

## SUND

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Installation, use and maintenance manual

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# 1. Introduction

## 1.1. Purpose of the manual

The purpose of this manual is to provide users with detailed information on the installation, operation, and maintenance of the product, with special regard to safety regulations.



### **WARNING**

Read the manual carefully before installing and using the product.



### **WARNING**

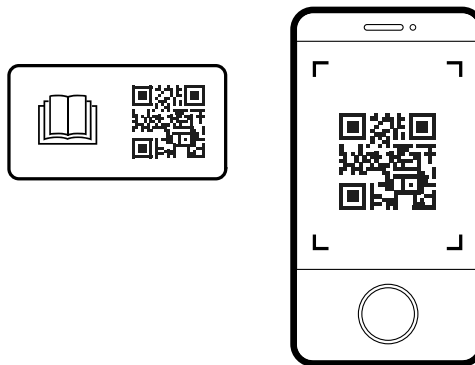
Failure to follow the instructions may result in damage to the product, the system in which it is installed and, in the worst cases, damage to property or persons with even fatal consequences.



### **NOTE**

Store the manual in a protected and easily accessible place next to the installation location for possible consultation. A digital copy of this manual can be downloaded from the manufacturer's website or via the QR code shown on the product itself.

The complete installation, use and maintenance manual of the product, constantly updated in its contents, can be downloaded by scanning the QR code shown in the product with the smartphone camera and following the relative link.



## 1.2. Product overview

SUND Range of solar pumps for the circulation and filtering of swimming pool water. It guarantees:

- Energy saving thanks to photovoltaic power supply and variable speed operation.
- Quick return on investment.
- Extended life of the system and greater reliability.
- Quick and simplified installation thanks to the electronics integrated on-board the motor and control via smartphone.
- Extremely silent operation.
- Installation in humid and dusty environments thanks to the IP55 protection rating (NEMA 4).

In the application with photovoltaic panels, the MPPT (Maximum Power Point Tracking: tracking of the maximum power point) function allows maximizing the electrical power obtained from the panel or the quantity of water pumped for different irradiation and temperature conditions. When irradiation increases, the pump increases its running speed and the water flow increases as a consequence. When irradiation decreases (at the passage of clouds or at different times of the day), the pump reduces the frequency and consequently the flow rate, but continues to supply water until irradiation falls below the minimum necessary to guarantee operation.

SUND it is powered by photovoltaic panels or, if necessary, by the mains. In this way, the operation of the pump is guaranteed at any time of day. It is also possible to satisfy the demand peaks through mains power supply thus avoid the oversizing of the photovoltaic system.

When installed, accessory HMA automatically manages the switching from one energy source to another based on multiple logics that can be selected by the user:

- irradiation level
- time of day
- achievement of the required daily flow rate
- remote control via digital input.

## 1.3. Nastec NSC solar calculator

To correctly size the solar pumping system, the Nastec NSC solar calculator is available free of charge on the site [solar.nastec.eu](http://solar.nastec.eu).

**Performance required**

Daily Delivery: 15 m<sup>3</sup>/Day

Dynamic Head: 60 m

**PV panel specs**

Panel Model: Nastec 2009110500 PV panel 330 Wp, poly

Wp: 330 W

Vmp: 38.35 VDC

Voc: 46.9 VDC

I mp: 5.63 A

NOCT: 45 °C

TC: -0.37 %/K

Tilt Angle: 45 degrees

Set optimal value

Orientation: South

**Pipe specs**

Length: 80 m

Internal Diameter: 42 mm

Roughness Coefficient: 120

Info: 90° Curves: 1

Check Valves: 1

Valves: 1

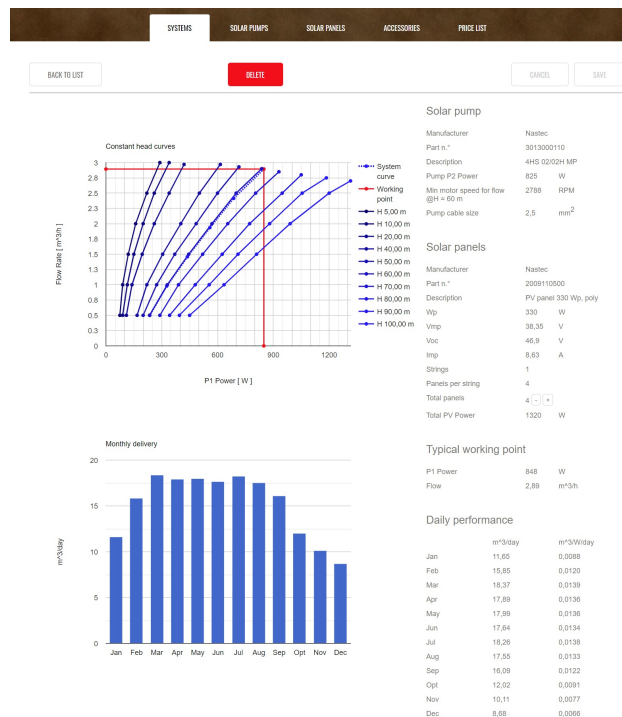
**Cable specs**

Motor Cable Length: 50 m

Estimated friction losses: 2.63 m (3.39 %)

Recalculate

WARNING: whenever possible increase pipe diameter in order to contain friction losses.



## 2. Safety

### 2.1. Symbols



#### TIP

This symbol indicates a TIP or recommendation.



#### NOTE

This symbol indicates a NOTE or an indication or concept to be emphasised.



#### CAUTION

This symbol indicates CAUTION, thus an indication which failure to respect can lead to minor or moderate damage.



#### WARNING

This symbol indicates a WARNING, thus an indication which, in the event of non-compliance, may lead to serious, even fatal damage to persons or things.



#### DANGER

This symbol indicates an ELECTRICAL HAZARD, which if not avoided will result in death or electrocution.

## 2.2. Qualified personnel

**WARNING**

The installation, use and maintenance of the product are strictly for qualified personnel who have undergone appropriate training. Any use by unqualified personnel must be carried out under the approval, responsibility, and close monitoring of the latter.

**WARNING**

Failure to follow the instructions may result in damage to the product, the system in which it is installed and, in the worst cases, damage to property or persons with even fatal consequences.

**WARNING**

Failure to comply with the instructions may lead to loss of warranty.

**WARNING**

Keep out of the reach of children.

## 2.3. Safety warnings

**WARNING**

During installation and use of the product, comply with the general safety regulations, working in a clean, dry environment, free of hazardous substances and using the appropriate accident prevention tools (gloves, helmet, goggles, shoes, and whatever else is necessary).

**WARNING**

The product is suitable for installation in industrial environments. In case of installation in a residential environment, it is recommended to adopt all the safety precautions required by local regulations.

**WARNING**

The unsuitable use of the product, non-original spare parts or tampering with the hardware and/or firmware of the product may lead to serious damage to property or persons in addition to the loss of warranty. The manufacturer waives all liability due to the improper use of its products.

**WARNING**

Before commissioning the product, ensure that the installation is safe and in accordance with local regulations.

**WARNING**

Comply with the provisions to meet EMC requirements.

**WARNING**

Use cables of the appropriate type and cross-section according to the electrical characteristics of the load, the ambient temperature and local regulations.

**WARNING**

Any insulation tests may only be performed in accordance with the manufacturer's instructions. Failure to do so may result in damage to the unit.

**CAUTION**

Electronic boards and components may be damaged by electrostatic discharge. We therefore, recommend to don't touch the components.

**CAUTION**

Take care during installation and electrical connection that no foreign bodies enter into the device.

**DANGER**

During the entire period in which the device is powered, regardless of whether it is operated or remains in stand-by (digital shutdown), high voltage is present inside the device and at the input and output terminals.

**DANGER**

The device, previously in stand-by condition, may suddenly start up following the reset of an alarm or changed system conditions. This may result in serious mechanical and electrical danger to the operator who, upon seeing the device stopped, may have intervened on it, on the load or on the system in which it is installed.

**DANGER**

Disconnect the device from the power supply, check that the load is completely stopped and wait at least 15 minutes before intervening on it or on the load applied to it.

**DANGER**

If the motor is of the permanent magnet type, the device may be energized by the passive rotation of the motor. In this case, both the power supply and the load should be disconnected before working on the device itself.

**DANGER**

Ensure that the device is fully closed and all fixing screws are properly tightened before supplying power. Do not remove the protective parts for any reason while the device is powered on.

**DANGER**

It is recommended to install the appropriate protection devices upstream of the device, such as a circuit breakers, fuses and a residual current device (RCD).

**DANGER**

Make sure that the device and the loads connected to it are properly grounded with the appropriate connection terminals before commissioning.

Ensure that the grounding system is compliant and refer to local regulations for grounding devices.

Each load must be fitted with its own earthing cable, the length of which must be as short as possible. Do not make interconnected grounding connections.

Leakage currents may exceed 3.5 mA. It is recommended to use the reinforced ground connection if necessary.

**CAUTION**

During operation, some surfaces may reach high temperatures that may cause burns upon contact with skin. Be very careful when touching the device!

Avoid contact with flammable products.

**WARNING**

Do not start the pump for any reason unless it is completely filled with water.

Failure to do so may cause serious damage to the pump and the warranty will be void.

**WARNING**

During operation the pump produces a strong suction action that may trap people (especially children) causing severe physical injury or even death. To reduce these risks, it is recommended to install the pump and the system according to local regulations and check the correct functioning of the grids that protect the suction points.

**DANGER**

Pay attention as the photovoltaic panels exposed to sunlight supply a DC voltage to any connected devices.



## 2.4. Acoustic emission

The device has an acoustic emission:  
< 70 dB.

## 2.5. Certifications

The product has the following certifications:

- CE

# 3. Maintenance

## 3.1. Maintenance



### WARNING

Before carrying out any work on the device, carefully read the chapter [Safety \[6\]](#) in the manual.



### WARNING

Failure to follow the instructions may result in damage to the product, the system in which it is installed and, in the worst cases, damage to property or persons with even fatal consequences.



### WARNING

Failure to comply with the instructions may lead to loss of warranty.

The device requires the following maintenance:

Intervention	Interval
Check the flow rate and pressure of the pumped liquid	Every 6 months or following an alarm
Check that the device cools down correctly	Every 6 months, or following a temperature alarm
Check the suction filter	Every 12 months
Check for any leaks	Every 12 months
Check for alarms	Every 12 months
Check the correct tightening of the power terminals	Every 12 months
Verify the maintenance of the protection rating (ingress of dust or water) by checking the tightening of the screws in the mechanical closing parts, the gaskets, and the cable glands.	Every 12 months



### WARNING

In the event of long periods of inactivity, the pump should be emptied completely to avoid blocking and freezing the hydraulic part.



### WARNING

Do not loosen, unscrew or open the filter cover for any reason while the pump is running. If the pump is installed under the water level, close the valve on the suction side before opening the filter cover.



### TIP

For more information contact the dealer or technical support at [service@nastec.eu](mailto:service@nastec.eu) or by opening a support ticket on the portal [service.nastec.eu](https://service.nastec.eu)

## 3.2. Warranty

Nastec guarantees that the products accompanied by this warranty are free from material or workmanship defects. The Company has the right to inspect any product returned under warranty, and confirm that the product contains a material or workmanship defect. The Company has the exclusive right to decide whether to repair or replace defective equipment, parts or components. To qualify for the warranty coverage, the buyer must return the product to the place of purchase. Subject to the terms and conditions listed below, the Company agrees to repair or

replace any part of this product that has material or workmanship defects. The Company will evaluate products under warranty for 24 months from the date of installation (only in case of product registration) but no longer than 36 months from the date of invoice. IN NO EVENT shall the Company be liable for any other costs incurred by the customer in removing and/or fastening any product, part or component thereof. The Company reserves the right to change or improve its products or any part thereof, without being obliged to provide such a change or improvement for products previously sold. THIS WARRANTY DOES NOT APPLY to products damaged by natural events, including lightning, normal wear and tear, normal maintenance services, or any other condition beyond the control of the Company. THIS WARRANTY WILL BE VOIDED if any of the following conditions occurs:

- The product is used for purposes other than those for which it was designed and manufactured.
- The product has not been installed in accordance with applicable codes and rulings.
- The product has not been installed by qualified personnel.
- The item has been damaged due to negligence, abuse, misapplication, tampering, alteration, improper installation, operation, maintenance and storage.

