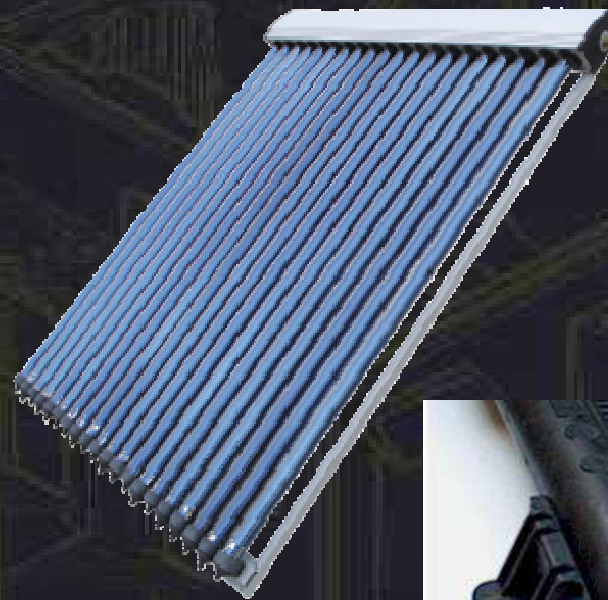




# SOLAR THERMAL ENERGY

## LESSON 4: SOLAR THERMAL PANNELS (2)

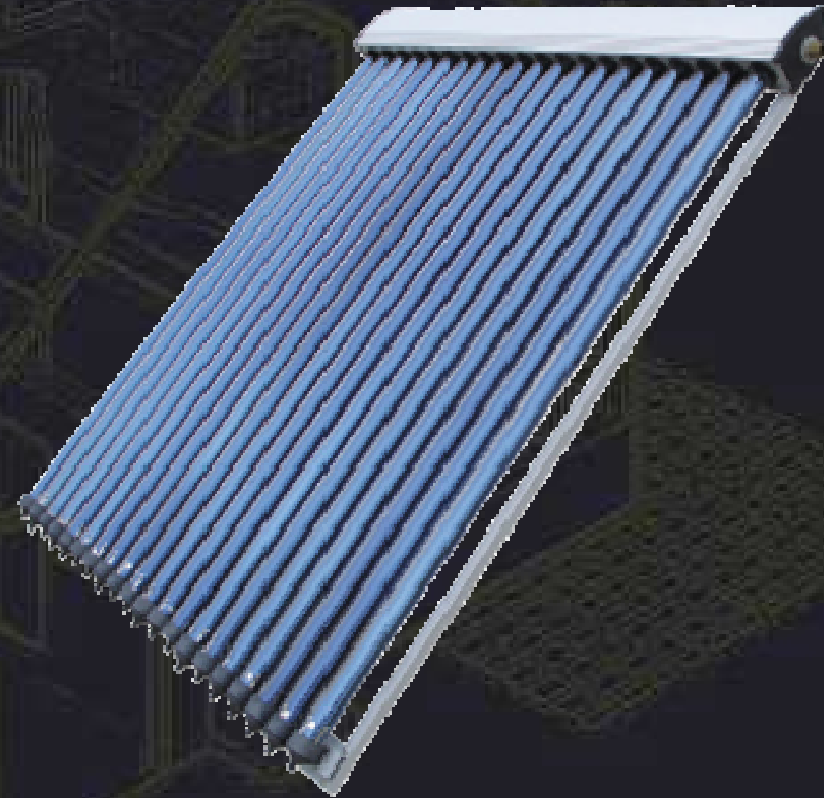




# SOLAR THERMAL ENERGY

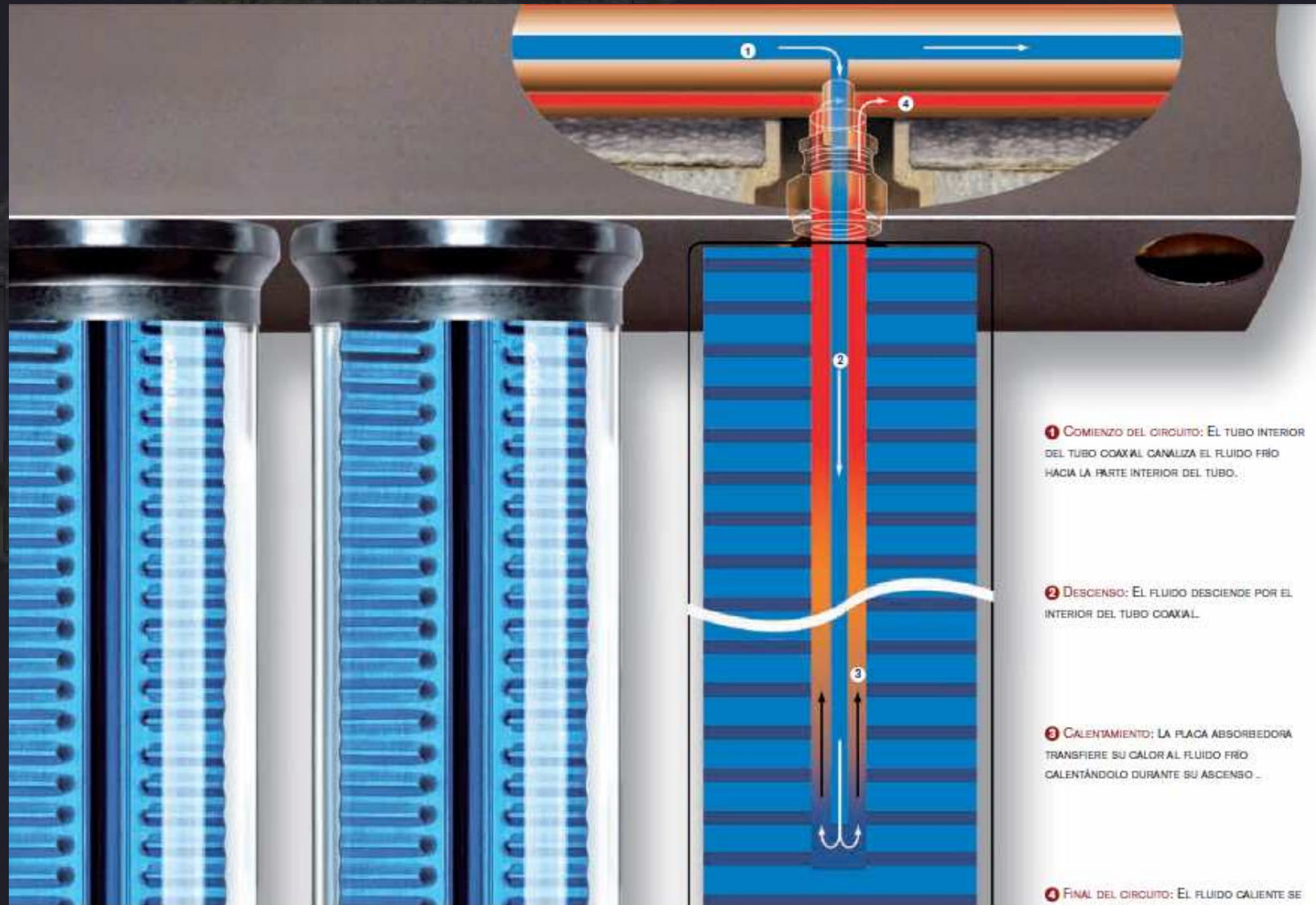
