



# **SOLAR ENERGY SYSTEMS**

## **Collectors Technical Data**



**OPUS™ Solar collectors are durable and highly efficient, flat-plate collectors.**

**The high efficiency is due to the absorber coating which is a highly selective Titanium Oxide-based layer pigmented with colloidal nickel.**

**The durability of the collectors is assured by the corrosion-resistant structural materials.**

**The collectors can be used in systems equipped with water pumps or thermosiphonical systems.**

<b>Collector type - PMC200085 - Technical data</b>	
Dimensions (thickness x width x height):	85 x 1010 x 1980 mm
Module nominal dimensions:	1010 x 1980 mm
Gross surface of collector:	2.00 m <sup>2</sup>
Radiation area (glass surface exposed to solar radiation):	1.87 m <sup>2</sup>
Absorber area:	1.82 m <sup>2</sup>
Gross weight without liquid:	36 kg
Volume of liquid:	1.85 liters
Covering:	3,7 mm thick, Mistlite Tempered-Security Glass ( $\tau=88\%$ ).
Collector frame:	Al-Mg alloy, electro statically painted, corrosion resistant waterproof casing. available in several colours (powder coating-black, brown, white, tiles colour), grey (RAL 9007) or unpainted aluminium.
Collector back side:	Embossed type galvanized steel sheet of high quality.
Collector sealing:	EPDM, silicon, proper air ventilation system
Thermal insulation of rear side:	35 mm thick Rockwool 40Kg/m <sup>3</sup>
Absorber structure:	Copper selective fins are welded on the copper tubes with the <b>ULTRASONIC WELDING</b> method.
Absorber selective coating:	Titanium Oxide selective treatment
Absorption factor:	$\alpha=95\%(+/-)2\%$
Emission factor at 82°C:	$\epsilon=4\%(+/-)2\%$
Maximum temperature at idle at solar radiation 1000W/m <sup>2</sup> and at 25°C:	185°C
Suggested operation pressure for heat-transferring liquid:	300-350 kPa (3-3.5 bars)
Maximum operation pressure for heat-transferring liquid:	500 kPa (5 bars)
Suggested flow rate:	50-120 liters per hour for each collector
Header tube:	copper tube of $\varnothing 22\text{mm} \times 0,7\text{mm}$
Tubes:	9 vertical copper tube of $\varnothing 10\text{mm} \times 0.4\text{mm}$

No data available concerning efficiency.

<b>Collector type - PCM200100 - Technical data</b>	
Dimensions (thickness x width x height):	100 x 1010 x 1980 mm
Module nominal dimensions:	1010 x 1980 mm
Gross surface of collector:	2.00 m <sup>2</sup>
Radiation area (glass surface exposed to solar radiation):	1.87 m <sup>2</sup>
Absorber area:	1.82 m <sup>2</sup>
Gross weight without liquid:	42 kg
Volume of liquid:	2.1 liters
Covering:	4 mm thick, Mistlite Tempered-Security Low Iron Glass ( $\tau=92\%$ ).
Collector frame:	Al-Mg alloy, electro statically painted, corrosion resistant waterproof casing. available in black colour.
Collector back side:	Embossed type galvanized steel sheet of high quality.
Collector sealing:	EPDM, silicon, proper air ventilation system
Thermal insulation of rear side:	50 mm thick Rockwool 40Kg/m <sup>3</sup>
Absorber structure:	Copper selective fins are welded on the copper tubes with the <b>ULTRASONIC WELDING</b> method.
Absorber selective coating:	Titanium Oxide selective treatment
Absorption factor:	$\alpha=95\%(+/-)2\%$
Emission factor at 82°C:	$\varepsilon=4\%(+/-)2\%$
Maximum temperature at idle at solar radiation 1000W/m <sup>2</sup> and at 25°C:	185°C
Suggested operation pressure for heat-transferring liquid:	350-500 kPa (3.5-5 bars)
Maximum operation pressure for heat-transferring liquid:	600 kPa (6 bars)
Suggested flow rate:	60-120 liters per hour for each collector
Header tube:	copper tube of $\varnothing 22\text{mm} \times 0,7\text{mm}$
Tubes:	12 vertical copper tube of $\varnothing 10\text{mm} \times 0.4\text{mm}$

Efficiency formula for solar collectors:  $\eta_A = \eta_{0A} - U_A \frac{t_m - t_a}{G}$

Where:

$\eta_{0A}=0,73$

Max. Collector thermal efficiency with reference to absorber area.