If the customer wishes to make a warranty claim, it is necessary:

- Fill in the warranty claim on the [service.nastec.eu](https://service.nastec.eu) portal
- Wait for the result from the Nastec technical support service. The outcome may envisage the following:
  - Absence of warranty based on the information received. A quotation for repair or spare parts may be made upon request.
  - Warranty advanced based on information received. Nastec will decide if the product is to be replaced under warranty. However, Nastec reserves the right to inspect the product.
  - Need to receive the product by the manufacturer in order to establish the potential warranty. Following the analysis of the returned product, Nastec will establish the unquestionable existence or absence of the warranty conditions by providing a detailed report on the damage found and its origins. If the warranty is applicable, Nastec will repair the device. Nastec is willing to refurbish the product upon offer. In the absence of a warranty, Nastec will make an offer to repair and/or refurbish the device. After 60 days from the offer, if no response is received from the buyer, Nastec will scrap the product upon notice. Nastec does not cover any warranties provided by the buyer to third parties, without its prior authorization.

### 3.3. Product registration

By registering the product on the portal [service.nastec.eu](https://service.nastec.eu), it is possible to activate the manufacturer's warranty valid for 24 months from the registration date up to a maximum of 36 months from the date of manufacture, according to the warranty conditions. Registration must be completed within one month from the date of installation of the product.

The warranty is offered through the distribution chain. It is therefore necessary to specify the official distributor or importer from which the product was purchased. Alternatively, the distributor can register the product in the customer's name.

### 3.4. Spare parts

The manufacturer provides spare parts for the device. Contact your dealer for more information.



#### **WARNING**

It is recommended to use only original spare parts.



#### **WARNING**

Failure to follow the instructions may result in damage to the product, the system in which it is installed and, in the worst cases, damage to property or persons with even fatal consequences.



#### **WARNING**

Failure to comply with the instructions may lead to loss of warranty.

### 3.5. Disassembly and repair

If it is necessary to disassemble and repair the device, it is recommended that the safety instructions be strictly observed.

**WARNING**

The installation, use and maintenance of the product are strictly for qualified personnel who have undergone appropriate training. Any use by unqualified personnel must be carried out under the approval, responsibility, and close monitoring of the latter.

**WARNING**

Failure to follow the instructions may result in damage to the product, the system in which it is installed and, in the worst cases, damage to property or persons with even fatal consequences.

**WARNING**

Failure to comply with the instructions may lead to loss of warranty.

**TIP**

For more information contact the dealer or technical support at [service@nastec.eu](mailto:service@nastec.eu) or by opening a support ticket on the portal [service.nastec.eu](https://service.nastec.eu)

## 3.6. Disposal



Devices marked with this symbol cannot be disposed of in household waste but must be disposed of at appropriate waste drop-off centres. It is recommended to contact the Waste Electrical and Electronic Equipment drop-off centres (WEEE) in the area. If not disposed of properly, the product may have potential harmful effects on the environment and on human health due to certain substances present within. Illegal or incorrect disposal of the product is subject to severe administrative and/or criminal penalties.

## 4. Transport and storage

### 4.1. Transport

Avoid subjecting the product to severe shocks or extreme weather conditions during transport. The packaging must remain dry and at a temperature between -20°C (-4°F) and +70°C (+158°F). Do not stack packages without first checking feasibility with the manufacturer.

**TIP**

It is advisable to always indicate FRAGILE on the packaging

### 4.2. Inspection on delivery

Upon receipt of the product, check:

- the integrity of the packaging
- the integrity of the content
- the presence of all components

In case of problems, notify the forwarder immediately.

**WARNING**

The manufacturer declines all responsibility for damage to the product due to transport

### 4.3. Handling

The product must be handled by hand or using suitable lifting equipment in relation to its weight and the regulations in force.

If necessary, use dedicated handling equipment (cranes, ropes, trolleys), using the lifting points provided in the product.

During handling it is recommended to:

- Handle with care
- keep away from suspended loads
- always wear accident prevention equipment
- be careful not to damage electrical cables

Do not handle the product using electrical cables as lifting gear.



#### WARNING

Failure to follow the instructions may result in damage to the product, the system in which it is installed and, in the worst cases, damage to property or persons with even fatal consequences.

## 4.4. Storage

The product must be stored in its packaging in a dry place, without sudden changes in humidity and temperature and protected from mechanical (weights, vibrations), thermal and chemical agents.

The temperature of the storage environment must be between -20°C (-4°F) and 70°C (+158°F) with a maximum relative humidity of 85% (non-condensing).

If the product remains in stock for more than 24 months from the manufacturing date shown on the packaging, it is necessary to check the mechanical integrity of its parts and supply power to it at least once every 12 months.

If the product is put back into storage after it has been used, it is advisable to contact the manufacturer for further information on storage.

In particular, store the pump in a place with a minimum temperature that is not below 4 °C (40 °F).



#### TIP

For more information contact the dealer or technical support at [service@nastec.eu](mailto:service@nastec.eu) or by opening a support ticket on the portal [service.nastec.eu](https://service.nastec.eu)

## 5. Technical features

### 5.1. Technical Data

Electrical specifications by model:

Model	Vin DC [VDC]	Vin AC [VAC]	Vnom **	I in [A]	P2 [kW]	P1 [kW]	Max RPM
SUND 50	90 - 400	1 x 90 - 265	90 V	Max 12 A 3,5 A (230 VAC)	0,55	0,8	3600

\*\*Minimum voltage for nominal performances.

General electrical specifications:

Power supply frequency	50 - 60 Hz (+/- 2%)
EMC compliance	EN61800-3 C1
Winding insulation class	Class F



#### WARNING

If the device is powered by a generator set, make sure that:

- The generator set supplies the required voltage and is equipped with an electronic voltage regulator (AVR).
- The power of the generator set is at least 50% higher than the rated electrical power of the device.
- The device is connected to the generator set only after the same has started.
- The device is disconnected from the generator set before the same is stopped.
- The device is not connected to the generator set when it is about to shut down due to lack of fuel.

Environmental specifications:

Relative humidity of the operating environment	5 - 95 % non-condensing
Workplace temperature	from -10 °C (14 °F) to 60 °C (140 °F)
Maximum workplace temperature at nominal load	50°C (122 °F)
Power derating beyond maximum temperature	-2.5% every °C (-1.4% every °F)
Maximum altitude at nominal load	1000 m (3280 ft)
Power derating beyond maximum altitude	- 1% every 100 m (328 ft)
Characteristics of the pumped liquid	Clean, non-corrosive, non-explosive, free of solid particles and fibers, with a maximum sand content of 50 g / m <sup>3</sup>  Fresh or salt water
Maximum temperature of the pumped liquid	40 °C (104 °F)

#### Mechanical specifications:

Protection rating	IP55 (NEMA 4)
Resistance to vibrations	EN60068-2-6:2008, EN60068-2-27:2009, EN60068-2-64:2008,
Maximum operating pressure	3 bar
Maximum suction head	2,5 m
Materials	Pump in reinforced technopolymer; motor and inverter in aluminum

## 5.2. Performance



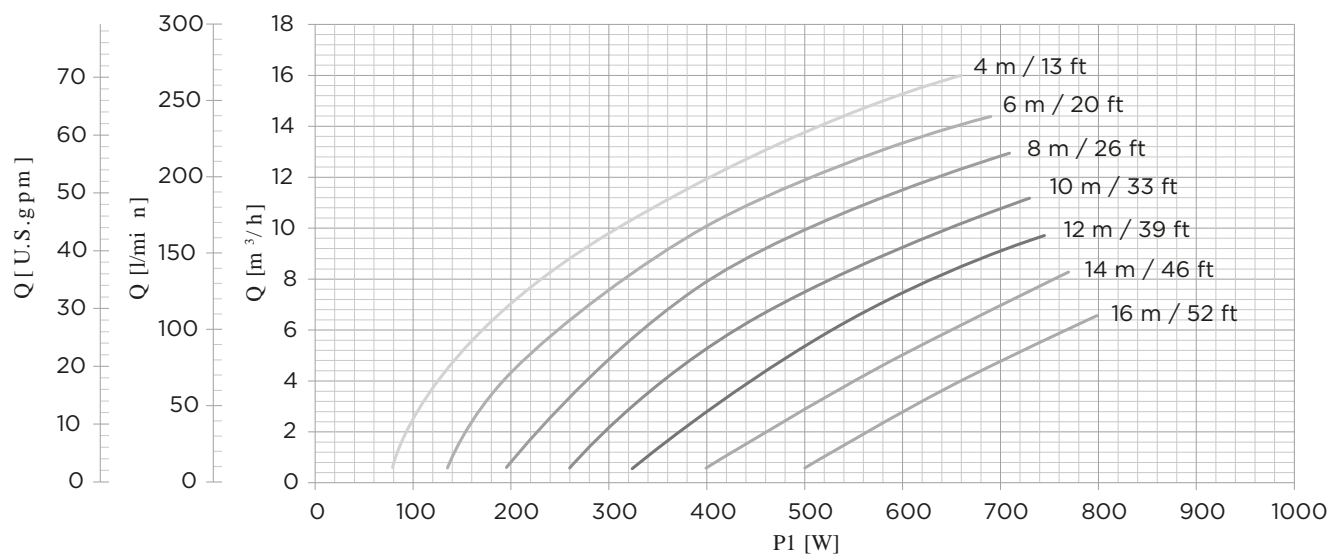
#### NOTE

The performance graphs show the performance of the pumps in terms of flow rate (Q), head (H) and absorbed electrical power (P1). The graphs show average values with a tolerance of 15% and are related to a water temperature of 20 °C (68 °F) and a density of 1 kg / m<sup>3</sup>.

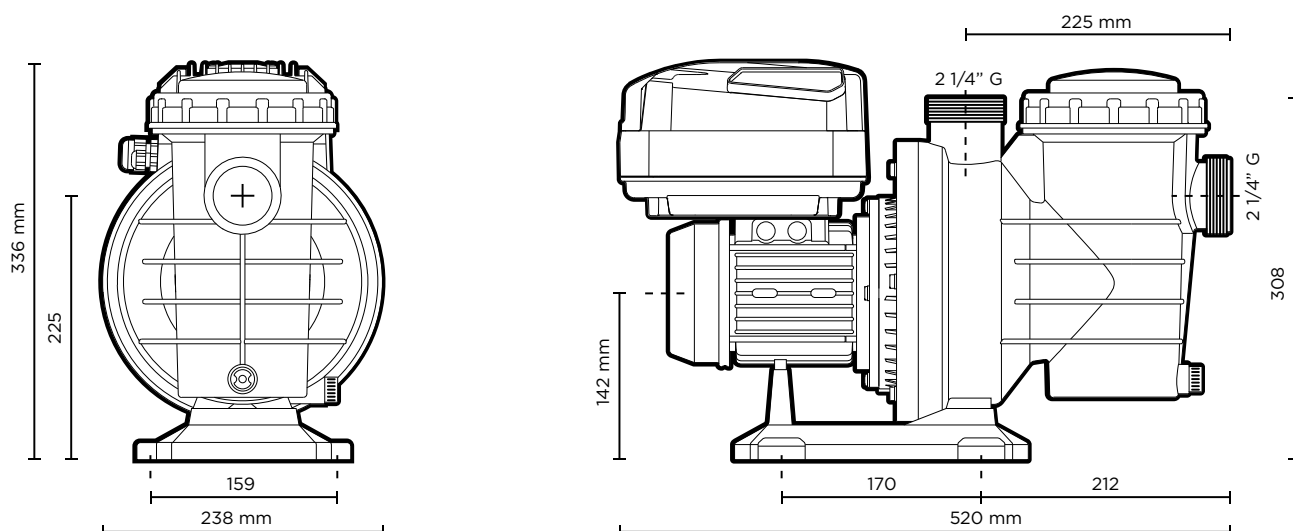
The photovoltaic power (Pp) that must be installed to obtain the desired performance must be at least equal to the electrical power (P1) absorbed by the pump at the working point. To take into account the losses due to the temperature of the photovoltaic modules and other factors, increase the photovoltaic power by 20% compared to the absorbed electrical power.

