

VARIABLE **S**PEED **CO**NTROLLER Solar

The inverter for solar pumping applications



VASCO Solar - VArIable Speed COntroller inverters are designed to power traditional **pumping systems using solar energy.** This way it is possible to convert old systems into renewable energy installations or to use the same AC pumps to create independent, cost-saving and environmentally sustainable water systems.

The device is able to convert DC voltage coming from solar panels into AC voltage for powering any pump driven by a three-phase motor.

Pump speed is constantly adapted to available solar irradiation thus maximising the amount of pumped water and making possible operation even in conditions of low sunlight.

The device also offers complete pump protection against surges, overloads and dry running.



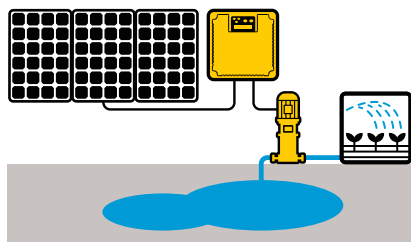
Designed to resist

VASCO Solar - VArIable Speed COntroller is built entirely of aluminium to ensure maximum cooling and durability. All other metal parts are made using AISI 304 stainless steel and therefore resistant to corrosion.

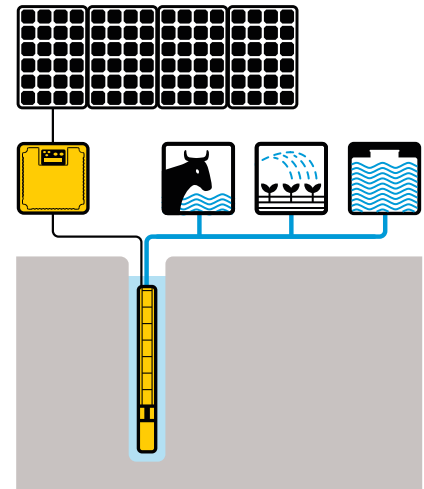
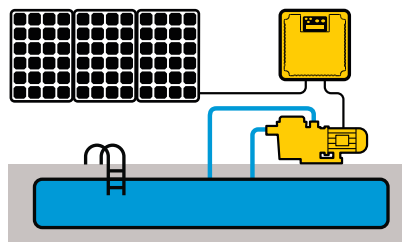
Two independent external fans and an internal fan provide perfect cooling. Their operation is adjusted according to actual thermal conditions, thus extending life.

VASCO Solar - VArIable Speed COntroller can be used with any type of traditional AC pump, thereby offering maximum flexibility in several areas of application.

When using surface pumps, device can be used for an irrigation system drawing water from a nearby water supply, or powering a pool pump at no cost.



When using submersible pumps, it is possible to fill tanks for watering livestock or simply irrigate lawns or crops.

