NASTEC®

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MIDA Solar

Installation, use and maintenance manual

V 3.0
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Table of Contents

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.
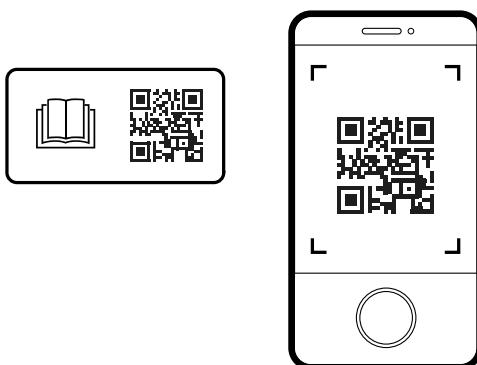
1.2. Product overview

The range of inverters MIDA Solar was created to power traditional pumping systems using photovoltaic energy. In this way, it is possible to convert old plants into renewable energy plants or to use the same pumps for power supply from the electricity grid in the creation of independent, economical and eco-sustainable water systems. MIDA Solar can convert the DC coming from panels into AC for the power supply of any electric pump.

The device also offers complete protection against overvoltage, overcurrent and dry runs.

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.

In the MP (MultiPower) versions, the inverter can be powered in DC by photovoltaic panels or in AC by the grid or generator set to guarantee the operation of the pump at any time of day.

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.

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 electro-cution.

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 place any interrupting or switching devices between the inverter and the load. Interruption or switching during motor operation may cause serious damage to the device.

WARNING
Do not perform insulation tests on the load or power cable without first disconnecting them from the device.

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

WARNING
Use the device only with pumps, do not use it with other types of loads.

2.4. Acoustic emission

The device has an acoustic emission:

<65 dB at a distance of 1 meter with cooling fans at maximum speed.

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 that the unit is properly cooled, that the fans are functioning and that the cooling surfaces are clean	Every 6 months, or following a temperature alarm
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

TIP

For more information contact the dealer or technical support at service@nastec.eu or by opening a support ticket on the portal 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 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, 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 or by opening a support ticket on the portal 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.

> 💡 **TIP**
> For more information contact the dealer or technical support at service@nastec.eu or by opening a support ticket on the portal service.nastec.eu

5. Technical features

5.1. Name

MIDA Solar ABCD (MP) - EFGH

* **MIDA Solar**: Product name
* **MP**: If present, it indicates that the device can be powered both with DC (panels) and AC (mains or generator set)
* **A**: Nominal AC supply voltage (2 =1x230 VAC, 3 = 3x230 VAC, 4 = 3x400 VAC)
* **BCD** Rated output current
* **EF**: Customization code (01 = standard customization)
* **G**: Mounting kit included in the package (0 = none, 1 = motor, 2 = wall, 3 = motor+wall)

• **H**: Pressure sensor included in the package (0 = none, 1 = pressure sensor 0-16 bar)

5.2. Technical Data

Electrical specifications by model:

Model	Vin DC [VDC]	Vin AC *[VAC]	Vnom **	Max V out [VAC]	I in [A]	Max I out [A]	Typical motor P2***		Maximum efficiency [%]	Size
MIDA Solar 203 MP	90 - 400	1 x 90 - 265	110 V	250	Max 11 A 5,5 A (230 VAC)	3,5	1 x 230 VAC 3 x 230 VAC	0,37 kW 0,55 kW	94,5	1
MIDA Solar 205 MP	90 - 400	1 x 90 - 265	155 V	250	Max 11 A 7,5 A (230 VAC)	5	1 x 230 VAC 3 x 230 VAC	0,55 kW 1,1 kW	94	1
MIDA Solar 207 MP	90 - 400	1 x 90 - 265	230 V	250	Max 11 A 11 A (230 VAC)	7,5	1 x 230 VAC 3 x 230 VAC	0,75 kW 1,5 kW	94	1

* AC power supply available only for MP (MultiPower) models

**Minimum voltage for nominal performances.

*** Typical motor power. Refer to the motor rated current when selecting the model.

General electrical specifications:

Power supply frequency	50 - 60 Hz (+/- 2%)
Voltage unbalance between the power supply phases	+/- 2%
Maximum output frequency	300 Hz
EMC compliance	EN61800-3 C1
Energy efficiency class (according to EN61800-9-2)	IE2

