

Presentation :

A photovoltaic panel is the first element in an off-grid, low-voltage solar power system. The panel converts the luminous flux into electricity. This electricity is supplied directly to the input of a "Solar Direct Drive" regulator that is controlled by a MPPT (Maximum Power Point Tracking), without add-on battery. After conversion, this regulator delivers optimized electrical energy to the final receiver, usually a motor (e.g.: a helical pump powering a raised pond). With even a very low input of electrical energy, this motor can operate virtually from morning to evening, "as the sun shines", at variable speed.

Classic photovoltaic panel

- Mono or polycrystalline with 60 cells (≈ 33V peak)
- Solar efficiency ≤ 20% (photovoltaic panel at 25°C)
- Power ≈ 300W for a surface of 1.5 x 1 m
- Weight: ≈ 20kg for the regular rigid version, or 5 kg for the flexible version (more costly).

This fundamental element of the solar installation cannot permanently provide its full power (300W for a sunshine of 1kW / m2) because it depends, in order of importance:

- ① on a random sunlight or a more or less subdued (see curves ①)
- ② on the panel orientation, preferably perpendicular to the sun
- ③ on the adaptation of the load depending on the level of sunlight.

nominal power	example of sunlight levels	Available power (simplified calculations)	
		without regulator	with regulator + MPPT
300W	0.5	$300 \times 0.5^2 = 75W$	$300 \times 0.5 = 150W$
	0.2	$300 \times 0.2^2 = 12W$	$300 \times 0.2 = 60W$

- ④ on its temperature : if $T^\circ \nearrow$ then efficiency \searrow (see curves ②)
- ⑤ on the variable precision of its constituent cells
- ⑥ on its obsolescence (decreasing power over the years)

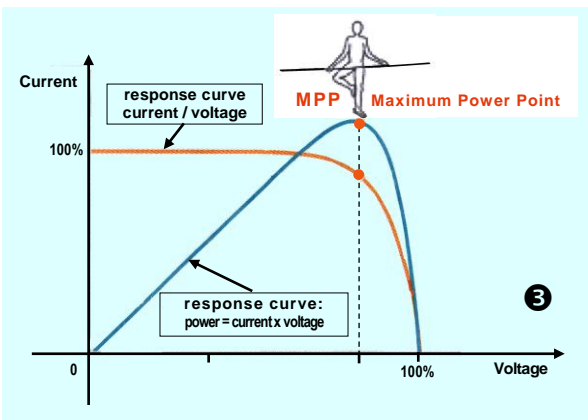
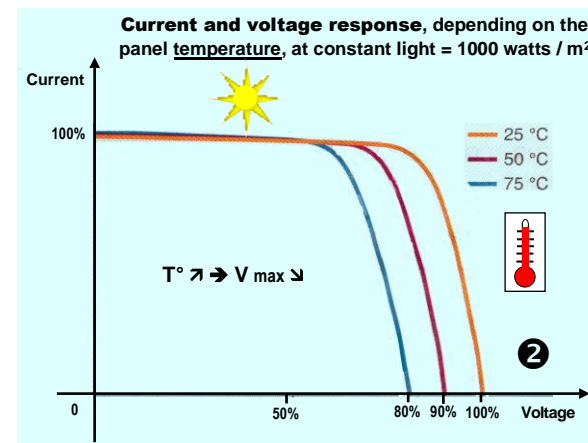
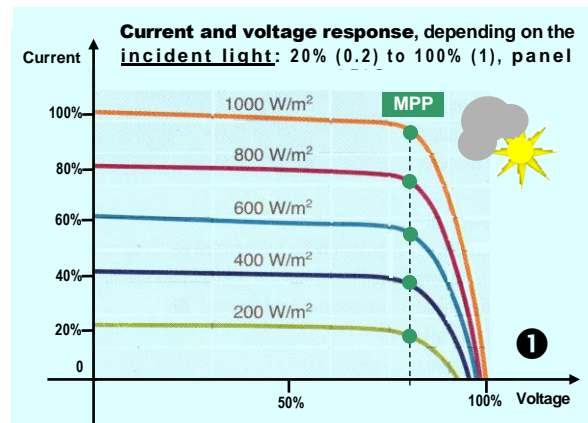
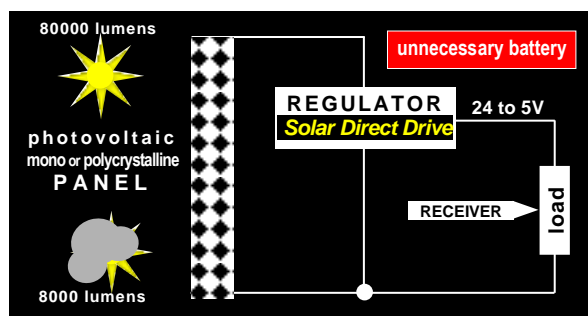
As a complex result of all the 6 variables mentioned above, the representative curve "Current / Voltage" of the photovoltaic panel has a preferential operating point MPP (= Maximum Power Point) such that the product of its coordinates (Current x Voltage) is maximum. This essential characteristic is judiciously exploited by a SDD MPPT Regulator (see "white on black" box at bottom).

Solar Direct Drive regulator

It is a MPPT controlled DC-DC regulator, with very high efficiency, directly connected to the photovoltaic panel. The output of this regulator directly powers the load, but in a modulated way, so that, on the response curve "current / voltage" of the photovoltaic panel, the operating point coincides with the MPP. This coincidence is obtained by a permanent control that reduces or increases the current absorbed by the load. For this purpose, the variable voltage applied to the terminals of the load is controlled by a fast electronic tracking system.

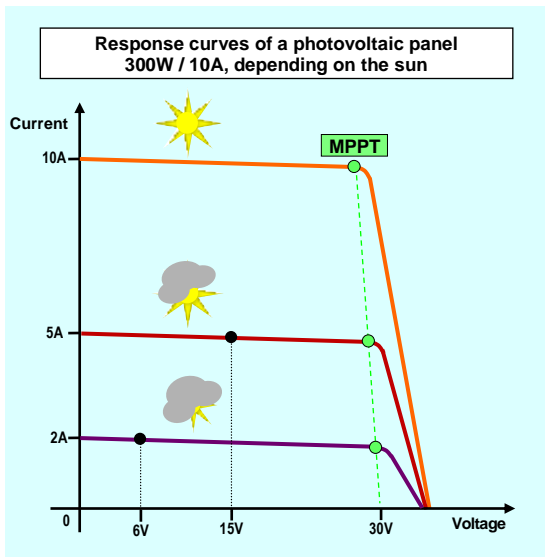
MPPT Maximum Power Point Tracking (curves ③ and history)

Most charge controllers on the market are based on the work of NASA, which, around 1968, used calculators to optimize the operation of its photovoltaic panels for space research. Currently, MPP tracking requires a current sensor, a microprocessor, its power supply and specific algorithms to control a DC-DC regulator, generally using one of two methods: "Incremental Conductance" (complex) or "Perturb and Observe"; cyclic load disturbance doesn't have only advantages!



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ELECDAN CONVERTER radically simplifies photovoltaic energy optimization. Instead of using complex NASA-type digital sequences to automatically find the Maximum Power Point, ELECDAN CONVERTER determines the MPP using permanent, self-powered analog tracking. **Advantages:** disappearance of the usual battery and chemical capacitors; uselessness of a current sensor and switches; deletion of memory, microprocessor or customizable algorithms. Controlling the DC-DC regulator associated with the mono or polycrystalline panel, this innovative analog MPPT allows extreme miniaturization and tenfold reliability, while increasing thermal insensitivity and electromagnetic protection.



When a photovoltaic panel powers a load, even one adapted to "full sun", but without an MPPT regulator* the energy collected by the load decreases dramatically, when the solar intensity decreases:

- **without MPPT regulator:** if the solar energy is divided by n , the electrical power collected is divided by $\approx n^2$.
- **with MPPT regulator:** if the solar energy is divided by n , the electrical power collected is only divided by $\approx n$.

* **MPPT regulator:** DC/DC converter, with very high efficiency, equipped with a **MPPT** (Maximum Power Point Tracking), optimizing the energy that the panel supplies to the load.

See examples in graph opposite; calculation methods and table below.

3 examples of "voltage / power" on a load of 3Ω , depending on sunshine ranging from 50% (0.5) to 2% (0.02):

$$V_{load} = \sqrt{P_{max} \times R_{load} \times incident\ light}$$

$$V_{load} = \sqrt{300 \times 3 \times 0.5} = 21.2V / 150W$$

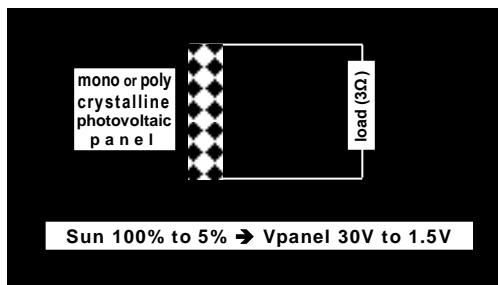
$$V_{load} = \sqrt{300 \times 3 \times 0.05} = 6.7V / 15W$$

$$V_{load} = \sqrt{300 \times 3 \times 0.02} = 4.24V / 6W$$

SUN		Without regulator			With regulator MPPT		
% (incident light)	i max generated by the panel	voltage on the load	current in the load	power in the 3Ω load	voltage on the load	current in the load	power in the 3Ω load
100% (1)	10A	30V	10A	300W	24V	12.5A	300W
50% (0.5)	5A	15V	5A	75W	21.2V	7.07A	150W
20% (0.2)	2A	6V	2A	12W	13.4V	4.47A	60W
5% (0.05)	0.5A	1.5V	0.5A	0.75W	6.7V	2.24A	15W

The comparison of these relative powers is valid for all types of mono- or poly-crystalline photovoltaic panels. The measurements were made at stabilized temperature, on a constant load of 3Ω . With only 5% sunlight (at sunrise and sunset), the energy supplied to the load (15W in one case and 0.75W in the other) proves, even in this extreme example, the efficiency of the MPPT. It is therefore particularly required during cloudy or rainy weather.