## Types of collectors

### Evacuated tubular collectors



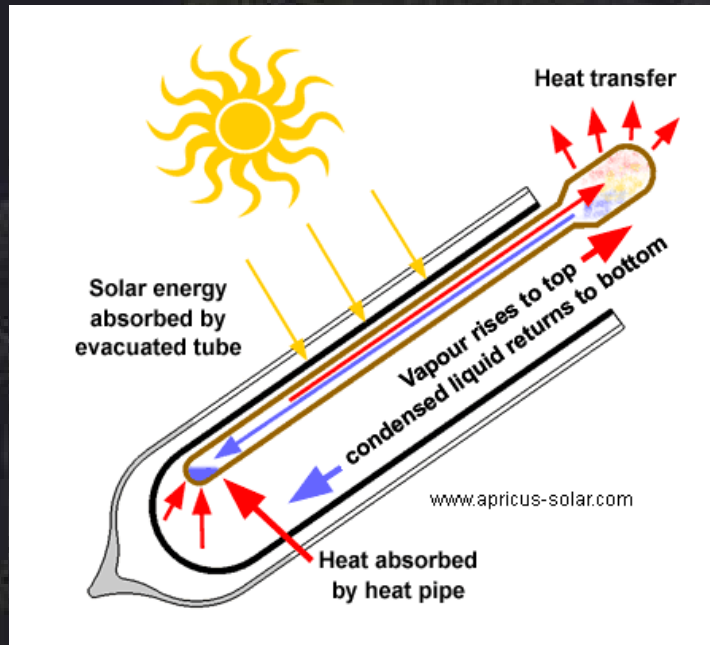


# SOLAR THERMAL ENERGY

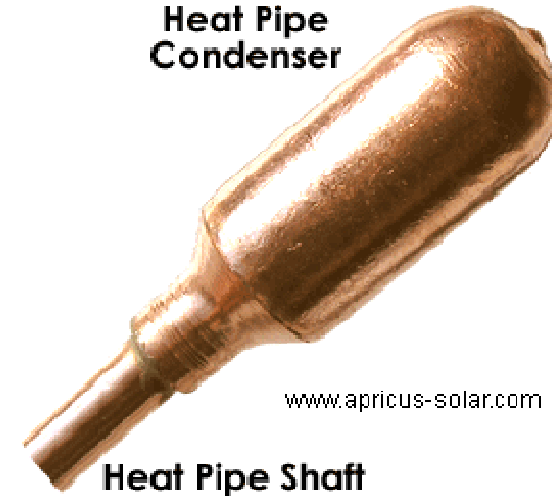




