TÜVRheinland®
DIN CERTCO

Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence Number	011-7S2187 F
	Issued	2013-06-26

Company holding the	KBB Kollektorbau GmbH	Country	Germany
Brand (optional)	-	Website	www.kbb-solar.com
Street, street number	Bruno-Bürgel-Weg 142-144	E-mail	info@kbb-solar.de
Postal Code / City, province	12439 Berlin	Tel/Fax	49 (0)30 678 1789 -0/-55

Collector Type (flat plate glazed/un-glazed; evacuate tubular)	Flat plate collector - glazed
Thermal / photo voltaic hybid collector? (PVT collector)	No
Integration in the roof possible ? (manufacturers declaration)	No

Collector name	Aperture area (Aa)	Gross length	Gross width	Gross height	Gross area (AG)	Power output per collector module G = 1000 W/m², Tm-Ta 0 K	10 K	30 K	50 K	70 K
	m²	mm	mm	mm	m²	W	W	W	W	W
K423-DH-AR	2.294	2 168	1 158	95	**2.51**	1 925	1 836	1 637	1 410	1 155

Performance test method		Glazed liquid heating collector - steady state - indoor								
Performance parameters related to aperture		η0	a1	a2						
Units		-	W/(m²K)	W/(m²K²)						
Test results - Flow rate and fluid see note 1		0.839	3.710	0.0155						
Bi-directional incidence angle	No	*Kϑ values are obligatory for 50°.*								
Incidence angle modifiers Kθ(θ)	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
	Kθ(θ)	1.00	0.99	0.98	0.96	0.92	0.86	0.72	0.31	0.00
Incidence angle modifier not bi-directional - leave fields blank										

Stagnation temperature - Weather conditions see note 2	Tstg	213	°C
Effective thermal capacity	ceff = C/Ag	5.4	kJ/(m²K)
Max. intende operation temperature - see note 3	Tmax,op	-	°C
Max. operation pressure - see note 3	pmax,op	1000	kPa

Pressure drop table - for a collector family, the values shall be for the module with highest ΔP per m² aperture area

Flow rate	kg/(s m²)	0.005	0.022	0.039	0.056	0.073				
Pressure drop, ΔP	Pa	94	1336	2899	4836	7142				

Optional weather data	Location		Link	

Testing Laboratory	Institut für Solarenergieforschung Hameln		
Website	www.isfh.de		
Test report id. number	111-12/KD, 112-12/KQ	Date of test report	12.06.2013, 25.06.2013

During the test GDIF/GTOT was always between	0.1	and	0.2

Comments of testing laboratory:

Pressure drop
Heat transfer fluid: water-glycol-mixture (Tyfocor LS), temperature: 20 +/- 2°C
Flow rate (note 1)
According to the manufacturer, normally 5 collectors are installed in series connection.

Note 1	Flow rate	0.070	kg/(s m²)	Fluid	Water
Note 2	Irradiance, G = 1000 W/m²; Ambient temperature , Ta=30 °C				
Note 3	Given by manufacturer				

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Datasheet version: 4.04, 2013-04-22

Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence Number	011-7S2187 F
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Annual collector output kWh/module

Collector name	Location and collector temperature (Tm)											
	Athens			Davos			Stockholm			Würzburg		
	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
K423-DH-AR	3 016	2 173	1 430	2 312	1 613	1 020	1 695	1 122	684	1 841	1 210	726

Collector mounting: Fixed or tracking	Fixed; slope = latitude - 15° (rounded to nearest 5°)

Overview of locations

Location	Latitude °	Gtot kWh/m²	Ta °C	Collector orientation or tracking mode
Athens	38	1 765	18.5	South, 25°
Davos	47	1 714	3.2	South, 30°
Stockholm	59	1 166	7.5	South, 45°
Würzburg	50	1 244	9.0	South, 35°

Gtot	Annual total irradiation on collector plane	kWh/m²
Ta	Mean annual ambient air temperature	°C
Tm	Constant collector operating temperature (mean of in- and outlet temperatures)	°C

The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool ScenoCalc. The collector output is calculated hour by hour according to the efficiency parameters from the Keymark test using constant collector operating temperature (Tm). A detailed description of the calculations is available at http://www.sp.se/en/index/services/solar/ScenoCalc/Sidor/default.aspx.

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Datasheet version: 4.04, 2013-04-22
ScenoCalc version: Ver. 4.04 (Jun, 2013)