The calculations have been simplified by neglecting the DC/DC conversion losses ($\leq 3\%$) and the slight slope of the quasi-horizontal part of the voltage/current response curves.

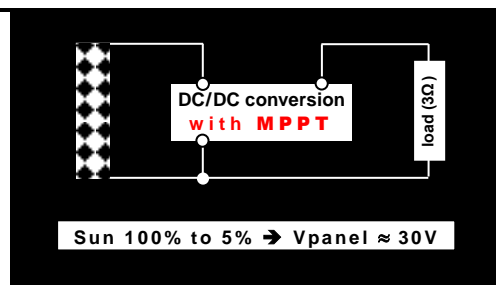


Mini MPPT regulator for solar direct drive

- adapted to panels $\leq 350W$
- efficiency $\leq 99\%$
- adjustable from 5 to 28V
- power: 300W under 24V
- mountable in series
- miniaturized: 51 x 51 x 26 mm
- waterproofing: IP67 / weight: 140g

Can be fixed directly under the panel frame

Can be equipped with regular waterproof connectors

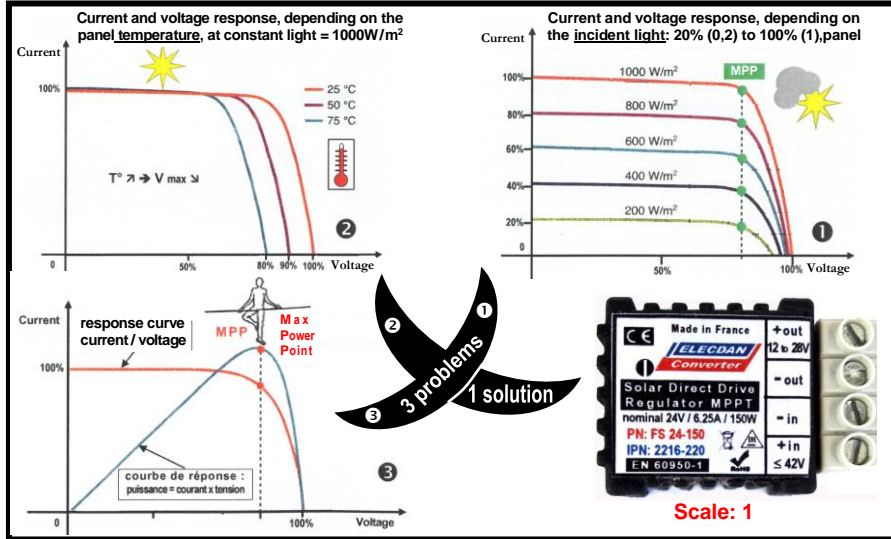
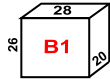


Four examples of solar direct drive use, from sunrise to sunset:

- variable flow pump filling a water tank, hydraulic accumulator
- motorized propeller stirring, at variable speed, the quality-controlled water of a pond
- SDD air-conditioning, with efficiency proportional to the solar intensity
- electric car charger, with 15 independent panels + 15 charge regulators in series $\rightarrow \approx 400V / 5kW$

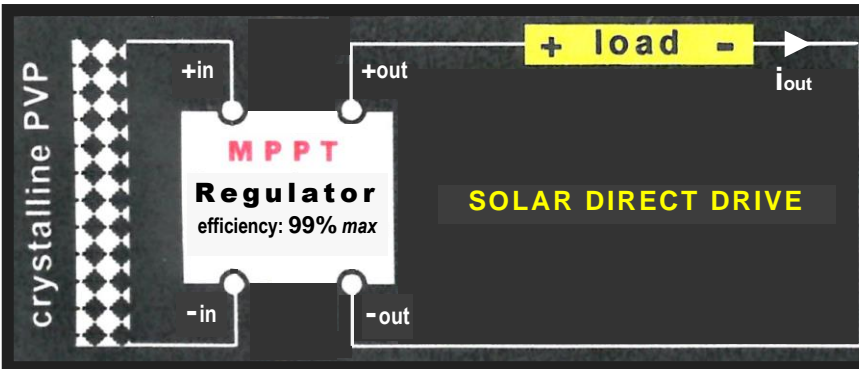
In-built switch + MC4 connectors

MPPT Regulator Controller case increased to 100 x 50 x 26 mm (instead of 51 x 51 x 26 mm)

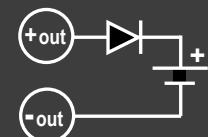


Case : in PA12 thermoplastic
 > 28 x 26 x thickness 20
 > weight: 26g (without heatsink)
 Screw terminals; 4mm² wires
 Fixing: self-tapping screws

SKU: case, V _{out} (or V _{out} range), I _{out} , option				Unit price (€)
case	V _{out} (V)	V _{out} range (V)	I _{out} (A)	
B1	12		10	
	24		6.25	
		5 / 14	10 to 8.6	
		5 / 28	10 to 5.4	
Some options and references		heatsink : D1 or D2 Wired outputs: F		
Examples		B1-12-10-D2 B1-5/28-10/5.4-D2-F		



In the absence of a battery, the torque and speed of a motor (e.g. helical pump) adapt perfectly to variations in light levels, morning, noon and evening. What's more, with a response time of < 0.1 seconds, our MPPT regulator takes the strain off mechanical transmissions: suddenly connected to a loaded motor, it supplies it with a voltage that is immediately lowered, then restored linearly in a matter of seconds.



If, however, the addition of a battery is desired, please insert a blocking Schottky diode, such as VS-19TQ015-M3. For a 24V battery, set V_{out} ≈ 27,6V.

This 150W / 24V regulator is the least powerful buck version of our MPPT SDD range, buck or buck-boost, with power increasing, in steps from 150W up to ≥ 2.4kW / 100V. Controlled by our innovative analog MPPT (sheet "5116" ①), it benefits from extreme reliability and miniaturization (15cm³, excluding cooling), as well as ≤ 99% efficiency and IP67 sealing. These qualities, and the choice of a suitable photovoltaic panel, facilitate a wide range of Solar Direct Drive applications: refrigerator, fan, helicoidal pump, bicycle ... and even, possibly, direct installation under the aluminum edge of the photovoltaic panel.

Input voltage V_{in} of the MPPT regulator and V_{out}

V_{in} is supplied by mono- or poly-crystalline cells (0.55V and 5W each), the number of which determines the voltage V_p and the power of the photovoltaic panel. The panel generally comprises 15, 30 or 60 cells. Example: a 15-cell panel supplies 75W at 8.25V.

- > Voltage supplied by panel ≥ V_{out} regulator + ≈3V
- > Power supplied by panel ≥ 1.1 (V_{out} regulator x I_{out})

V_{out} : either fixed (12 or 24V) or adjustable (5 to 14V, or 5 to 28V).

PANEL		Some possibilities with the regulator (150W max)		
cells	V _p (V)	V _{out} (V)	I _{out} max (A)	efficiency
15	8.25	5	10	0.93
30	16.5			0.93
60	33			0.92
30	16.5	12	10	0.98
60	33			0.96
60	33	24	6.25	0.98
60	33	28	5.4	0.99

Thermal characteristics:

- > case thermal resistance (R_{th}): 12°C / W
- > extreme case temperatures: -30°C to +90°C
- > cooling: direct on wall or, optionally, in heatsink D1 or D2, R_{th} = 10°C and 5°C / W

Options: custom output voltages; molded-wire outputs; heatsinks with lower R_{th}.

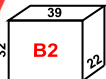
Standards and special features: EN / UL / CSA / 60950-1 / RoHS; MTBF: > 10⁶ hours, base at 50°C (with thermal grease)

Specialized since 1974 in electrical energy conversion, analog calculation and signal processing, over the past 5 years we have also been studying and testing our innovative MPPT (breakthrough technique and technology, new patent). We have also expanded our knowledge of green, autonomous or complementary energies. So please do not hesitate to ask us for advice if our technical data sheets are not sufficiently didactic. **Note:** we are also involved in the development of ultra-light photovoltaic panels, with the option of an inbuilt MPPT controller, 150 or 300W.