# SOLAR THERMAL ENERGY



**Heat Pipe  
Condenser**



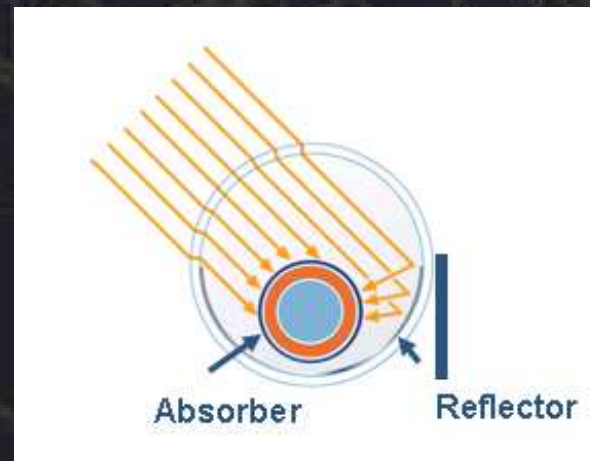
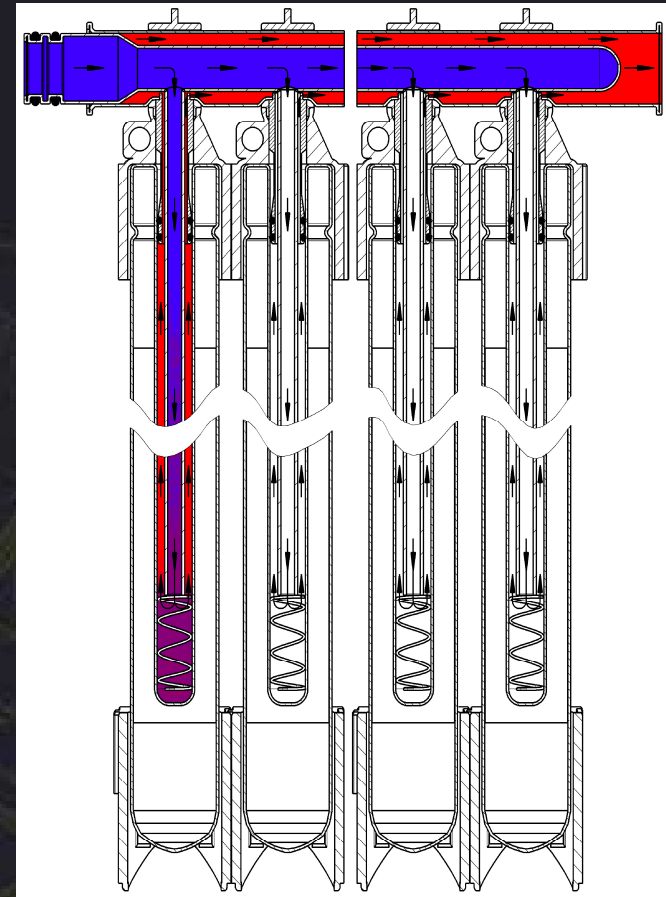
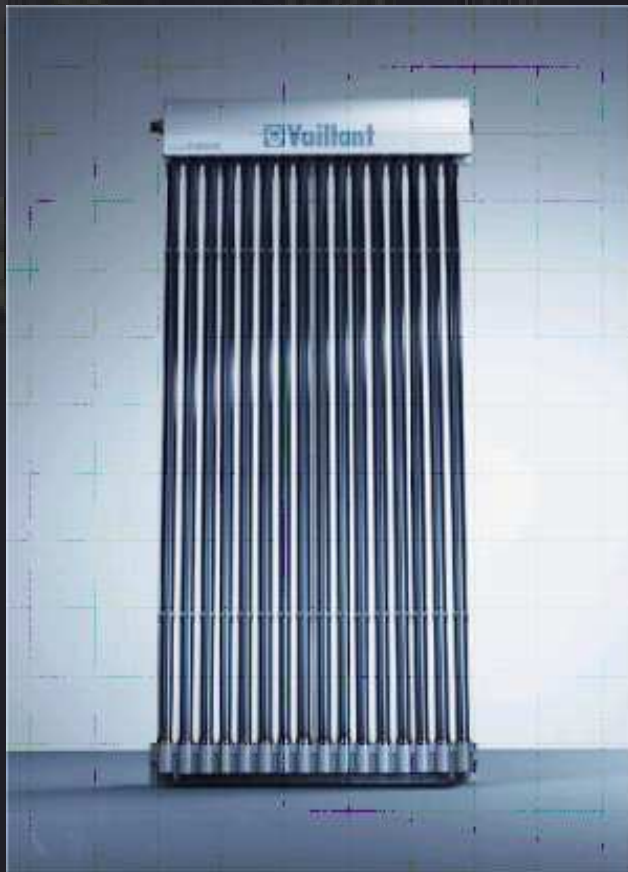
**Heat Pipe Shaft**





