FEGEN

The HYBRID Evolution

SUN for Electricity & hot Water

FORGET COMPLEX
INDOOR ROOMY
HEATING
INSTALLATIONS

NO MORE
AESTHETIC
COMPROMISES

ONE SOLUTION:

- ALL IN ONE
- OUTDOOR
- PLUG & PLAY

WHAT IS HYBRID SOLAR?

Hybrid Solar technology produces both electric energy for **Net Metering** grid tied (or off-grid) installations, and thermal energy (**solar heated water**) for self-consumption.

Fegen makes this possible using **Hybrid panels identically looking with the conventional solar** ones in the roofs (or ground-fitted) and the use of **only 1 additional all-in-one device**.

1. Combines electric and thermal energy

This is carried out using panels identically looking with the conventional PV ones, that have an **integrated hydraulic circuit**, which combined with various other components **provides high temperature to tens of times multiple to the circuit water volume**.

2. Maximizes the electric energy produced in hot climate conditions

Conventional PV panels derate in heat. The hybrid panels circuit apart from producing hot water, it also cools their solar part resulting in **100% performance during summertime when the sunshine is intense and constant**.

3. Minimizes the installation space needed

Hot water production drastically reduces the electric consumption of thermal energy production devices, resulting in the **need of less panels in a hybrid installation (not all panels need to be hybrid), so less space is needed in the roof, and less investment cost** compared to what someone would expect from such an installation.

This means **POSSIBILITY OF INSTALLATION IN SMALL SURFACES AND SIGNIFICANTLY SHORTER RETURN OF INVESTMENT** compared to a conventional PV installation.

FEGEN HYBRID SOLAR

Fegen has the most compact and powerful **up to 300W electric power & up to 1300W combined power** hybrid panels in the market, without any compromise in aesthetics, as they are produced in various colors.

Moving one step forward, Fegen produces all the additionally needed hybrid (electric and hydraulic) gear in **one compact, heavy duty, IP55 waterproof, outdoor, fully certified device, with good aesthetics, which is all-in-one, totally pre-engineered and pre-assembled, and therefore plug & play (HSM)**.

This results in:

- **Elimination of the conventional boiler room located in the building**, freeing space in the building
- **Elimination of the added labor assembly cost of the boiler room on site**, as everything is pre-assembled in one box
- **Immediate start up**, so **almost zero installation time**, as only the electric and hydraulic connection of HSM with the building, the panels and the grid is needed
- **Avoidance of responsibility conflicts in case of malfunction**, as the supplier is one
- **Easy control and maintenance**, as it is outdoor

Hybrid Solar technology produces electric and thermal energy, so, **hot water for heating, space, usage water and pools.**

IT DOESN'T REQUIRE ANY SPECIAL COMPONENTS SELECTION DEPENDING ON EACH INSTALLATION, as HSM is pre-dimensioned in a few sizes that have all the necessary gear, whereas with the use of specially designed hardware and software, **it constantly monitors the water requirements from all sources and reacts accordingly**.

Moreover, depending on the installation size, the **parallel connection of two or more HSM is easily possible (Modularity)**, resulting in **unlimited applications**, while can be both ground or wall positioned depending on the installation.

Fegen Hybrid Solar products features:

- Aesthetically impeccable
- Compact
- Totally industrialized
- Top performance
- Best value for money
- Minor maintenance cost
- Short return of investment
- Many applications
  A) Residential
  B) Hotel
  C) Offices
  D) Commercial – industrial
  E) Remote

Especially in **complex building constructions** they contribute in the **decentralization of the installation with multiple cost benefits** in, installation (digging, piping etc.), maintenance and running costs. Adoption of Hybrid Solar technology drastically contributes in the acquisition of the **highest energy class grade** resulting in multiple benefits.

Fegen Hybrid Solar technology applications in buildings:

- Under construction
- Existing without any solar installation
- Existing with a solar installation, where it is possible to upgrade it (**RetroFit**), by adding the required hydraulic components in the existing PV panels and other gear in the boiler room.

All Fegen Hybrid Solar products are fully certified for both EU and USA as well as for most countries (CE, UL etc.)