For initial information, see data sheets "5116" ①, "5088" ②

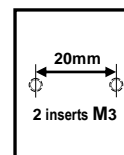
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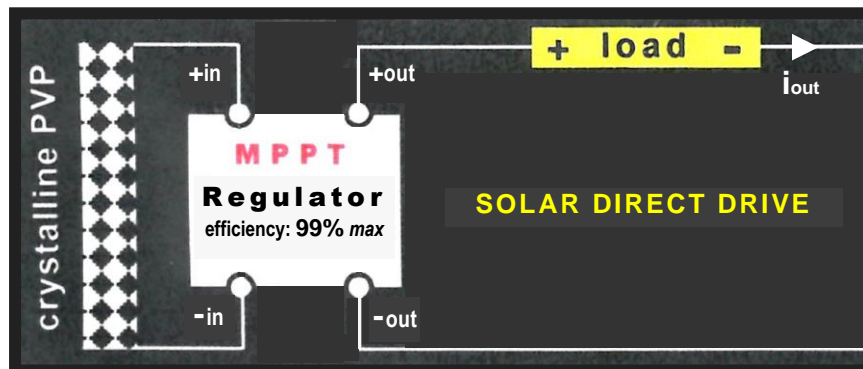
ELECDAN
Converter
MPPT solar buck regulator 300W

Solar Direct Drive (SDD), without battery
Vout possible: 5 to 28V, with photovoltaic panel 33V / 300W

Made in France

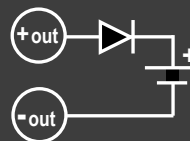

 13/11/23
 (6013-A)

 Case : in PA12 thermoplastic
 > 39 x 32 x thickness 22
 > weight: 60g (without heatsink)
 Screw terminals; 4mm² wires
 Fixing: 2 M3, 4mm deep


SKU : case, Vout (or Vout range), İout, option				Unit price (€)
case	Vout (V)	Vout range (V)	İout (A)	
B2	12		20	
	24		12.5	
		5 / 14	20 to 17.2	
		5 / 28	20 to 10.8	
Some options and references			heatsink: D2 or D3	
			wired outputs: F	
			voltmeter: V	
Examples			B2-12-20-D2	
			B2-5/28-20/10.8-D3-F	



In the absence of a battery, the torque and speed of a motor (e.g. helical pump) adapt perfectly to variations in light levels, morning, noon and evening. What's more, with a response time of < 0.1 seconds, our MPPT regulator takes the strain of mechanical transmissions: suddenly connected to a loaded motor, it supplies it with a voltage that is immediately lowered, then restored linearly in a matter of seconds.



If, however, the addition of a battery is desired, please insert a blocking Schottky diode, such as VS-19TQ015-M3. For a 24V battery, set Vout ≈ 27,6V.

This 300W / 24V regulator is the buck version of our MPPT SDD range, buck or buck-boost, with power increasing, in steps from 150W up to ≥ 2,4kW / 100V. Controlled by our innovative analog MPPT (sheet "5116" ①), it benefits from extreme reliability and miniaturization (28cm³, excluding cooling), as well as ≤ 99% efficiency and IP67 sealing. These qualities, and the choice of a suitable photovoltaic panel, facilitate a wide range of Solar Direct Drive applications: refrigerator, fan, helicoidal pump, bicycle ... and even, possibly, direct installation under the aluminum edge of the photovoltaic panel.

Input voltage Vin of the MPPT regulator and Vout
Vin is supplied by mono- or poly-crystalline cells (0.55V and 5W each), the number of which determines the voltage Vp and the power of the photovoltaic panel. The panel generally comprises 15, 30 or 60 cells. Example: a 15-cell panel supplies 75W at 8.25V. > Voltage supplied by panel ≥ Vout regulator + ≈3V > Power supplied by panel ≥ 1.1 (Vout regulator x İout)
Vout : either fixed (12 or 24V) or adjustable (5 to 14V, or 5 to 28V).

PANEL		Some possibilities with the regulator (300W max)		
cells	Vp (V)	Vout (V)	İout <u>max</u> (A)	Efficiency
15	8.25	5	14	0.93
30	16.5		20	0.93
60	33			0.92
30	16.5	12	20	0.98
60	33			0.96
60	33	24	12.5	0.98
60	33	28	10.8	0.99

Thermal characteristics:

- > case thermal resistance (Rth): 10°C / W (7°C / W for A1 aluminium case 51 x 51 x 26mm)
- > extreme case temperatures: -30°C to +90°C
- > cooling: direct on wall or, optionally, in heatsink D2 or D3, Rth = 5°C and 4°C / W

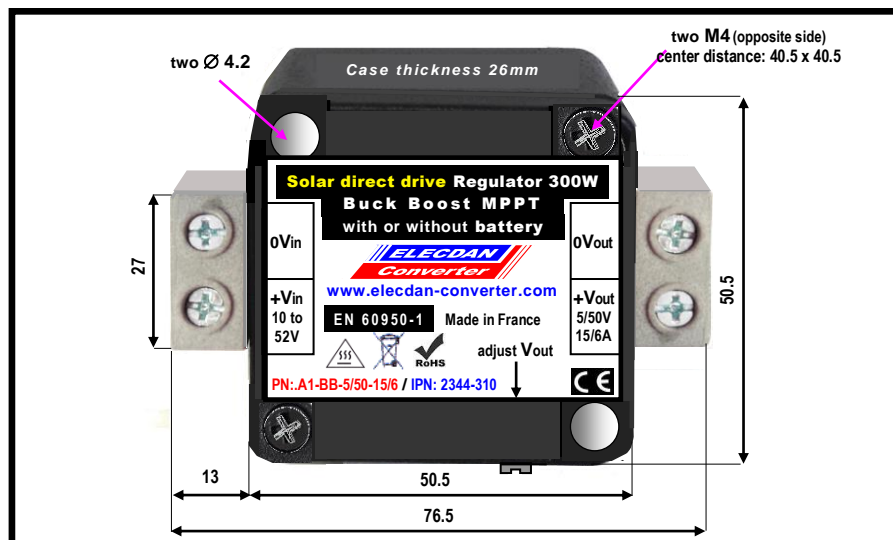
Options: custom output voltages; plug-in voltmeter; molded-wire outputs; heatsinks with lower Rth.

Standards and special features: EN / UL / CSA / 60950-1 / RoHS; MTBF: > 10⁶ hours, base at 50°C (with thermal grease)

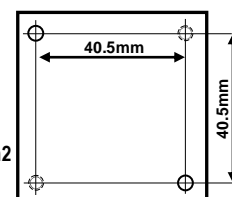
Specialized since 1974 in electrical energy conversion, analog calculation and signal processing, over the past 5 years we have also been studying and testing our innovative MPPT (breakthrough technique and technology, new patent). We have also expanded our knowledge of green, autonomous or complementary energies. So please do not hesitate to ask us for advice if our technical data sheets are not sufficiently didactic. **Note:** we are also involved in the development of ultra-light photovoltaic panels, with the option of an inbuilt MPPT controller, 150 or 300W.

For initial information, see data sheets "5116" ①, "5088" ② et "6154" ③

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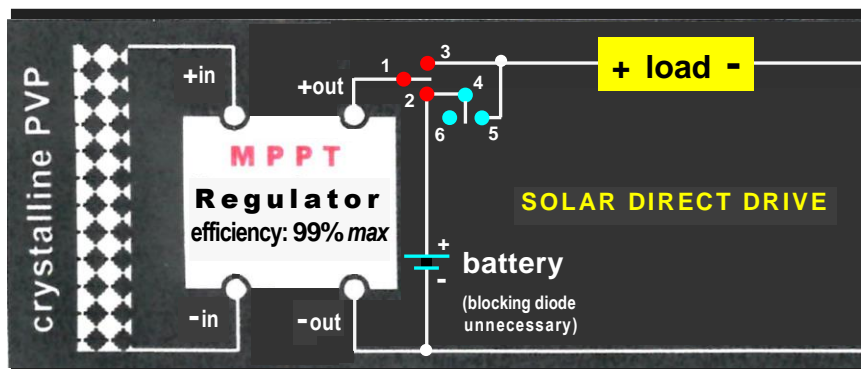


Case: molded aluminum
 ➤ 51 x 51 x thickness 26
 ➤ weight: 140g (without heatsink)
 Terminal blocks: screw + clamp
 with maximum wire cross-section 30mm²
 Fixing: two-sided (two M4)



SKU: case, type, Vout (or Vout range), İout, option

case	type	Vout (V)	Vout range (V)	İout (A)	Unit price (€)
A1	BB	12		15	
		24		12.5	
		42		7.1	
			5 / 50	15 / 6	
Some options and references			heatsink : D4 on / off : ON wired outputs: F		
Examples of references			A1-BB-24-12,5-D4 A1-BB-5/50-15/6-F		



In the absence of a battery, the torque and speed of a motor (e.g. helical pump) adapt perfectly to variations in light levels, morning, noon and evening. What's more, with a response time of < 0.1 seconds, our MPPT regulator takes the strain off mechanical transmissions: suddenly connected to a loaded motor, it supplies it with a voltage that is immediately lowered, then restored linearly in a matter of seconds.

link	link	receiver supply	battery supply
1 & 3	4 & 6	yes	no
1 & 2	4 & 6	no	yes
1 & 3	4 & 5	yes	yes

This 300W *max* regulator is the buck-boost version of our MPPT SDD range, buck or buck-boost, with power increasing, in steps from 150W up to $\geq 2.4\text{kW} / 100\text{V}$. Controlled by our innovative analog MPPT (sheet "5116" ①), it benefits from extreme reliability and miniaturization (68cm³, excluding cooling), as well as $\leq 98\%$ efficiency and IP67 sealing. These qualities, and the choice of a suitable photovoltaic panel, facilitate a wide range of Solar Direct Drive applications: refrigerator, fan, helicoidal pump, tricycle ... and even, possibly, direct installation under the aluminum edge of the photovoltaic panel.

Vin input voltage: any voltage, from 10V to 52V Pin input voltage: $\approx 10\text{W} \times \text{Vin}$ (Pin $\leq 320\text{W}$)
Vin is supplied by mono- or poly-crystalline cells (0.55V and 5W each), the number of which determines the voltage Vp and the power of the photovoltaic panel. The panel generally comprises 18, 30 or 60 cells. Example: a 18-cell panel supplies 90W at 10V. Power supplied by the panel ≥ 1.1 (Vout regulator x İout)
Vout output voltage: any, from 5V to 50V Pout output power: Pin x efficiency (İout $\leq 15\text{A}$)

PANEL		Some possibilities with the regulator (300W max)		
cells	Vp (V)	Vout (V)	İout max(A)	efficiency
18	10	5 to 44	12 / 2	0.90 / 0.93
30	16.5	24	6.5	0.96
		36	4.4	0.98
		42	3.7	0.98
60	33	24	12.5	0.98
		36	8.3	0.98
		42	7.1	0.98

Thermal characteristics:

- case thermal resistance (Rth): 7°C / W
- extreme case temperatures: -30°C to +90°C
- cooling: direct on wall or, optionally, in heatsink D4, Rth = 2°C / W

Options: custom output voltages; molded-wire outputs; heatsinks with lower Rth.