# SOLAR THERMAL ENERGY

## Evacuated parabolic tubular collectors





# SOLAR THERMAL ENERGY

## Evacuated parabolic tubular collectors

auroTHERM collectors		auroTHERM exclusive		auroTHERM plus	
		VTK 570/2		VFK 150 H	VFK 150 V
Area gross	m <sup>2</sup>	1.16		2.5	
Area net - aperture (H1)	m <sup>2</sup>	1.0		2.3	
Absorber content	l	0.9		2,16	1,85
Connection, flat sealing DN 16	DN	16 (G3/4")		16 (G3/4")	
Insulation vacuum / rock wool	mm	Tubes vacuum / 50 header		40	
Operation pressure max.	Bar	10		10	
Solar anti-reflex /security glass transmission t	%	95		96	
Absorber absorption a	%	94		95	
Absorber-emission e	%	5		5	
Absorber material		Stainless steel / glass		Copper / aluminium	
Stagnation temperature EN 12975-2, c < 1 m/s	°C	290		220	
coefficient_Ø EN 12975 (H2)	%	64.2		84	
Efficiency coefficient k1 (H3)	W/m <sup>2</sup> K	0.885		3.7	
Efficiency coefficient k2	W/m <sup>2</sup> /K <sup>2</sup>	0.001		0.012	
<b>Collector dimensions</b>					
Height	mm	1650		1233	2033
Width	mm	700		2033	1233
Depth	mm	110		80	
Weight	kg	19		38	