RETROFIT

A HYBRID SOLAR UPGRADE APPLICATION FOR EVERYBODY

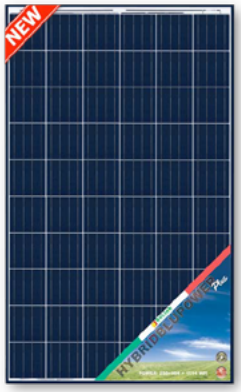
RetroFit is a **kit of hydraulic components** that can be integrated to the majority of the existing residential or commercial rooftop installations.

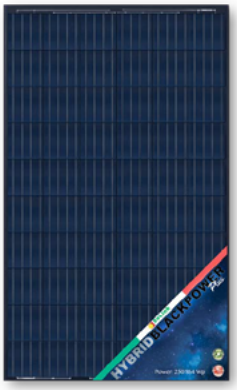
It **upgrades the existing conventional solar panels** to hybrid ones, as well as **the rest of the existing hydraulic equipment** of the installation adding special components.

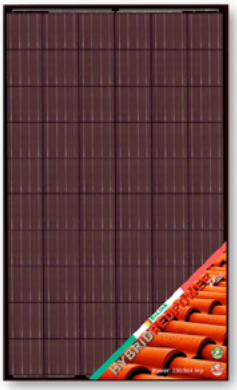
There is **no aesthetic compromise**, as the upgraded hybrid solar panels are **identically looking** with the conventional solar ones.

The hybrid panels are connected via tubes that are covered in such a way that looks of a **homogeneous surface** is ensured. In the boiler room, there is **no extra space needed**.

RetroFit has **no geographic boundaries**. Existing boiler room is indoor, so it is not exposed to extreme cold conditions that could freeze water. However, even in this case, as the closed liquid circuit of the hybrid panels is heated by the sun, it **prevents freezing** in most weather conditions, inside the panels and the running of all circuit.







Mechanical data	
Hail test	25mm-23m/s
Max Load	5400 Pa
Number of cells polycristalline	60 (156x156mm)
Weight	28 Kg

Temperature coefficient	
NOCT	46 +/- 2°C
Pmax temperature coefficient	0,42% / °C
Voc temperature coefficient	0,33% / °C
Isc temperature coefficient	0,05% / °C

Thermal data		
Rated thermal input	W	849+/-14
Opening area	sqm	1,45
Max temperature of stagnation	°C	83
Max flow thermal fluid	lit/min	2
Current efficiency opening area	η	0,588
Curernt efficiency absorber area	η	0,583
Loss ratio (Opening area)	a1	15,529 Wm-2K-1
	a2	0,010 Wm-2K-2
Loss ratio (Absorber area)	a1	16,987 Wm-2K-1
	a2	0,011 Wm-2K-2

General information	
front glass	Tempered AR coated glass
Glass thickness	3,2 mm
Frame	Anodized aluminium alloy
Juntion Box	IP 67 rating, 3 Bypass diodes
Output cables	E317230-C PV 4 mm2

Dimensions		
Width	L	991
Height	H	1649
Depth	P	40

	Hybrid Green/Red Power				Hybrid Blu/Black Power				
Electrical data (STC)	HP230/..	HP235/..	HP240/..	HP245/..	**HP250/..**	HP255/..	HP260/..	HP265/..	HP270/..
Open circuit voltage (VOC)	37,3 V	37,6 V	37,9 V	38,1 V	**38,4 V**	38,7 V	39,0 V	39,3 V	39,6 V
Pmax voltage (Vmp)	29,3 V	29,6 V	29,9 V	30,1 V	**30,3 V**	30,5 V	30,9 V	31,2 V	31,4 V
Short circuit current (Isc)	8,40 A	8,50 A	8,55 A	8,65 A	**8,75 A**	8,85 A	8,90 A	9,00 A	9,10 A
Pmax current (Ipm)	7,85 A	7,95 A	8,03 A	8,15 A	**8,25 A**	8,35 A	8,40 A	8,50 A	8,60 A
Pmax (Tolerance -0 +5Wp*)	230 Wp	235 Wp	240 Wp	245 Wp	**250 Wp**	255 Wp	260 Wp	265 Wp	270 Wp
Module efficiency	14,1%	14,4%	14,7%	15,0%	**15,3%**	15,6%	15,9%	16,2%	16,5%
Maximum voltage (DC)	1000 V	1000 V	1000 V	1000 V	**1000 V**	1000 V	1000 V	1000 V	1000 V
Maximum series fuse rating	13 A	13 A	13 A	13 A	**13 A**	13 A	13 A	13 A	13 A
Operating temperature	-40+85°C	-40+85°C	-40+85°C	-40+85°C	**-40+85°C**	-40+85°C	-40+85°C	-40+85°C	-40+85°C