Standards and special features: EN / UL / CSA / 60950-1 / RoHS; MTBF: > 10⁶ hours, base at 50°C (with thermal grease)

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For initial information, see data sheets "5116" ①, "5088" ②, "6154" ③ and "6013" ④

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ELECDAN
Converter
600W solar regulator, buck, MPPT,
Solar Direct Drive, without battery
Vout possible: 20 to 28V, with 33V / 300W photovoltaic panels

Made in France


 22/11/23
 (6157)

Also available in 2 versions
 100 x 50 x 26 mm case:
 > terminal connections
 > wire connections
 (¼ scale)

two Ø 4.2
 Case thickness 26mm
 two M4 (opposite side)
 center distance: 40.5 x 40.5

51
 A1
 26

two 27
 50.5
 13
 50.5
 76.5

Case: molded aluminum
 > 51 x 51 x thickness 26
 > weight: 140g (without heatsink)

Terminal blocks: screw + clamp
 with max wire cross-section 30mm²
 Fixing: two-sided (two M4)

SKU: case, type, Vout (or Vout range), İout, option				Unit price (€)
boîtier	type	Vout (V)	plage Vout (V)	İout (A)
A1		24	20 / 28	25
				28 / 21
Some options and references			heatsink : D4 on / off : ON wired outputs : F	
Examples of references			A1-24-25-D4 A1-20/28-25/21-F	

MPPT Regulator
 efficiency: 99% max

SOLAR DIRECT DRIVE

crystalline PVP

In the absence of a battery, the torque and speed of a motor (e.g. helical pump) adapt perfectly to variations in light levels, morning, noon and evening. What's more, with a response time of < 0.1 second, our MPPT regulator takes the strain off mechanical transmissions: suddenly connected to a loaded motor, it supplies it with a voltage that is immediately lowered, then restored linearly in a matter of seconds.

If, however, the addition of a battery is desired, please insert two **blocking Schottky diode**, such as VS-19TQ015-M3. For a 24V battery, set Vout ≈ 27,6V.

This 600W / 24V regulator is the buck version of our MPPT SDD range, buck or buck-boost, with power increasing, in steps from 150W up to ≥ 2.4kW / 100V. Controlled by our innovative analog MPPT (sheet "5116" ①), it benefits from extreme reliability and miniaturization (68cm³, excluding cooling), as well as ≤ 99% efficiency and IP67 sealing. These qualities, combined with two suitable photovoltaic panel, facilitate a wide range of Solar Direct Drive applications: refrigerator, fan, helicoidal pump, tricycle ... and even, possibly, direct installation under the aluminum edge of the photovoltaic panel.

Input voltage Vin of the MPPT regulator and Vout
Vin is supplied by mono- or poly-crystalline cells (0.55V and 5W each), the number of which determines the voltage Vp and the power of the photovoltaic panel. The panel generally comprises 60 or 72 cells. Example: a 60-cell panel supplies 300W at 33V. > Voltage supplied by panel ≥ Vout regulator + ≈3V > Power supplied by panel ≥ 1.1 (Vout regulator x İout)
Vout : either fixed (24V) or adjustable (20 to 28V / 28 to 21A)

PANEL		Some possibilities with the regulator (600W max)		
cellules	Vp (V)	Vout (V)	İout <u>max</u> (A)	efficiency
60	33	20	28	0.98
60	33	24	25	0.99
60	33	28	21	0.99

Thermal characteristics:

- > case thermal resistance (Rth): 7°C / W
- > extreme case temperatures: -30°C to +90°C
- > cooling: direct on wall or, optionally, in heatsink D4 or D5, Rth = 0.5°C and 1°C / W

Options: custom output voltages; Vout adjustment via external resistor; outputs on molded wires

Standards and special features: EN / UL / CSA / 60950-1 / RoHS; MTBF: > 10⁶ hours, base at 50°C (with thermal grease)

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For initial information, see data sheets "5116" ①, "5088" ② "6154" ③, "6013" ④ et "6155" ⑤

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ELECDAN
Converter

600W solar regulator
boost, MPPT, Solar Direct Drive

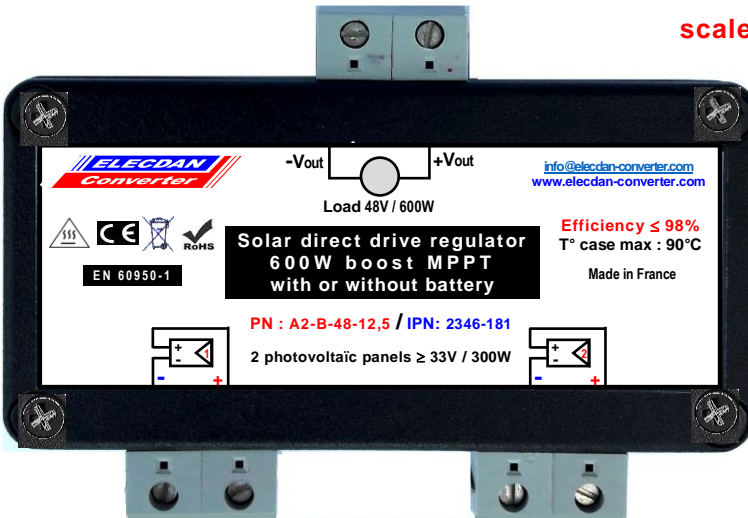
V_{out} possible : 40 to 56V / V_{in} : 33 to 52V



Made in France

13/12/23
(6158)

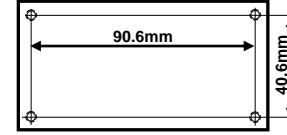




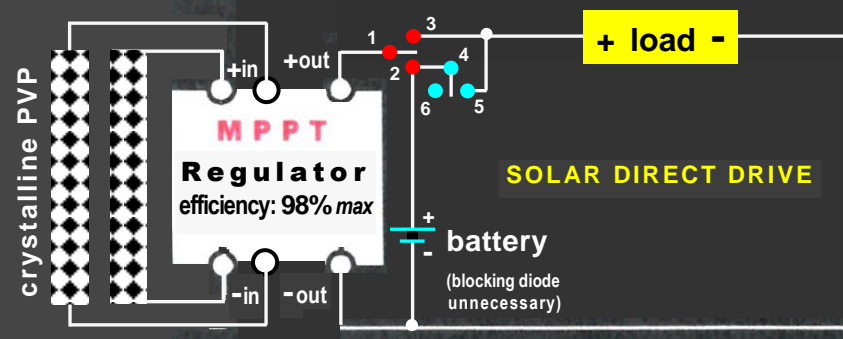
scale: 1

Case: molded aluminum
 > 100 x 50 x thickness 26mm
 > weight: 270g (without heatsink)

Terminal blocks:
 Input and output: 8 mm²
 Bottom mounting



SKU: case, type, V _{out} (or V _{out} range), I _{out} , option					Unit price (€)
case	type	V _{out} (V)	V _{out} range (V)	I _{out} (A)	
A2	B	48	40 / 56	12.5	
				12.5 / 10.7	
		56		10.7	
Some options and their references				heatsink: D4 or D5 on / off : ON wired outputs: F	
Examples of references				A2-B-48-12,5-D4 A2-B-40/56-12.5/10.7-D5	



+ load -

SOLAR DIRECT DRIVE

crystalline PVP

MPPT Regulator efficiency: 98% max

battery (blocking diode unnecessary)

In the absence of a battery, the torque and speed of a motor (e.g. helical pump) adapt perfectly to variations in light levels, morning, noon and evening. What's more, with a response time of < 0.1 seconds, our MPPT regulator takes the strain off mechanical transmissions: suddenly connected to a loaded motor, it supplies it with a voltage that is immediately lowered, then restored linearly in a matter of seconds.

link	link	receiver supply	battery supply
1 & 3	4 & 6	yes	no
1 & 2	4 & 6	no	yes
1 & 3	4 & 5	yes	yes

This 600W / 48V regulator is the boost version of our MPPT SDD range, buck or buck-boost, with power increasing, in steps, from 150W up to $\geq 2.4\text{kW}$ / 100V. Controlled by two innovative analog MPPT (sheet "5116" ①), it benefits from extreme reliability and miniaturization (130 cm³, excluding cooling), as well as 98% *max* efficiency and IP67 sealing. These qualities, and the choice of two suitable photovoltaic panel, facilitate a wide range of Solar Direct Drive applications: refrigerator, fan, helicoidal pump, tricycle ... and even, possibly, direct installation under the aluminum edge of the photovoltaic panel.

Input voltage V _{in} of the MPPT regulator and V _{out}		PANEL			Some possibilities with the regulator (600W max)	
V _{in}	V _{out}	cellules	V _p (V)	V _{out} (V)	I _{out} <u>max</u> (A)	efficiency
33V	48V	60	33	48	12.5	0.98
33V	40V	60	33	40	12.5	0.97
33V	56V	60	33	56	10.7	0.98

Thermal characteristics:

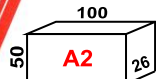
- > case thermal resistance (R_{th}): 5°C / W
- > extreme case temperatures: -30°C to +90°C
- > cooling: direct on wall or, optionally, in heatsink D4 or D6, R_{th} = 2°C and 1°C / W

Options: custom output voltages; V_{out} adjustment via external resistor; outputs on molded wires

Standards and special features: EN / UL / CSA / 60950-1 / RoHS; MTBF: > 10⁶ hours, base at 50°C (with thermal grease)

Specialized since 1974 in electrical energy conversion, analog calculation and signal processing, over the past 5 years we have also been studying and testing our innovative MPPT (breakthrough technique and technology, new patent). We have also expanded our knowledge of green, autonomous or complementary energies. So please do not hesitate to ask us for advice if our technical data sheets are not sufficiently didactic; **Note:** we are also involved in the development of ultra-light photovoltaic panels, with the option of an inbuilt MPPT controller, 150 or 300W.