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)

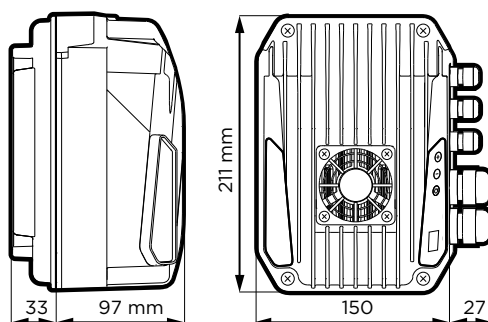Mechanical specifications:

Protection rating	IP66 (NEMA 4X)
Resistance to vibrations	EN60068-2-6:2008, EN60068-2-27:2009, EN60068-2-64:2008,

⚠️ **WARNING**
Protect the device from direct exposure to weather and sunlight.

5.3. Dimensions and weight

Size	Maximum weight [kg]
1	2,5

5.4. Cables entry

Cable gland	Tightening torque [Nm]	Cable diameter [mm]	Size 1
M12	1,5	3,5-7	3
M20	6	7-13	2

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 device is cooled primarily by forced air circulation through the heat sink element.

In addition to the heat sink, the device also uses the remaining surfaces to cool itself. It is therefore necessary to ensure sufficient space around the device during installation.

In particular, the distance between the suction and discharge side of the heat sink and the other surfaces must be at least:

• 150 mm for current intensity up to 18 A

On the other sides, maintain a minimum distance of 100 mm to ensure cooling and to make installation and maintenance operations easier.

⚠️🔥	During operation, the surfaces of the device can become hot enough to cause burns. Do not touch them.

In the case of installation inside electric cabinet, it is necessary to guarantee the appropriate air flow for the heat dissipation of all the components. The heat released by the device may be calculated from its conversion efficiency.
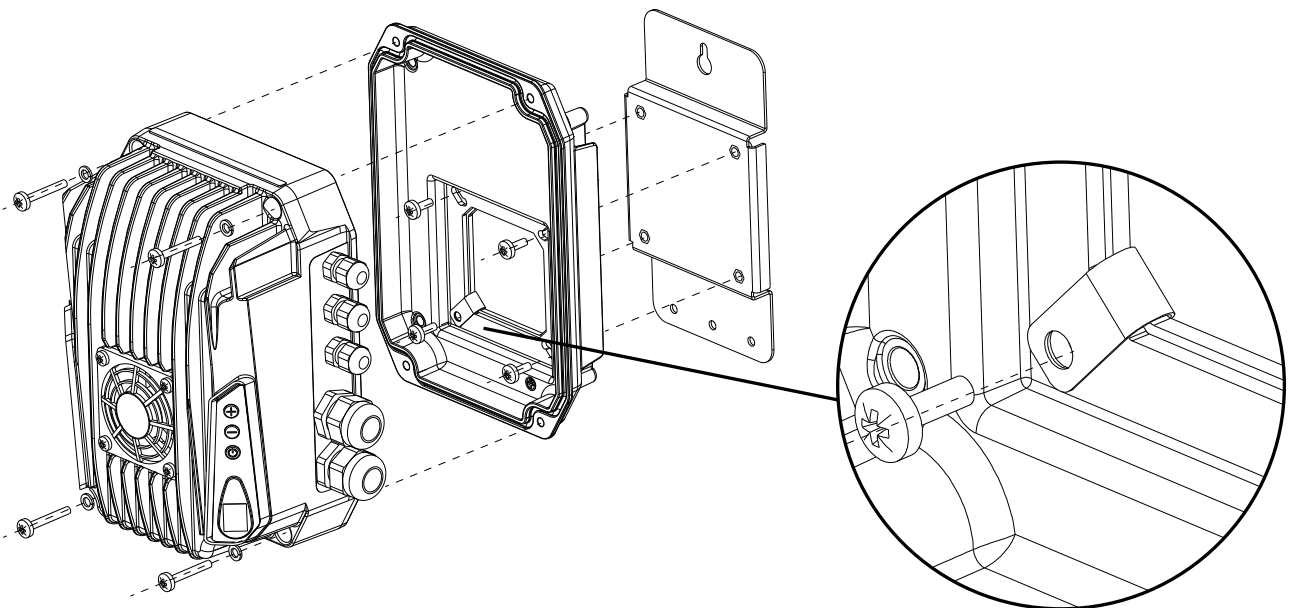
> ⚠️ **WARNING**
> Do not place any heat-generating elements (outlet filters) on the suction side of the device to prevent dangerous overheating.

