


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		<b>011-7S2842 R</b>				
					Date issued		<b>2018-03-27</b>				
					Issued by		TÜV Rheinland Energy GmbH				
Licence holder	<b>Elco GmbH</b>				Country	Germany					
Brand (optional)	ELCO				Web	http://www.elco.net					
Street, Number	Dreieichstraße 10				E-mail	info@de.elco.net					
Postcode, City	64546, Mörfelden-Walldorf				Tel	+49 7471 187-0					
Collector Type					Evacuated tubular collector						
Collector name	Gross area (A <sub>G</sub> ) m <sup>2</sup>	Gross length mm	Gross width mm	Gross height mm	Power output per collector G <sub>b</sub> = 850 W/m <sup>2</sup> ; G <sub>d</sub> = 150 W/m <sup>2</sup> ; u = 3 m/s ∅ <sub>m</sub> - ∅ <sub>a</sub>						
					0 K W	10 K W	30 K W	50 K W	70 K W	90 K W	
<b>Auron DF-15</b>	2.63	1 910	1 380	178	1 279	1 245	1 165	1 071	962	838	
<b>Auron DF-20</b>	3.51	1 910	1 840	178	1 707	1 661	1 555	1 429	1 284	1 118	
Power output per m <sup>2</sup> gross area					486	473	443	407	366	319	
Performance parameters test method		Quasi dynamic									
Performance parameters (related to A <sub>G</sub> )		η <sub>0,b</sub>	c <sub>1</sub>	c <sub>2</sub>	c <sub>3</sub>	c <sub>4</sub>	c <sub>6</sub>	K <sub>d</sub>			
Units		-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )	J/(m <sup>3</sup> K)	-	s/m	-			
Test results		0.484	1.233	0.007	0.000	0.000	0.000	1.032			
Incidence angle modifier test method		Quasi dynamic - outdoor									
Bi-directional incidence angle modifiers		Yes									
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal		K <sub>GT, coll</sub>	1.00	1.00	0.99	0.98	0.97	0.94	0.89	0.73	0.00
Longitudinal		K <sub>GL, coll</sub>	1.00	1.00	1.01	1.03	1.05	1.09	1.03	0.86	0.00
Heat transfer medium for testing		Water									
Flow rate for testing (per gross area, A <sub>G</sub> )		dm/dt	0.049	kg/(sm <sup>2</sup> )							
Maximum temperature difference for thermal performance calculations		(∅ <sub>m</sub> -∅ <sub>a</sub> ) <sub>max</sub>	90	K							
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; ∅ <sub>a</sub> = 30 °C)		∅ <sub>stg</sub>	240	°C							
Effective thermal capacity, incl. fluid (per gross area, A <sub>G</sub> )		C/m <sup>2</sup>	15.357	kJ/(Km <sup>2</sup> )							
Maximum operating temperature		∅ <sub>max, op</sub>	-	°C							
Maximum operating pressure		p <sub>max, op</sub>	600	kPa							
Testing laboratory		TÜV Rheinland Energy GmbH				www.tuv.com/solarpower					
Test report(s)		21240780.001 21240780.002Rev1				Dated		12.03.2018 20.03.2018			
Comments of testing laboratory					Datasheet version: 5.01, 2016-03-01						
					 Genau. Richtig.  TÜV Rheinland Energy GmbH Am Grauen Stein 51105 Köln						
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											

<b>Annex to Solar Keymark Certificate Supplementary Information</b>	<b>Licence Number</b>	<b>011-7S2842 R</b>
	<b>Issued</b>	<b>2018-03-27</b>

<b>Annual collector output in kWh/collector at mean fluid temperature <math>\vartheta_m</math>, based on EN ISO 9806:2013 test results</b>													
Standard Locations		Athens			Davos			Stockholm			Würzburg		
Collector name	$\vartheta_m$	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
Auron DF-15		2 198	1 830	1 445	1 818	1 463	1 121	1 314	1 024	754	1 427	1 115	820
Auron DF-20		2 934	2 442	1 929	2 426	1 953	1 496	1 754	1 366	1 006	1 904	1 488	1 094
Annual output per m <sup>2</sup> gross area		836	696	549	691	556	426	500	389	287	543	424	312
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1714 kWh/m <sup>2</sup>			1166 kWh/m <sup>2</sup>			1244 kWh/m <sup>2</sup>		
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  $\vartheta_m$  (mean of in- and outlet temperatures). The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool Scenocalc Ver. 5.01 (March 2016). A detailed description of the calculations is available at [www.solarkeymark.org/scenocalc](http://www.solarkeymark.org/scenocalc)

<b>Additional Information</b>		
Collector heat transfer medium	Water-Glycole	
Hybrid Thermal and Photo Voltaic collector	No	
The collector is deemed to be suitable for roof integration	No	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	A	--
Maximum tested positive load	2400	Pa
Maximum tested negative load	2200	Pa
Hail resistance using steel ball (maximum drop height)	35	m

<b>Energy Labelling Information</b>				
	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$		
Auron DF-15	2.63	Collector efficiency ( $\eta_{col}$ )	43	%
Auron DF-20	3.51	Remark: Collector efficiency ( $\eta_{col}$ ) 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/m <sup>2</sup> , expressed in % and rounded to the nearest integer. Deviating from the regulation $\eta_{col}$ is based on reference area ( $A_{sol}$ ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2013.		
		Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$		
		Zero-loss efficiency ( $\eta_0$ )	0.486	--
		First-order coefficient ( $a_1$ )	1.23	W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0.007	W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	1.01	--
		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.		