For initial information, see data sheets 5116 ①, 5088 ②, 6154 ③, 6013 ④, 6155 ⑤ & 6157 ⑥ Reproduction authorized if source is acknowledged: "elec-dan-converter.com"



Fixed or adjustable load voltage, from 14V to 90V
Charging current, depending on V_{battery}: 15 to 6,8A


 14/12/23
(6161)

scale: 1

**Solar direct drive CHARGER
600W buck-boost MPPT
for Lithium Battery 14 to 90V**

Efficiency $\leq 98\%$
T° case max : 90°C
Made in France

PN : A2-BB-14/90-15/6,8 / IPN: 2347-121
2 photovoltaic panels $\geq 33V / 300W$
adjust V_{out}

Case: molded aluminum
 $> 100 \times 50 \times \text{thickness } 26$
 $> \text{weight: } 270g$ (without heatsink)

Terminal blocks:
 inputs and outputs: 8mm²
 Mounting: on base (4 M4)

SKU: case, type, V _{out} (or V _{out} range), I _{out} , option					Unit price (€)
case	type	V _{out} (V)	V _{out} range (V)	I _{out} (A)	
A2	BB	your choice		corresponding	
			14 / 90	15 to 6.8	
Some options and references			heatsink: D4 ou D5 on / off: ON wired outputs: F		
Examples of references			A2-BB-72-6.8 A2-BB-14/90-15/6.8		

MPPT Regulator
efficiency: 98% max

Load characteristics, 0,5C, of 2 Lithium Ferro-Phosphate (Li Fe PO₄) "24V" and "48V" batteries

This 600W / 90V max regulator is the multi-battery-charger version of our MPPT SDD range, buck or buck-boost, with power increasing, in steps, from 150W up to $\geq 2.4\text{kW} / 100\text{V}$. Controlled by two innovative analog MPPT (sheet "5116" ①), it benefits from extreme reliability and miniaturization (130cm³, excluding cooling), as well as 98% max efficiency and IP67 sealing. These qualities, combined with two 300W photovoltaic panels, provide optimized solar charging for 6 types of lithium batteries (from 12V to 72V), with maximum charging currents from 15A to 6.8A.

<p>Permissible input voltage V_{in} of the regulator MPPT: 33 to 52V (16.5 to 52V at half-power)</p> <p>V_{in} is supplied by mono- or poly-crystalline cells (0.55V and 5W each), the number of which determines the voltage V_p and the power of the photovoltaic panel. The panel generally comprises 60 or 72 cells. Example: 1) a 60-cell panel supplies 300W at 33V. 2/ lit at 83%, a 72-cell panel would supply 300W.</p> <p>Power supplied by the panel $\geq 1.1 (V_{\text{out charger}} \times I_{\text{out}})$</p> <p>V_{out}: either fixed (your choice), or adjustable 14V to 90V / 15A to 6.8A</p>
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2 panels		Charging current according to battery type			
cells	V _p (V)	Type	Nominal voltage (V)	Load voltage (V)	I _{load} (A)
60	33	12	12.8	14,4	15 max
		24	25.6	28.8	15 max
		36	38.4	43.2	14
		48	51.2	57.6	10.4
		60	64	72	8.2
		72	76.8	86.4	6.8

Two 30-cell panels deliver the same output voltages, but with load currents halved.
 Note: these two panels must be mounted separately (please see product label above).

The battery can be replaced by a classic receiver, for example a 72V / 600W motor.

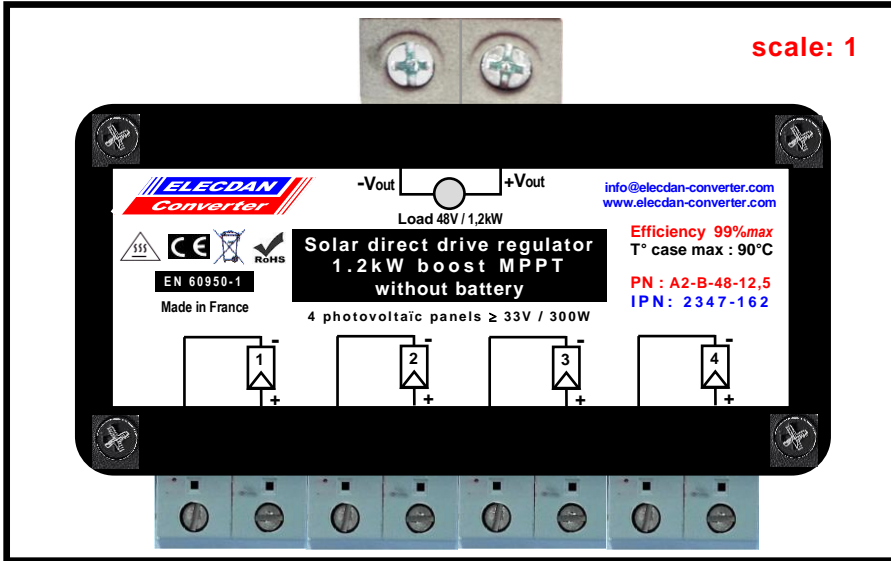
Thermal characteristics:

- > case thermal resistance (R_{th}): 5°C / W
- > extreme case temperatures: -30°C to +90°C (info: when charged, these batteries can withstand temperatures from 0 to 50°C)
- > cooling: direct on wall or, optionally, in heatsink D4 or D6, R_{th} = 2°C and 1°C / W

Options: custom output voltages; V_{out} adjustment via external resistor; outputs on molded wires.

Standards and special features: EN / UL / CSA / 60950-1 / RoHS; MTBF: $> 10^6$ hours, base at 50°C (with thermal grease)

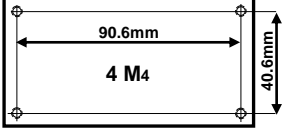
Specialized since 1974 in electrical energy conversion, analog calculation and signal processing, over the past 5 years we have also been studying and testing our innovative MPPT (breakthrough technique and technology, new patent). We have also expanded our knowledge of green, autonomous or complementary energies. So please do not hesitate to ask us for advice if our technical data sheets are not sufficiently didactic. Note: we are also involved in the development of ultra-light photovoltaic panels, with the option of an inbuilt MPPT controller, 150 or 300W.



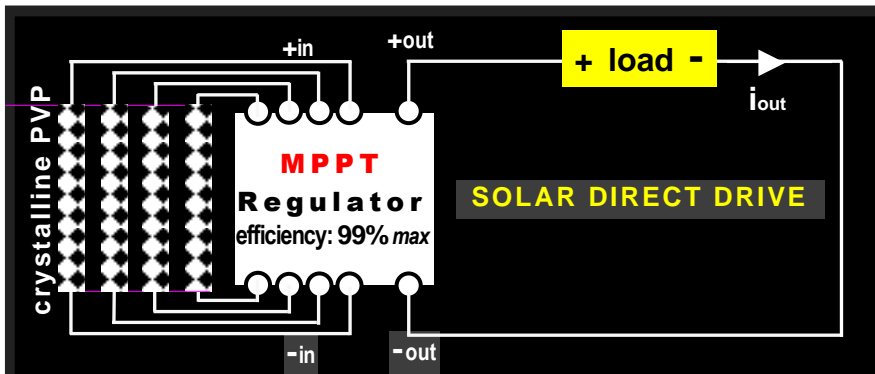
Case: molded aluminum
 > 100 x 50 x thickness 26
 > weight: 290g (without heatsink)

Terminal blocks:
 > screw inputs (8mm² wires)
 > output: screw + clamp (30mm²)

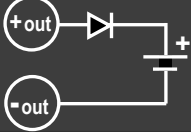
Bottom mounting (4 M4)



SKU: case, type, Vout (or Vout range), İout, option					PUHT (€)
case	type	Vout (V)	Vout range (V)	İout (A)	
A2	B	48	40 / 56	25	
		56		21.4	
		Some options and their references			heatsink: D5 on / off : ON wired outputs: F
Examples of references			A2-B-48-25 A2-B-40/56-28/21-D5		



In the absence of a battery, the torque and speed of a motor (e.g. helical pump) adapt perfectly to variations in light levels, morning, noon and evening. What's more, with a response time of < 0.1 seconds, our MPPT regulator takes the strain off mechanical transmissions: suddenly connected to a loaded motor, it supplies it with a voltage that is immediately lowered, then restored linearly in a matter of seconds.



If, however, the addition of a battery is desired, please insert two blocking Schottky diode, such as VS-MBR6045WT-N3. For a 48V battery, set Vout ≈ 55.2V.

This 1,2kW / 48V regulator is the boost version of our MPPT SDD range, buck or buck-boost, with power increasing, in steps from 150W up to ≥ 2.4kW / 100V. Controlled by two innovative analog MPPT (sheet "5116" ①), it benefits from extreme reliability and miniaturization (130 cm³, excluding cooling), as well as 99% max efficiency and IP67 sealing. These qualities, and the choice of two suitable photovoltaic panel, facilitate a wide range of Solar Direct Drive applications: air conditioning, ventilation, boating, quadricycle, inverter 1,2kW (48Vdc → 230V~) and even, possibly, direct installation under the aluminum edge of the photovoltaic panel.