*STC (Standard test conditions) Irraggiamento 100w/mq, temperatura modulo 25°C, AM=1,5

SOLAR KEYMARK

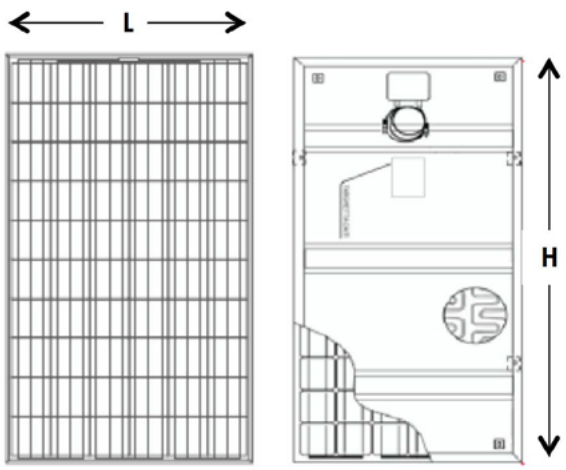
034

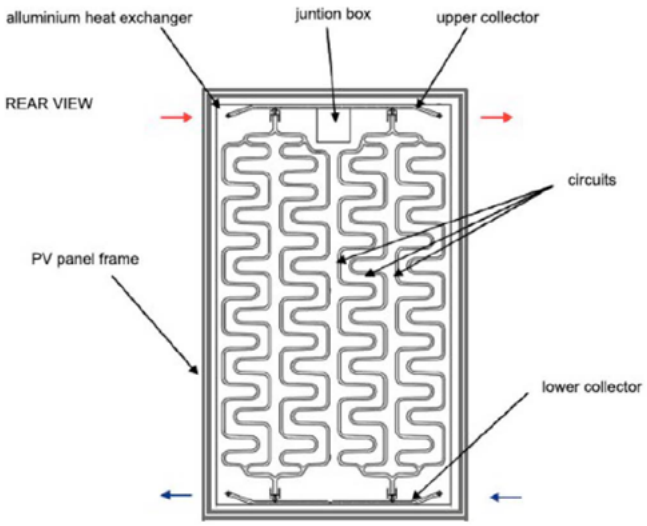
The new solar panel HYBRID POWER is one of a wide product range branded.

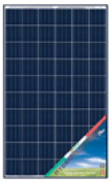
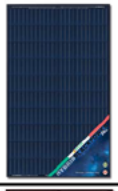
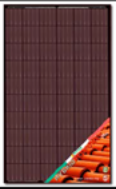
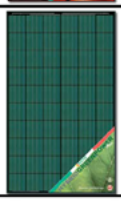
It is manufactured according to IEC 61215,IEC 61730 standard and CE.
High quality materials, 4 BusBar cells with welding induction for long lasting electric performance.

The new hybrid technology, besides increasing the yield of the photovoltaic modules through a sophisticated cooling system which increase the duration also generates heat energy for residential use.
Directly connectable to a heat accumulation tank.
Connectable with a heat pump for home heating or DHW.
Surfaces and costs of installation are reduced.

25 years warranty for a power output of 80% in comparison to starting power and 10 years product warranty.