For a correct sizing of the system, use the solar calculator available free of charge by connecting to the site [solar.nastec.eu](http://solar.nastec.eu)

**Figure 1. SUND 50**



## 5.3. Dimensions and weight



Model	Weight [kg]
SUND 50	10,7

## 5.4. Cables entry

Cable gland	Tightening torque [Nm]	Cable diameter [mm]
M12	1,5	3,5-7

# 6. Mechanical installation



### WARNING

Read the safety chapter carefully before continuing.

## 6.1. Installation environment



### WARNING

The environmental specifications stated in the technical data of the product must be strictly complied with.



### WARNING

Do not install the device in environments at a risk of explosion, flooding, or in the presence of flammable fluids or solids. Ensure sufficient ventilation in the room.

Refer to local regulations when selecting the appropriate installation location.



### WARNING

The degree of protection of the device is only ensured if, at the end of the installation, the cover screws and the cable glands have been properly tightened. Close the holes of unused cable glands with the appropriate plugs.

Protect the device from direct exposure to weather and sunlight.

Do not leave the device installed without cover or with the cable glands open, even if not connected to the power supply. The infiltration of dust, water or humidity may irreparably damage the device.

**WARNING**

To ensure uninterrupted operation, the device can gradually and automatically reduce performance before shutting down following over-temperature. However, prolonged operation above the rated temperature leads to a reduction in the life of the device.

## 6.2. Cooling

The motor and the inverter on-board are cooled by special fans through forced air circulation. In order to ensure correct cooling, it is necessary that:

- the ambient temperature complies with the environmental specifications.
- the temperature of the pumped liquid complies with the environmental specifications.
- a distance of at least 150 mm is maintained between the motor / inverter unit and any surrounding walls.

## 6.3. Hydraulic connections

Install the pump horizontally on a sufficiently sturdy base raised from the ground (at least 10 cm). Preferably use plastic pipes welded to the delivery and suction connections of the pump (external diameter 50 mm) using a suitable sealing adhesive. The delivery and suction pipes must be correctly supported so as not to weigh down on the pump connections.

## 6.4. SUND priming

In case of installation under the water level, fill the pump by slowly opening the gate valve in the suction line by keeping the delivery gate open to let the air out. In the case of installation above the water level, remove the cover and fill the pump by pouring water through the opening on the filter. Verify that the pump is properly primed before starting it. Prolonged operation in non-primed condition can damage the pump itself.

# 7. Electrical installation

**WARNING**

Read the safety chapter carefully before continuing.

## 7.1. Grounding

**DANGER**

Make sure that the device and the loads connected to it are properly grounded with the appropriate connection terminals before commissioning.

Ensure that the grounding system is compliant and refer to local regulations for grounding devices.

Each load must be fitted with its own earthing cable, the length of which must be as short as possible. Do not make interconnected grounding connections.

Leakage currents may exceed 3.5 mA. It is recommended to use the reinforced ground connection if necessary.

Use the following minimum cross-sections for ground cables:

- cross-section equal to the mains power cable cross-section up to 16 mm<sup>2</sup>. (6 AWG)
- 16 mm<sup>2</sup> (6 AWG) for mains power cable cross-section between 16 mm<sup>2</sup> (6 AWG) and 35 mm<sup>2</sup> (1 AWG).
- cross-section equal to half the cross-section of the power supply cable when the latter is greater than 35 mm<sup>2</sup> (1 AWG).

## 7.2. Protection devices

**DANGER**

It is recommended to install the appropriate protection devices upstream of the device, such as a circuit breakers, fuses and a residual current device (RCD).

**Fuses and switches.**

The control device can protect the motor from overloads by digitally controlling the absorbed current against the set rated current.

Instead, it is necessary to install overcurrent and short-circuit protection devices, such as fuses and circuit breakers, upstream of the device. These trigger in the event of failure of a component inside the device.

Install on the AC side:

Supply voltage	Model	Recommended fuse gC	Recommended circuit breaker ABB MCB S200
1 x 230 VAC	SUND 50	10	S201-C10

Install on the DC side:

- DC disconnect of suitable voltage and current
- DC fuses of suitable voltage and current on both the positive and negative poles. Generally, DC fuses are chosen for a current that is approximately double the short-circuit current of a string of panels and are installed only if the photovoltaic system consists of three or more strings.
- surge arresters of suitable voltage and current

## 7.3. Connecting cables



### WARNING

The connecting cables must comply with local regulations, feature the appropriate cross-section, and meet the requirements for voltage, current, and temperature.

### 7.3.1. Power cable



### WARNING

Always use cables with appropriate cable lugs, which may be supplied with the product.

### 7.3.2. Control cables

Model	Maximum cross-section of the control cables	Tightening torque [Nm]
Control terminals of all models	1 mm <sup>2</sup>	0,5



### WARNING

Use shielded cable for control cables.



### WARNING

Always use cables with appropriate cable lugs, which may be supplied with the product.

## 7.4. Electromagnetic Compatibility (EMC)

The device meets the requirements of electromagnetic compatibility according to the EN61800-3 standard.

However, to ensure the electromagnetic compatibility of the system in which it is installed, it is necessary:

- use ground connection cables that are as short as possible.
- use shielded signal cables with the shield connected at one end only.



### WARNING

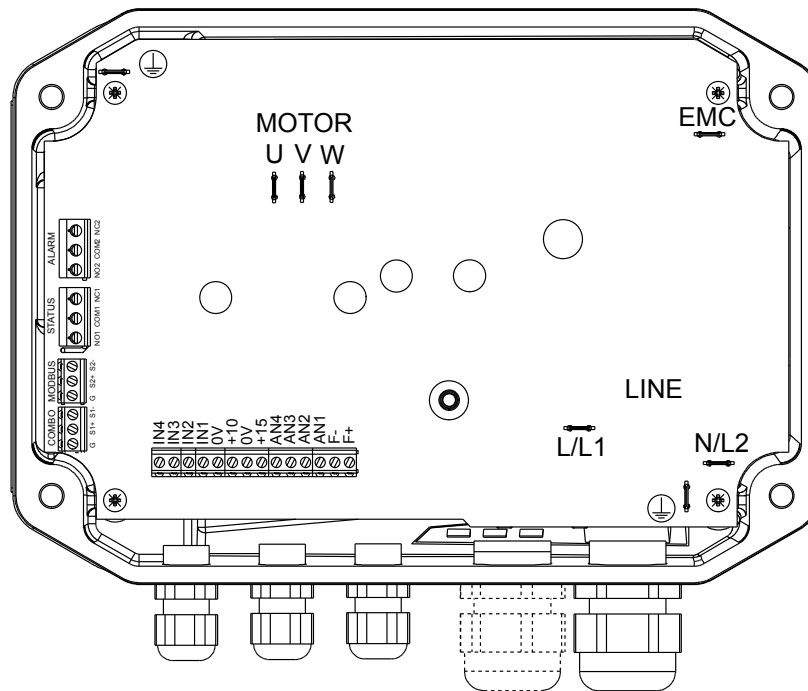
Install signal, motor, and power cables separately from each other at a distance of at least 30 cm. If the signal cables meet the power cables, cross them perpendicularly.

## 7.5. Electrical connections



### 7.5.1. Power connections

#### SUND 50



		A [mm]	Pre-insulated cable lug	Stripping diagram
DC Power Supply	L1/L	70	6.3 x 0.8 mm female Faston	
	L2/N	70	6.3 x 0.8 mm female Faston	
	LINE P.E. ⊕	70	6.3 x 0.8 mm female Faston	
AC Power Supply	L1/L	70	6.3 x 0.8 mm female Faston	
	L2/N	70	6.3 x 0.8 mm female Faston	
	LINE P.E. ⊕	70	6.3 x 0.8 mm female Faston	
Motor <b>MOTOR</b>	U	120 (200)	6.3 x 0.8 mm female Faston	Installation on board the engine 
	V	120 (200)	6.3 x 0.8 mm female Faston	
	W	120 (200)	6.3 x 0.8 mm female Faston	
	P.E. ⊕	120 (200)	6.3 x 0.8 mm female Faston	



#### DANGER

Connect only one power source at a time (AC or DC).



#### NOTE

When connecting the DC power supply, it is not necessary to respect the polarity.



#### CAUTION

In order to ensure the correct running direction of the motor, respect the connections of the output phases: U - red, V - black, W - blue

## 7.5.2. Control connections

Type		Description	Functionality	Comments
Analog inputs	AN1	4-20 mA	Sensor 1	-
	AN2	4-20 mA	Sensor 2	-
	AN3	0-10 V	External set value	
	AN4	0-10 V	External frequency External set value 2	
Power Supply	+15V	15 VDC, max 100 mA	Power supply for 4-20 mA analog inputs	Do not use as a power supply for the digital inputs!
Power Supply	+10V	10 VDC, max 3 mA	Power supply for 0-10 V analog inputs	Do not use as a power supply for the digital inputs!
Signal GND	0V	Insulated	Signal GND for analog and digital inputs	-
Digital inputs	IN1	Active low	Motor start and stop	Programmable as Normally Open or Normally Closed.
	IN2	Active low	Motor start and stop Switching of set value 1 and 2 Switching of work frequency 1 and 2	Programmable as Normally Open or Normally Closed.
	IN3	Active low	Motor start and stop Switching of sensors 1 and 2	Programmable as Normally Open or Normally Closed.
	IN4	Active low	Alarms reset Motor start and stop Switch between main and auxiliary control modes	Programmable as Normally Open or Normally Closed.
Relay outputs	NO1	Normally Open	STATUS relay	Potential-free contacts
	COM 1	Common	NO1, COM1: closed contact with motor running.	Max 250 VAC, 2 A
	NC1	Normally Closed	NC1, COM1: closed contact with motor stopped.	Max 30 VDC, 2 A
Relay outputs	NO2	Normally Open	ALARM relay	Potential-free contacts
	COM 2	Common	NO2, COM2: closed contact without alarm.	Max 250 VAC, 2 A
	NC2	Normally Closed	NC2, COM2: closed contact with alarm or without power supply.	Max 30 VDC, 2 A
RS485 serial port	S1+	Positive	Communication	-
	S1-	Negative	COMBO	-
	G	Serial GND		The serial GND is isolated from the signal GND
RS485 serial port	S2+	Positive	Communication	-
	S2-	Negative	MODBUS RTU	-
	G	Serial GND		The serial GND is isolated from the signal GND

## 8. Commissioning

### 8.1. Preliminary checks

Before supplying power to the device, carry out the following electrical and mechanical checks:

- Verify proper grounding of the device, of the load, and of the entire system.
- Check the correct connection of the power supply cable and the motor cable, paying particular attention to any connection reversal.
- Check the correct connection of the power and signal cables, paying particular attention to any polarity.
- Check that the connection terminals of the power and signal cables are correctly tightened.

- Check the implementation of electromagnetic compatibility (EMC) regulations and the correct connection of cable shields.
- Check that the protective devices are present and correctly installed.
- Check that the mechanical installation is correct, sturdy and complies with environmental and cooling requirements.
- Check that the pump is completely filled with water and that the filter cover is tightly closed.
- Check that the seals are intact and correctly positioned in their seats.
- Check that the cable glands and screws are properly tightened.
- Check that the device is completely closed and that live parts are not accessible.

**NOTE**

The pump may contain traces of water used for the final tests of the product. Before commissioning, rinse with fresh water. Under no circumstance should solvents or other chemical products be used to clean any part of the product.

## 8.2. Powering

**DANGER**

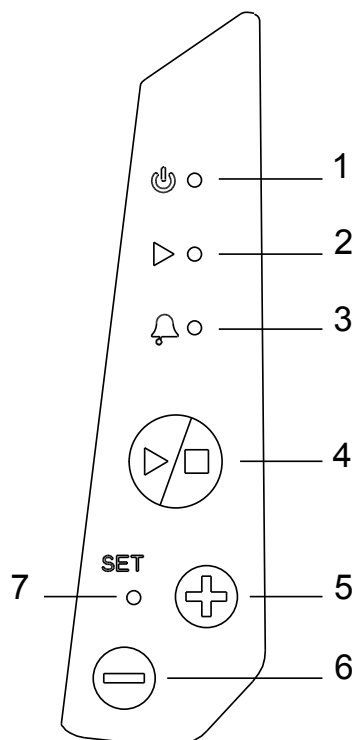
Before supplying power to the device, make sure you have read, understood and implemented all the safety, mechanical, and electrical installation instructions.

