,184 :7.2,184 234S-A: 234S-A: for CDI ency (ŋ. fficient coefficie e modif	ation Cd 12-C:20. 12-C:20. 7.2,1842 R (EU) N 0 (a1) ent (a2) ier IAM	de 6,1060- 6,1190- 2- 2- 0 812/2 (50°)	Ape 013 - R 0. 3. 0.0 0.	erature A 1.3 2.3 2.3 2.3 2.3 2.3 2.3 2.3 2.3 2.3 2	e Area / W/(r W/(n	A _{sol} - m ² K) n ² K ²)			
Solfos CuS 2000 Solfos CuS 2300 Solfos CuS 2600 Data required for CDR (EU) No 811/20 Collector efficiency (η_{col}) Remark: Collector efficiency (η_{col}) is defined 311/2013 as collector efficiency of the solar emperature difference between the solar courrounding air of 40 K and a global solar irra	Referen 13 - Refe d in CDR collector a adiance co	ce Area, 2.01 2.27 2.53 erence A 55% (EU) No r at a und the of 1000 V	Area V/m²,	7-VH-1 9-VH-1 1 Data re Zero-lo First-or Second Inciden Remark	draulic 234S-A 234S-A 0-VH-12 0-VH-12 sequired ss effici der coe -order co ce angle the dat	Designa :7.2,184 :7.2,184 234S-A: 234S-A: for CDI ency (ŋ. efficient coefficie e modif ta given	ation Cd 12-C:20. 12-C:20. 12-C:20. 7.2,1842 (a)	de 6,1060- 6,1190- 2- 0 812/2 (50°) ction are	Ape 013 - R 0. 3. 0.0 0. related	erature A 1.3 2.3 2.3 2.3 2.3 2.3 2.3 2.3 2.3 2.3 2	e Area A W/(r W/(r	A _{sol} - m²K) - n²K²) - ence			
Solfos CuS 2000 Solfos CuS 2300 Solfos CuS 2600 Data required for CDR (EU) No 811/20 Collector efficiency (η_{col}) Remark: Collector efficiency (η_{col}) is define 311/2013 as collector efficiency of the solar remperature difference between the solar construction of the s	Referen	erence A 55% (EU) No rata ind the bf 1000 V peviating	Area V/m²,	7-VH-1 9-VH-1 1 Data re Zero-lo First-or Second Inciden Remark area (A	draulic 234S-A 234S-A 0-VH-12	Designa :7.2,184 :7.2,184 234S-A: 234S-A: definition for CDI ency (ŋ. efficient coefficie e modif ta given h is aper	ation Cd 12-C:20. 12-C:20. 12-C:20. 7.2,1842 (a)	de 6,1060- 6,1190- 2- 2- 0 812/2 (50°) ction are 1 for value	Ape 013 - R 0. 3. 0.0 0. related es accor	Image: Control of the second	e Area A W/(r W/(r W/(n 12975	A _{sol} - m ² K) n ² K ²) - ence i-2 <u>or</u>			
Solfos CuS 2000 Solfos CuS 2300 Solfos CuS 2600 Data required for CDR (EU) No 811/20 Collector efficiency (η_{col}) Remark: Collector efficiency (η_{col}) is defined 311/2013 as collector efficiency of the solar construction of the solar construct	Referen	erence A 2.01 2.27 2.53 erence A 55% (EU) No r at a and the of 1000 V Deviating which is	Area V/m², from	7-VH-1 9-VH-1 1 Data re Zero-lo First-or Second Inciden Remark area (A gross ar	draulic 234S-A 234S-A 0-VH-12	Designa :7.2,184 :7.2,184 2345-A: 2345	ation Cd 12-C:20. 12-C:20. 12-C:20. 7.2,1842 (a) (b) (c)	de 6,1060- 6,1190- 2- 0 812/2 (50°) ction are t for value nt data so	Ape 013 - R 0. 3. 0.(0. related es accor ets for e	erature A 1.3 2.3 2.3 2.3 2.3 2.3 2.3 2.3 2.3 2.3 2	e Area / W/(r W/(r W/(n 12975 erture or	A _{sol} - m ² K) - ence i-2 <u>or</u> gross			
Solfos CuS 2000 Solfos CuS 2300 Solfos CuS 2300 Solfos CuS 2600 Data required for CDR (EU) No 811/201 Collector efficiency (η_{col}) Remark: Collector efficiency (η_{col}) Remark: Collector efficiency of the solar emperature difference between the solar construction of the	Referen	erence A 2.01 2.27 2.53 erence A 55% (EU) No r at a and the of 1000 V Deviating which is	Area V/m², from	7-VH-1 9-VH-1 1 Data re Zero-lo First-or Second Inciden Remark area (A gross ar area cal	draulic 234S-A 234S-A 0-VH-12	Designa :7.2,184 :7.2,184 2345-A: 2345	ation Cd 12-C:20. 12-C:20. 12-C:20. 7.2,1842 (a) (b) (c)	de 6,1060- 6,1190- 2- 0 812/2 (50°) ction are t for value nt data so	Ape 013 - R 0. 3. 0.(0. related es accor ets for e	Reference 72 27 024 84 7 to collec rding to E either ape	e Area / W/(r W/(r W/(n 12975 erture or	A _{sol} - m²K) - ence i-2 <u>or</u> gross			