Permissible input voltages Vin of the MPPT regulator: 33V to 52V

Vin is supplied by mono- or poly-crystalline cells (0.55V and 5W each), the number of which determines the voltage Vp and the power of the photovoltaic panel. The panel generally comprises 60 or 72 cells. Example: 1/ a 60-cell panel supplies 300W at 33V. 2/ lighted at 83%, a 72-cell panel would supply 300W

Power supplied by panel ≥ 1.1 (Vout regulator x İout)

Vout : either fixed 48V or 56V, either adjustable 40 to 56V

PANEL		Some possibilities with the regulator (1.2kW max)		
cells	Vp (V)	Vout (V)	İout max (A)	efficiency
60	33	40	28	0.98
60	33	48	25	0.99
60	33	56	21.4	0.99

Thermal characteristics:

- > case thermal resistance (Rth): 5°C / W
- > extreme case temperatures: -30°C to +90°C
- > cooling: direct on wall or, optionally, in heatsink D6, Rth = 1°C

Options: custom output voltages; Vout adjustment via external resistor; outputs on molded wires

Standards and special features: EN / UL / CSA / 60950-1 / RoHS; MTBF: > 10⁶ hours, base at 50°C (with thermal grease)

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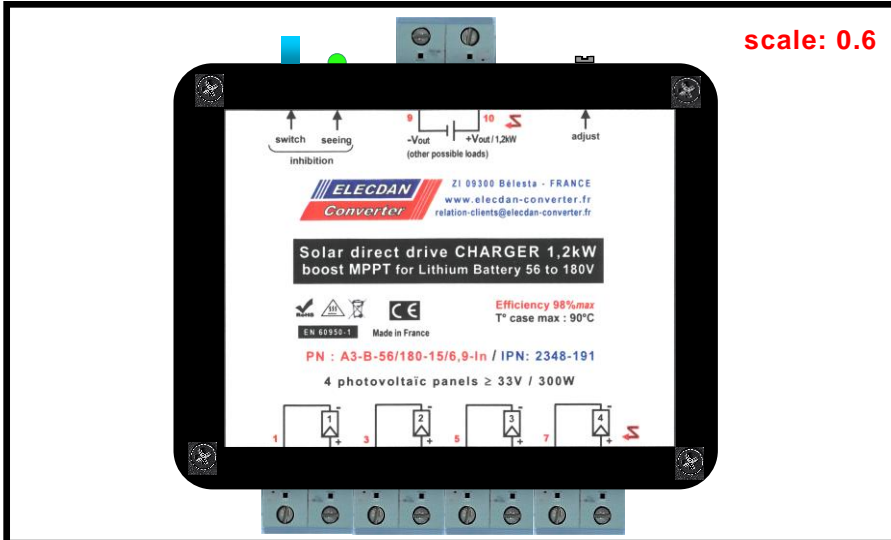
MPPT SOLAR CHARGER 1.2kW
for 48V to 144V lithium batteries

Fixed or adjustable charging voltage, from 56V to 180V
Charging current, depending on V_{battery} : 15A to 6.9A



Made in France

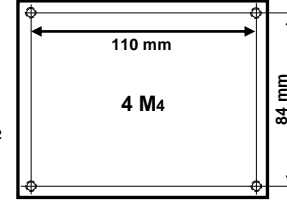
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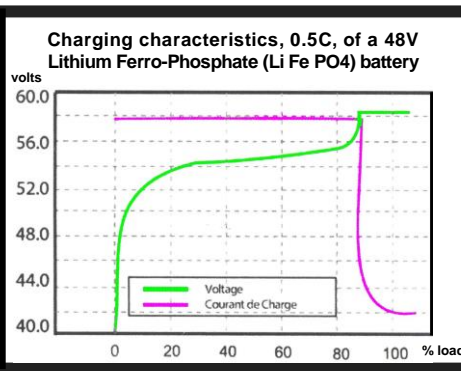
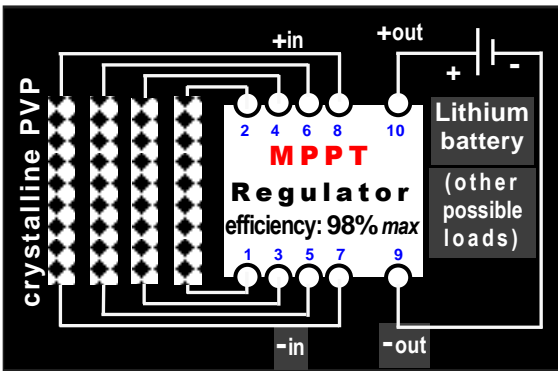
scale: 0.6

Case: molded aluminum
 > 120 x 94 x thickness 26
 > weight: 590g (without heatsink)

Terminal blocks:
 Inputs and outputs: 8mm²
 Bottom mounting (4 M4)



SKU: case, type, V _{out} (or V _{out} range), I _{out} , option					Price (€)
case	type	V _{out} (V)	V _{out} range (V)	I _{out} (A)	
A3	B	your choice		corresponding	
			56 / 180	15 to 6.9	
Some options and their references			heatsink: D6 inhibition ; In wired outputs: F		
Examples of references			A3-B-96-10.4 A3-B-56/180-15/6.9-In		



Connections "2" to "10" are at voltages increasing from 58V to 180V max and are accessible on the locking screws.

Safety precautions for installation if the panel incomings do not have individual switches upstream:

- > 1st method: protect all panels simultaneously from light before connection
- > 2nd method: opt for the "inhibit all risers" option by positioning the integrated side switch "down" (LED not lit whereas the first panel is connected).

This 1.2kW / 180V max regulator is the multi-battery-charger version of our MPPT SDD range, buck or buck-boost, with power increasing, in steps from 150W up to ≥ 2.4kW / 100V. Controlled by our innovative analog MPPT (sheet "5116" ①), it benefits from extreme reliability and miniaturization (293 cm³, excluding cooling), as well as 98% max efficiency and IP67 sealing. These qualities, and four 300W photovoltaic panel, provide optimized, customized, solar charging for 5 types of lithium batteries (from 48V to 144V), with maximum charging currents from 15A to 6.9A.

Permissible input voltages V_{in} of the MPPT regulator: 33V to 52V

V_{in} is supplied by mono- or poly-crystalline cells (0.55V and 5W each), the number of which determines the voltage V_p and the power of the photovoltaic panel. The panel generally comprises 60 or 72 cells. Example: 1/ a 60-cell panel supplies 300W at 33V. 2/ lighted at 83%, a 72-cell panel would supply 300W

Power supplied by panel ≥ 1.1 (V_{out} regulator x I_{out})

V_{out}: either fixed (your choice), or adjustable 56V to 180V / 15A to 6.8A

4 panels		Charging current by battery type			
cells	V _p (V)	Type	Nominal voltage (V)	Charging voltage (V)	I _{load} (A)
60	33	48	51.2	57.6	15 max
		72	76.8	86.4	13.9
		96	102.4	115.2	10.4
		120	128	144	8.3
		144	153	172.8	6.9

Nota: these 4 panels must be mounted separately (see label above).
 The battery can be replaced by a regular receiver;
 Example: 120V / 1.2kW motor that adapts, from morning to night, to variations in luminosity as the sun goes by.

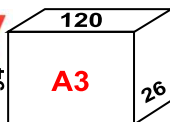
Thermal characteristics:

- > case thermal resistance (R_{th}): 2.5°C / W
- > extreme case temperatures: -30°C to +90°C (info: when charged, these batteries can withstand 0 to 50°C)
- > cooling: direct on wall or, optionally, in heatsink D7, R_{th} = 0.5°C / W

Options: custom output voltages; V_{out} adjustment via external resistor; outputs on molded wires

Standards and special features: EN / UL / CSA / 60950-1 / RoHS; MTBF maintained at > 10⁶ h (base at 50°C), thanks to the absence of chemical capacitors.

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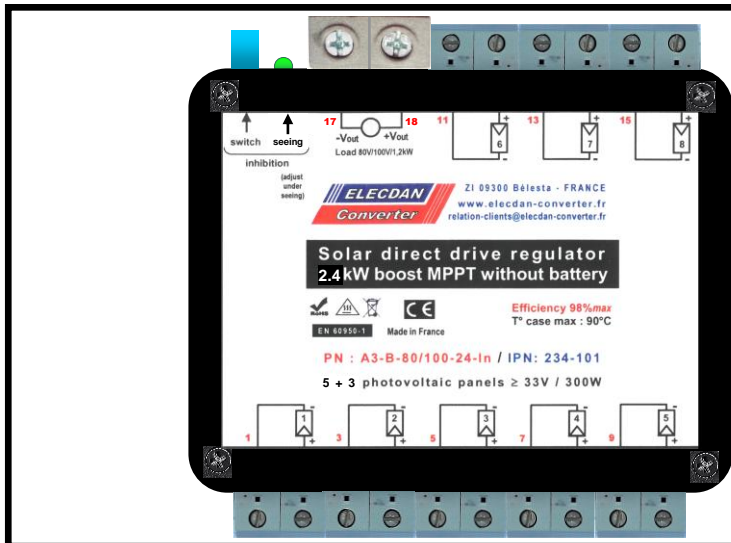