6.3. Wall installation

Wall installation is carried out by means of the special metal bracket available on request.

Wall installation for size 1 devices

⚡ **DANGER**
The ground continuity between the base of the device and the bracket is ensured by the special component shown in the figure. Install this component and verify the ground continuity between the bracket and the base of the device at the end of the installation.

Alternatively, it is possible to drill the aluminum base in the area where the four special fixing holes are.

The fixing screws must be equipped with O-rings to guarantee the protection rating.

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 16 mm^2. (6 AWG)
- 16 mm2 (6 AWG) for mains power cable cross-section between 16 mm^2 (6 AWG) and 35 mm^2 (1 AWG).
- cross-section equal to half the cross-section of the power supply cable when the latter is greater than 35 mm^2 (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.

It is therefore not necessary to install any overload protection device between the inverter and the motor.

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	MIDA Solar 203 MP	10	S201-C10
1 x 230 VAC	MIDA Solar 205 MP	10	S201-C10
1 x 230 VAC	MIDA Solar 207 MP	16	S201-C16

Residual Current Devices (RCD)

For inverter devices with single-phase power supply, use AC-sensitive RCD devices of both sine and pulse types. The devices listed are, in order of priority:

- type F, marked with the symbols ∿ ⟿ capable of detecting high-frequency currents up to 1 kHz.

- type A-APR, marked with the symbols   �▨⌐   characterized by a slight intervention delay.
- type A, marked with the symbols ⌐▨⌐

Install on the DC side:

- DC disconnector 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 cables

Model	Maximum cross-section of the input cable with ground	Maximum cross-section of the output cable with ground	Cable tightening torque [Nm]	Ground cable tightening torque
MIDA Solar 203 MP	3 x 2,5 mm^2	4 x 2,5 mm^2	-	-
MIDA Solar 205 MP	3 x 2,5 mm^2	4 x 2,5 mm^2	-	-
MIDA Solar 207 MP	3 x 2,5 mm^2	4 x 2,5 mm^2	-	-

⚠️ **WARNING**
Use unshielded cables for input cables and shielded cables for output cables.

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

⚠️ **WARNING**
For motor cable lengths greater than 5 meters, the use of special output filters, available on request, is recommended.

7.3.2. Control cables

Model	Maximum cross-section of the control cables	Tightening torque [Nm]
Control terminals of all models	1 mm^2	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 motor cables that are as short as possible and shielded, with the shield connected at both ends.
- 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.

> ⚠️ **WARNING**
> It is possible to remove the connection of the filter capacitors Cy to the ground by removing the screws marked with the EMC symbol. In this way, the ground leakage currents caused by the filter are reduced, but the intrinsic EMC compatibility of the device is no longer valid and must therefore be guaranteed externally in another way.