CODE	DESCRIPTION		ELECTRIC POWER (Wp)
HBP250850	HYBRID BLUPOWER PLUS		250
HBP255850			255
HBP260850			260
HBP265850			265
HBP270850			270
HBK250850	HYBRID BLACKPOWER PLUS		250
HBK255850			255
HBK260850			260
HBK265850			265
HBK270850			270
HRP230850	HYBRID REDPOWER PLUS		230
HRP235850			235
HRP240850			240
HRP245850			245
HRP250850			250
HGP230850	HYBRID GREENPOWER PLUS		230
HGP235850			235
HGP240850			240
HGP245850			245
HGP250850			250

Thermal Data		
Rated thermal input	W	1020
Surface opening	m2	1,45
Stagnation Max Temperature	°C	83
Max thermal fluid flow	lit/min	2
Current efficiency opening area	η	0,588
Current efficiency absorber area	η	0,583
Loss ratio (open surface)	a1	15,529 Wm-2K-1
	a2	0,010 Wm-2K-2
Loss ratio (Absorber area)	a1	16,987 Wm-2K-1
	a2	0,011 Wm-2K-2

Electrical data (STC)		HCF300M
Rated Power	W	300
Short circuit current (Isc)	A	9,90
Open circuit Voltage (VOC)	V	40,4
Current at Pmax	A	9,50
Voltage at Pmac	V	31,6
Cell efficiency	%	20,9
Module efficiency	%	18,4
Pmax tolerance	W	+/- 5
Max series fuse rating	A	18
Max Voltage	V	1000

STC: Irradiance 1000w/m2, moduke temperature 25°C, AM=1,5 Tolerance= 3%

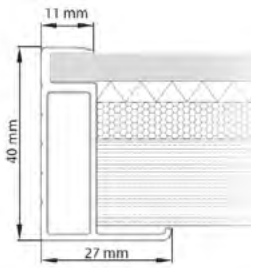
Mechanical data	
Hail test	25mm-23m/s
Max load	5400 Pa
Number of cells	60 (156x156)
Weight	28 kg

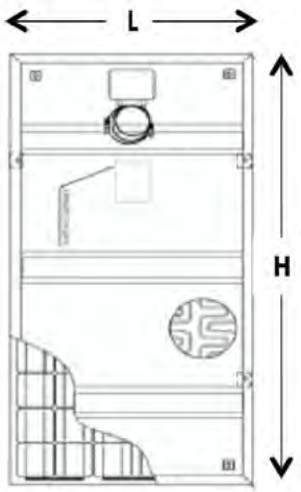
Dimensions (mm)		
Width	L	991
Height	H	1649
Depth	P	40

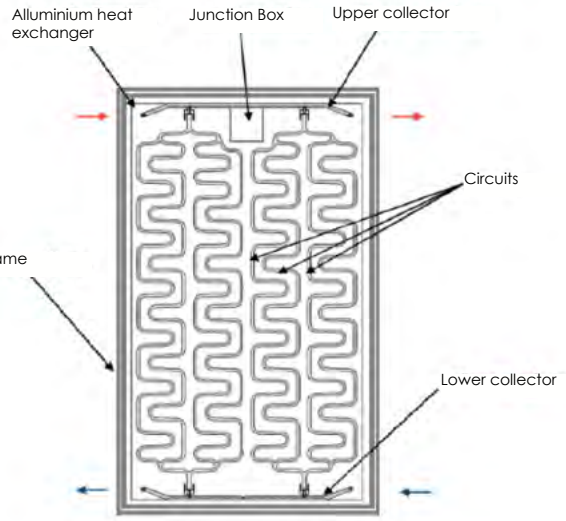
General data	
Front glass	Temperated anti-glare
Glass Thickness	3,2 mm
Frame	Anodized alluminium alloy
Juntion Box	IP 67 rating, 3 Bypass diodes
Cavi di uscita	Cable E317230-C PV 4 mm2

Temperature coefficient	
NOCT	44°C
Pmax coefficient	+0,046 %K
Voc coefficient	-0,30 %K
Isc coefficient	-0,39 %K

