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IGTE

Annex to Solar Keymark Certificate		Licence Number	011-7S3142 F
		Date issued	2022-09-20
		Issued by	DIN CERTCO

Licence holder	**MEFA Befestigungs- und Montagesysteme**	**Country**	Germany		
Brand (optional)		**Web**	https://www.mefa.de		
Street, Number	Schillerstr. 15	**E-mail**	peter.koemmelt@mefa.de		
Postcode, City	74635 Kupferzell	**Tel**	+49	(0)7944 64-0	

Collector Type	WISC (Wind and/or infrared sensitive collector)

Collector name	Gross area (A_G)	Gross length	Gross width	Gross height	Power output per collector Gb = 850 W/m2, Gd = 150 W/m2 & u = 1.3 m/s $\vartheta_m - \vartheta_a$					
					0 K	10 K	30 K	50 K	70 K	59 K
	m²	mm	mm	mm	W	W	W	W	W	W
multiQ sun 1225	3.23	2 560	1 260	43	2 066	1 315	0	0	--	0
multiQ sun 0650	3.31	5 060	655	43	2 117	1 347	0	0	--	0
multiQ sun 0670	4.62	7 060	655	43	2 955	1 881	0	0	--	0
multiQ sun 1150	5.84	5 060	1 155	43	3 736	2 377	0	0	--	0
multiQ sun 1160	7.00	6 060	1 155	43	4 478	2 850	0	0	--	0
multiQ sun 1235	4.47	3 560	1 255	43	2 859	1 820	0	0	--	0
multiQ sun 1240	5.10	4 060	1 255	43	3 262	2 076	0	0	--	0
multiQ sun 1250	6.35	5 060	1 255	43	4 062	2 585	0	0	--	0
multiQ sun 1260	7.61	6 060	1 255	43	4 868	3 098	0	0	--	0
multiQ sun 1270	8.65	7 060	1 255	43	5 533	3 521	0	0	--	0
Power output per m² gross area					640	407	0	0	--	0

Performance parameters test method	Quasi dynamic									
Performance parameters (related to A_G)	η0, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd
Units	-	W/(m²K)	W/(m²K²)	J/(m³K)	-	J/(m²K)	s/m	W/(m²K⁴)	W/(m²K⁴)	-
Test results	0.657	33.37	0.000	5.948	0.47	21 030	0.020	0.00	0.0E+00	0.96

Incidence angle modifier test method		Quasi dynamic - outdoor								
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0.020	kg/(sm²)
Maximum temperature difference during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	29	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	80	°C
Maximum operating temperature	ϑ_{max_op}	50	°C
Maximum operating pressure	$p_{max,op}$	150	kPa

Testing laboratory	Institut für Gebäudeenergetik, Thermotechnik und Energiespeicherung (IGTE)	http://www.igte.uni-stuttgart.de	
Test report(s)	22COL1648 22COL1648Q	**Dated**	22.09.2022 22.09.2022

Comments of testing laboratory Ver. 6.2 (13.01.2022)

Documented performance parameters are taken from 22COL1648 (multiQ 1225)

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

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Supplementary Information	Issued	2022-09-20

Gross Thermal Yield in kWh/collector at mean fluid temperature ϑ_m

Standard Locations		Athens			Davos			Stockholm			Würzburg		
Collector name	ϑ_m	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
multiQ sun 1225		2 766	59		645	1		766	7		927	22	
multiQ sun 0650		2 835	60		661	1		785	7		950	23	
multiQ sun 0670		3 957	84		923	1		1 096	10		1 326	32	
multiQ sun 1150		5 002	106		1 167	2		1 386	13		1 677	40	
multiQ sun 1160		5 995	127		1 399	2		1 661	15		2 010	48	
multiQ sun 1235		3 828	81		893	1		1 061	10		1 283	31	
multiQ sun 1240		4 368	93		1 019	2		1 210	11		1 464	35	
multiQ sun 1250		5 438	115		1 269	2		1 507	14		1 823	43	
multiQ sun 1260		6 517	138		1 521	2		1 806	17		2 185	52	
multiQ sun 1270		7 408	157		1 728	3		2 053	19		2 483	59	
Gross Thermal Yield per m² gross area		856	18	--	200	0	--	237	2	--	287	7	--
Annual efficiency, η_a		49%	1%	--	12%	0%	--	20%	0%	--	23%	1%	--
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m²			1630 kWh/m²			1166 kWh/m²			1244 kWh/m²		
Mean annual ambient air temperature		18.5°C			3.2°C			7.5°C			9.0°C		
Collector orientation or tracking mode		South, 25°			South, 30°			South, 45°			South, 35°		

The collector is operated at constant temperature ϑm (mean of in- and outlet temperatures). The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool Scenocalc Ver. 6.2 (13.01.2022). A detailed description of the calculations is available at http://www.estif.org/solarkeymarknew/

Additional Information

Collector heat transfer medium				Water	
The collector is deemed to be suitable for roof integration				No	
The collector was tested successfully under the following conditions:					
Climate class (A+, A, B or C)				B	--
G (W/m²) >	900	ϑ_a (°C) >	15	H_x (MJ/m²) >	540
Maximum tested positive load				2500	Pa
Maximum tested negative load				2500	Pa
Hail resistance using steel ball (maximum drop height)				2	m

Additional collector attribute(s)

Using external power source(s) for normal operation	No	Active or passive measure(s) for self-protection	No
Co-generating thermal and electrical power	No	Façade collector(s)	No

Energy Labelling Information

	Reference Area, A_{sol} (m²)
multiQ sun 1225	3.23
multiQ sun 0650	3.31
multiQ sun 0670	4.62
multiQ sun 1150	5.84
multiQ sun 1160	7.00
multiQ sun 1235	4.47
multiQ sun 1240	5.10
multiQ sun 1250	6.35
multiQ sun 1260	7.61
multiQ sun 1270	6.35

Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}

Collector efficiency (η_{col})	-29%

Remark: Collector efficiency (ηcol) is defined in CDR (EU) No 811/2013 as collector efficiency of the solar collector at a temperature difference between the solar collector and the surrounding air of 40 K and a global solar irradiance of 1000 W/m², expressed in % and rounded to the nearest integer. Deviating from the regulation ηcol is based on reference area (Asol) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.

Additional Informative Technical Data

Hydraulic Designation Code	Aperture Area, A_a (m²)
190-H-1234V-4.5,2500-18,1240-D	3.00
86-H-1234V-4.5,5000-18,640-D	3.00
86-H-1234V-4.5,7000-18,640-D	4.20
172-H-1234V-4.5,5000-18,1140-D	5.50
172-H-1234V-4.5,6000-18,1140-D	6.60
190-H-1234V-4.5,3500-18,1240-D	4.20
190-H-1234V-4.5,4000-18,1240-D	4.80
190-H-1234V-4.5,5000-18,1240-D	6.00
190-H-1234V-4.5,6000-18,1240-D	7.20
190-H-1234V-4.5,7000-18,1240-D	8.40

Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}

Zero-loss efficiency (η_0)	0.64	--
First-order coefficient (a_1)	23.26	W/(m²K)
Second-order coefficient (a_2)	0.000	W/(m²K²)
Incidence angle modifier IAM (50°)	0.99	--

Remark: The data given in this section are related to collector reference area (A_{sol}) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806. Consistent data sets for either aperture or gross area can be used in calculations like in the regulation 811 and 812 and simulation programs.