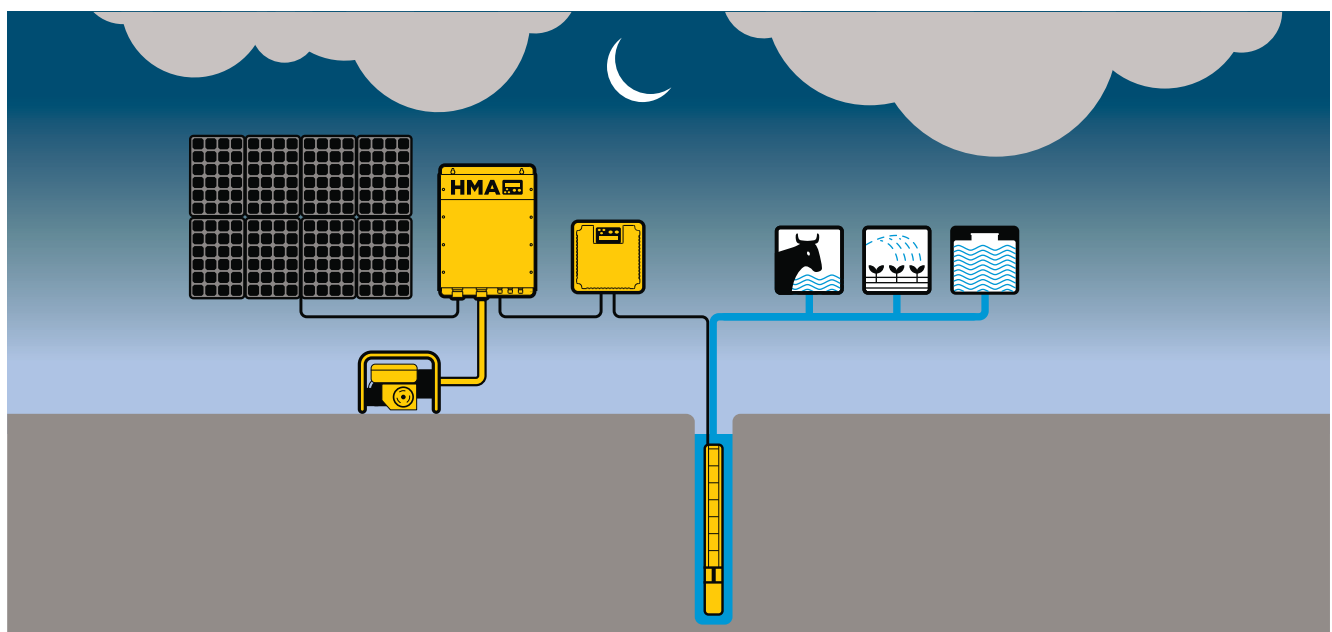


The inverter, in MP (MultiPower) version, can be powered in DC by solar panels or in AC by network or generator

to ensure the functioning of the pump at any hour of the day. This controls the peaks of water demand using AC input to avoid the oversizing of the photovoltaic system. HMA accessory,

used in combination with Solar MP models, manages independently the exchange from a source of energy to another on the basis of several options that can be select by the user:

- irradiance level
- hour of the day
- achievement of the requested daily range
- remote control trough digital command



COMBO Group Control

Function to enable multiple VASCO Solar - VArIable Speed Controller Pump Inverters to work in parallel.

Up to 8 VASCO Solar - VArIable Speed Controller units can be connected in parallel to maximize system efficiency.

The function realizes parallel operation of pumps using advance energy management algorithm and optimizing pump operation as per available PV Power.

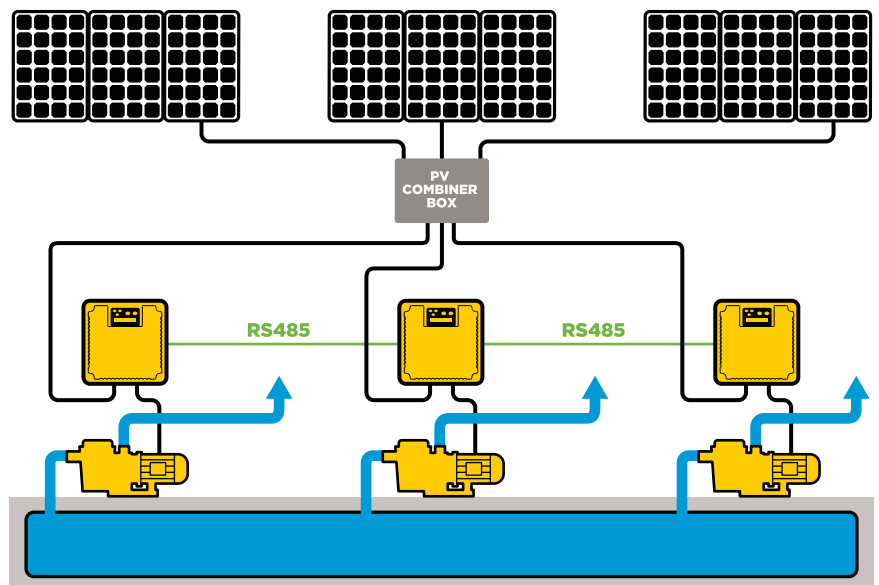
VASCO Solar - VArIable Speed Controller Inverters can be connected to a supervisory computer with a remote terminal (RTU) in supervisory control and data acquisition (SCADA) systems via Modbus over RS485 links.