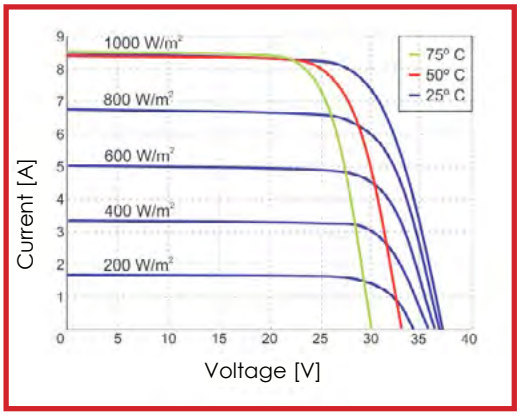
Solink reserves the right to modify at any time its products to improve quality without notice



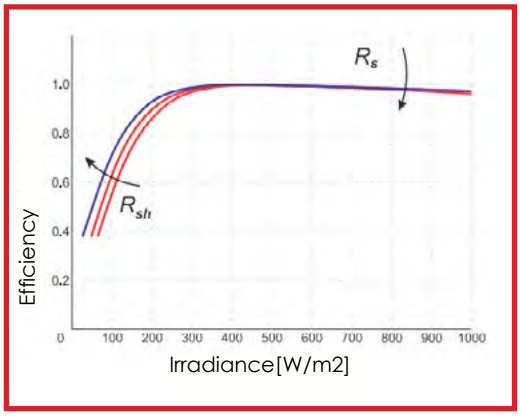


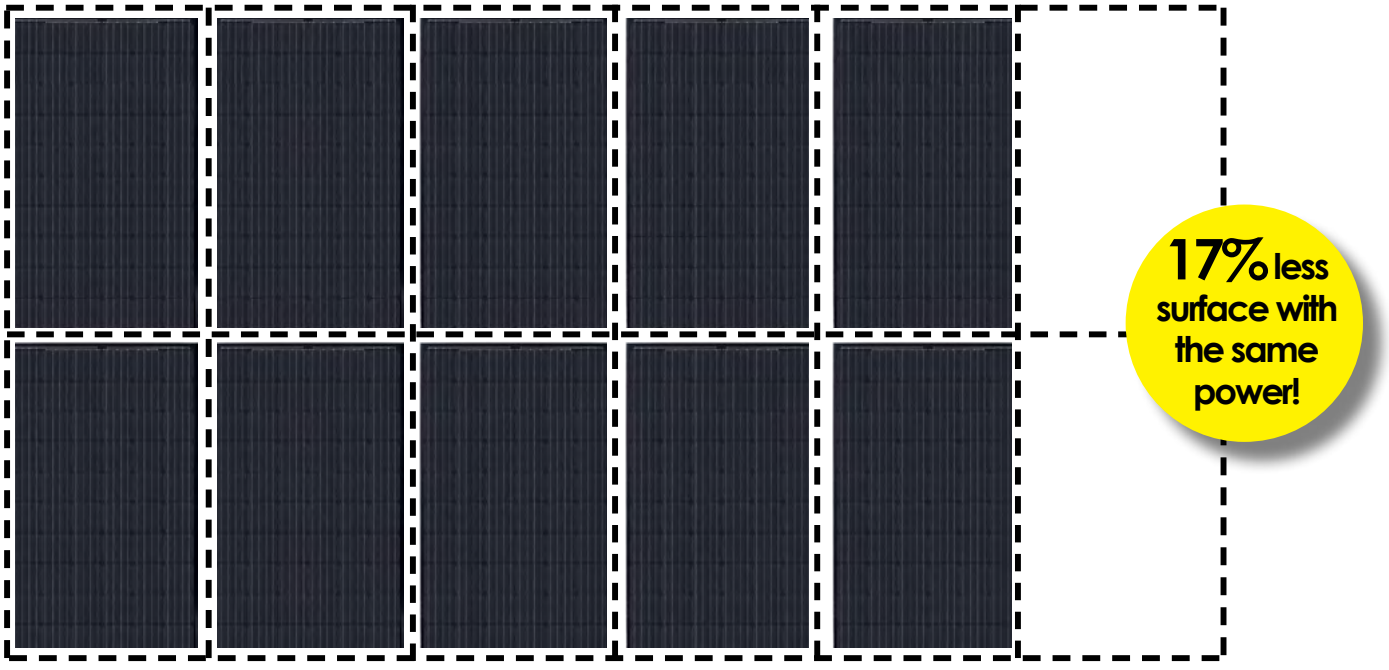


I-V Different Level of irradiance and cells temperature



Efficiency





CERTIFIED IEC 61730 Ed.1 · CERTIFIED IEC 61215 Ed.2 · ÖVE · European Recycling Platform · Resistenza all'ammoniaca NH3 · CE · PV CYCLE · MCS · Certificato