VARIABLE SPEED CONTROLLER

Variable speed controller for pumps

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VASCO - VAriable Speed COntroller is a purpose-built family of variable frequency drives, designed to control and protect pumping systems based on changing pump speed.

Maximum compactness

VASCO - VAriable Speed COntroller units are extremely compact and, connected to any pump on the market, will manage the operation of the pump to maintain a constant desired physical dimension (such as pressure, flow, temperature or other). The pumping system runs only at the speed necessary to meet the user's requirements, ensuring energy savings and extending the life of the system.

The device also provides motor protection and monitoring, such as:

- protection against overload and dry running
- indication of input current and supply voltage
- integrated soft start and soft stop functions, extending the life of the system and reducing peak absorption
- recording running hours and loggings errors and alarms reported by the system
- controlling a second or third pump at constant speed DOL (DOL: Direct On Line)
- connect to other devices to get combined operation

From water supply for domestic, irrigation, commercial and industrial applications, to heating and air conditioning, from filtering to pressure washing, the VASCO - VAriable Speed COntroller range perfectly fits any new or existing application ensuring:

- energy and cost saving
- simplified installation
- longevity of pumping system
- greater reliability

The compact body is constructed entirely of aluminium, making he device extremely solid, lightweight and easily cooled, adding to the unit's versatility.

The IP55 degree of protection makes it possible to install the device virtually anywhere, including humid and dusty environments.

The illuminated liquid crystal display ensures that it is easy to operate, and a buzzer provides an immediate indication of alarm.

The installation is simple and intuitive, requiring just a few quick steps

- Power connection.
- Connection to the pump.
- Connection to the sensor, located wherever in the piping you want to maintain the desired constant physical dimension (pressure, flow, liquid temperature, etc.).
- Set device to configure the pump to the system and the desired performance.

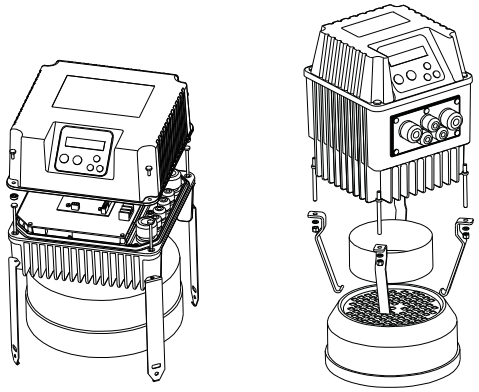
When first powering the device, a quick initial wizard is required for complete configuration of the drive. Additional parameters can be configured later by entering three different setting levels:

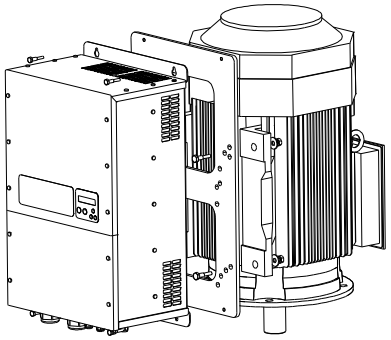
- **End user level.** The only level which can be accessed without a password. It allows the user to monitor electrical and hydraulic parameters and the status of the inverter and pump.
- **Installer level.** In this level the installer can configure the pump system to the characteristics of the hydraulic system. A password is required.
- **Advanced level.** This level allows the electrical configuration of the inverter according to the pump. Another password is required.

It can be installed directly on the motor or directly to the wall with a supplied installation kit

Motor kit

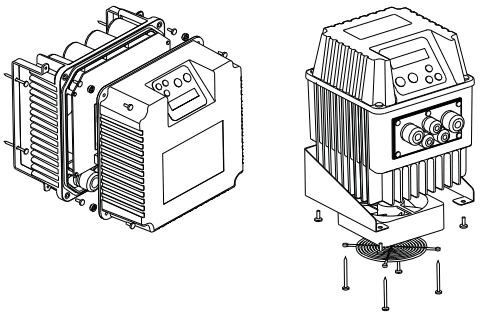
The inverter is cooled by the motor cooling fan. Motor kit consists of 4 special clamps (or flange adapter) to secure the device to the motor fan cover (or motor feet).