$U_A=4,79$  [W/(m<sup>2</sup>K)]

Measured overall heat loss coefficient with reference to absorber area

$\eta_A$

Collector thermal efficiency with reference to absorber area

$t_m$  [K]:

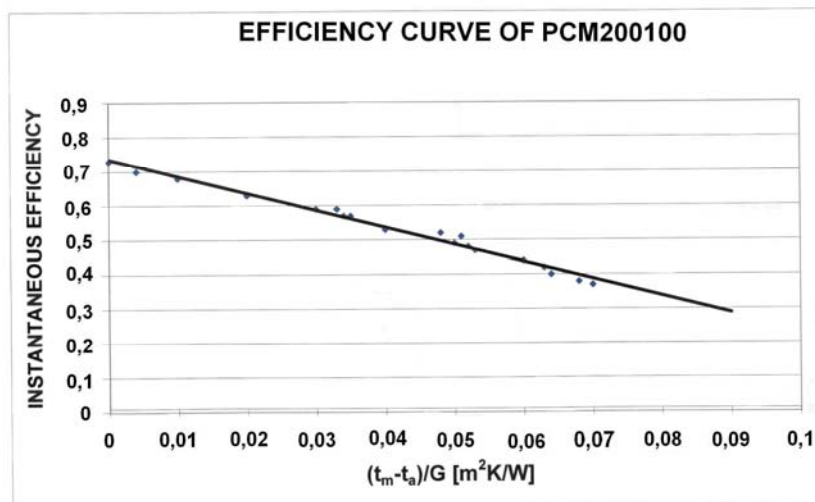
mean temperature of heat transfer fluid

$t_a$  [K]:

external air temperature

$G_k$  [W/m<sup>2</sup>]:

total incoming solar radiation



Collector type – PCM237085 - Technical data	
Dimensions (thickness x width x height):	85 x 1230 x 1930 mm
Module nominal dimensions:	1230 x 1930 mm
Gross surface of collector:	2,37 m <sup>2</sup>
Radiation area (glass surface exposed to solar radiation):	2,24 m <sup>2</sup>
Absorber area:	2,10 m <sup>2</sup>
Gross weight without liquid:	38 kg
Volume of liquid:	2,21 liters
Covering:	3,7 mm thick, Mistlite Tempered-Security Glass (τ=88%).
Collector frame:	Al-Mg alloy, electro statically painted, corrosion resistant waterproof casing. available in several colours (powder coating-black, brown, white, tiles colour), anodized or unpainted aluminium.
Collector back side:	Embossed type galvanized steel sheet of high quality.
Collector sealing:	EPDM, silicon, proper air ventilation system
Thermal insulation of rear side:	35 mm thick Rockwool 40Kg/m <sup>3</sup>
Absorber structure:	Copper selective fins are welded on the copper tubes with the <b>ULTRASONIC WELDING</b> method.
Absorber selective coating:	Titanium Oxide selective treatment
Absorption factor:	α=95%(+/-)2%
Emission factor at 82°C:	ε=4%(+/-)2%
Maximum temperature at idle at solar radiation 1000W/m <sup>2</sup> and at 25°C:	185°C
Suggested operation pressure for heat-transferring liquid:	300-350 kPa (3-3.5 bars)
Maximum operation pressure for heat-transferring liquid:	500 kPa (5 bars)
Suggested flow rate:	60-120 liters per hour for each collector
Header tube:	copper tube of Ø22mm x 0,7mm
Tubes:	11 vertical copper tube of Ø10mm x 0.4mm

Efficiency formula for solar collectors:  $\eta_A = \eta_{0A} - U_A \frac{t_m - t_a}{G}$

Where:

$\eta_{0A}=0,71$

$U_A=5,30$  [W/(m<sup>2</sup>K)]

$\eta_A$

$t_m$  [K]:

$t_a$  [K]:

$G$  [W/m<sup>2</sup>]:

Max. Collector thermal efficiency with reference to absorber area.