2.4kW solar boost controller Solar Direct Drive MPPT, without battery

V_{out} possible: 80 to 100V with
33 V / 300W photovoltaic panels

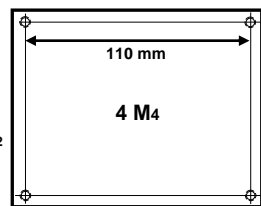


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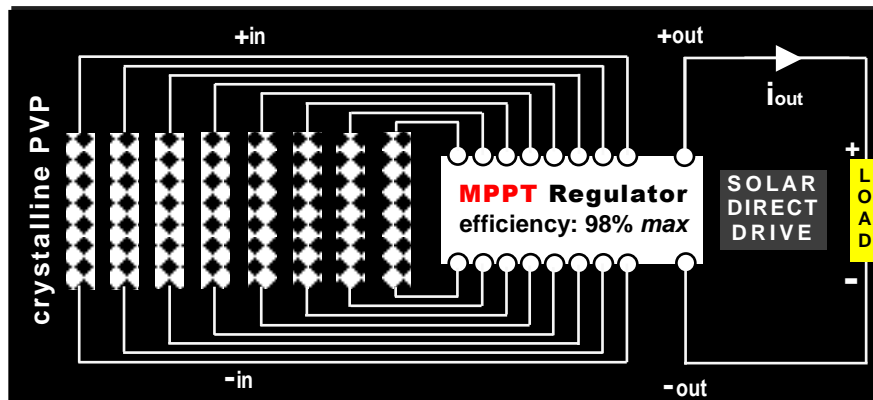


scale: 0.6

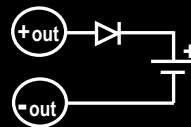
Case: molded aluminum
> 120 x 94 x thickness 26
> weight: 590g (without heatsink)
Terminal blocks:
Inputs and outputs: 8mm²
Bottom mounting (4 M4)



SKU: case, type, V _{out} (or V _{out} range), I _{out} , option					Price (€)
case	type	V _{out} (V)	V _{out} range (V)	I _{out} (A)	
A3	B	100		24	
			80 / 100	24	
Some options and their references			heatsink: D6 inhibition: In wired outputs: F		
Examples of references			A3-B-100-24-In A3-B-80/100-24		



In the absence of a battery, the torque and speed of a motor (e.g. helical pump) adapt perfectly to variations in light levels, morning, noon and evening. What's more, with a response time of < 0.1 seconds, our MPPT regulator takes the strain off mechanical transmissions: suddenly connected to a loaded motor, it supplies it with a voltage that is immediately lowered, then restored linearly in a matter of seconds.



If, however, the addition of a battery is desired, please insert a blocking diode, such as DSEK 60-02AR. For a 72V lithium battery, set V_{out} ≈ 86.4V.

This 2.4kW / 100V, boost, miniaturized (no chemical capacitors), IP67 waterproof and very high-efficiency regulator completes our Solar Direct Drive range (150W, 300W, 600W, 1.2kW, 2.4kW). Its 4 innovative MPPTs optimize the electrical energy of 4 pairs of 300W panels, positioned independently in pairs. These qualities facilitate the most diverse uses, from morning to evening: air conditioning, stirring stagnant water, water desalination, boating, electric vehicles, 2kW inverter (100Vdc → 230V~), charging lithium batteries (72V or 84V) by adding a diode (see diagram above).

Permissible input voltages V _{in} of the MPPT regulator: 33V to 52V
V _{in} is supplied by mono- or poly-crystalline cells (0.55V and 5W each), the number of which determines the voltage V _p and the power of the photovoltaic panel. The panel generally comprises 60 or 72 cells. Example: 1/ a 60-cell panel supplies 300W at 33V. 2/ lighted at 83%, a 72-cell panel would supply 300W
Power supplied by panel ≥ 1.1 (V _{out} regulator x I _{out})
V _{out} : either fixed 80V or 90V or 100V, or adjustable 80 to 100V

8 PANELS		Some possibilities with the regulator (2.4kW max)		
cells	V _p (V)	V _{out} (V)	I _{out} max (A)	efficiency
60	33	80	24	0.97
		90		0.98
		100		0.99

Connections "2" to "18" are at voltages increasing up to 100V and are accessible on the locking screws.
Safety precautions for installation if the panel incomings do not have individual switches upstream:
> 1st method: protect all panels simultaneously from light before connection
> 2nd method: opt for the "inhibit all risers" option by positioning the integrated side switch "down" (LED not lit whereas the first panel is connected).

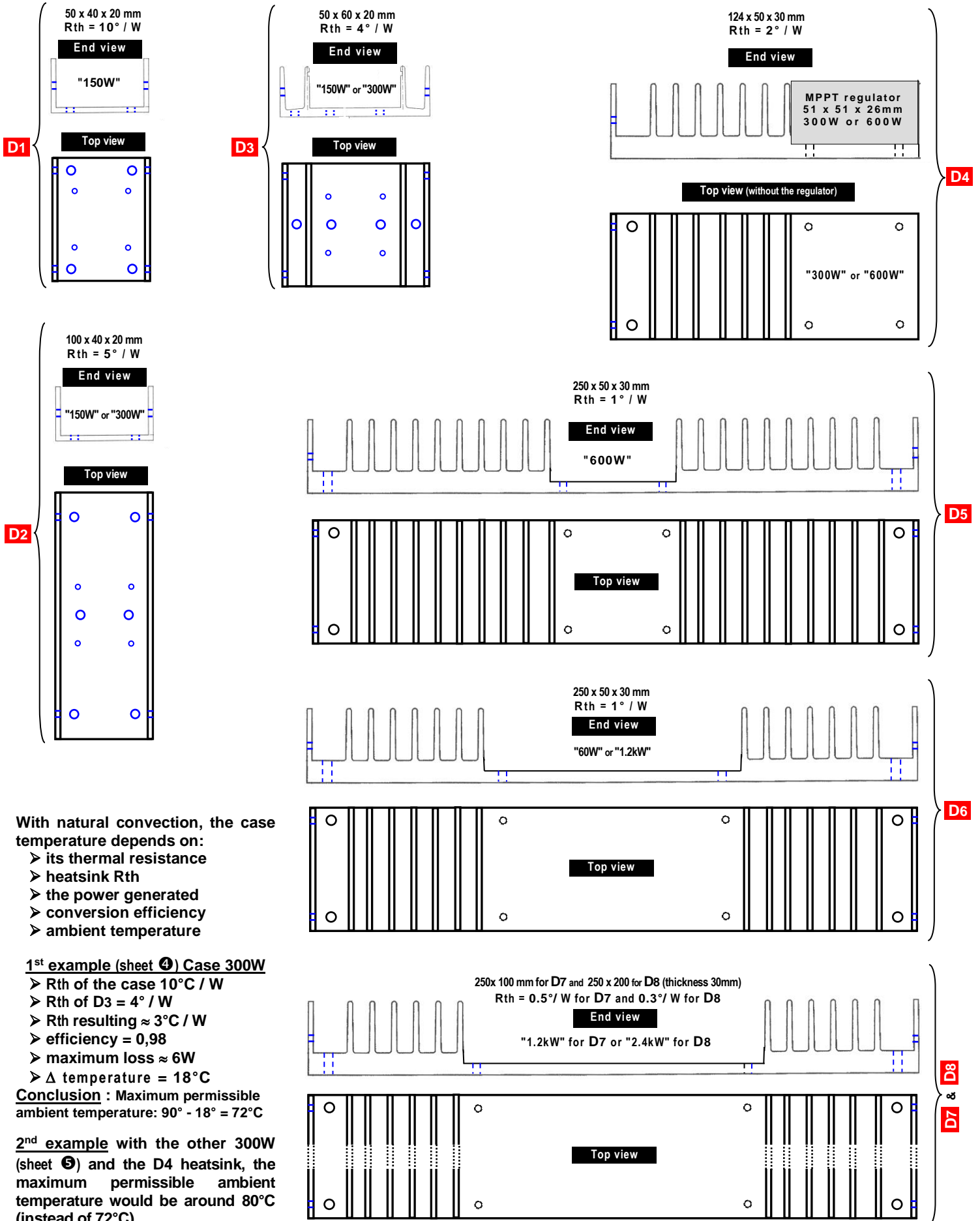
Thermal characteristics

- > case thermal resistance (R_{th}): 2.5°C / W
- > extreme case temperatures: -30°C to +90°C
- > cooling: direct on wall or, optionally, in heatsink D7, R_{th} = 0.5°C / W

Options: custom output voltages; V_{out} adjustment via external resistor; outputs on molded wires
Standards and special features: EN / UL / CSA / 60950-1 / RoHS; MTBF > 5.10⁵ h (base at 50°C), thanks to the absence of chemical capacitors.

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Flat or side-mounted heatsinks for inserting MPPT controllers (scale 1/2)
for use when a thermally conductive mounting base is not available (detailed drawings, scale 1, on request)



With natural convection, the case temperature depends on:

- its thermal resistance
- heatsink Rth
- the power generated
- conversion efficiency
- ambient temperature

1st example (sheet 4) Case 300W

- Rth of the case 10°C / W
- Rth of D3 = 4° / W
- Rth resulting ≈ 3°C / W
- efficiency = 0,98
- maximum loss ≈ 6W
- Δ temperature = 18°C

Conclusion : Maximum permissible ambient temperature: 90° - 18° = 72°C

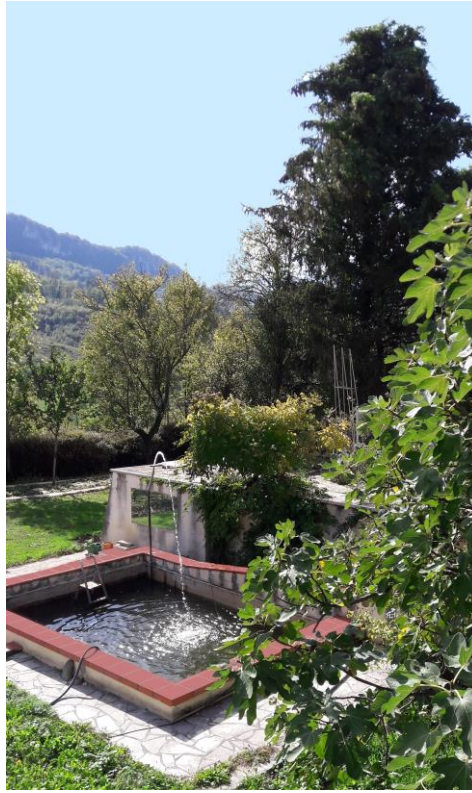
2nd example with the other 300W (sheet 5) and the D4 heatsink, the maximum permissible ambient temperature would be around 80°C (instead of 72°C).

