VARIABLE SPEED CONTROLLER Solar

THE INVERTER FOR SOLAR PUMPING APPLICATIONS

NASTEC®

> we move it faster >

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.

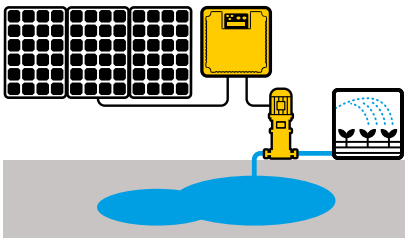
DESIGNED TO RESIST

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.

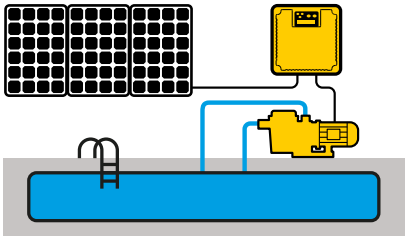
Two independent external fans and an internal fan provide perfect cooling. Their operation is adjusted according to actual thermal conditions, thus extending life.

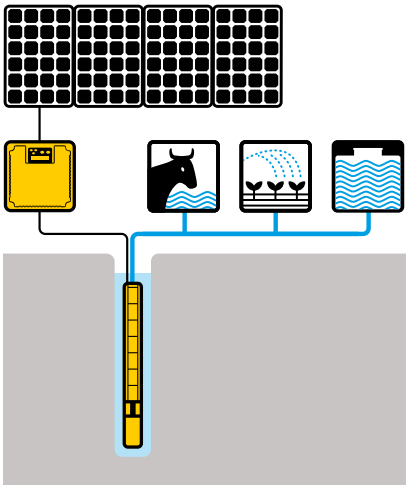
VASCO Solar - VAriable Speed COntroller CAN BE USED WITH ANY TYPE OF TRADITIONAL AC PUMP, THEREBY OFFERING MAXIMUM FLEXIBILITY IN SEVERAL AREAS OF APPLICATION.

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.



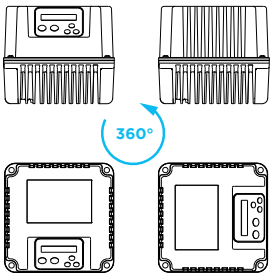


NEW KEYBOARD

- OLED graphic display with extended operating temperature range and wide viewing angle.
- Digital text rotation based on installation position.
- LED indication for standby, run, and alarm conditions.
- Audible alert in case of alarm.