COMBO Group Alternance Function

The COMBO group function allows alternating between the inverters connected in parallel in order to allow equal use of each pump in the group; master will reorganize the starting priority of the pumps by checking the life of each of them.

COMBO Group Synchrony Function

With this parameter it is possible to activate the synchronous operation (same speed) of the pumps in COMBO.

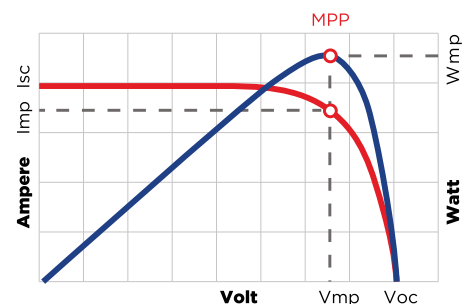


MPPT: always the maximum power available

Based on the varying conditions of solar irradiation and temperature, MPPT (Maximum Power Point Tracking) maximises the electrical power drawn from the panels and therefore the amount of water pumped.

The greater the solar irradiation the faster the pump's rotation speed, and consequently water flow increases.

When solar irradiation decreases (due to clouds or the different times of day), the pump reduces frequency and therefore the flow, but it continues to provide water until the irradiation falls below a minimum level necessary to ensure operation.



Advanced connectivity

It is possible to connect:

- An alarm
- A motor run/stop signal
- A pressure sensor or a flow sensor for monitoring
- Up to four digital inputs for pump start and stop (float switch, level sensors, etc.)
- Modbus RTU

Complete pump protection

The device is able to protect the pump against overload and dry running. Dry running protection is performed by monitoring the motor's power factor and therefore probes are not required. The device also protects itself against surges and overheating.

Monitoring parameters

The inverter is equipped with a backlit alphanumeric display and is designed to monitor key electrical parameters like input voltage, power, current and motor power factor. It is also possible to connect a pressure or flow sensor to monitor performance levels.

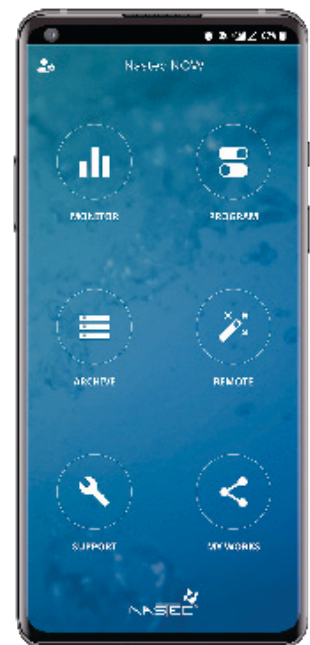
In the diagnosis menu are recorded inverter and motor hours, operation statistics, and the last eight alarms occurred. The programming menus are password-protected to prevent unwanted tampering.



Unmatched user experience

Thanks to the Nastec NOW app it is possible to communicate with all Nastec SMART Bluetooth® devices in order to:

- Monitor multiple operating parameters simultaneously on the wide, high-definition colour screen of your smartphone or tablet.
- Get energy consumption statistics and check the alarm log.
- Develop programs, save them in the archive, copy them to other devices and share them among multiple users.
- Create reports with the possibility of adding notes and images, and email or store them in the digital archive.
- Remotely control a Nastec device via Wi-Fi or GSM by tethering to a nearby smartphone.



PV system sizing

The pumping system must be designed taking into account the required daily flow rate, total head and the installation site. In particular, the choice of the pump must be made considering the average daily solar irradiation. Once the appropriate pump has been identified, it is necessary to know:

- Rated pump power (P2)
- Electrical motor power (P1). P1 can be derived by dividing P2 by motor efficiency.
- Rated motor current
- Rated motor voltage
3 x 230 VAC or
3 x 400 VAC

The inverter model to be used is determined by considering voltage and rated motor current. To ensure maximum performance, the solar system - consisting of one or more strings of solar panels connected in series - must provide:

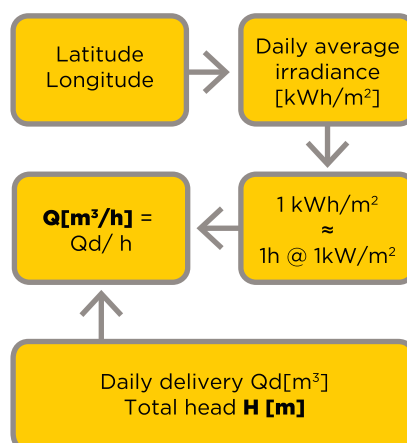
Electrical motor power (P1). The photovoltaic power (Wp) must be at least equal to the

electric motor power (P1). Typically, taking into account the efficiency loss due to panel temperature, it is recommended to increase Wp by 15% with respect to P1.