At the end, it shall be possible to:

- power up the device.
- verify the correct switching on and the absence of alarm messages.
- perform programming.
- start the motor.

## 9. Use and programming

### 9.1. Keyboard (version without display)

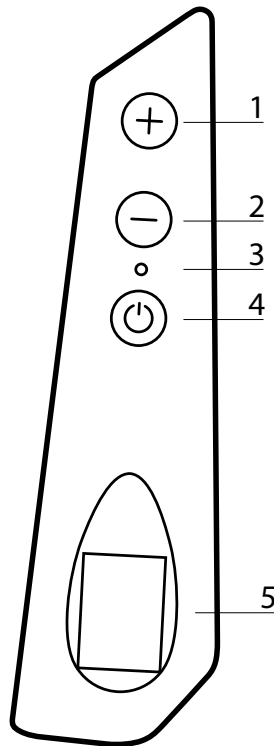


1. Red LED ON: the unit is powered with the correct power supply voltage.

FLASHING red led: undervoltage.

2. Green LED ON: motor running. Green led OFF: motor stopped. When the unit is in "constant value" control mode, the green LED flashes with a greater frequency the closer the measured value is to the set value. If the measured value is the same as the set value, the green LED is constantly on.
3. The yellow LED flashes with a variable frequency according to the type of alarm. See the chapter on alarms.
4. Starting and stopping the engine. If the unit is in an alarm state, it is possible to try to reset the alarm by pressing the key twice.
5. +: parameter scrolling / parameter editing  
Use the + key to increase the set value or frequency. In order to allow the set value to be edited, it is necessary to hold down the + or - button for more than 5 seconds until the set value to be edited starts flashing. To confirm the set value, simply wait 5 seconds or press the START/STOP button.
6. -: parameter scrolling / parameter editing  
Use the - key to decrease the set value or frequency. In order to allow the set value to be edited, it is necessary to hold down the + or - button for more than 5 seconds until the set value to be edited starts flashing. To confirm the set value, simply wait 5 seconds or press the START/STOP button.
7. Green LED is ON when it is possible to change the set value (constant value mode) or the set frequency (fixed frequency mode). Press and hold the Up key or the Down key for more than 5 seconds in order to allow the set adjustment. If the SET led is off, it is not possible to change the set value. When two or more units are in COMBO mode, the SET LED flashes only in correspondence with the master unit. In this way it is possible to understand which unit in the group is the master and act on it to start or stop the system. The green LED flashes quickly when the unit is connected to a smartphone for control via the App.

## 9.2. Keyboard and display



1. +: parameter scrolling / parameter editing  
Use the + key to increase the set value or frequency. In order to allow the set value to be edited, it is necessary to hold down the + or - button for more than 5 seconds until the set value to be edited starts flashing. To confirm the set value, simply wait 5 seconds or press the START/STOP button.
2. -: parameter scrolling / parameter editing  
Use the - key to decrease the set value or frequency. In order to allow the set value to be edited, it is necessary to hold down the + or - button for more than 5 seconds until the set value to be edited starts flashing. To confirm the set value, simply wait 5 seconds or press the START/STOP button.
3. Signaling LEDs:
  - RED on: the device is powered with the correct supply voltage and is in stand-by.
  - GREEN: motor running.

- YELLOW flashing: alarm condition.
4. START / STOP: motor start / stop
  5. DISPLAY

Keep the START / STOP key pressed down for at least 5 seconds to activate the START/STOP key lock function through which it is only possible to scroll and view the operating parameters, using the + and - keys; this does not allow starting or stopping the motor. Press the START/STOP button again for at least 5 seconds to deactivate the lock.

Keep the + and - keys pressed for at least 5 seconds to reverse the display.

### 9.3. Control via App

The device can be controlled using a smartphone or tablet equipped with Bluetooth BTLE connectivity and with the App Nastec NOW installed. The App is available for Android and iOS and may be downloaded, free of charge, from the respective online stores.

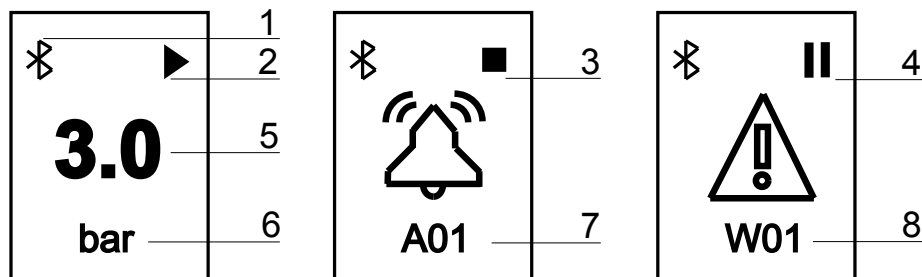
Through the application it is possible to:

- Monitor multiple operating parameters simultaneously.
- Obtain energy consumption statistics and check alarm history.
- Run reports with the possibility of adding notes, images and send them by e-mail or store them in the digital archive.
- Create schedules, save them in the archive, copy them to other devices, and share them among multiple users
- Control a device remotely, via Wi-Fi or GSM, using a smartphone placed nearby as a modem.
- Access manuals and additional technical documentation.
- Receive online help on parameters and alarms.

### 9.4. Initial display

When the device is switched on, the control firmware version (LCD = X.XX), the power firmware version (INV = X.XX) and the hardware version (HW = X.XX) are communicated to the user.

Next, the initial view opens.



1: Bluetooth on. Flashing during communication; 2: Motor running; 3: Motor stopped; 4: Stand-by; 5: Value read; 6: Units of measurement; 7: Alarm; 8: Warning

Parameter	Description
XX.X [bar]	Measured pressure value.
XXX.X [Hz]	Frequency with which the inverter is powering the motor.
XXX [VAC]	Inverter power supply voltage. This appears only while the motor is in the OFF state. In the ON state, the current absorbed by the motor is displayed instead of the supply voltage.
XX.X [A]	Current absorbed by the motor.
X.XX [cosφ]	Cosine of the φ phase displacement angle between voltage and current. It is also called the motor power factor.
XX.X [kW]	Estimate of the active electrical power absorbed by the motor.
X [INV]	Device address when COMBO functionality is enabled.
AXX	Alarm XX.
WXX	Warning XX.

The App allows monitoring other parameters and consult the alarm log.

### 9.5. Menu

Access to the menus is password-protected at two levels:

- **Installer level:** Allows editing the parameters related to pump operation in the hydraulic system on which it is installed. **Password 1, default 001.**
- **Advanced level:** Allows editing the parameters that so critical that they may compromise the life of the device, the pump, and the system if they are set incorrectly. **Password 2, default 002.**

Within each menu, it is possible to change the relative access password.



#### NOTE

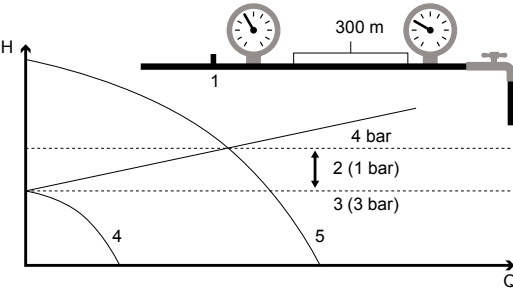
When an incorrect password is entered to access both the installer and advanced level, the parameters can only be displayed but not edited.

In case of loss of the password, contact the technical support service to obtain the universal password.

Menu	Description	Level	Default password
Control parameters	Menu of parameters for controlling the pump in the hydraulic system in which it is installed.	Installer	001
Motor parameters	Menu of parameters for motor control	Advanced	002
IN/OUT parameters	Menu of parameters for analog and digital inputs and outputs	Installer	001
Connectivity parameters	Menu of parameters for connectivity and external communication.	Installer	001

## 9.6. Control parameters

Parameter	Default	Description	1	2	3	4	5	6
Control mode 1. Constant value 2. Fix speed 3. Constant value 2 set 4. Fix speed 2 values 5. External speed 6. MPPT	MPPT	The following control modes can be selected:  1. Constant value: the device varies the speed of the pump in such a way as to keep the set value constant regardless of water consumption. 2. Fix speed: the device powers the pump at the set frequency. 3. Constant value 2 set: two desired values can be selected by opening or closing digital input 2. 4. Fix speed 2 values: two desired frequency values can be selected by opening or closing digital input 2. 5. External speed: it is possible to control the motor frequency through an analog signal connected to analog input 4. 6. MPPT: the device varies the speed of the pump to maximize the power obtained from the photovoltaic panels.	x	x	x	x	x	x
Control mode aux XXXXXXXX		Operate on digital input 4 to switch from the main control mode to the auxiliary control mode and vice versa.	x	x	x	x	x	x
Max alarm value p = XX.X [bar]	10	Value that can be reached in the system beyond which, even in constant frequency operating mode, the pump is stopped and an alarm signal is emitted. The pump is restarted only after the measured value has dropped below the maximum alarm value for more than 5 seconds.	x	x	x	x	x	x
Min alarm value p = XX.X [bar]	0	Minimum value that can be reached in the system below which, even in constant frequency operating mode, the pump is stopped and an alarm signal is emitted. The pump is restarted only after the measured value has risen above the minimum alarm value for more than 5 seconds.	x	x	x	x	x	x
Open circuit voltage PV V = XXX [VDC]		Open circuit voltage of the string of photovoltaic panels.						x
MPPT: voltage gap dV = XXX.X [V]		Voltage range used in the MPPT control algorithm.						x
MPPT: time gap dt = XX.X [s]		Time interval used in the MPPT control algorithm.						x
MPPT: frequency gap df = XXX.X [Hz]		Frequency range used in the MPPT control algorithm.						x

Parameter	Default	Description	1	2	3	4	5	6
Pipe fill ramp XXX [s]	= Ramp up time	Ramp time to follow after a start if the measured value is lower than the minimum alarm value. The piping filling ramp expires after the set time or if the measured value reaches the set value.  In COMBO mode, only one unit is enabled to operate as long as the filling ramp is active.	x		x			
External set enabling ON/OFF	OFF	Enabling the setting of the set value via analog input 3.	x		x			
Set value p = XXX.X [bar]	3	Value that you want to keep constant.	x					x
Compensation p = XXX.X [bar]	0	<p>Compensation at the maximum frequency. The sign can be reversed via the green key.</p>  <p>1: sensor; 2: Compensation ; 3: Set value ; 4: Min motor frequency; 5: Max motor frequency</p> <p>In the case of a group of pumps in COMBO mode, the compensation must be referred to each pump.</p>	x					
Set value 2 p = XXX.X [bar]	3	Value that you want to keep constant.			x			
Compensation set 2 p = XX.X [bar]	0	Compensation at the maximum frequency. The sign can be reversed via the green key.			x			
Value set update t = XX [s]	5	Time interval for updating the set value according to the compensation.	x		x			
Operating frequency f = XXX [Hz]	= Max motor frequency	Frequency used by the device to power the motor.		x		x		
Operating frequency 2 f = XXX [Hz]	= Max motor frequency	Frequency used by the device to power the motor.				x		
Frequency min control fmin = XXX [Hz]	50	Minimum frequency below which the pump must try to stop following the control ramp (Control ramp).	x		x			
Stop delay t = XX [s]	5	Delay during which an attempt is made to stop the pump below the minimum control frequency (Frequency min control).	x		x			
Control ramp t = XX [s]	40	Time in which the device decreases the motor power frequency from the minimum control frequency (Frequency min control) to the minimum motor frequency (Min motor frequency). If during this time the measured value falls below Set value - Delta control, the device restarts the motor. If not, the device will stop the motor completely following the control ramp (Control ramp).	x		x			
Delta start p = XXX.X [bar]	0.5	This parameter communicates by how much the measured value must fall from the set value for the previously stopped pump to be restarted.	x		x			