ROTATING COVER

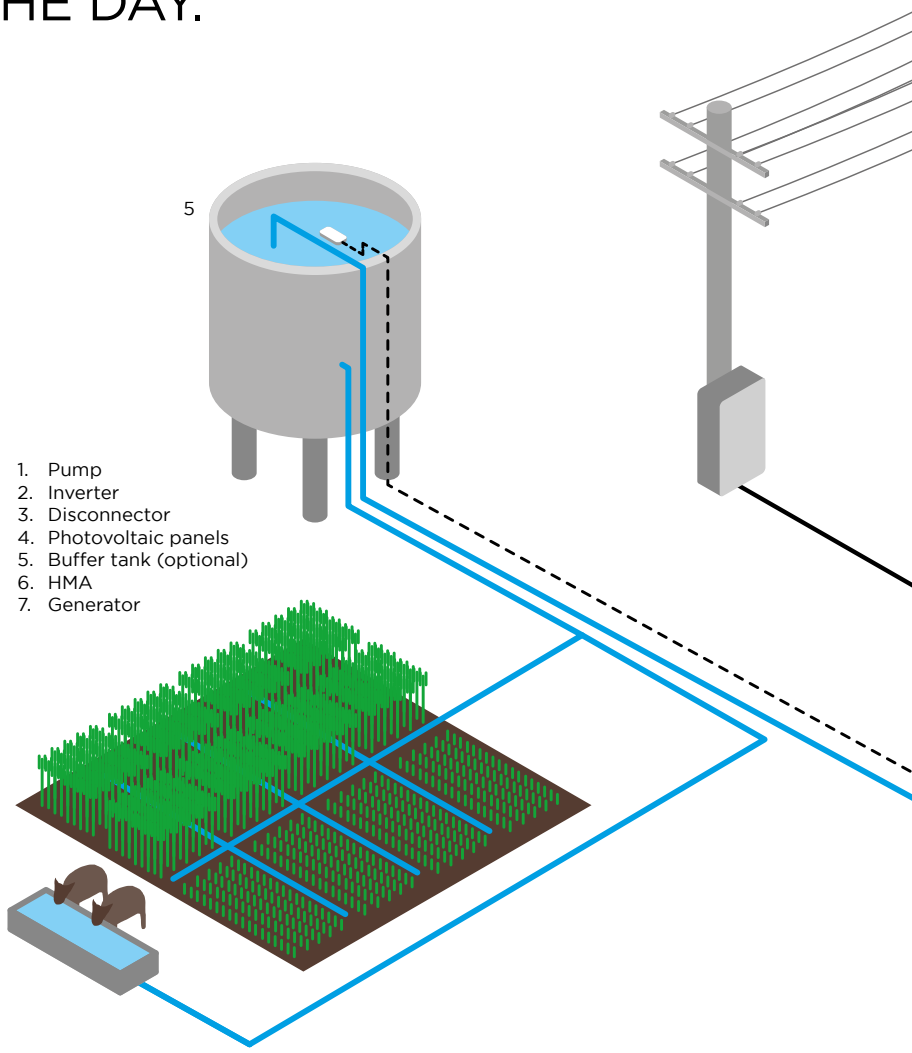
The cover and keyboard can be freely rotated in relation to the base according to installation and wiring needs.