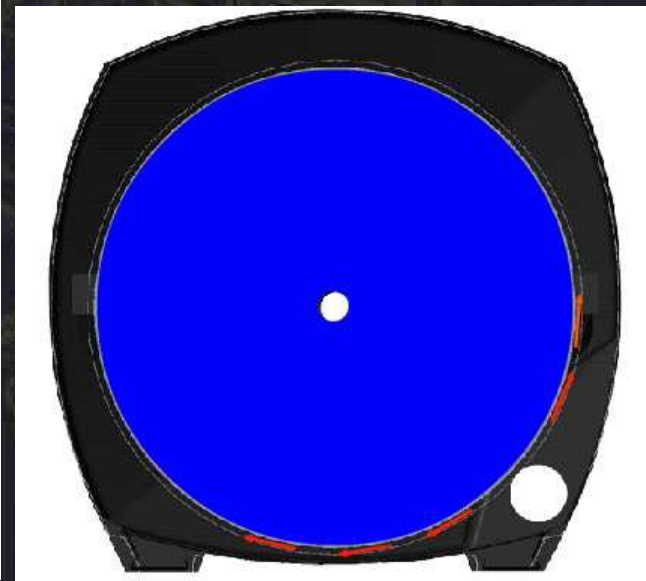
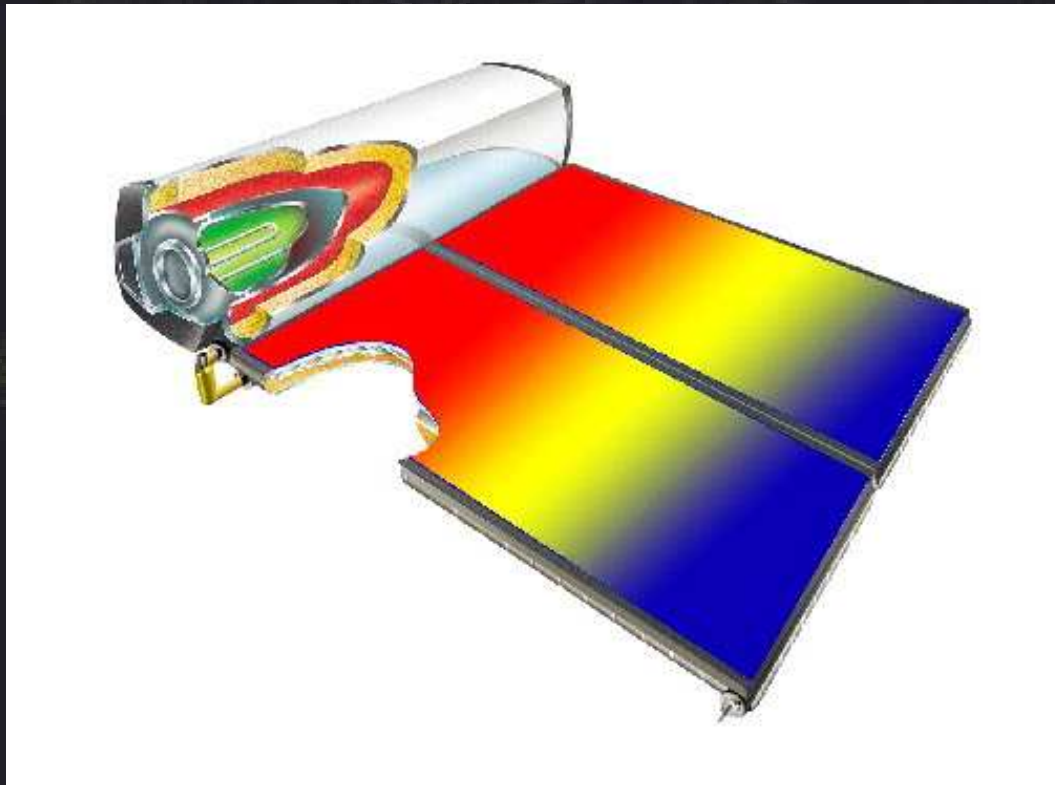