Wall kit

The unit is cooled by an external cooling fan attached to the inverter radiator. A special metal bracket is supplied for device to be mounted on the wall.



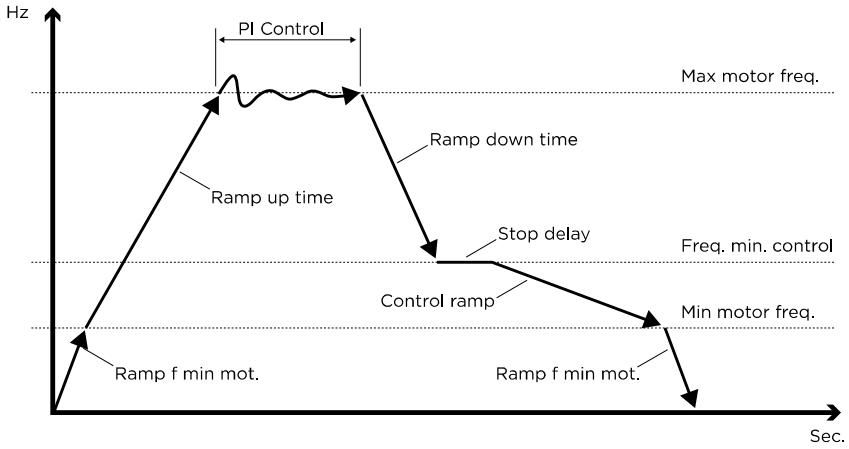
Software implemented in each drive of VASCO - VAriable Speed COntroller range is the result of a long-time experience in solving customer requests and constantly following new drive applications.

Minimum motor frequency

This parameter prevents motor operation below a certain frequency, thus avoiding damage to the thrust bearing of the submersible motors.

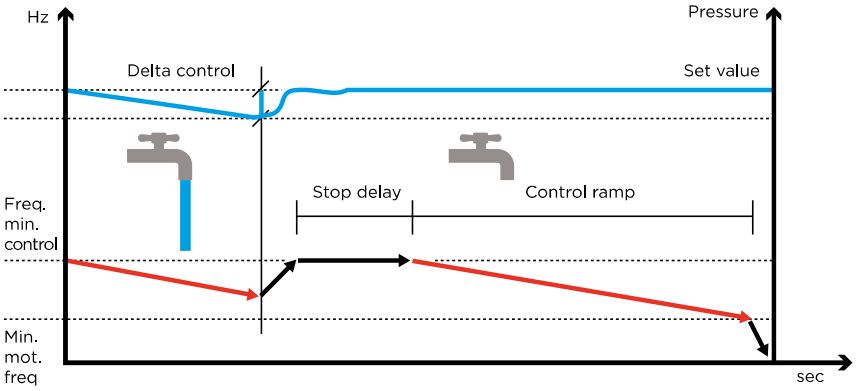
Minimum motor frequency ramp

Motor can accelerate from 0 to the minimum motor frequency following a very fast ramp and then go through a slower ramp.



Intelligent stop of pump at no flow condition

Below minimum control frequency, the inverter gradually reduces the pump speed while monitoring the pressure transducer signal. If this value is maintained close to the set pressure, the inverter will reduce the output frequency until stopping the pump definitely.