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

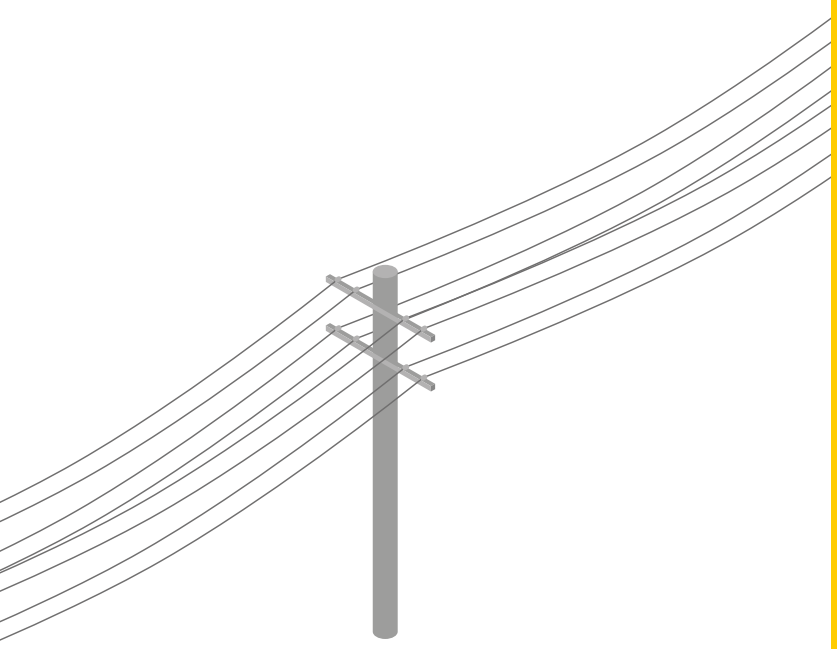


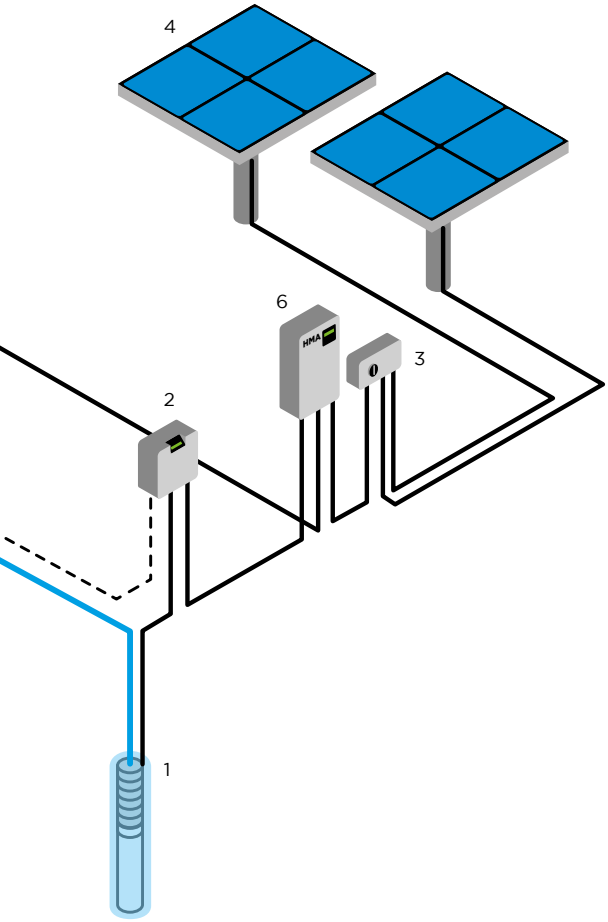
MULTIPOWER HYBRID OPERATION

In the MPH (MultiPower Hybrid) versions, available upon request for certain models, specific blocking diodes are added to the power electronics. These diodes enable the inverter to be powered simultaneously through DC (photovoltaic panels) and AC (grid or generator).

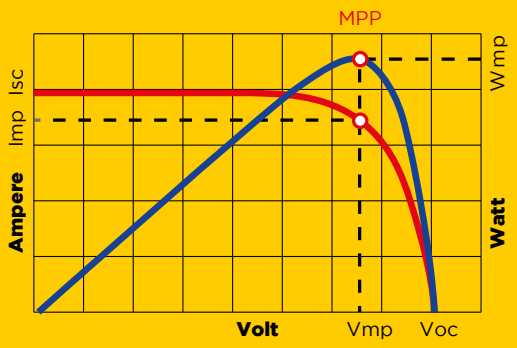
This allows the pump to be primarily driven by the solar source, with the AC contribution added in the right amount to meet operational needs.

As the two power sources are not galvanically isolated, it is necessary to install appropriate safety devices upstream of both.





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.

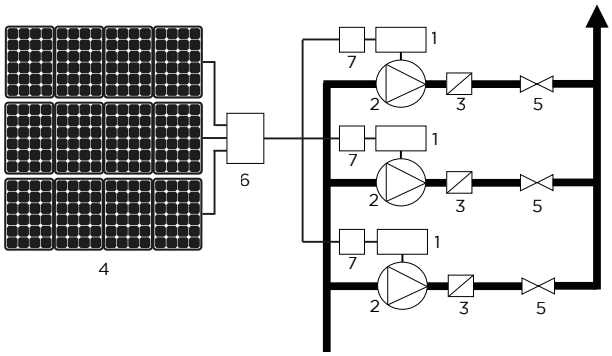
When solar irradiation decreases (due to clouds or the different times of day), the pump reduces frequency and therefore the flow, but it continues to provide water until the irradiation falls below a minimum level necessary to ensure operation.

SOLAR COMBO FUNCTIONALITY

To maximize the efficiency and reliability of a solar pumping system, instead of using a single high-power pump, it is possible to divide it into two or more pumps in parallel, each controlled by variable-speed inverters and powered by the same photovoltaic system. When the system consists of a single pump, in conditions of low irradiation, the pump is often stopped as the photovoltaic power is not sufficient to ensure its operation.