# SOLAR THERMAL ENERGY





# SOLAR THERMAL ENERGY



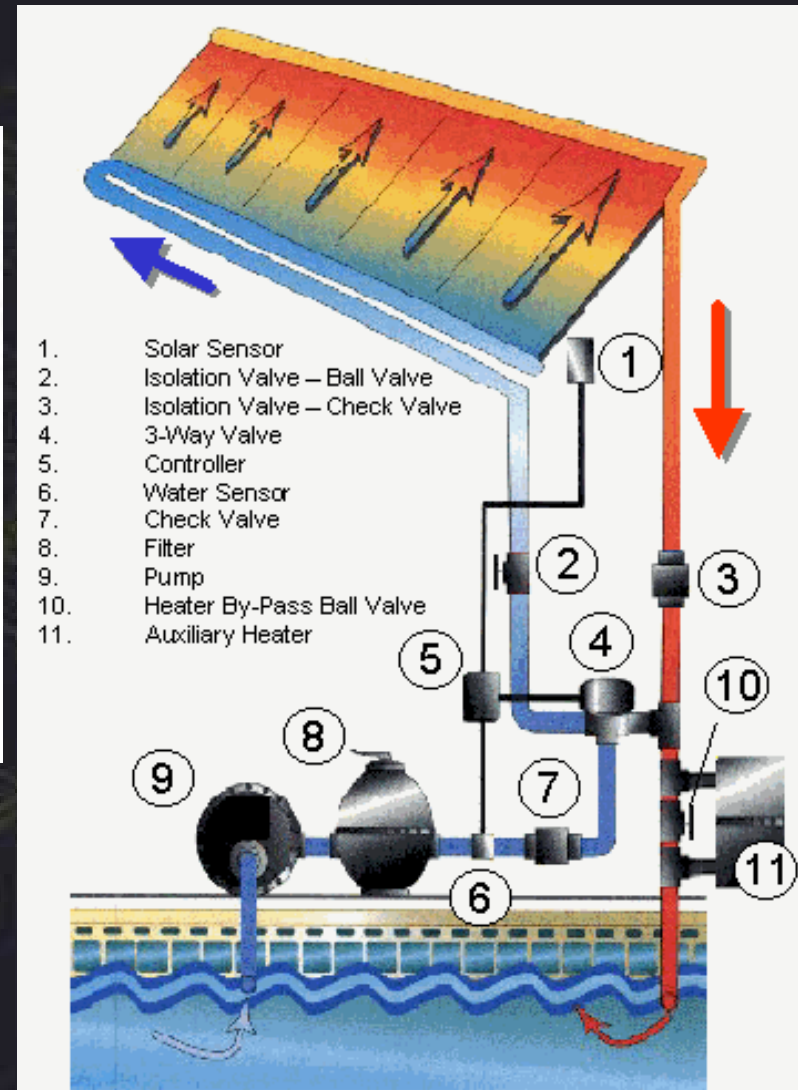




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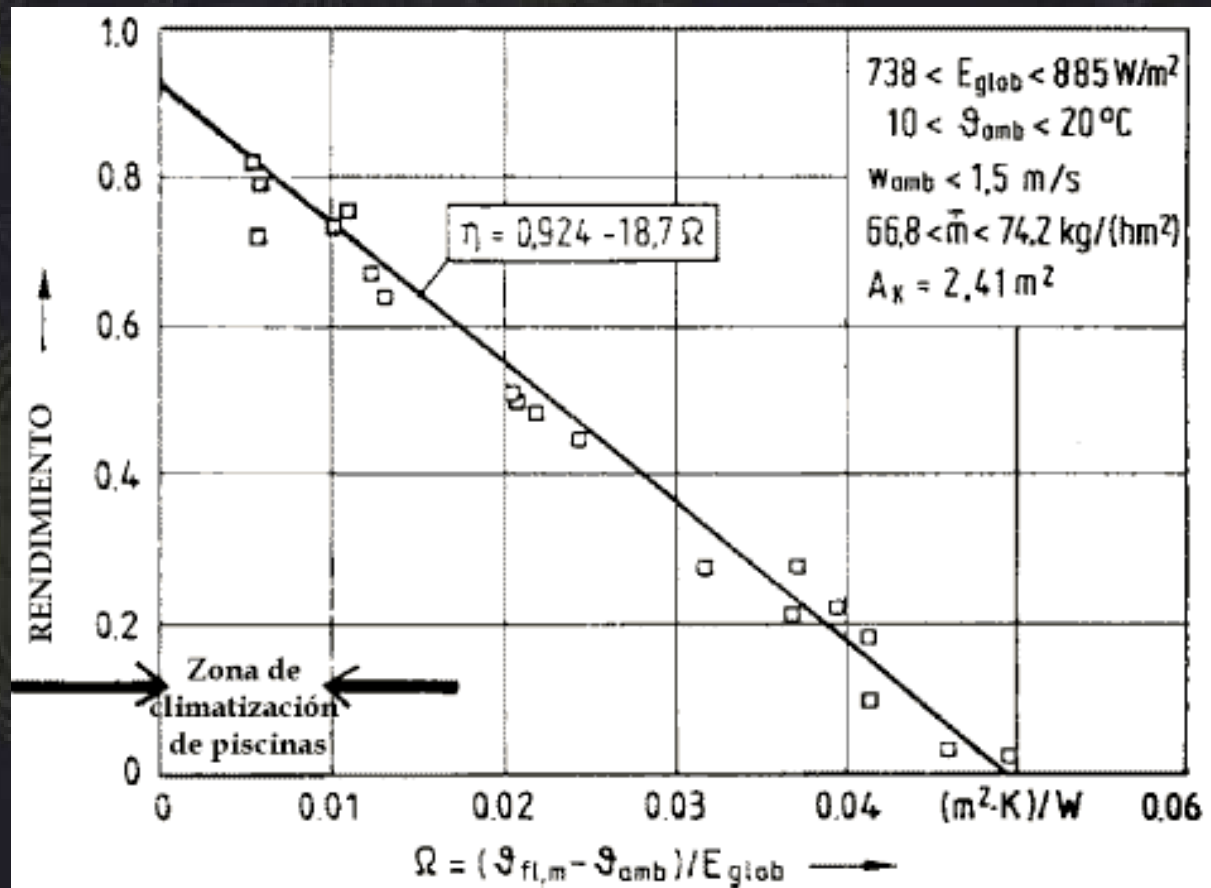