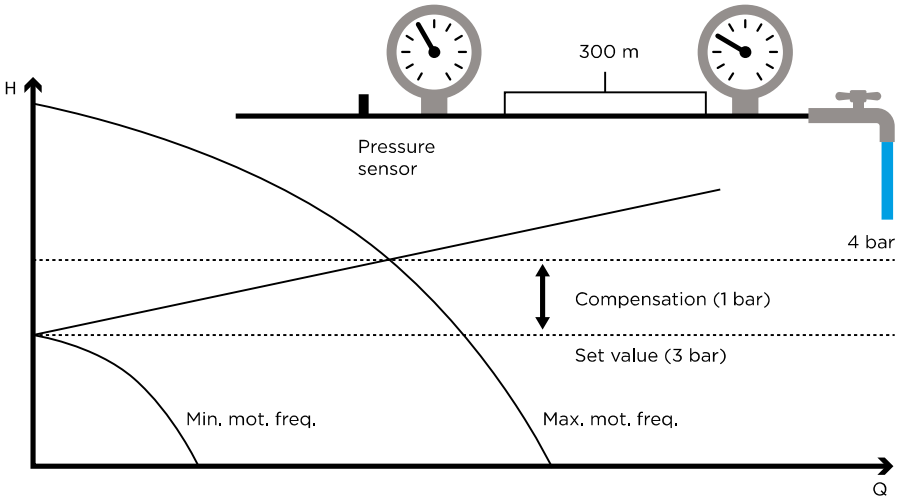


Maximum and minimum alarm pressure

When the pressure rises above a certain settable pressure value, the inverter will stop the pump to prevent damage to the hydraulic components in the system. Similarly, if the pressure drops below a certain pressure an alarm is triggered and the pump is stopped.

Loss compensation proportional to the water flow

If the pressure sensor is placed near the pump, with the increase in flow the pressure value at the furthest outlet is lower than the set pressure. It is possible to vary the set pressure in proportion to the frequency to compensate pressure loss in the pipes.



Dry running alarm via cosphi value

If the pump runs dry, its cosphi value drops below a settable cosphi value, and the inverter stops the pump after 3 seconds. The device will try to make 5 attempts every 10, 20, 40, 80 and 160 minutes, after which it will trigger an alarm and stop the pump if the condition persists.

V/f programmable curve

Device offers two different methods of torque control (voltage) versus pump speed (frequency):

- constant torque (linear V/f)
- quadratic variable torque (squared V/f)

For centrifugal pumps, energy savings can be obtained by selecting squared V/f control.

Settable carrier frequency between 2.5, 4, 6, 8, 10 kHz

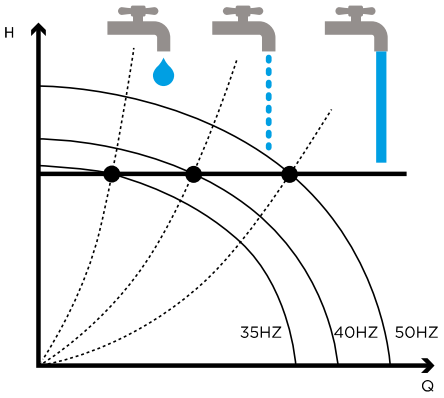
If inverter controls a submersible pump with long cables, it is possible to decrease the carrier frequency value to ensure longer motor life.

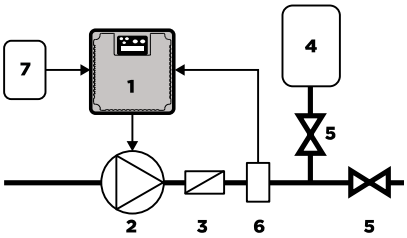
In addition to constant pressure control, VASCO - VAriable Speed COntroller allows other control modes such as fixed frequency, constant flow, constant temperature.

Constant pressure

The inverter controls the pump speed to maintain constant pressure at a set point independent of the water demand in the system.

In a hydraulic system equipped with inverter, the standard pressure tank is replaced by a smaller tank which functions to maintain the set pressure in the system when the pump is stopped.

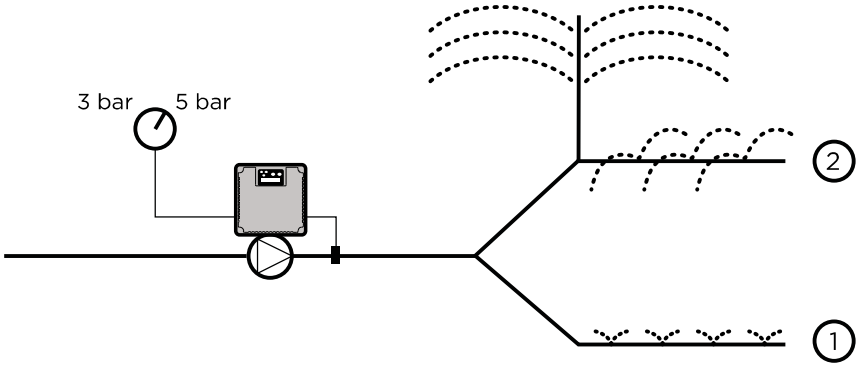




1 Inverter
2 Pump
3 No return valve
4 Pressure tank
5 Valve
6 Pressure transducer
7 Power supply

Constant pressure 2 values

By selecting the constant pressure 2 values control mode, in irrigation systems, only one pump can serve two zones with different pressure sets. It is possible to switch the two values by acting on a digit input contact.