Note: the thickness (≤ 30mm) of our heatsinks (and MPPT regulators) means that, if desired, they can be placed directly against the panel's aluminum frame, secured by the 2 pre-drilled side holes.

"Parabolic" water jet
 High luminosity (80 000 lumens)
 Full sunl (around 2pm)



**Watering basin containing
 Standing water (overview)
 Rainwater harvesting**



**Water jet still notable and
 at low luminosity (8000 lumens)
 in the absence of sunlight**



Interest of this purification system

By channeling the water to the desired height, we obtain a "cascade effect" with a double action (see photos):

- better oxygenation of the water sprayed during the descent
- agitation of the water surface when it falls down

Without forgetting that the water is first subjected to a first mixing in the helicoidal screw of the pump.

Optimization of the energy that the photovoltaic panel (flexible or rigid) supplies to the pump, thanks to the **ELECDAN-CONVERTER MPPT controller (Solar Direct Drive)**

Particularities of the Solar Direct Drive MPPT Regulator from **ELECDAN-CONVERTER**

It is not necessary to use a battery; moreover, it would reduce the cost and reliability of the installation, its efficiency and its flexibility. On the other hand, a SDD MPPT controller (SDD = Solar Direct Drive) of reduced dimensions (51 x 51 x 26 mm or 39 x 32 x 23 mm), which can be fixed directly under the photovoltaic panel, allows the pump's flow from sunrise to sunset, by modifying the speed and the torque of the pump axis.

"Classic" rigid photovoltaic panel

- mono or polycrystalline 60 cells
- dimensions : 1 x 1.5 m
- power : 300 W
- weight : 20 kg

NB : a flexible panel (like the one of the picture) has practical advantages related to its weight of 5kg (instead of 20kg): handling, installation, choice of support and possible displacement.



Helical pump 320W / 24V

(sold in stores or on the Internet, generally from 60 to 100€)

Its shape is simple (cylindrical, Ø 78mm, length 450mm ; weight 3,8kg).

Connection of the output from above.

Examples of possible fixings:

- against a pole driven into the ground
- on a pierced base (example: a simple stool) placed on a hard floor.



Universal buck-boost solar controller 450W max, with MPPT, powering a motor and/or a battery

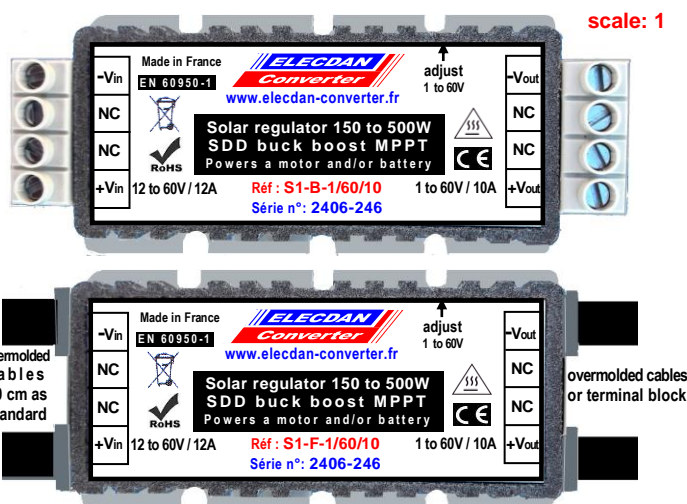
Any input voltage from 12V to 60V
Adjustable output voltages, max range: 1V to 60V



Made in France

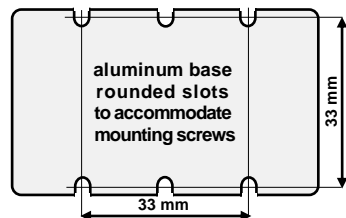
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(6183)

2 presentations for a same powerhouse of performances

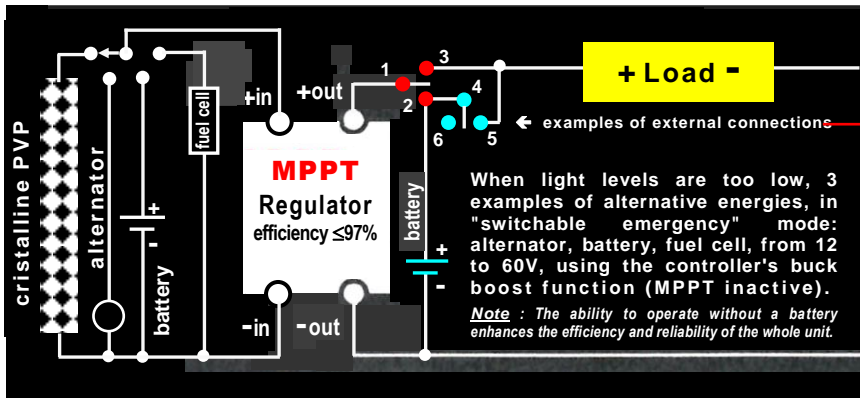


scale: 1

- Case: aluminum and PA12 65 x 29 x 16mm / 30cm³
- Base: aluminum; 61 x 37 x 3mm
- Set: 65 x 37 x 19mm; weight: 90g
- Screw terminals (B) or wires 4mm²(F)
- Mounting: 4 M3 ; spacing 33 x ≥ 33mm
- Setting Vs: inbuilt trimmer (10-round-axis)



SKU: case, type, Vout (or Vout range), İout, option					Price (€)
case	type	Vout (V)	Vout range (V)	İout (A)	
S1	Terminals: B Wires: F	value on demand	24 to 30	10	
			36 to 48		
			40 to 60		
			1 to 60		
Some options and their references			limitable current: L on / off ; ON external settings: R		
Examples of references			S1-B-40/60/10 S1-F-36/48/10		



In the absence of a battery :

1st example: the torque and speed of a motor (e.g. helical pump) adapt perfectly to variations in luminosity morning, noon and night,

2nd example: on a SDD solar bicycle, equipped with a simple 48V / 250W motor, the contribution of solar energy eliminates or complements muscular effort. In addition :

1/ the "1 to 60V setting" option, via an external resistor, enables the "manual gas pedal" function

2/ the "ON / OFF" option, via push-button, enables or disables motor power supply (safety).

link	link	receiver supply	battery supply
1 & 3	4 & 6	yes	no
1 & 2	4 & 6	no	yes
1 & 3	4 & 5	yes	yes

This MPPT solar controller, delivering up to 450W (600W in "switchable backup" mode), is the latest addition to our range of solar controllers, from 150W to 2.4 kW. Its universal feature sets it apart:

- 1/ A very wide range of input and output voltages, and easy, immediate set-up.
- 2/ Direct use of photovoltaic panel at voltages higher or lower than its output voltage.
- 3/ Its self-powered MPPT allows battery-free operation, even in low light conditions, in order to continue driving a motor in under-powered mode or to recharge a completely discharged battery (if any).
- 4/ High automatic modulation of the selected output voltage, 60V max, which can be reduced to 1V in case of high inrush current or very low luminosity (see table above: Vout at requested value and suggested Vout ranges).
- 5/ Its conversion efficiency, independent of thermal variations of the photovoltaic panel.
- 6/ Automatic restart after high inrush current, potential mechanical blockage, short-circuit, overheating, intense electromagnetic disturbance (climatic one or malicious one in the intent of energy neutralization).
- 7/ Total elimination of chemical capacitors, resulting in extreme reliability and miniaturization.
- 8/ The choice of an operating temperature range (-30°C to +100°C), for all components.

Permissible input voltage Vin : 12 to 60V (65V at no load), from (except in "emergency" mode) 30 to 100 crystalline cells (generally at Vmpp = 0.55V / 5W, at a temperature of 25°C) making up the standard or special photovoltaic panel.

Input current : limited to 12A, it determines Pin (Pin) max = Vin x 12A, hence output power (Pout) = Pin x efficiency (≤97%). Please note, moreover, that input power depends on the 5W (generally) of each cell and their number. Example: with 100 cells, Vin = 55V, Pin = 5W x 100 = 500W (brightness 100%) → P output = 500W x ≤0.97

Protections ➤ IP67 molding (shock, vibration, humidity); output current limited to 10A (overload and short-circuit)
➤ protection of the transmission mechanics: descent to 1V and gradual rise after a sudden connection

Thermal characteristics ➤ case thermal resistance: 6°C / W; case temperature extremes: -30°C to +90°C
➤ easy cooling on a simple thermally conductive surface

Options : ON/OFF. Output current limitable from 1A to 10A. External voltage and current settings via resistors.

Notes ➤ In CHARGE REGULATOR mode for 12V, 24V, 36V, 48V lithium batteries, their inbuilt BMS "Battery Management System" and user-selectable max charge voltage secure the battery's min and max voltages. The CHARGE REGULATOR can even be mounted (on an insulated cooler support) with the 2 battery terminals.
➤ Powered by independent panels, these controllers can be connected in series or in parallel.

Standards and specifications : EN/UL/62368/RoHS; MTBF > 5.10⁵ h, thanks to the absence of chemical capacitors (base at 50°C).

See also sheets : 1 "5116", 2 "5088", 3 "6154", 4 "6013", 5 "6155", 6 "6157", 7 "6158", 8 "6161", 9 "6163", 10 "6165", 11 "6168", 12 "6171", 13 "6173" Heatsinks, 14 & 15 various suggestions and applications

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