Parameter	Default	Description	1	2	3	4	5	6
Delta control p = XXX.X [bar]	0.1	<p>This parameter communicates by how much the measured value must fall in relation to the set value so that the pump, during shutdown in control ramp, is restarted.</p> <p>1: Min motor frequency; 2: Frequency min control; 3: Delta control; 4: Set value; 5: Stop delay; 6: Control ramp</p>	x		x			
Delta stop p = XX.X [bar]	0.5	This parameter represents the increment of the measured value with respect to the set value that must be exceeded so that a forced shutdown of the pump according to the stop ramp can occur.	x		x			
Ki XXX		Integral coefficient used in constant value adjustment.	x		x			x
Kp XXX		Proportional coefficient used in constant value adjustment.	x		x			x
COMBO ON/OFF	OFF	Enable the function COMBO for the combined operation of several pumps in parallel. Read the dedicated chapter.	x		x			x
Address XX	01	<p>Device address when in COMBO mode:</p> <ul style="list-style-type: none"> <li>• 0: master</li> <li>• 01 to 07: slave</li> </ul>	x		x			x
Alternance ON/OFF	ON	<p>Enabling the alternation between units in COMBO and D.O.L.</p> <p>The order of priority of operation is alternated based on the previous start-up of each pump in order to obtain an almost uniform wear of the pumps.</p>	x		x			x
Alternance period t = XX [h]	0	<p>Maximum difference in operating hours between multiple devices in the unit.</p> <p>0 means 5 minutes.</p>	x		x			x
COMBO synchrony ON/OFF	OFF	<p>Through this parameter it is possible to activate the synchronous operation of the pumps in COMBO. Read the dedicated chapter.</p> <p>However, it is necessary to lower parameter Frequency min control accordingly.</p>	x		x			
Start delay AUX t = XX [s]	00	Time delay with which the pumps in a group start up after the variable speed pump has reached the maximum motor frequency and the measured value has fallen below the difference Set value - Delta control.	x		x			x
PI control Direct/Reverse	Direct	<p>PI control mode:</p> <ul style="list-style-type: none"> <li>• Direct: as the pump speed increases, the measured value increases.</li> <li>• Reverse: as the pump speed increases, the measured value decreases.</li> </ul>	x		x			
Periodic autorun t = XX [h]	00	Periodic pump start-up after X hours of inactivity. The value 0 disables the function.	x	x	x	x	x	
Dry run cosphi cosphi = X.XX			x	x	x	x	x	x
Restarts delay t = XX [min]	10	Time base that establishes the delay of attempts to restart the pump following a no-water alarm. With each attempt, the delay time is doubled. The maximum number of attempts is 5.	x	x	x	x	x	x
Change password1 Press ENT		By pressing the ENT key it is possible to change the installer level password (level 1) (default 001).	x	x	x	x	x	x



## 9.7. Motor parameters

Parameter	Default	Description
Max motor frequency f = XXX [Hz]	50	Maximum frequency intended to power the motor. Reducing the maximum motor frequency reduces the maximum current consumption.
Min motor frequency f = XXX [Hz]	30	Minimum motor frequency.
Ramp up time t = XX [sec]		Motor start ramp from minimum frequency (Min motor frequency) to maximum frequency (Max motor frequency).  Slower ramps cause less strain on the motor and pump and therefore promote longer life. On the other hand, response times are longer.  Excessively fast start-up ramps may lead to an overload in the inverter.
Ramp down t = XX [sec]		Motor stop ramp from maximum frequency (Max motor frequency) to minimum frequency (Min motor frequency).  Slower ramps cause less strain on the motor and pump and therefore promote longer life. On the other hand, response times are longer.  Excessively fast stop ramps may lead to an overvoltage in the inverter due to the regenerative effect.
Autorestart ON/OFF	OFF	By selecting ON, when the mains power is restored after a power failure, the device will return to the same state it was in before the power failure: this means that if the pump was working, it will start working again
Change password2 Press ENT		By pressing the ENT key it is possible to change the advanced level password (level 2) (default 002).

## 9.8. IN / OUT parameters

Parameter	Default	Description
Unit XXXXXX	bar	Units of measurement [bar, %, ft, in, cm, m, K, F, C, gpm, l / min, m3 / h, atm, psi].
Full scale sensor p = XXX.X [bar]	16	Full scale of the sensor.
Min value sensor p = XXX.X [bar]	0	Minimum sensor value.
Offset input1 XX.X [%]	20%	Zero correction for analog input 1 (4-20 mA). (20 mA x 20% = 4 mA).
Offset input2 XX.X [%]	20%	Zero correction for analog input 2 (4-20 mA). (20 mA x 20% = 4 mA).
Offset input3 XX.X [%]	20%	Zero correction for analog input 3. 0-10 V : 10V x 0% = 0 V
Offset input4 XX.X [%]	0%	Zero correction for analog input 4. 0-10 V : 10V x 0% = 0 V
AN1, AN2 function XXXXXXXX	Independent	Operating logic of analog inputs AN1, AN2: <ul style="list-style-type: none"> <li>• Independent. The active sensor is relative to analog input 1, while the sensor connected to analog input 2 serves as an auxiliary in case of failure of the sensor or of analog input 1.</li> <li>• Selectable. The active sensor may be selected via digital input 3.</li> <li>• Difference 1-2. The digital difference in absolute value is performed between the measurements of analog input 1 and analog input 2.</li> <li>• Higher value. The maximum value between the measurements of the two sensors is considered.</li> <li>• Lower value. The minimum value between the measurements of the two sensors is considered.</li> </ul>
Digital input1 N.O./N.C.	N.O.	If N.O. (Normally Open) is selected, the device will continue to operate the motor if digital input 1 is open. Conversely, it will stop the motor if digital input 1 is closed.  If N.C. (Normally Closed) is selected, the device will continue to operate the motor if digital input 1 is closed. Conversely, it will stop the motor if digital input 1 is open.

Parameter	Default	Description
Digital input2 N.O./N.C.	N.O.	<p>If N.O.(Normally Open) is selected, the device will continue to operate the motor if digital input 2 is open. Conversely, it will stop the motor if digital input 2 is closed.</p> <p>If N.C. (Normally Closed) is selected, the device will continue to operate the motor if digital input 2 is closed. Conversely, it will stop the motor if digital input 2 is open.</p> <p>Digital input 2 is also used to select set value 1 or set value 2 in the control mode Constant value 2 set or to select working frequency 1 or 2 in the control mode Fix speed 2 values.</p> <p>In the presence of the flow switch, it is used for operation via flow switch.</p>
Digital input3 N.O./N.C.	N.O.	<p>If N.O.(Normally Open) is selected, the device will continue to operate the motor if digital input 3 is open. Conversely, it will stop the motor if digital input 3 is closed.</p> <p>If N.C. (Normally Closed) is selected, the device will continue to operate the motor if digital input 3 is closed. Conversely, it will stop the motor if digital input 3 is open.</p> <p>Digital input 3 is also used to select sensor 1 or sensor 2 when the parameter AN1, AN2 function is set to Selectable.</p>
Digital input4 N.O./N.C.	N.O.	<p>If N.O.(Normally Open) is selected, the device will continue to operate the motor if digital input 4 is open. Conversely, it will stop the motor if digital input 4 is closed.</p> <p>If N.C.(Normally Closed) is selected, the device will continue to operate the motor if digital input 4 is closed. Conversely, it will stop the motor if digital input 4 is open.</p> <p>Digital input 4 is also used to select the main or auxiliary control mode in case they are different.</p> <p>Digital input 4 also serves as alarm reset.</p>
Dig. input 2/3 delay t = XX [s]	1	<p>Delay of digital inputs 2 and 3.</p> <p>Digital inputs 1 and 4 have a fixed delay of 1 second.</p> <p>By setting a value greater than 30 seconds, digital input 2 serves as the input for the flow switch.</p>
Flow Measure XXXXXXXXXX	None	<p>Flow measurement mode:</p> <ul style="list-style-type: none"> <li>• None: the flow rate is not measured.</li> <li>• Frequency proport.: the flow rate is calculated proportionally to the frequency of rotation of the pump.</li> <li>• AN2 4-20mA: the flow rate is read through analog input 2 (4-20 ma).</li> <li>• AN3 pulse: The flow rate is read via analogue input 3 (0-10) with a pulse signal.</li> </ul>
Rated Flow XXX.X [m3/h]	1	<p>If parameter Flow Measure is set to Frequency proport., the nominal flow rate corresponds to the pump flow rate at nominal speed.</p> <p>If parameter Flow Measure is set to AN2 4-20mA, the nominal flow rate corresponds to the full scale of the flow meter.</p>
Pulse XXXX.X [l/pulse]		<p>If parameter Flow Measure is set to AN3 pulse, it is necessary to specify how many liters correspond to each pulse sent by the flow meter.</p>
Min stop flow XXX.X [m3/h]	0	<p>If the measured flow remains below parameter Min stop flow for more than 60 seconds, the pump will be stopped. The device will attempt to restart the pump every XX minutes based on the value specified in parameter Restarts delay.</p>
Full scale solarimeter XXXX [W/m2]	0	<p>The 4-20 mA solarimeter full scale connected to analog input 2. A value of 0 means that the measurement is disabled.</p>
Min stop irradiation XXXX [W/m2]	0	<p>If the measured irradiation remains below parameter Min stop irradiation for more than 60 seconds, the pump will be stopped. The device will attempt to restart the pump every XX minutes based on the value specified in parameter Restarts delay.</p>
Min start irradiation XXXX [W/m2]	0	<p>In COMBO Solar operating mode with solar meter connected, it specifies the additional irradiation value to the irradiation specified by the parameter Min stop irradiation necessary to start another pump in sequence. It is advisable to set this parameter equal to the irradiation value necessary for the operation of a pump in the group at maximum power increased by 10%.</p>
Change password1 Press ENT		<p>By pressing the ENT key it is possible to change the installer level password (level 1) (default 001).</p>

## 9.9. Connectivity parameters

Parameter	Default	Description
MODBUS address XXX	1	MODBUS address from 1 to 247
MODBUS baudrate XXXXX	9600	MODBUS baudrate from 1200 bps to 57600 bps

Parameter	Default	Description
MODBUS data format XXXXX	RTU N81	MODBUS data format: RTU N81, RTU N82, RTU E81, RTU O81
MODBUS EEPROM write  ON/OFF	OFF	Setting the writing mode of the parameters transmitted via MODBUS:  ON: the datum is saved in EEPROM  OFF: the datum is not saved in EEPROM
Change password1  Press ENT		By pressing the ENT key it is possible to change the installer level password (level 1) (default 001).

## 9.10. Pump stop under low irradiation conditions

Centrifugal pumps develop the head in relation to their running speed (frequency). If irradiation is too weak, the pump may continue to operate without generating flow since the developed head is lower than the minimum head necessary to produce the flow.

Since the water flow is responsible for cooling the motor (submerged) and the pump, the persistence of this condition would lead to dangerous overheating of the motor (submerged) and of the pump.

### 9.10.1. Minimum frequency stop

Parameter Min motor frequency can be set from the menu Motor parameters at a sufficiently high value to ensure that the pump stops below a certain frequency, according to the formula:

$$f_{\min} = f_{\max} \cdot \sqrt{\left(\frac{H_{\min}}{H_{\max}}\right)} + 2 \quad (1)$$

- $f_{\min}$  [Hz]: Min motor frequency
- $f_{\max}$  [Hz]: Max motor frequency
- $H_{\min}$  [m]: head of the system at minimum frequency (static head)
- $H_{\max}$  [m]: maximum head of the pump (at zero flow) at maximum frequency. It is generally available in the pump data plate.
- 2 [Hz]: variable safety factor between 2 and 5 Hz.

### 9.10.2. Shutdown due to minimal irradiation

If a solarimeter is connected to digital input 2, it is possible to set parameter Min stop irradiation from the menu IN/OUT parameters at a value below which the pump will be stopped after 60 seconds of operation. The device will attempt to restart the pump every XX minutes based on the value specified in parameter Restarts delay.