EMC clip for cable glands

To ensure correct grounding of the shield when using shielded cables, it is recommended to use the appropriate EMC clips as shown below.
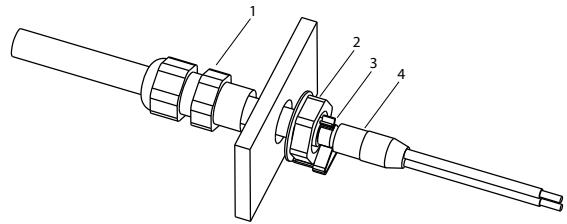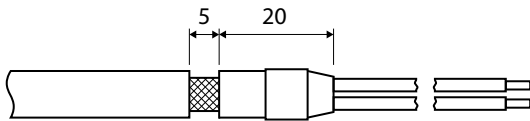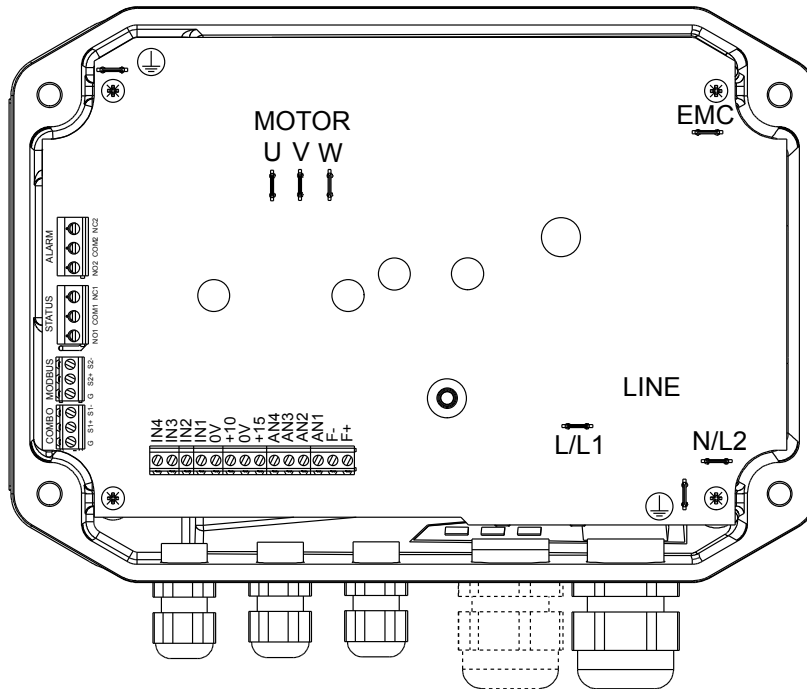

1: Cable gland; 2: Lock nut; 3: EMC clip; 4: Shielded cable

7.5. Electrical connections

7.5.1. Power connections

MIDA Solar 203 MP , MIDA Solar 205 MP , MIDA Solar 207 MP

		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	
	U	120	6.3 x 0.8 mm female Faston	
	V	120	6.3 x 0.8 mm female Faston	
Motor	W	120	6.3 x 0.8 mm female Faston	
MOTOR	P.E. ⏚	180	6.3 x 0.8 mm female Faston	

⚡ **DANGER**
Connect only one power source at a time (AC or DC).
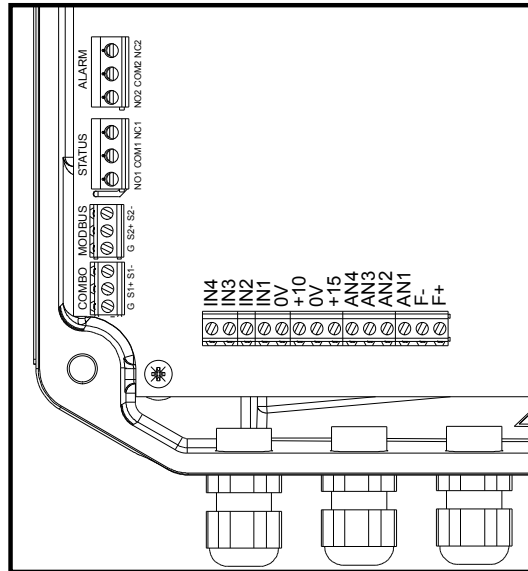
📝 **NOTE**
When connecting the DC power supply, it is not necessary to respect the polarity.

7.5.2. Control connections
Control connections for size 1 devices

Type		Description	Functionality	Comments
Analog inputs	AN1	4-20 mA	Sensor 1	-
	AN2	4-20 mA	Sensor 2 Solarimeter Analog flow meter	-
	AN3	0-10 V	External set value Pulse flow meter	
	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 Flow switch functionality	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 NO1, COM1: closed contact with motor running. NC1, COM1: closed contact with motor stopped.	Potential-free contacts Max 250 VAC, 2 A Max 30 VDC, 2 A
	COM 1	Common		
	NC1	Normally Closed		
Relay outputs	NO2	Normally Open	ALARM relay NO2, COM2: closed contact without alarm.	Potential-free contacts Max 250 VAC, 2 A Max 30 VDC, 2 A
	COM 2	Common		

Type		Description	Functionality	Comments
	NC2	Normally Closed	NC2, COM2: closed contact with alarm or without power supply.	
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:

- Check that the device complies with the motor control according to its data plate.
- 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 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.