Unglazed pannels need high radiation  $>700\text{w/m}^2$



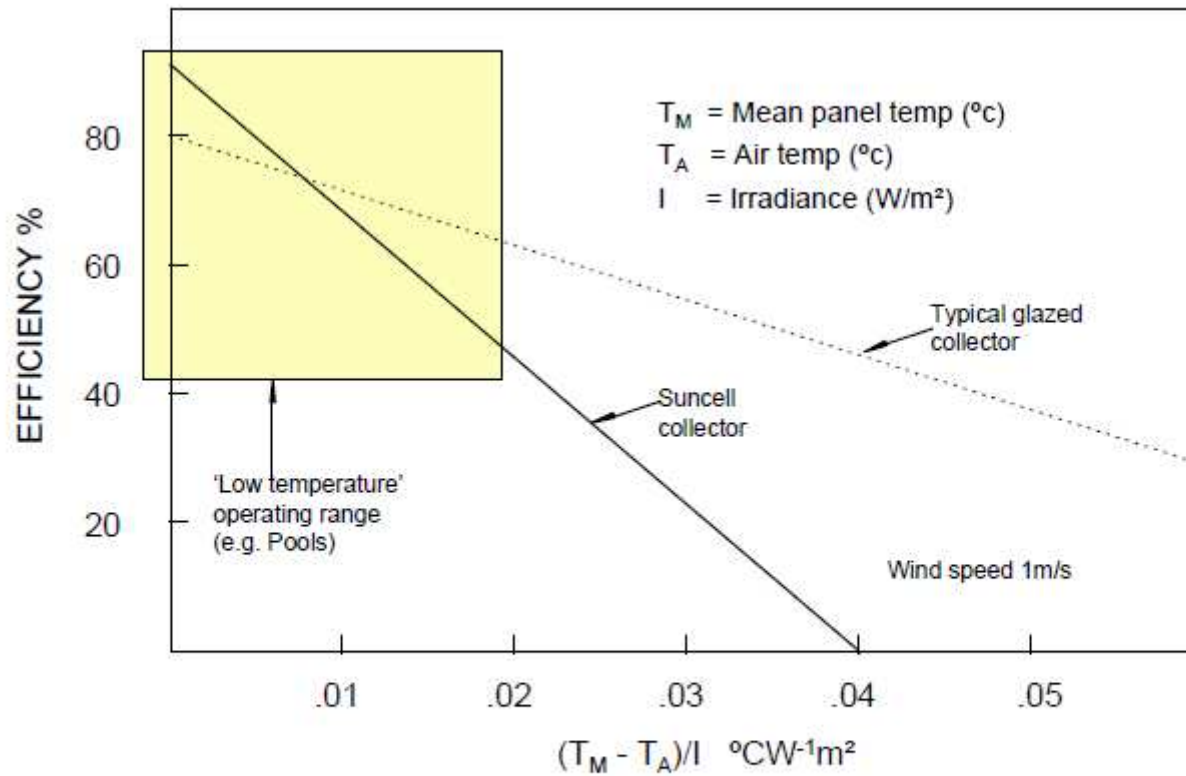


# SOLAR THERMAL ENERGY





# SOLAR THERMAL ENERGY



$$\eta = 0,9 - 23(T_m - T_a)/I$$