On the other hand, when the system is divided into multiple lower-power pumps, even in conditions of low irradiation, at least one or more pumps continue to operate, providing water. This results in a significant increase in the overall efficiency of the system. In addition to this, the following benefits are ensured:

- Increased system reliability, as if one pump or inverter were to malfunction, the other pumps can continue to operate.
- Uniform wear of the pumps due to the alternating operation managed by the inverters in the group.

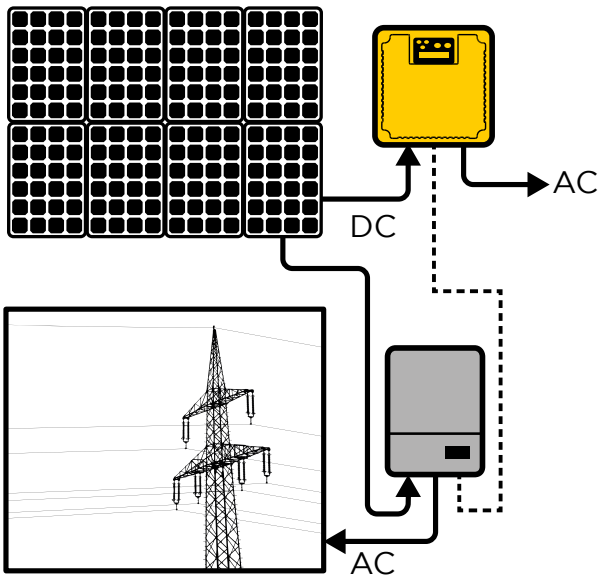


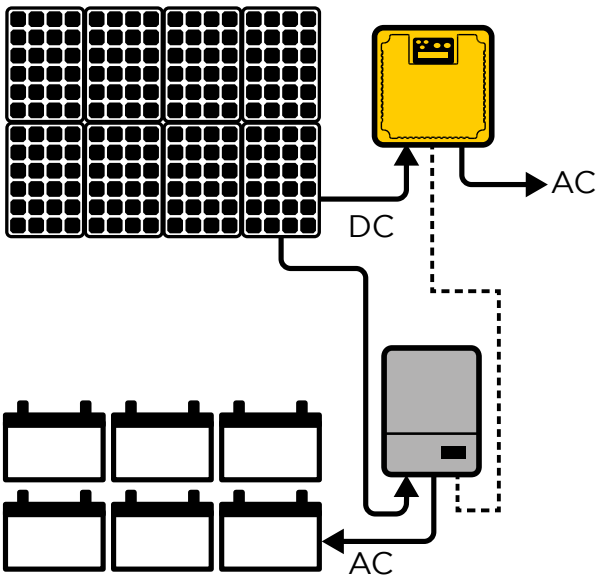
1. Inverter
2. Pump
3. Check valve
4. Photovoltaic system
5. Gate valve
6. String combiner box with protections
7. DC disconnect switch

EXTRA POWER FUNCTIONALITY

The “Extra Power” function, in combination with a grid-connected inverter or a solar charger, allows for the generation of energy into the grid or charging of batteries when the pump is not in operation or has already reached its maximum performance.

Through the dedicated relay output, the device sends a signal to the external device connected to the same photovoltaic system to enable or interrupt its operation. This ensures prioritized pumping and, secondarily, the generation of energy for the grid or charging of batteries.





MONITORING PARAMETERS

The inverter is equipped with a display 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.

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.

AUTOMATIC ADJUSTMENT

In addition to protecting the motor from overvoltage and overload, the inverter is capable of automatically adapting its performance to power and environmental conditions.

Therefore, if the ambient temperature or the current absorbed by the motor were to reach allowed limits, the inverter will automatically limit the motor frequency, ensuring continuous operation.

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

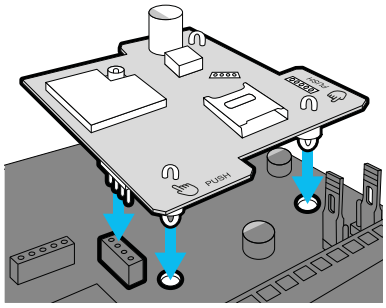
DYNAMIC PARAMETER CONFIGURATION
Modifying certain parameters often requires changing others to ensure the correct operation of the system. However, it is not always easy to know or remember the existing relationships between all parameters. For this purpose, the device can automatically adjust secondary parameters based on primary parameters, preventing users from important oversights.