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)
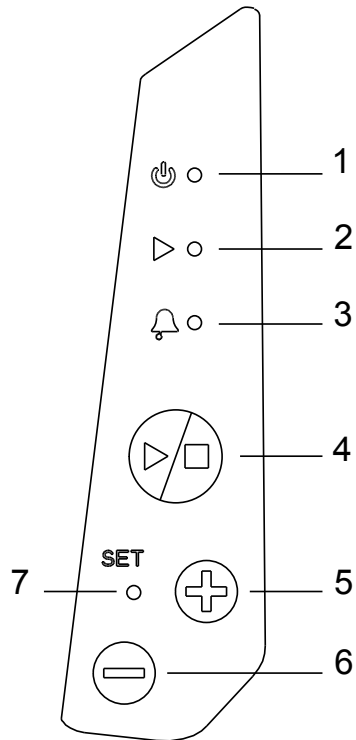
1. Red LED ON: the unit is powered with the correct power supply voltage.
    FLASHING red led: undervoltage.
2. Green LED ON: motor running. Green led OFF: motor stopped. When the unit is in "constant value" control mode, the green LED flashes with a greater frequency the closer the measured value is 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
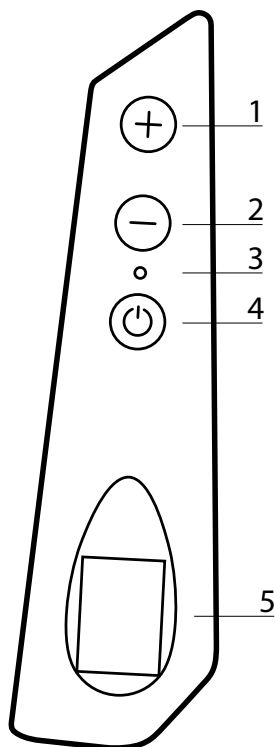
1. +: parameter scrolling / parameter editing
   Use the + key to increase the set value or frequency. In order to allow the set value to be edited, it is necessary to hold down the + or - button for more than 5 seconds until the set value to be edited starts flashing. To confirm the set value, simply 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.
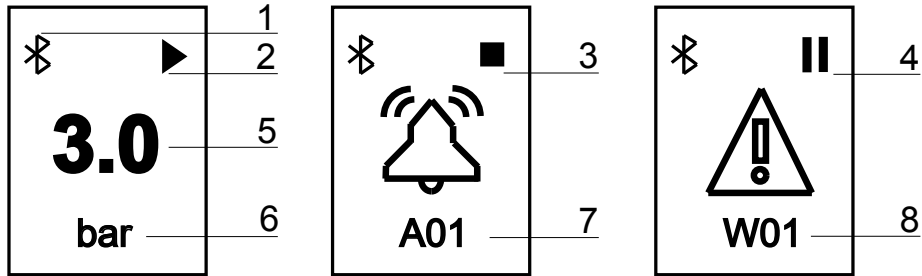
1: Bluetooth on. Flashing during communication; 2: Motor running; 3: Motor stopped; 4: Stand-by; 5: Value read; 6: Units of measurement; 7: Alarm; 8: Warning

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 [cosø]	Cosine of the ø 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. FOC motor control

9.5.1. Introduction

The benefits provided by the FOC (Field Oriented Control) motor control implemented in the "FOC-ready" inverters over a traditional control are as follows:

- Ideal control of the current at each operating point.
- Quick and accurate speed adjustment.
- Lower energy consumption.
- Reduction of torque fluctuations (vibrations) for smoother and more regular operation throughout the frequency range and less system noise.
- Less mechanical stress on the motor, pump and hydraulic system.

The FOC control of "FOC-ready" devices can be used with:

- Three-phase asynchronous motors
- Permanent magnet three-phase synchronous motors

The control is "sensorless" and therefore does not require the use of any sensor.

9.5.2. FOC control calibration

To enable the device to perform the FOC check it is necessary:

1. Carry out all system wiring. Connect the load (pump) to the inverter using a cable of suitable length, and any dV / dt or sine filter.