di resistenza alla corrosione da nebbia salina · Standard AS5033 · AIT Austrian Institute of Technology · ISO 9001 ISO 14001 OHSAS 18001 BUREAU VERITAS Certification · ISTITUTO GIORDANO Qualità al Plurale · Reazione al Fuoco – Classe 1 (UNI 9177)

N° riferimento collettore: 186

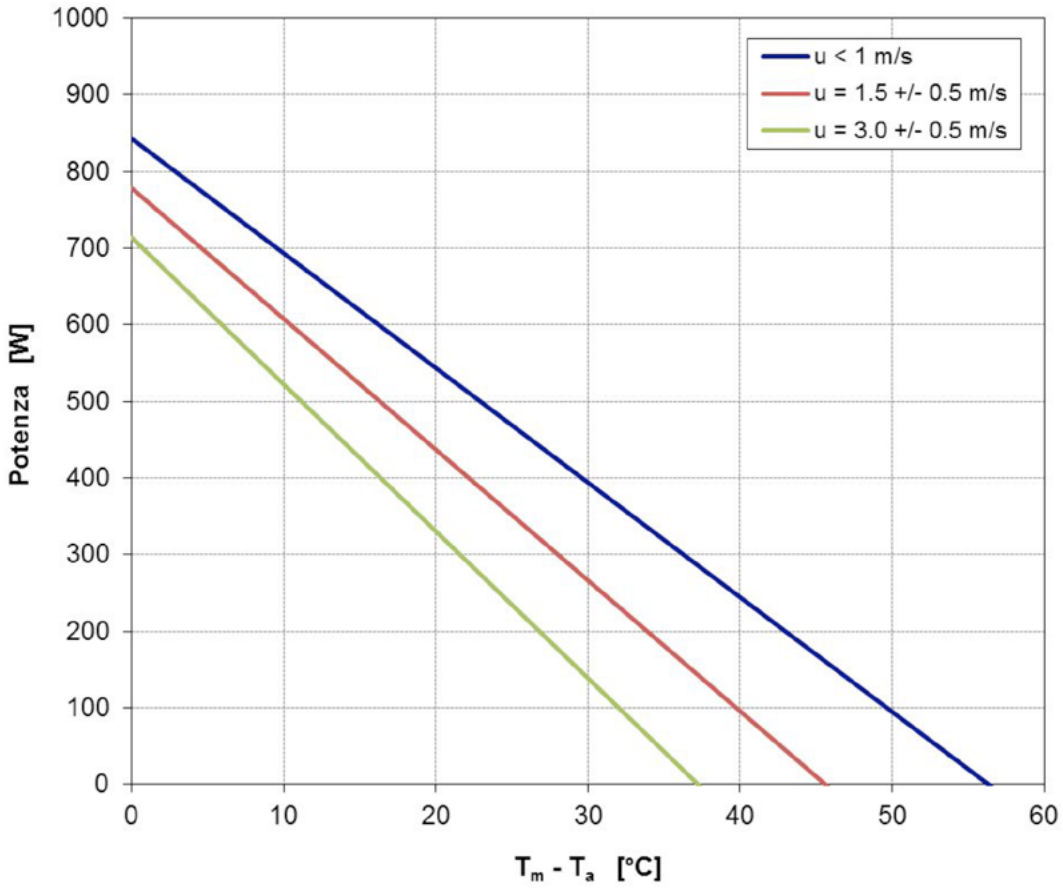
3.3 Single Collector power

Peak power (G = 1000 W/m²) for single collector: 843 W_{peak}

Tab 3 - Single collector power [W]