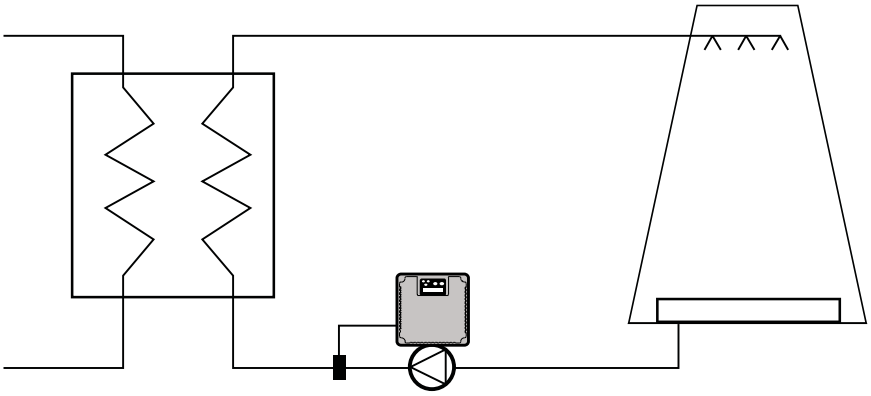


Fixed frequency 2 values

If it is not necessary to operate at constant pressure but is required to select 2 different pump speeds, by selecting fixed frequency 2 values control mode it is possible to switch the 2 values by acting on a digit input contact.

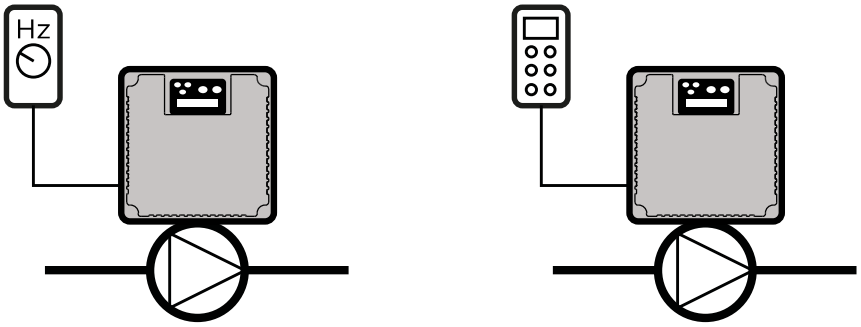
Constant temperature

The control method at constant temperature is used to maintain the temperature of the pumped fluid to vary the thermal load. This control system is used in air conditioning or refrigeration and cooling towers. In this latter case, for example, the temperature measured by a sensor in the return water is kept constant.



External frequency

In some application, it is chosen to change the frequency of the pump by using an external signal coming from a trimmer or a PLC. In this case, after selecting the External Frequency control mode, it is enough to connect an input signal 4-20 mA or 0-10V, proportional to the desired frequency, to the AN4 analogue contact.



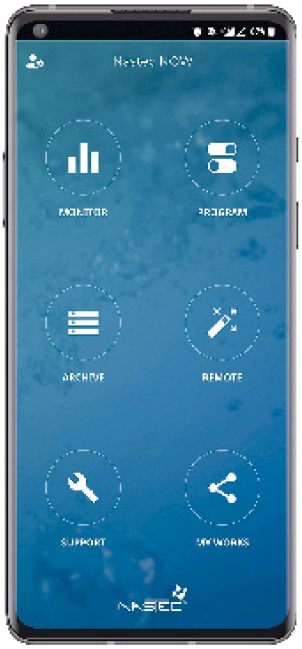
Constant flow

By selecting the constant flow control mode and using a flow transducer, it is possible to control the flow of the pumped liquid to vary the system condition. This control mode is used, for example, in a system for filtering the pumped fluid in which the obstruction of the filter would lead to a progressive reduction of the flow rate if it is not compensated by an increasing of the pump speed.