2. Power up the system and follow the initial set-up procedure specifying:
    a. Motor type: three-phase asynchronous or permanent magnet synchronous motor.
    b. Rated voltage of the motor according to its data plate.
    c. Rated frequency of the motor according to its data plate.
    d. Rated current of the motor increased by 5% compared to the value on the data plate.
3. Carry out the Auto tuning process to allow the inverter to learn the electrical information of the load connected to it (motor, cable and filter - if any). The calibration process can take up to 1 minute.
4. Wait for the calibration process to be completed successfully.

> **NOTE**
> The calibration process can take up to 1 minute. Wait until it is completed.

> **NOTE**
> The calibration process must be performed in the final electrical configuration of the system, that is after the motor, the cable and any filter have been fitted.
> If a change is made to the motor, cable or filter once they have been fitted, the calibration process must be repeated.

> **CAUTION**
> Incorrect setting of motor voltage, frequency and rated current leads to incorrect results in the calibration process and consequently to motor malfunction.

> **WARNING**
> Setting the rated current of the motor too high compared to the value on the data plate can seriously damage both the motor and the inverter. Setting the rated current of the motor too high compared to the value on the data plate can seriously damage both the motor and the inverter.

> **WARNING**
> During calibration the motor coils are heated by the test current. If the motor is self-ventilated, the absence of motor rotation does not allow the heat to be dispersed by force. The motor should therefore be allowed to cool between one calibration and the next.

> **DANGER**
> During the calibration process, the motor remains stationary but is powered for the entire calibration period. Disconnect the device from the power supply before any intervention on the equipment and on the loads connected to it.

If the calibration process is not successful, check that:

- The connections between the inverter and the load (including any interposed motor filters).
- The set rated voltage, frequency and current values.

> **NOTE**
> The motor cannot be started until the calibration process has been completed.

> **NOTE**
> If the calibration process cannot be completed, it is possible to manually enter the parameters or stator resistance (Rs) and stator inductance (Ls) in the motor parameters menu (default password 002). These data can be provided by the motor manufacturer or obtained through measurements. If you do not have these data and the self-calibration process is not successful, contact the technical support service.

9.5.3. Adjusting the FOC control

The FOC control algorithm checks current (torque) and speed with defined response dynamics.

The FOC dynamics is set by default to a value sufficient to guarantee accurate and oscillation-free control in most applications.

In some cases, however, it may be necessary to increase (in case of frequency oscillations) or to lower (in case of overcurrent or igbt trip alarms) the "FOC dynamic" setting in the motor parameters menu (default password 002) according to the following table:

Configuration	FOC dynamics
Motor cables shorter than 100 m and no filter between inverter and motor.	200
Motor cables shorter than 100 m and a dV/dt filter between the inverter and the motor.	150
Motor cables longer than 100 m and a dV/dt filter between the inverter and the motor.	100
Presence of a sine filter between the inverter and the motor.	50 or 40 or less

> ⚠️ **WARNING**
>
> The incorrect configuration of the FOC dynamics may cause:
>
> - Speed oscillations if the FOC dynamics is too slow.
> - Overcurrent or igbt trip alarms if the FOC dynamics is too fast.
>
> Intervene promptly by appropriately adjusting the "FOC Dynamics" parameter if the conditions listed above are present. Failure to act may lead to damages to the inverter, the motor and the system.

9.6. 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**.

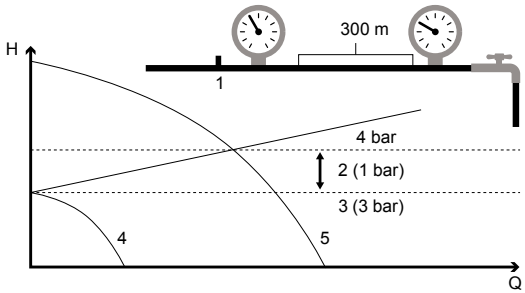Within each menu, it is possible to change the relative access password.