### 9.10.3. Stop for minimum flow

It is possible to stop the pump if the flow rate falls below the value set in parameter Min stop flow.

The flow measurement mode is set in the menu IN/OUT parameters through parameter Flow Measure.

## 9.11. Control by flow switch

In control mode MPPT, a flow switch can be connected to the device to stop the operation of the pump in the presence of zero flow or in conditions of low irradiation, when the head developed by the pump is not sufficient, or when the delivery is closed. The flow switch, potential-free contact, must be connected to digital input 2 or to terminals 0V, IN2.

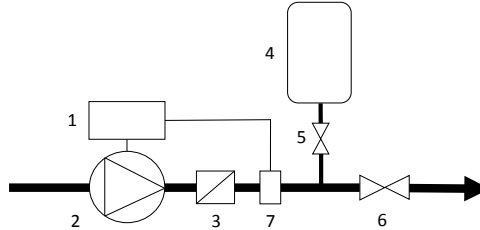
The programming of the device, needed to implement the flow switch control, is based on the following parameters:

Menu	Parameter	Description
IN/OUT parameters	Digital input 2	Configuration of digital input 2, to which the flow switch is connected, as Normally Open (pump running with open contact) or Normally Closed (pump running with closed contact).
IN/OUT parameters	Dig. input 2/3 delay	By setting a value higher than 30 seconds, the device will stop the pump if the flow is zero for more than XX seconds. The pump will restart as soon as the flow switch detects new flow.
Control parameters	Restarts delay	Every XX minutes (default 5 minutes) the inverter will try to restart the pump even if the flow switch detects no flow. If flow is re-established, the pump will continue to run. If the flow remains zero for longer than the delay set for digital input 2, the inverter will stop the pump again.

## 10. Constant pressure operation

### 10.1. Introduction

TheSUND can manage the running speed of the pump in such a way as to keep the pressure constant as the water demand changes. A pressure sensor placed as close as possible to the pump is used for this purpose.



1: Inverter; 2: Pump; 3: Check valve; 4: Pressure vessel; 5: Gate valve; 6: Gate valve; 7: Pressure sensor

### 10.2. The pressure vessel

In water systems equipped with inverters, the function of the pressure vessel is to compensate for losses (or minimum water consumption) and maintain pressure when the pump is stopped, thus avoiding excessively frequent start/stop cycles. It is of fundamental importance to correctly choose the volume and the pre-charge pressure of the pressure vessel. Too small volumes do not allow effectively compensating the minimum water consumption or the losses when the pump is stopped, while too high volumes make it difficult for the inverter to control the pressure.

It is generally sufficient to place a pressure vessel with a volume of about 10% of the maximum flow rate required, considered in liters/minute.

#### Example

If the maximum flow rate required is 60 l/min, it is sufficient to use a 6 liter pressure vessel.

The pre-charge pressure of the pressure vessel must be approx. 80% of the operating pressure.

#### Example

If the set pressure in the inverter is 4 bar, the pre-charge pressure of the pressure vessel should be approx. 3.2 bar.



#### NOTE

The pre-charge pressure must be adjusted with the system completely unloaded.

### 10.3. Electrical connections

The device may be connected to linear pressure sensors with 4 - 20 mA output. The supply voltage range of the sensor must be such as to include the 15 V DC voltage with which the device feeds the analog inputs.

The pressure sensor is connected via the terminals of the analogue input 1, i.e:

- AN1: 4-20 mA signal (-)
- +15V: 15 VDC power supply (+)

The device supports the installation of a second pressure sensor for:

- Operating at constant differential pressure (read the dedicated chapter).
- Automatic replacement of the main pressure sensor in case of failure.
- Exchange of active pressure sensor via digital input.

The secondary pressure sensor is connected via the terminals of the analogue input 2, i.e:

- AN2: 4-20 mA signal (-)
- +15V: 15 VDC power supply (+)

# 11. Splitting the solar pumping system

## 11.1. Introduction.

To maximize the efficiency and reliability of a solar pumping system, instead of using a single high-power pump, it is possible to split it into two or more pumps in parallel, each controlled by a variable speed inverter and powered by the same photovoltaic system.

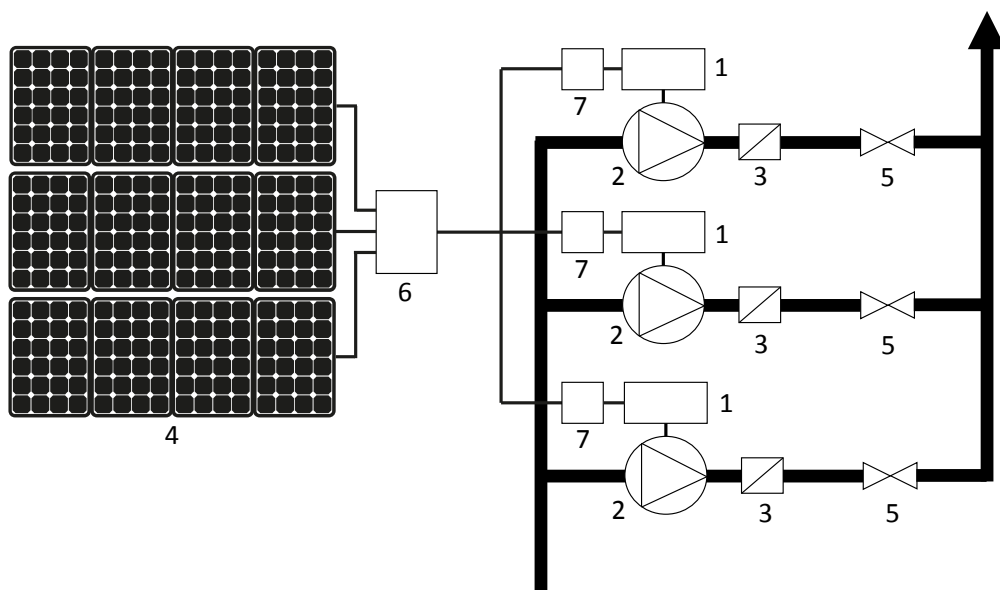
When the system consists of a single pump, in conditions of low irradiance, the pump is often stopped as the photovoltaic power is not sufficient to guarantee its operation.

Vice versa, when the system is split into several lower power pumps, even in conditions of poor irradiation, at least one or more pumps continue to operate supplying water.

This results in a significant increase in the total efficiency of the system.

In addition to this, the following are ensured:

- greater system reliability as, if one pump or inverter fails, the other pumps can continue to operate
- uniformity of pump wear thanks to the alternation of operation managed by the inverters in the unit.



1: Inverter; 2: Pump; 3: Check valve; 4: PV system; 5: Gate valve; 6: Strings combiner with protections; 7: DC disconnect

## 11.2. Solar pumping unit with two or more pumps in COMBO Solar.

The unit consists of two or more pumps (up to 8) each controlled by an inverter. The inverters are connected to each other via COMBO RS485 serial port.

One inverter is configured as master (address 00) whereas the others are configured as slaves (addresses 01 to 07).

### 11.2.1. Cascade operating principle.

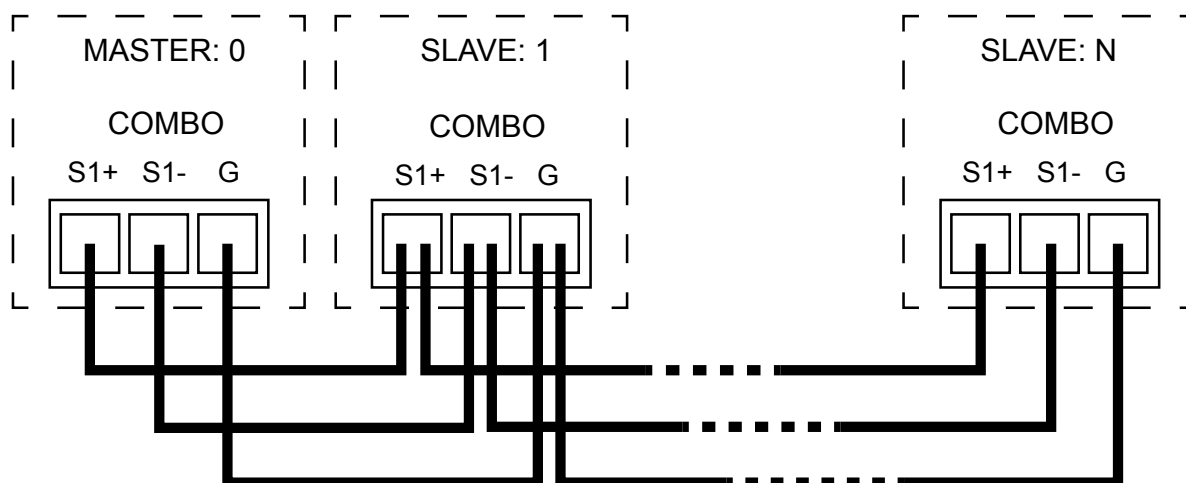
When the unit is started, a single pump is started at variable speed to maximize the available photovoltaic power (MPPT).

If the photovoltaic power is sufficient to reach the maximum frequency of the pump, the second pump of the unit is started.

If the photovoltaic power is sufficient to reach the maximum frequency also of the second pump, the third pump of the unit is started and so on according to the number of pumps present in the group.

When the irradiation decreases, the pumps are progressively slowed down and stopped in sequence.

### 11.2.2. Electrical connections.



#### WARNING

Respect the polarity of the connections.

### 11.2.3. Programming the master unit.

Menu	Parameter	Value
Control parameters	COMBO	ON to activate.
Control parameters	Address	00
Control parameters	Alternance	ON to activate / OFF to deactivate.
Control parameters	Alternance period	Establishes the number of hours of continuous operation after which the pumps in the unit are forced to alternate. The value 0 means 5 minutes.
Control parameters	Start delay AUX	We recommend setting 0 s.
IN/OUT parameters	Min start irradiation	In COMBO Solar operating mode with solar meter connected, it specifies the additional irradiation value to the irradiation specified by the parameter Min stop irradiation necessary to start another pump in sequence. It is advisable to set this parameter equal to the irradiation value necessary for the operation of a pump in the group at maximum power increased by 10%.

### 11.2.4. Programming of slave units.

Menu	Parameter	Value
Control parameters	COMBO	ON to activate.
Control parameters	Address	from 01 to 07.
Control parameters	Alternance	ON to activate / OFF to deactivate. It is possible to determine which devices are included in the alternation and which are not. Devices excluded from the alternation will receive a starting priority based on their address.



#### NOTE

To start or stop a unit in COMBO mode, simply press the START or STOP button on the master unit only.



#### NOTE

To change the operating parameters of a COMBO unit, operate on the unit's master. When the Master Menu is exited, the remote programming of the connected slave units is required. In this manner, all parameters set in the master are also copied to the slaves with the exception of parameter Address.

**CAUTION**

When the master menu is accessed, the communication with the slave units is interrupted and the A13 No communication alarm is produced. Communication is automatically re-established by exiting the Master Menu.

**WARNING**

In case of pumps in COMBO mode, it is recommended to make the connections to the motor respecting the same phase sequence. In this manner, it will be ensured that by copying parameter Rotation sense from the master unit to the slave units, all the pumps in the unit will maintain the correct running direction.

### 11.2.5. Automatic master replacement

In COMBO mode, if a slave or the pump connected to it should fail or enter an alarm state, the unit will continue to operate with the remaining units.

In case the master or the pump connected to it should break down or enter an alarm state, the unit will stop for about 30 seconds generating the A13 No communication alarm in the slaves. After the waiting time has elapsed, the slave with address 1 will become the master, thus allowing the unit to resume operation.

If the master reappears in the unit, the latter will stop again for about 30 seconds, generating the A12 Address error alarm in the master and in the slave 1.

After the waiting time has elapsed, the master will assume address 0 and the slave address 1, thus allowing the unit to resume operation.

**CAUTION**



In order to enable automatic master changeover, parameter Autorestart must be set to ON. Do not touch the keypad of the devices during the master replacement process, otherwise the master change process will be interrupted.

## 12. Alarms


**WARNING**

Immediate remedies must be implemented in case of alarms to safeguard the integrity of the device itself and of the system in which it is installed.