Unmatched user experience

Thanks to 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, coloured 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.



With VASCO - VAriable Speed COntroller inverters is possible to realise booster sets with one or more pumps (up to 8) to be controlled at constant pressure.

VASCO - VAriable Speed COntroller can be mounted directly on the motor fan cover with a specific kit. The extreme strength of the connection allows VASCO - VAriable Speed COntroller installation even on horizontal pumps. Screen display can be easily rotated to optimise the parameter view.

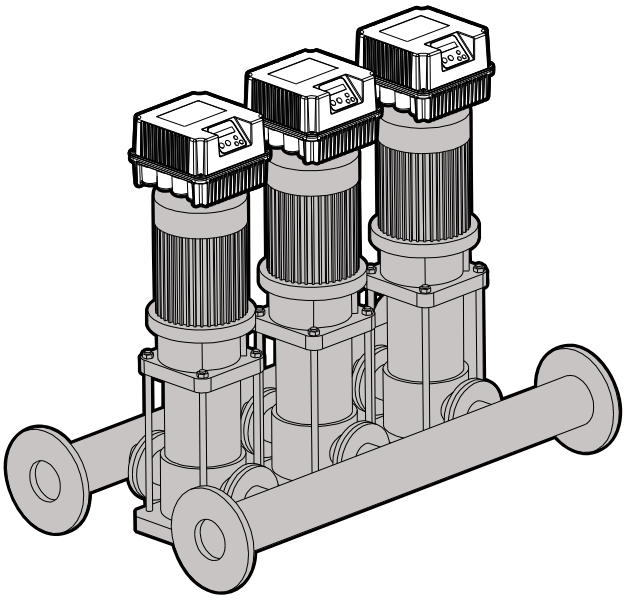
Motor mounting - besides the compactness and the saving of additional control panels and wiring - guarantees very good cooling of the inverter and low electromagnetic emissions due to the reduced length of the motor cable.

IP55 protection allows installation in humid and dusty environments.

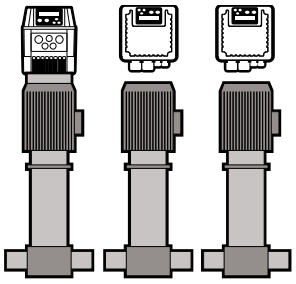
If VASCO - VAriable Speed COntroller cannot be installed on the motor fan cover, it is possible to secure the device to the wall with an optional kit composed by a cooling fan fed by the device itself and a metal wall bracket. IP 55 protection does not require including the inverter in any additional control box so it can be installed very near the pump.

COMBO mode control allows to switch the starting of pumps based on real working time and, in case of failure, the remaining pumps continue operation to always guarantee service.

Once the damaged unit is replaced, COMBO will preferably move the operation to the new pumps to equalise the running time.

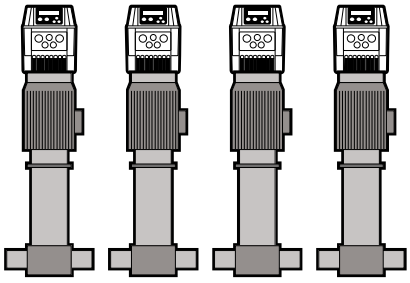


1 inverter + 1 or 2 DOL pumps



A first method of splitting consists of installing one pump driven by the inverter and 1 or 2 DOL pumps directly connected to the main power (Direct On Line). Inverter switches the 1 or 2 DOL pumps on/off through contactors. Inverter alternates the two DOL pumps to average pump wear.

From 1 to 8 inverters in COMBO connection

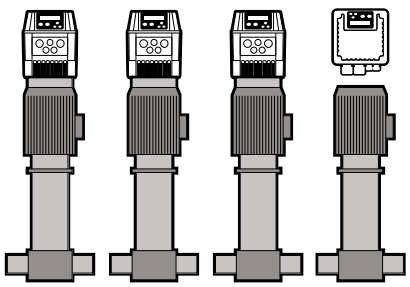


A second way of splitting (named COMBO) consists of using several pumps in parallel (up to 8) each driven by an inverter.