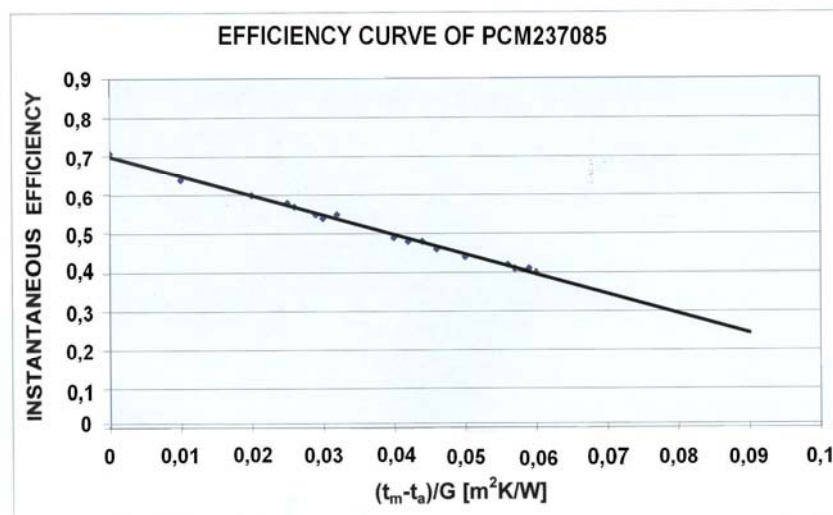
Measured overall heat loss coefficient with reference to absorber area

Collector thermal efficiency with reference to absorber area

mean temperature of heat transfer fluid

external air temperature

total incoming solar radiation



<b>Collector type – PCM237100 - Technical data</b>	
Dimensions (thickness x width x height):	100 x 1230 x 1930 mm
Module nominal dimensions:	1280 x 1930 mm
Gross surface of collector:	2.37 m <sup>2</sup>
Radiation area (glass surface exposed to solar radiation):	2,24 m <sup>2</sup>
Absorber area:	2,10 m <sup>2</sup>
Gross weight without liquid:	45 kg
Volume of liquid:	2.57 liters
Covering:	3,7 mm thick, Mistlite Tempered-Security Glass (τ=88%).
Collector frame:	Al-Mg alloy, electro statically painted, corrosion resistant waterproof casing. available in black colour.
Collector back side:	Embossed type galvanized steel sheet of high quality.
Collector sealing:	EPDM, silicon, proper air ventilation system
Thermal insulation of rear side:	50 mm thick Rockwool 40Kg/m <sup>3</sup>
Absorber structure:	Copper selective fins are welded on the copper tubes with the <b>ULTRASONIC WELDING</b> method.
Absorber selective coating:	Titanium Oxide selective treatment
Absorption factor:	α=95%(+/-)2%
Emission factor at 82°C:	ε=4%(+/-)2%
Maximum temperature at idle at solar radiation 1000W/m <sup>2</sup> and at 25°C:	185°C
Suggested operation pressure for heat-transferring liquid:	350-500 kPa (3.5-5 bars)
Maximum operation pressure for heat-transferring liquid:	600 kPa (6 bars)
Suggested flow rate:	60-120 liters per hour for each collector
Header tube:	copper tube of Ø22mm x 0,7mm
Tubes:	14 vertical copper tube of Ø10mm x 0.4mm

Efficiency formula for solar collectors:  $\eta_A = \eta_{0A} - U_A \frac{t_m - t_a}{G_k}$

Where:

$\eta_{0A}=0,81$

Max. Collector thermal efficiency with reference to absorber area.

$U_A=5,20$  [W/(m<sup>2</sup>K)]

Measured overall heat loss coefficient with reference to absorber area

$\eta_A$

Collector thermal efficiency with reference to absorber area

$t_m$  [K]:

mean temperature of heat transfer fluid

$t_a$  [K]:

external air temperature

$G_k$  [W/m<sup>2</sup>]:

total incoming solar radiation

**EFFICIENCY CURVE OF PCM237100**