Alarm	Description	Possible solutions
A01 Overcurrent motor	<p>The current absorbed by the motor exceeds the maximum allowed value.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset after 10 seconds for up to 7 attempts, after which you must wait for 60 minutes.</li> <li>Disconnecting the power supply.</li> </ul>	<ul style="list-style-type: none"> <li>Check that motor parameters are correctly set.</li> <li>Check that the pump is turning in the correct direction.</li> <li>Make sure that the motor is free to rotate and check for any mechanical issues.</li> <li>Adjust parameter Voltage boost</li> </ul>
A02 Sensor fault	<p>The current value read by the analog input is less than 4 mA.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Alarm reset by STOP key.</li> <li>Disconnecting the power supply</li> </ul>	<ul style="list-style-type: none"> <li>Check that the connections on the device side and on the sensor side are correct.</li> <li>Check that the sensor is fed the correct power.</li> <li>Check that the sensor is working properly.</li> <li>If only one sensor is connected to analog input 1, try to connect it to analog input 2.</li> </ul>

Alarm	Description	Possible solutions
A03 Over temperature inverter	<p>The temperature reached by the device is higher than the maximum allowed value.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset</li> </ul>	<ul style="list-style-type: none"> <li>Check that the ambient temperature is within the allowed limits.</li> <li>Make sure the device is protected from direct exposure to sunlight or heat sources.</li> <li>Check that both the external and internal cooling fans (if present) are working properly.</li> <li>Check that the dissipation channels are clean.</li> <li>Check that the device is cooled as indicated in the dedicated chapter.</li> </ul> <div>  <p><b>NOTE</b></p> <p>To ensure uninterrupted operation, the inverter automatically reduces the maximum frequency (i.e. power) when the internal temperature reaches a certain threshold. If such frequency reduction is not sufficient to keep the temperature above the maximum permitted value, the inverter will stop the motor and trigger the alarm A03 Over temperature inverter.</p> </div>
A04 Dry run cosphi	<p>The warning W26 No water appeared 5 consecutive times following the automatic reset attempts.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Alarm reset by STOP key.</li> <li>Disconnecting the power supply</li> </ul>	<div>  <p><b>WARNING</b></p> <p>When the warning W26 No water appears, the device will automatically restart the load after a time equal to the value set in the parameter Restarts delay multiplied by the number of attempts made. At the end of the fifth attempt, the device will definitively stop the load producing the alarm A04 Dry run cosphi. The alarm must be reset manually.</p> </div>
A05 Under voltage	<ul style="list-style-type: none"> <li>Supply voltage below the minimum allowed value.</li> <li>Insufficient input power to power the device.</li> </ul> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset if parameter Autoreset = ON</li> </ul>	<ul style="list-style-type: none"> <li>Check the value of the power supply voltage both under no load and load conditions.</li> <li>Verify that the source has enough power to power the load.</li> </ul>
A06 Over voltage	<p>The power supply voltage or the voltage inside the device exceeds the maximum allowed value.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset if parameter Autoreset = ON</li> </ul>	<ul style="list-style-type: none"> <li>Check the value of the power supply voltage both under no load and load conditions.</li> <li>Check for regeneration from the load.</li> <li>Increase parameter Ramp down</li> <li>Increase parameter Ramp freq. min motor</li> <li>In the case of a permanent magnet motor, check that the load is not subjected to passive movement.</li> </ul>
A07 Max value alarm	<p>The value read by the analog input is higher than the value set for the parameter Max alarm value.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset</li> </ul>	<ul style="list-style-type: none"> <li>Check the value set for the parameter.</li> <li>Check the hydraulic causes that lead to the alarm condition.</li> <li>Check that the sensor is working properly.</li> </ul>
A08 Locked rotor	<p>The automatic frequency limitation created by the inverter following an excessive absorption by the motor (beyond the value set in the parameter Rated motor current) causes a reduction of the frequency below the average value between Min motor frequency and Max motor frequency.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Alarm reset by STOP key.</li> <li>Disconnecting the power supply</li> </ul>	<ul style="list-style-type: none"> <li>Check the possible solutions for the alarm A01 Overcurrent motor</li> </ul>
A09 Overload inverter	<p>The current absorbed by the load exceeds the rated current of the device.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Alarm reset by STOP key.</li> <li>Disconnecting the power supply</li> </ul>	<ul style="list-style-type: none"> <li>Make sure that the motor is free to rotate and check for any mechanical issues.</li> <li>Increase the value of the parameter Ramp up time.</li> <li>Increase the value of the parameter Ramp freq. min motor.</li> <li>Adjust parameter Voltage boost</li> <li>Check the value of the power supply voltage both under no load and load conditions.</li> </ul>





Alarm	Description	Possible solutions
A10 IGBT trip alarm	<p>The current absorbed by the load instantaneously exceeds the maximum current protection of the device's power module.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset after 10 seconds for up to 3 attempts, after which you must wait for 60 minutes.</li> <li>Disconnecting the power supply</li> </ul>	<ul style="list-style-type: none"> <li>Check the possible solutions for alarms A01 Overcurrent motor and A09 Overload inverter.</li> <li>Check for short circuits between the output phases and the ground insulation.</li> <li>Check that the system is properly grounded.</li> <li>Check for electrical noise from other devices connected to the system.</li> </ul>
A11 No load	<p>The current absorbed by the load is too low in relation to the parameter Rated motor current.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Alarm reset by STOP key.</li> <li>Disconnecting the power supply</li> </ul>	<ul style="list-style-type: none"> <li>Check the possible solutions for the alarm A01 Overcurrent motor</li> </ul>
A12 Address error	<p>In COMBO mode, multiple devices in the group have the same address.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset</li> </ul>	<ul style="list-style-type: none"> <li>Restore the correct value of parameter Address in all the devices in the group.</li> <li>Verify which situation triggers the alarm.</li> <li>If the alarm is triggered after a master replacement, check that the parameter Autorestart is activated.</li> <li>Check the electrical connection between the slave unit and the master, and the presence of possible disturbances.</li> </ul>
A13 No communication	<p>In COMBO mode, the communication between the slave unit and the master has been interrupted.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset</li> </ul>	<ul style="list-style-type: none"> <li>Check the electrical connection between the slave unit and the master, and the presence of possible disturbances.</li> <li>Exit the master programming menu.</li> <li>Attempt a manual reset of the alarm.</li> </ul> <div style="background-color: #f0f0f0; padding: 10px; margin-top: 10px;">  <p><b>CAUTION</b></p> <p>Keep signal cables separate and never parallel to power cables. If it is necessary to cross them, make sure that they cross perpendicularly.</p> </div>
A14 Min value alarm	<p>The value read by the analog input is lower than the value set for the parameter Min alarm value.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset</li> </ul>	<ul style="list-style-type: none"> <li>Check the value set for the parameter.</li> <li>Check the hydraulic causes that lead to the alarm condition.</li> <li>Check that the sensor is working properly.</li> </ul>
A15 Keyboard fault	<p>One of the keys of the keyboard was held down for more than 30 seconds.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Alarm reset by STOP key.</li> <li>Disconnecting the power supply</li> </ul>	<ul style="list-style-type: none"> <li>Check that the keys are mechanically free.</li> </ul>
A16 CPU alarm	<p>Communication error between the control part and the power part or error in the CPU.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset</li> </ul>	<ul style="list-style-type: none"> <li>Check the value of the power supply voltage both under no load and load conditions.</li> <li>Check for electrical noise from other devices connected to the system.</li> <li>Check the integrity of the communication cable between the control board and the power board.</li> </ul>
A19 Out of step	<p>Loss of motor control</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset with a 3-minute delay.</li> </ul>	<ul style="list-style-type: none"> <li>Check the possible solutions for the alarm A01 Overcurrent motor</li> </ul>


## 13. Alarms (version without display)



### WARNING

Immediate remedies must be implemented in case of alarms to safeguard the integrity of the device itself and of the system in which it is installed.

Alarm	Notification LED	Description	Possible solutions
A01 Overcurrent motor	2 flashes of the yellow alarm led	<p>The current absorbed by the motor exceeds the maximum allowed value.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset after 10 seconds for up to 7 attempts, after which you must wait for 60 minutes.</li> <li>Disconnecting the power supply.</li> </ul>	<ul style="list-style-type: none"> <li>Check that motor parameters are correctly set.</li> <li>Check that the pump is turning in the correct direction.</li> <li>Make sure that the motor is free to rotate and check for any mechanical issues.</li> <li>Adjust parameter Voltage boost</li> </ul>
A02 Sensor fault	3 flashes of the yellow alarm led	<p>The current value read by the analog input is less than 4 mA.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Alarm reset by STOP key.</li> <li>Disconnecting the power supply</li> </ul>	<ul style="list-style-type: none"> <li>Check that the connections on the device side and on the sensor side are correct.</li> <li>Check that the sensor is fed the correct power.</li> <li>Check that the sensor is working properly.</li> <li>If only one sensor is connected to analog input 1, try to connect it to analog input 2.</li> </ul>
A03 Over temperature inverter	4 flashes of the yellow alarm led	<p>The temperature reached by the device is higher than the maximum allowed value.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset</li> </ul>	<ul style="list-style-type: none"> <li>Check that the ambient temperature is within the allowed limits.</li> <li>Make sure the device is protected from direct exposure to sunlight or heat sources.</li> <li>Check that both the external and internal cooling fans (if present) are working properly.</li> <li>Check that the dissipation channels are clean.</li> <li>Check that the device is cooled as indicated in the dedicated chapter.</li> </ul> <div>  <p><b>NOTE</b></p> <p>To ensure uninterrupted operation, the inverter automatically reduces the maximum frequency (i.e. power) when the internal temperature reaches a certain threshold. If such frequency reduction is not sufficient to keep the temperature above the maximum permitted value, the inverter will stop the motor and trigger the alarm A03 Over temperature inverter.</p> </div>
A04 Dry run cosphi	1 flash of the yellow alarm led	<p>The warning W26 No water appeared 5 consecutive times following the automatic reset attempts.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Alarm reset by STOP key.</li> <li>Disconnecting the power supply</li> </ul>	<div>  <p><b>WARNING</b></p> <p>When the warning W26 No water appears, the device will automatically restart the load after a time equal to the value set in the parameter Restarts delay multiplied by the number of attempts made. At the end of the fifth attempt, the device will definitively stop the load producing the alarm A04 Dry run cosphi. The alarm must be reset manually.</p> </div>
A05 Under voltage	Flashing red STAND-BY led	<ul style="list-style-type: none"> <li>Supply voltage below the minimum allowed value.</li> <li>Insufficient input power to power the device.</li> </ul> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset if parameter Autor-start = ON</li> </ul>	<ul style="list-style-type: none"> <li>Check the value of the power supply voltage both under no load and load conditions.</li> <li>Verify that the source has enough power to power the load.</li> </ul>
A06 Over voltage	Red STAND-BY LED and yellow ALARM LED flashing.	<p>The power supply voltage or the voltage inside the device exceeds the maximum allowed value.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset if parameter Autor-start = ON</li> </ul>	<ul style="list-style-type: none"> <li>Check the value of the power supply voltage both under no load and load conditions.</li> <li>Check for regeneration from the load.</li> <li>Increase parameter Ramp down</li> <li>Increase parameter Ramp freq. min motor</li> <li>In the case of a permanent magnet motor, check that the load is not subjected to passive movement.</li> </ul>
A07 Max value alarm	7 flashes of the yellow alarm led	<p>The value read by the analog input is higher than the value set for the parameter Max alarm value.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset</li> </ul>	<ul style="list-style-type: none"> <li>Check the value set for the parameter.</li> <li>Check the hydraulic causes that lead to the alarm condition.</li> <li>Check that the sensor is working properly.</li> </ul>