In this way, efficiency and the reliability of the pump group is maximised.

Each device controls and protects its pump and the operation is shared among all the connected pumps to average pump wear. In case of failure the remaining pumps will maintain the pumping operation.

From 1 to 8 inverters + 1 or 2 DOL pumps



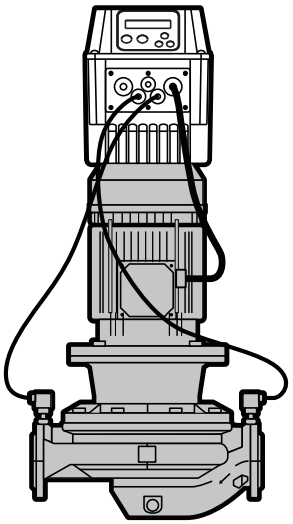
Additionally it is possible to equip the system with pumps connected in COMBO mode plus 1 or 2 DOL pumps to satisfy additional water demand.

VASCO - VAriable Speed COntroller, in addition to other control modes, performs the operation at constant differential pressure

by using a differential pressure sensor or using 2 pressure sensors installed in the suction and delivery sides of the pump.

Difference value is calculated by the inverter itself from the two values read.

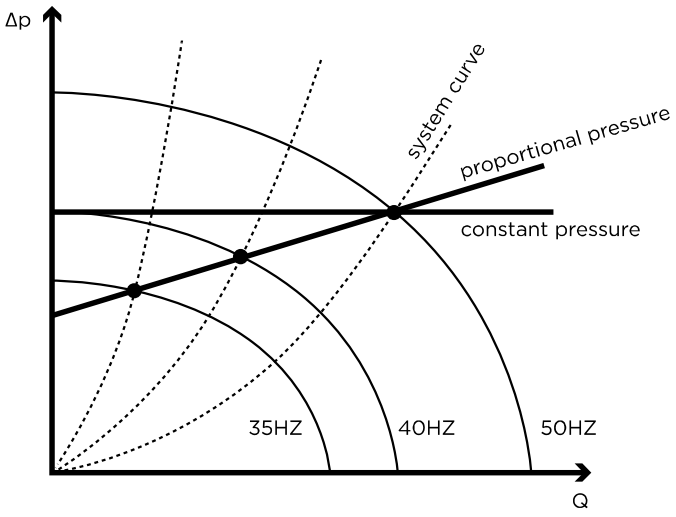
This solution enables significant cost savings as well as providing protection against cavitation (by setting a minimum alarm pressure on the suction side) and against overpressure (by setting a maximum pressure alarm on the delivery side).



Constant differential pressure control can be extended to operation in a group, i.e. twin pump application.

COMBO system ensures alternation of the pumps during operation to average the pumps' wear and easily plan maintenance operations.

In systems characterized by high drops in pressure, VASCO - VAriable Speed COntroller performs the proportional differential pressure control to maximise energy saving.



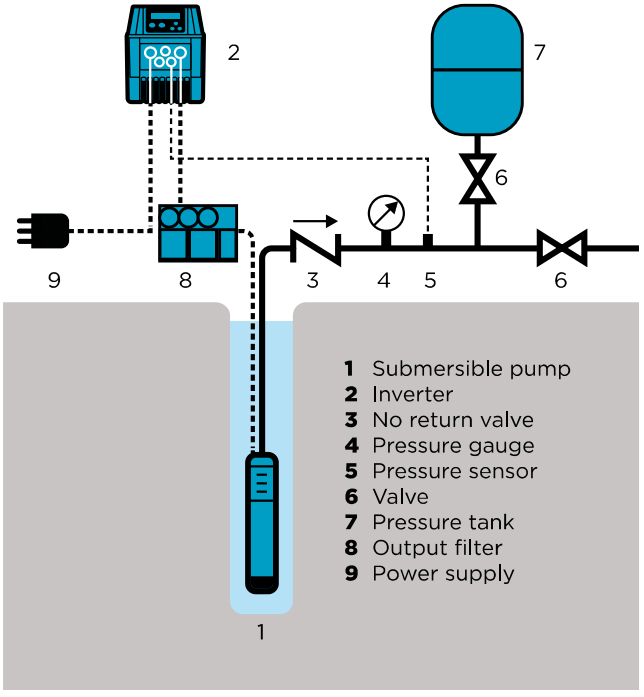
Submersible pumps

Submersible pumps of various powers can be managed by VASCO - VAriable Speed COntroller.