> 📝 **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

9.7. Control parameters

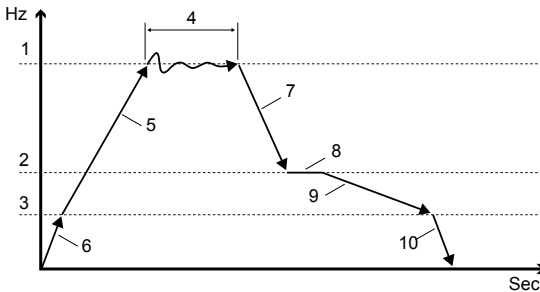| Parameter	Default	Description	1	2	3	4	5	6
Control mode 1. Constant value 2. Fix speed 3. Constant value 2 set 4. Fix speed 2 values 5. External speed 6. MPPT	MPPT	The following control modes can be selected: 1. Constant value: the device varies the speed of the pump in such a way as to keep the set 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

Parameter	Default	Description	1	2	3	4	5	6
Control mode aux XXXXXXXX	MPPT	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
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. In MPPT control mode, the pump automatically limits the frequency to keep the pressure read by the pressure sensor (if installed) constant.	x					x
Compensation p = XXX.X [bar]	0	Compensation at the maximum frequency. The sign can be reversed via the green key. 1: sensor; 2: Compensation ; 3: Set value ; 4: Min motor frequency; 5: Max motor frequency In the case of a group of pumps in COMBO mode, the compensation must be referred to each pump.	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			

Parameter	Default	Description	1	2	3	4	5	6
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			
Delta control p = XXX.X [bar]	0.1	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. 1: Min motor frequency; 2: Frequency min control; 3: Delta control; 4: Set value ; 5: Stop delay; 6: Control ramp	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	Device address when in COMBO mode: • 0: master • 01 to 07: slave	x		x			x
Alternance ON/OFF	ON	Enabling the alternation between units in COMBO and D.O.L. 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.	x		x			x
Alternance period t = XX [h]	0	Maximum difference in operating hours between multiple devices in the unit. 0 means 5 minutes.	x		x			x

Parameter	Default	Description	1	2	3	4	5	6
COMBO synchrony ON/OFF	OFF	Through this parameter it is possible to activate the synchronous operation of the pumps in COMBO. Read the dedicated chapter. However, it is necessary to lower parameter Frequency min controlaccordingly.	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	PI control mode: • Direct: as the pump speed increases, the measured value increases. • Reverse: as the pump speed increases, the measured value decreases.	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		Cosphi value that is measured when the pump is running dry. Below this value the device stops the pump and generates a water shortage alarm. If the motor is of the synchronous type with permanent magnets, this parameter represents the percentage with respect to the rated current set below which the device stops the motor and generates the no-water alarm.	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

9.8. Motor parameters

Parameter	Default	Description
Motor type XXXXXXXX	Threephase asynchronous	Type of motor connected and control used: • Singlephase PSC: control for single-phase 2-wire PSC motors. • Threephase asynchronous: control for three-phase asynchronous motors. • Synchronous PM: control for permanent magnet synchronous motors. • Scalar: V / f scalar control.
Rated motor voltage V = XXX [V]		Rated voltage of the motor according to its data plate. The average voltage drop across the inverter is 20 to 30V RMS depending on the load conditions.
Voltage boost V = XX.X [%]		Motor starting voltage increase to favor the starting torque. Contact the motor manufacturer for more information.
Rated motor current I = XX.X [A]		Motor rated current according to its data plate increased by 5%. The voltage drop across the inverter may result in a current absorption greater than the motor rated current indicated on the data plate. It is necessary to check with the motor manufacturer that this overcurrent can be tolerated.
Rated motor frequency f = XXX [Hz]	50	Rated frequency of the motor according to its data plate.
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. When using submersible pumps with Kingsbury type thrust system, it is recommended not to go below 1750 rpm so as not to compromise the thrust system.
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.