Rated motor voltage.

The rated voltage of each string of solar panels (Vmp) must be at least equal to the rated motor voltage multiplied by the factor 1.4.

The open-circuit voltage of each string (Voc) must be less than inverter's maximum operating voltage.



Example

Pump nameplate.

- Rated motor power: P2 = 3 kW
- Electric motor power: P1 = 4 kW
- Rated motor current: 8.3A
- Rated motor voltage: 3x400VAC

Model selection.

The rated motor voltage being 400 VAC and the rated current 8.3 A, the most suitable model for the application is VS409.

PV system sizing.

PV panels used:

- Wp = 240 W
- Vmp = 30 VDC
- Voc = 37 VDC
- Imp = 8 A

Since P1 = 4 kW the required electrical power is increased by 15% so Wp = 4.6 kW.

To develop 4.6 kW 19 panels of 240 W are needed.

Vmp = 19 x 30 = 570 VDC is greater than the rated motor voltage multiplied by 1.4 (400 x 1.4 = 560 VDC) and Voc = 19 x 37 = 703 VDC is less than the maximum voltage of VS409 (850 VDC).

For this reason a single string of 19 panels can be installed.

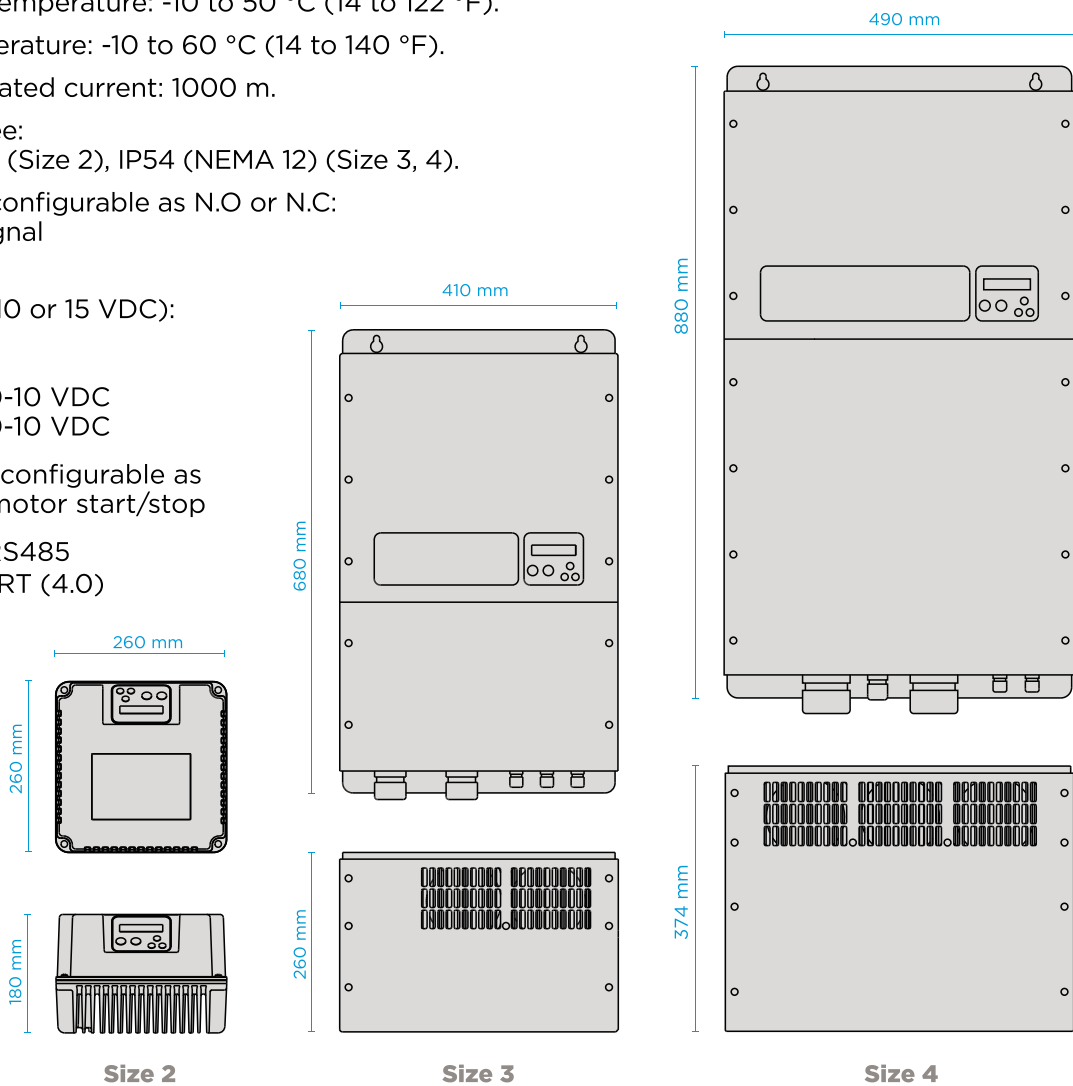
Technical specifications

Model	Vin DC VDC	Vin AC * VAC	Vin, P1 nom** VDC	Max Vout VAC	Max I out A	Typical motor P2***		Size
						VAC	kW	
VS212	160 650	3x190-520	> 320	3 x 250	12	3 x 230	2,2	2
VS409	320 850	3x190-520	> 560	3 x 460	9	3 x 400	3	2
VS412	320 850	3x190-520	> 560	3 x 460	12	3 x 400	4	2
VS415	320 850	3x190-520	> 560	3 x 460	15	3 x 400	5,5	2
VS418	320 850	3x190-520	> 560	3 x 460	18	3 x 400	7,5	2
VS425	320 850	3x190-520	> 560	3 x 460	25	3 x 400	11	2