Sometimes it is necessary to install a filter between pump and inverter to:

- reduce the spikes on the motor coils caused by voltage reflection (dv/dt filters)
- avoid electromagnetic noise in the surrounding environment (sinusoidal filters).

It is recommended to keep the motor cable separate from other cables, maintaining a certain distance. Nastec can provide filters and shielded cables for proper pump installation.

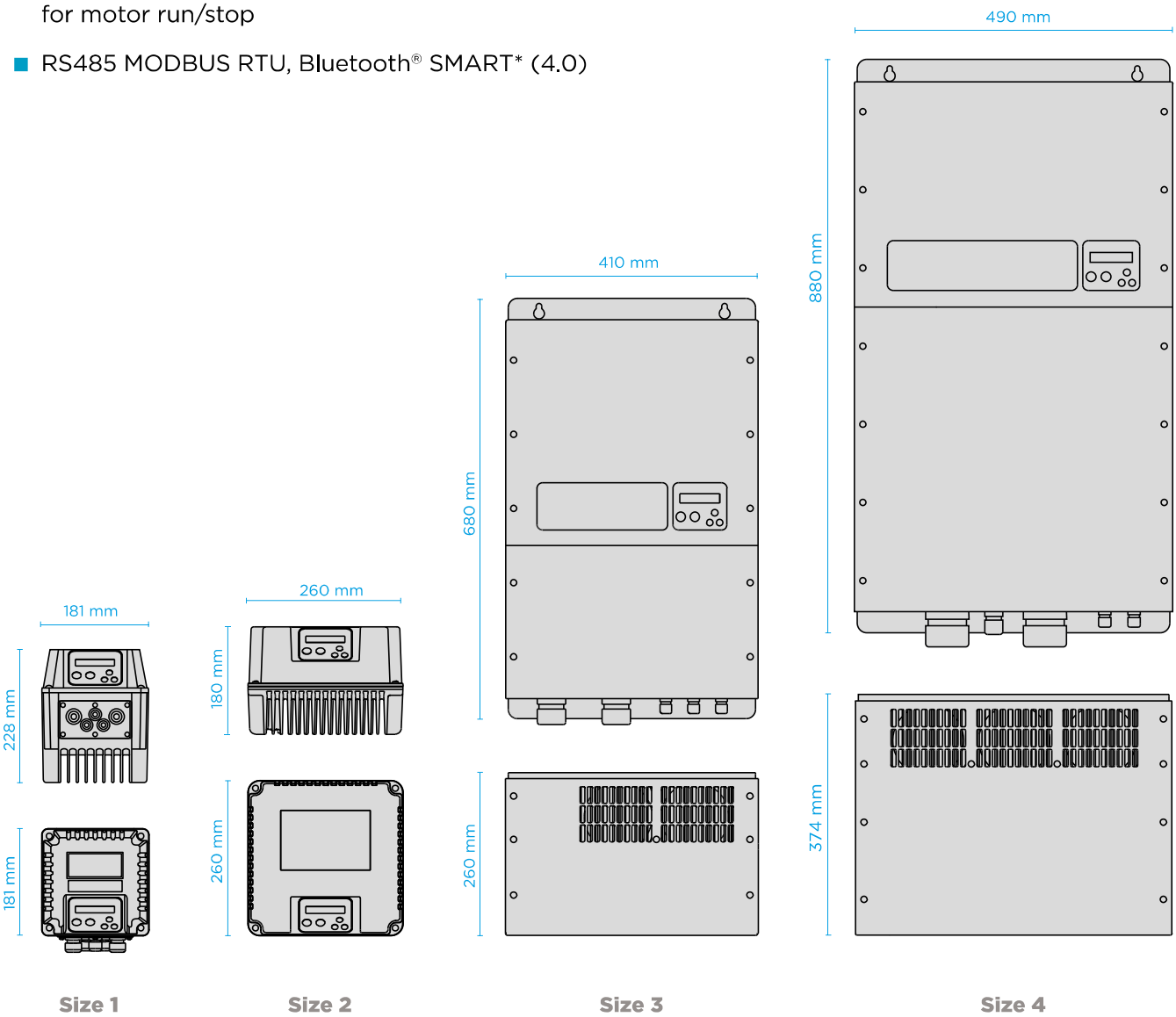


Technical specifications

Model	Vin ± 15% VAC	Max V out VAC	Max I out A	P2 motor power* kW	Size
V209	1 x 230	1 x Vin	9	1,1	1
		3 x Vin	7	1,5	1
V214	1 x 230	1 x Vin	9	1,1	1
		3 x Vin	11	3	1
V218	1 x 230	3 x Vin	18	4	2
V225	1 x 230	3 x Vin	25	5,5	2
V230	1 x 230	3 x Vin	30	7,5	3
V238	1 x 230	3 x Vin	38	9,3	3
V306	3 x 230	3 x Vin	6	1,1	1
V309	3 x 230	3 x Vin	9	2,2	1
V314	3 x 230	3 x Vin	14	3	2
V318	3 x 230	3 x Vin	18	4	2
V325	3 x 230	3 x Vin	25	5,5	2
V330	3 x 230	3 x Vin	30	7,5	2
V338	3 x 230	3 x Vin	38	9,3	3
V348	3 x 230	3 x Vin	48	11	3
V365	3 x 230	3 x Vin	65	15	3
V375	3 x 230	3 x Vin	75	18,5	3
V385	3 x 230	3 x Vin	85	22	3
V3118	3 x 230	3 x Vin	118	30	3
V3158	3 x 230	3 x Vin	158	37	4
V3185	3 x 230	3 x Vin	185	45	4
V3215	3 x 230	3 x Vin	215	55	4
V3268	3 x 230	3 x Vin	268	75	4
V406	3 x 380-460	3 x Vin	6	2,2	1