$T_m - T_a = 2$ K	Radiation		
	400 W/m²	700 W/m²	1000 W/m²
u < 1 m/s	307	560	813
u = 1.5 ± 0.5 m/s	277	511	744
u = 3.0 ± 0.5 m/s	247	461	675
N.B. The values reported refer to the case of radiation with normal incidence			

The following diagram shows the trend of the output power for a single module with a radiation of 1000 W/m² and in different wind conditions

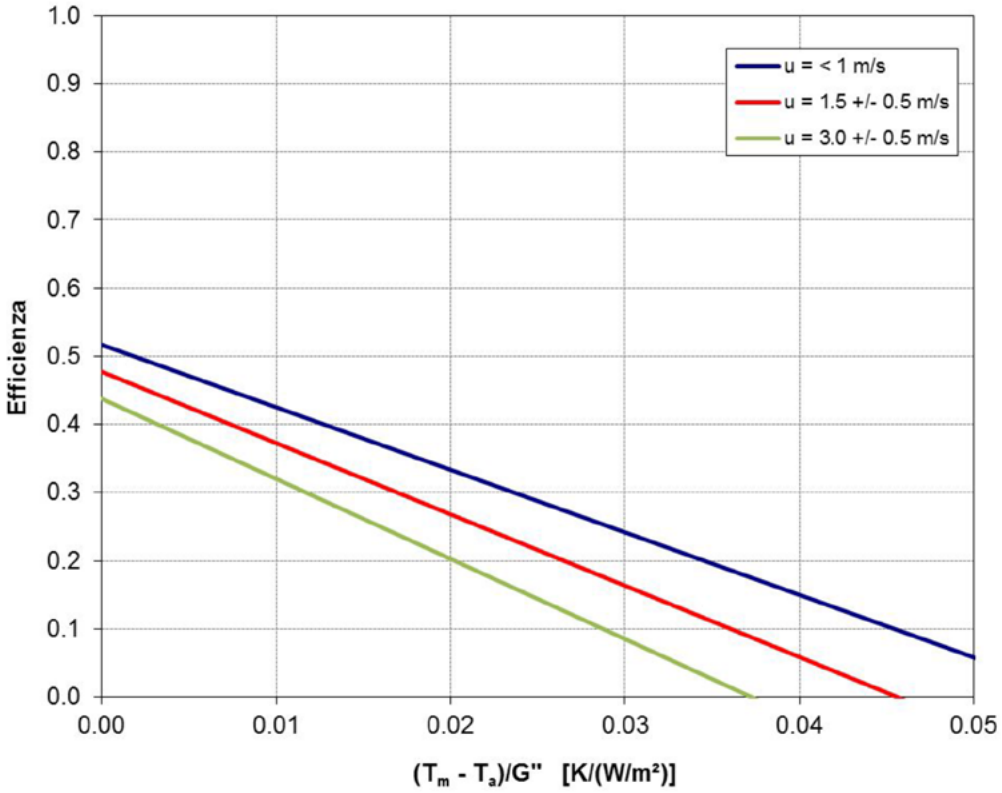


N° riferimento collettore: 186

3.4 Efficiency curves based on gross area and mean fluid temperature.

Efficiency is defined as: $$\eta = \frac{Q}{A_G G''}$$

Test average flow:	0.028	kg/s
Gross area:	1.63	m²
Opening area:	1.45	m²



Regression curve: $$\eta = \eta_0(1 - b_u u) - (b_1 + b_2 u)\frac{T_m - T_a}{G''}$$

Parameters valued with respect to gross area:

	Gross area		Measure units
	Value	dev.standard	
η_0	0.517	0.008	-
b_u	0.051	0.008	s/m
b_1	9.177	0.38	W m^{-2} K^{-1}
b_2	0.860	0.22	J m^{-3} K^{-1}

HSM

Hybrid Solar Module

One compact, heavy duty, IP55 waterproof, outdoor, fully certified device, with good aesthetics, which is all-in-one, totally pre-engineered and pre-assembled, and therefore plug & play.