VS430	320 850	3x190-520	> 560	3 x 460	30	3 x 400	15	2
VS438	320 850	3x190-520	> 560	3 x 460	38	3 x 400	18,5	3
VS448	320 850	3x190-520	> 560	3 x 460	48	3 x 400	22	3
VS465	320 850	3x190-520	> 560	3 x 460	65	3 x 400	30	3
VS485	320 850	3x190-520	> 560	3 x 460	85	3 x 400	37	3
VS4100	320 850	3x190-520	> 560	3 x 460	100	3 x 400	45	3
VS4118	320 850	3x190-520	> 560	3 x 460	118	3 x 400	55	3
VS4158	320 850	3x190-520	> 560	3 x 460	158	3 x 400	75	4
VS4198	320 850	3x190-520	> 560	3 x 460	198	3 x 400	93	4
VS4228	320 850	3x190-520	> 560	3 x 460	228	3 x 400	110	4
VS4268	320 850	3x190-520	> 560	3 x 460	268	3 x 400	132	4

* AC power available only for MP (MultiPower) models.
** Input voltage necessary to obtain 100% of rated motor power.
*** Typical motor power. It is recommended to refer to the rated motor current when selecting the VASCO Solar - VArIable Speed Controller model.

Electrical characteristics

- Rated ambient temperature: -10 to 50 °C (14 to 122 °F).
- Operating temperature: -10 to 60 °C (14 to 140 °F).
- Max altitude at rated current: 1000 m.
- Protection degree:
IP66 (NEMA 4X) (Size 2), IP54 (NEMA 12) (Size 3, 4).
- Digital outputs configurable as N.O or N.C:
 1. Motor run signal
 2. Alarm signal
- Analog inputs, (10 or 15 VDC):
 1. 4-20 mA
 2. 4-20 mA
 3. 4-20 mA or 0-10 VDC
 4. 4-20 mA or 0-10 VDC
- 4 digital inputs, configurable as N.O or N.C, for motor start/stop
- MODBUS RTU RS485
Bluetooth® SMART (4.0)



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