CONFIGURABLE ANALOG AND DIGITAL INPUTS
Analog and digital inputs are extensively configurable based on user needs to enable the satisfaction of most applications.

ADVANCED MOTOR CONTROLS:
- Field Oriented Control (FOC) with motor autotuning.
- Control of next-generation asynchronous motors, both three-phase and single-phase.
- Sensorless control of permanent magnet synchronous motors.

DIFFERENTIATED MANAGEMENT OF ALARMS AND WARNINGS
In addition to alarms that result in the motor shutdown, the device notifies the user of possible malfunctions and, where possible and desired, implements automatic corrections to the motor control to prevent plant shutdown. Both alarms and warnings are stored in the device's history for easy reference over time.

REMOTE CONTROL VIA WIFI OR GSM
In addition to Bluetooth connectivity for control through a smartphone and app, it is possible to install a Wifi or GSM card onboard the device and manage the system remotely through the **remo.nastec.eu** portal. Therefore, there is no need to install any external communication device or subscribe to expensive telemetry services.



PREDICTIVE ANALYSIS AND REMOTE CONTROL

Through predictive analysis conducted by the device during operation, it is possible to intervene before a problem occurs, minimizing intervention and repair costs.

If the device is connected to the internet, warning or alarm notifications can be sent via email to the relevant users. To do so, a quick configuration is required through the **remo.nastec.eu** portal.

MODBUS RTU AND BACNET CONNECTIVITY AS STANDARD

The device can be connected via RS485 serial port to external control systems based on MODBUS RTU and BACnet protocols.

ALWAYS UPDATED FIRMWARE

To obtain the latest available firmware version, updated with new features and improvements, simply connect to the device via smartphone and follow the guided update process provided by the app.

This ensures that each installation is carried out with the utmost capabilities, or new functions can be added to existing systems.

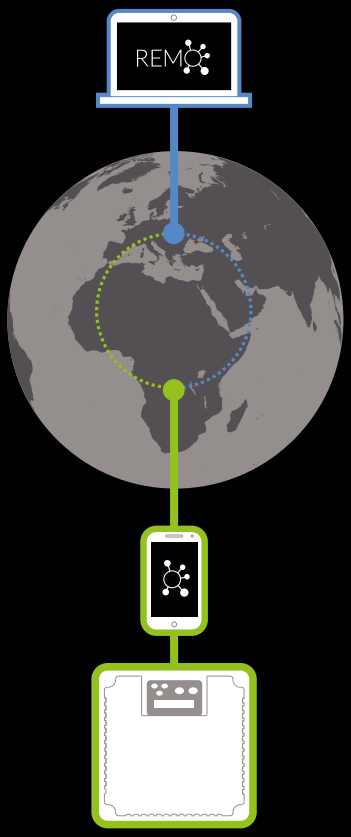
REMO

remo.nastec.eu

REMO, the revolutionary Nastec system for remote controlling devices.

To implement the REMO control system you will need to:

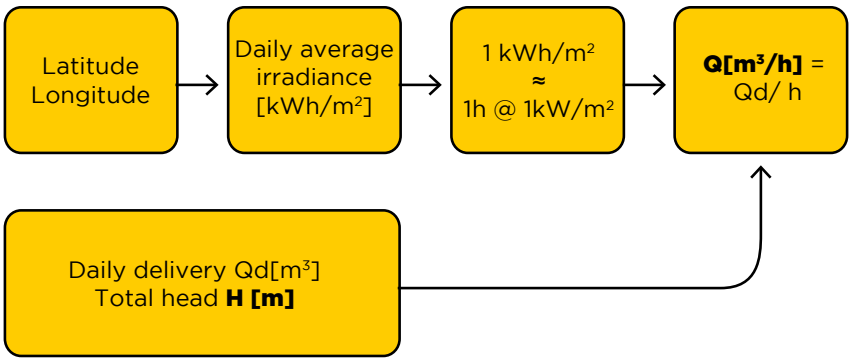
- Install an Android or iOS smartphone nearby Nastec device you wish to control. The smartphone, connected to the network via Wifi or GSM, communicates via Bluetooth with the associated Nastec device.
- Download and install Nastec NOW App on the smartphone, register for free and activate REMO mode on the App.
- From a PC or mobile, access to **remo.nastec.eu** to monitor or program the Nastec device from anywhere in the world.