HYBRID SOLAR MODULE (HSM)	
CABIN General Characteristics	
External dimensions W x H x D (front view)	1600 x 2000 x 800mm / 62,99x78,74x31,50inch
Protection	IP55
Scalability	Unlimited

HYDRAULIC SOLAR SIDE		
CABIN General Characteristics		
External dimensions W x H x D (front view)	1200 x 2000 x 800mm / 47,24x78,74x31,50inch	
Protection	IP55	
Door	Double 600mm/23,62inch Width each	
Light	Auto door power On/Off - 600 lumens	
Scalability	Unlimited	
TANKS		
Main tank	350lt / 92,46gal	500lt / 132,09gal
Supply Expansion tank	8lt / 2,11gal @10bar	12lt / 3,17gal @10bar
Solar tank	30lt / 7,93gal @10bar	45lt / 11,89gal @10bar
SUPPORT		
People	2-6	6-8
PV (Solar) panels connectivity	Up to 20	Up to 40
MAIN COMPONENTS General Characteristics		
Solar Inverter Pump (WILO)	Yonos Para ST 15/7	Yonos Para ST 15/13
Electric Auto Arm Resistance	4kW	
Security Valve (cold water)	6bar	
Pressure Regulator	2-6bar	
INTERIOR PIPING		
Water Piping - Stainless Steel	Φ16 Isolated	Φ20 Isolated
Solar Piping - Stainless Steel	Φ16 Isolated	Φ20 Isolated
Main Supply - Copper pressurized	Φ28 Isolated	Φ35 Isolated
Circulation - Stainless Steel	Φ16	
EXTERIOR PIPING		
Cold/Hot Supply	3/4inch	1inch
Main Supply	1inch	$1^{1/4}$inch
Circulation	3/4inch	3/4inch
Solar	3/4inch	3/4inch
SENSORS OPERATION TEMPERATURES		
Boiler	-35 to 105°C / -31 to 221°F	
Solar Roof	-50 to 180°C / -58 to 356°F	

ELECTRIC SOLAR SIDE	
CABIN General Characteristics	
External dimensions W x H x D (front view)	400 x 2000 x 800mm / 15,75 x 78,74 x 31,50inch
Protection	IP55
Air flow	500m^3/h
Door	Single 800mm/31,50inch Width
Light	Auto door power On/Off - 600 lumens
Scalability	Unlimited
INVERTER max Capabilities fitted (with up to date market models)	
W x H x D (max available space)	720 x 910 x 320mm / 28,35 x 35,83 x 12,60inch
Vdc	1000V / 1500V
DC incoming (from PV field – combiner box)	Up to 3 inputs
AC system	1 to 3 phases (L1-L2-L3-PE)
Apparent Power (max@25C-77F)	100kVA (1000V) – 120kVA (1500V)
Operating Voltage	Up to 550V
DC ELECTRIC BOARD general characteristics	
Internal dimensions	1 Row 18 Modules DIN rail
Protection	IP65
Vdc	1000V / 1500V
DC incoming (from PV field – combiner box)	Up to 3 inputs
DC monitoring sensors	1 per incoming
Overvoltage Protection	SPD – Class I+II up to 3 inputs
AC ELECTRIC BOARD general characteristics	
Internal dimensions	1 Row 18 Modules DIN rail
Protection	IP65
AC system	1 to 3 phases (L1-L2-L3-PE)
Overvoltage Protection	SPD – Class I+II
AUX ELECTRIC BOARD general characteristics	
Internal dimensions	1 Row 18 Modules DIN rail
Protection	IP65
General Switch	TBS by client order
General Fuses	TBS by client order
3 Phase resistance Fuse	TBS by client order
Load resistance Relay	TBS by client order
Boards sockets Fuse	TBS by client order
AUX Fuses	TBS by client order
Socket	TBS by client order
MONITORING ELECTRIC BOARD (Optional) general characteristics	
Internal dimensions	1 Row 18 Modules DIN rail
Protection	IP65
Inputs	4 Digital, 4 Analogue
Modem	Ethernet
Communication	1 x Ethernet, 1 x RS485

FEGEN PARTNER

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