Alarm	Notification LED	Description	Possible solutions
A08 Locked rotor	2 flashes of the yellow alarm led	<p>The automatic frequency limitation created by the inverter following an excessive absorption by the motor (beyond the value set in the parameter Rated motor current) causes a reduction of the frequency below the average value between Min motor frequency and Max motor frequency.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Alarm reset by STOP key.</li> <li>Disconnecting the power supply</li> </ul>	<ul style="list-style-type: none"> <li>Check the possible solutions for the alarm A01 Overcurrent motor</li> </ul>
A09 Overload inverter	5 flashes of the yellow alarm led	<p>The current absorbed by the load exceeds the rated current of the device.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Alarm reset by STOP key.</li> <li>Disconnecting the power supply</li> </ul>	<ul style="list-style-type: none"> <li>Make sure that the motor is free to rotate and check for any mechanical issues.</li> <li>Increase the value of the parameter Ramp up time.</li> <li>Increase the value of the parameter Ramp freq. min motor.</li> <li>Adjust parameter Voltage boost</li> <li>Check the value of the power supply voltage both under no load and load conditions.</li> </ul>
A10 IGBT trip alarm	5 flashes of the yellow alarm led	<p>The current absorbed by the load instantaneously exceeds the maximum current protection of the device's power module.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset after 10 seconds for up to 3 attempts, after which you must wait for 60 minutes.</li> <li>Disconnecting the power supply</li> </ul>	<ul style="list-style-type: none"> <li>Check the possible solutions for alarms A01 Overcurrent motor and A09 Overload inverter.</li> <li>Check for short circuits between the output phases and the ground insulation.</li> <li>Check that the system is properly grounded.</li> <li>Check for electrical noise from other devices connected to the system.</li> </ul>
A11 No load	Yellow alarm LED on and alarm display via App.	<p>The current absorbed by the load is too low in relation to the parameter Rated motor current.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Alarm reset by STOP key.</li> <li>Disconnecting the power supply</li> </ul>	<ul style="list-style-type: none"> <li>Check the possible solutions for the alarm A01 Overcurrent motor</li> </ul>
A12 Address error	9 flashes of the yellow alarm led	<p>In COMBO mode, multiple devices in the group have the same address.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset</li> </ul>	<ul style="list-style-type: none"> <li>Restore the correct value of parameter Address in all the devices in the group.</li> <li>Verify which situation triggers the alarm.</li> <li>If the alarm is triggered after a master replacement, check that the parameter Autorestart is activated.</li> <li>Check the electrical connection between the slave unit and the master, and the presence of possible disturbances.</li> </ul>
A13 No communication	6 flashes of the yellow alarm led	<p>In COMBO mode, the communication between the slave unit and the master has been interrupted.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset</li> </ul>	<ul style="list-style-type: none"> <li>Check the electrical connection between the slave unit and the master, and the presence of possible disturbances.</li> <li>Exit the master programming menu.</li> <li>Attempt a manual reset of the alarm.</li> </ul> <div style="background-color: #f0f0f0; padding: 10px; margin-top: 10px;">  <p><b>CAUTION</b></p> <p>Keep signal cables separate and never parallel to power cables. If it is necessary to cross them, make sure that they cross perpendicularly.</p> </div>
A14 Min value alarm	8 flashes of the yellow alarm led	<p>The value read by the analog input is lower than the value set for the parameter Min alarm value.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Automatic reset</li> </ul>	<ul style="list-style-type: none"> <li>Check the value set for the parameter.</li> <li>Check the hydraulic causes that lead to the alarm condition.</li> <li>Check that the sensor is working properly.</li> </ul>
A15 Keyboard fault	Yellow alarm LED on and alarm display via App.	<p>One of the keys of the keyboard was held down for more than 30 seconds.</p> <p>Reset mode:</p> <ul style="list-style-type: none"> <li>Alarm reset by STOP key.</li> <li>Disconnecting the power supply</li> </ul>	<ul style="list-style-type: none"> <li>Check that the keys are mechanically free.</li> </ul>

Alarm	Notification LED	Description	Possible solutions
A16 CPU alarm	10 flashes of the yellow alarm led	Communication error between the control part and the power part or error in the CPU.  Reset mode: <ul style="list-style-type: none"> <li>Automatic reset</li> </ul>	<ul style="list-style-type: none"> <li>Check the value of the power supply voltage both under no load and load conditions.</li> <li>Check for electrical noise from other devices connected to the system.</li> <li>Check the integrity of the communication cable between the control board and the power board.</li> </ul>
A19 Out of step	Yellow alarm LED on and alarm display via App.	Loss of motor control  Reset mode: <ul style="list-style-type: none"> <li>Automatic reset with a 3-minute delay.</li> </ul>	<ul style="list-style-type: none"> <li>Check the possible solutions for the alarm A01 Overcurrent motor</li> </ul>

## 14. Warnings

Warning	Description	Possible solutions
W01 Digital input active 1	Digital input 1 has been activated.	<ul style="list-style-type: none"> <li>Check the configuration and connections to digital input 1.</li> </ul>
W02 Digital input active 2	Digital input 2 has been activated.	<ul style="list-style-type: none"> <li>Check the configuration and connections to digital input 2.</li> </ul>
W03 Digital input active 3	Digital input 3 has been activated.	<ul style="list-style-type: none"> <li>Check the configuration and connections to digital input 3.</li> </ul>
W04 Digital input active 4	Digital input 4 has been activated.	<ul style="list-style-type: none"> <li>Check the configuration and connections to digital input 4.</li> </ul>
W05 Minimum irradiation	In control mode MPPT, when parameter Full scale solarimeter is greater than 0, the irradiation reading has fallen below the value set for parameter Min stop irradiation.	<ul style="list-style-type: none"> <li>Check that the parameters Full scale solarimeter and Min stop irradiation are set correctly.</li> </ul>
W18 Minimum flow	In control mode MPPT, when parameter Flow Measure is active, the flow rate reading has fallen below the value set for parameter Min stop flow.	<ul style="list-style-type: none"> <li>Check that the parameters Flow Measure and Min stop flow are set correctly.</li> </ul>
W19 Flow switch active	In control mode MPPT, when parameter Dig. input 2/3 delay is greater than 30 seconds, the digital input 2, to which the flow switch is connected, has been activated.	<ul style="list-style-type: none"> <li>Check the correct configuration of digital input 2.</li> <li>Check the correct operation of the flow switch and the connection to digital input 2.</li> <li>Check the value of parameter Dig. input 2/3 delay.</li> </ul>
W20 Temp. derate	The inverter is limiting the maximum motor frequency to keep the inverter temperature below the maximum limit.	<ul style="list-style-type: none"> <li>Check the possible solutions for the alarm A03 Over temperature inverter.</li> </ul>
W21 Overload 15V	15V power supply overload.	<ul style="list-style-type: none"> <li>Check the absorption of the loads and any short circuits connected to the 15V power supply</li> </ul>
W22 EEPROM COM.	No communication with EEPROM	<ul style="list-style-type: none"> <li>Contact the technical support service.</li> </ul>
W23 EEPROM fault	Failure in EEPROM	<ul style="list-style-type: none"> <li>Contact the technical support service</li> </ul>
W24 Low PV energy	The energy from the photovoltaic panels is insufficient to drive the motor until it reaches its minimum frequency.  The inverter attempts an automatic start every 5 minutes.	<ul style="list-style-type: none"> <li>Check the available photo voltaic power in relation to the motor and pump power.</li> <li>Check the series and parallel connections of the photovoltaic panels.</li> <li>Check the photovoltaic system open circuit voltage and short circuit current.</li> <li>Check the short-circuit current of the photovoltaic system. The short-circuit current is proportional to the available irradiation.</li> <li>Check the available power in relation to the available irradiation.</li> <li>Check that the surface of all panels is clean and free from shading (even partial).</li> <li>Check that the value of parameter Min motor frequency is not too high compared to parameter Max motor frequency. It usually doesn't exceed 80%.</li> <li>Check the other motor parameters.</li> </ul>
W25 Alarm slave X	In control mode COMBO, the master has detected an alarm in the X slave.	<ul style="list-style-type: none"> <li>Check the status of the XX slave unit indicated by the master.</li> </ul>
W26 No water	The power factor (cosphi) of the motor read by the device is permanently below the value set in the parameter Dry run cosphi.	<ul style="list-style-type: none"> <li>Check that the pump is properly primed.</li> <li>Check that the pump is turning in the correct direction.</li> <li>Check that the parameter Dry run cosphi is set correctly.</li> </ul>

Warning	Description	Possible solutions
W27 START/STOP block	The START/STOP buttons have been locked.	<ul style="list-style-type: none"> <li>Press the START or STOP button for at least 5 seconds to release the lock.</li> </ul>

## 15. Warnings (version without display)

Warning	Notification LED	Description	Possible solutions
W01 Digital input active 1	Fast flashing yellow alarm LED	Digital input 1 has been activated.	<ul style="list-style-type: none"> <li>Check the configuration and connections to digital input 1.</li> </ul>
W02 Digital input active 2	Fast flashing yellow alarm LED	Digital input 2 has been activated.	<ul style="list-style-type: none"> <li>Check the configuration and connections to digital input 2.</li> </ul>
W05 Minimum irradiation	Yellow alarm LED on and alarm display via App.	In control mode MPPT, when parameter Full scale solarimeter is greater than 0, the irradiation reading has fallen below the value set for parameter Min stop irradiation.	<ul style="list-style-type: none"> <li>Check that the parameters Full scale solarimeter and Min stop irradiation are set correctly.</li> </ul>
W18 Minimum flow	Yellow alarm LED on and alarm display via App.	In control mode MPPT, when parameter Flow Measure is active, the flow rate reading has fallen below the value set for parameter Min stop flow.	<ul style="list-style-type: none"> <li>Check that the parameters Flow Measure and Min stop flow are set correctly.</li> </ul>
W19 Flow switch active	Yellow alarm LED on and alarm display via App.	In control mode MPPT, when parameter Dig. input 2/3 delay is greater than 30 seconds, the digital input 2, to which the flow switch is connected, has been activated.	<ul style="list-style-type: none"> <li>Check the correct configuration of digital input 2.</li> <li>Check the correct operation of the flow switch and the connection to digital input 2.</li> <li>Check the value of parameter Dig. input 2/3 delay.</li> </ul>

## 16. EC Declaration of Conformity

The manufacturer hereby:

**Nastec srl**

**Via della Tecnica, 8, 36048, Barbarano Mossano, Vicenza, Italy**

declares under its own responsibility that the product:

**SUND**

complies with the following directives:

- 2014/53 / EU Radio Equipment Directive (RED)
- 2011/65 / EU - RoHS Directive

and that the following harmonized standards and technical specifications have been applied:

- EN 61000-6-3:2007 + A1:2011
- EN 61000-6-1:2007 + A1:2011
- EN 61800-3:2004 + A1:2012
- EN 62233:2008
- EN 62311:2008
- ETSI EN 301 489-17 V3.1.1:2017
- ETSI EN 301 489-1 V2.1.1:2017
- ETSI EN 300 328 V2.1.1:2016-11
- EN 60529:1991 + A1:2000 + A2:2013
- EN 60335-1:2012 + AC:2014 + A11:2014 + A13:2017
- EN 60335-2-41:2012
- EN 50581:2012
- EN 809+A1:2009

Barbarano Mossano

13/11/2018

Ing. Marco Nassuato

Managing Director



## 17. UK Declaration of Conformity

The manufacturer hereby:

**Nastec srl**

**Via della Tecnica, 8, 36048, Barbarano Mossano, Vicenza, Italy**

declares, under its own responsibility, that the product:

**SUND**

complies with the following directives:

- UK SI 2017 No. 1206 Radio Equipment Regulations 2017
- UK SI 2012 No. 3032. Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (RoHS2)

and that the following harmonised standards and technical specifications have been applied:

- BS EN 61000-6-3:2007 + A1:2011
- BS EN 61000-6-1:2007 + A1:2011
- BS EN 61800-3:2004 + A1:2012
- BS EN 62233:2008
- BS EN 62311:2008
- ETSI EN 301 489-17 V3.1.1:2017
- ETSI EN 301 489-1 V2.1.1:2017
- ETSI EN 300 328 V2.1.1:2016-11
- BS EN 60529:1991 + A1:2000 + A2:2013
- BS EN 60335-1:2012 + AC:2014 + A11:2014 + A13:2017
- BS EN 60335-2-41:2012
- BS EN 50581:2012
- BS EN 809+A1:2009

Barbarano Mossano

02/03/2022

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Managing Director