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:
  8.3 A
- Rated motor voltage:
  3 x 400 VAC

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.

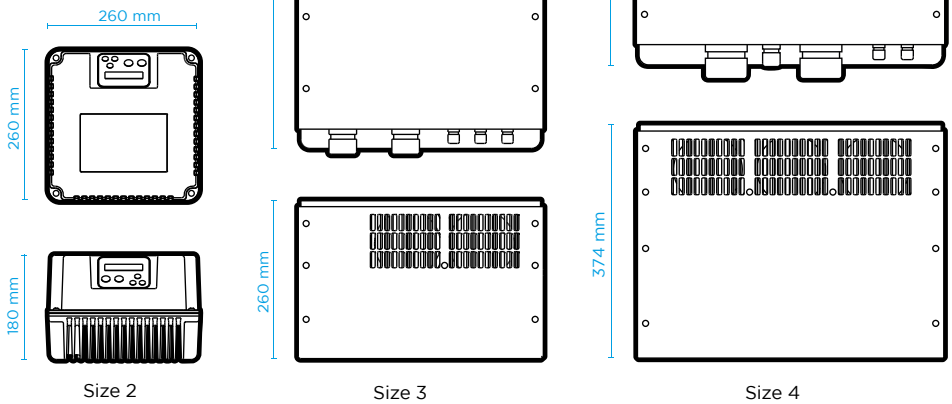
TECHNICAL SPECIFICATIONS

Model	Vin DC VDC	Vin AC * VAC	Vin, P1 nom** VDC	Max Vout VAC	Max I out A	Typical motor P2*** VAC	kW	Size
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.

GENERAL SPECIFICATIONS

- Rated frequency: 50 - 60 Hz (+/- 2%)
- EMC compliance: EN61800-3 C2 Energy Efficiency Class (EN61800-9-2): IE2
- Relative humidity in the working environment: 5 - 95% non-condensing
- Operating ambient temperature: from -10 °C (14 °F) to 60 °C (140 °F)
- Maximum operating ambient temperature at full load: 50°C (122 °F)
- Maximum altitude at full load: 1000 m
- Vibration resistance (Size 2): EN60068-2-6:2008 EN60068-2-27:2009 EN60068-2-64:2008
- Degree of protection: IP66 (NEMA 4X) Taglia 2 IP54 (NEMA 12) Taglie 3, 4
- Settable digital outputs N.O. or N.C:
  1. Motor run signal
  2. Alarm signal
  3. Extra Power signal
- Analog inputs (10 o 15 VDC):
  1. 4-20 mA
  2. 4-20 mA
  3. 4-20 mA o 0 - 10 VDC
  4. 4-20 mA o 0 - 10 VDC
- 4 digital inputs, configurable N.O. or N.C. for motor run/stop.
- RS485 MODBUS RTU, BACnet Bluetooth® SMART



Size 2 Size 3 Size 4

nastec.eu

We were born in 2007 with over 30 years of previous experience in water pumps.

We develop products dedicated to specific applications. We don't claim to do everything, but we strive to do the best at what we do.

We pay attention to details.

We love manufacturing and encourage every form of repair. That's why we offer spare parts.

We update our products while maintaining compatibility with the past.

We support our customers always and by every possible means.

We are global in sales but local in assistance.

Our mission? To make pumping systems intelligent, efficient, and connected.

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