V409	3 x 380-460	3 x Vin	9	4	1
V414	3 x 380-460	3 x Vin	14	5,5	2
V418	3 x 380-460	3 x Vin	18	7,5	2
V425	3 x 380-460	3 x Vin	25	11	2
V430	3 x 380-460	3 x Vin	30	15	2
V438	3 x 380-460	3 x Vin	38	18,5	3
V448	3 x 380-460	3 x Vin	48	22	3
V465	3 x 380-460	3 x Vin	65	30	3
V475	3 x 380-460	3 x Vin	75	37	3
V485	3 x 380-460	3 x Vin	85	45	3
V4118	3 x 380-460	3 x Vin	118	55	3
V4158	3 x 380-460	3 x Vin	158	75	4
V4185	3 x 380-460	3 x Vin	185	90	4
V4215	3 x 380-460	3 x Vin	215	110	4
V4268	3 x 380-460	3 x Vin	268	132	4

* Typical motor power. It is recommended to refer to the rated motor current when selecting the suitable model.

Nastec offers a wide range of accessories including pressure sensors, flow sensors, temperature sensors, shielded cables, input and output filters. For more information, contact our sales staff.

General specifications

- Rated frequency: 50 - 60 Hz (+/- 2%)
- Ambient temperature: - 10 to 40°C (14 to 104 °F)
- Max. altitude at rated current: 1000 m
- Protection degree:
  IP55 (NEMA 4) Sizes 1, 2
  IP54 (NEMA 12) Sizes 3, 4
- Settable digital outputs, N.O. or N.C. :
  1. Motor run signal
  2. Alarm signal
  3. DOL 1 pump signal
  4. DOL 2 pump 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 N.O. or N.C.
  for motor run/stop
- RS485 MODBUS RTU, Bluetooth® SMART* (4.0)