Parameter	Default	Description
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.
Ramp freq. min motor t = XX [sec]		Time in which the motor reaches the minimum frequency from standstill (Min motor frequency) and vice versa. 1: Max motor frequency; 2: Frequency min control; 3: Min motor frequency; 4: PI control; 5: Ramp up time; 6: Ramp freq. min motor ; 7: Ramp down; 8: Stop delay; 9: Control ramp; 10: Ramp freq. min motor
PWM f = XX [kHz]		Inverter modulation frequency. It is possible to choose between 2.5, 4, 6, 8, 10 kHz depending on the inverter model. Higher values correspond to a more faithful reconstruction of the sine wave. When using very long motor cables (>20 m), the appropriate output filters, available upon request, should be interposes between the inverter and the motor and the correct value of the PWM parameter according to the type of filter and the length of the cable should be set. This reduces the probability of voltage peaks at the motor input while safeguarding the winding insulation. Lower values reduce the heating of the inverter.
V/f linear quadratic XXX %	80%	This parameter allows changing the V/f characteristic with which the device supplies the motor. The linear characteristic corresponds to a constant torque characteristic with varying revolutions. The quadratic characteristic corresponds to a variable torque characteristic and is generally suitable for use with centrifugal pumps. The torque characteristic must be chosen ensuring smooth operation, reduced energy consumption and lower heating and motor noise. With single-phase motors, we recommend setting linear V/f (0%).
Rotation sense ---> / <---	--->	Running direction of the motor. Should the motor run in the wrong direction, it is possible to reverse the running direction without having to change the phase sequence in the connection. ⚠ **CAUTION** If there is more than one pump in a COMBO unit, it is best to use the same phase sequence when connecting the motors and to set the same running direction.
Motor tuning ENT to access		If the device is "FOC-ready", motor calibration must be carried out before commissioning. ⚠ **WARNING** Carefully read the chapter dedicated to the FOC motor control.
Motor resistance Rs=XXX.XX [Ohm]		Manual setting of the stator resistance.
Motor inductance Ls=XXX.XX [mH]		Manual setting of the stator inductance.
FOC dynamics XXX	200	Setting of the control dynamic of the FOC algorithm.
FOC speed XXX	5	Setting of the control speed of the FOC algorithm.
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).

9.9. IN / OUT parameters

Parameter	Default	Description
Unit XXXXX	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% 0%	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	Inde-pendent	Operating logic of analog inputs AN1, AN2: • 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. • Selectable. The active sensor may be selected via digital input 3. • Difference 1-2. The digital difference in absolute value is performed between the measurements of analog input 1 and analog input 2. • Higher value. The maximum value between the measurements of the two sensors is considered. • Lower value. The minimum value between the measurements of the two sensors is considered.
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.
Digital input2 N.O./N.C.	N.O.	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. 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. 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. In the presence of the flow switch, it is used for operation via flow switch.
Digital input3 N.O./N.C.	N.O.	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. 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. Digital input 3 is also used to select sensor 1 or sensor 2 when the parameter AN1, AN2 function is set to Selectable.
Digital input4 N.O./N.C.	N.O.	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. 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. Digital input 4 is also used to select the main or auxiliary control mode in case they are different. Digital input 4 also serves as alarm reset.
Man reset In Dig1	OFF	Enabling or disabling the manual reset of the digital input.
Man reset In Dig2	OFF	Enabling or disabling the manual reset of the digital input.
Dig. input 2/3 delay t = XX [s]	1	Delay of digital inputs 2 and 3. Digital inputs 1 and 4 have a fixed delay of 1 second. By setting a value greater than 30 seconds, digital input 2 serves as the input for the flow switch.

Parameter	Default	Description
Flow Measure XXXXXXXXXX	None	Flow measurement mode: • None: the flow rate is not measured. • Frequency proport.: the flow rate is calculated proportionally to the frequency of rotation of the pump. • AN2 4-20mA: the flow rate is read through analog input 2 (4-20 ma). • AN3 pulse: The flow rate is read via analogue input 3 (0-10) with a pulse signal.
Rated Flow XXX.X [m3/h]	1	If parameter Flow Measure is set to Frequency proport., the nominal flow rate corresponds to the pump flow rate at nominal speed. If parameter Flow Measure is set to AN2 4-20mA, the nominal flow rate corresponds to the full scale of the flow meter.
Pulse XXXX.X [l/pulse]		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.
Min stop flow XXX.X [m3/h]	0	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.
Full scale solarimeter XXXX [W/m2]	0	The 4-20 mA solarimeter full scale connected to analog input 2. A value of 0 means that the measurement is disabled.
Min stop irradiation XXXX [W/m2]	0	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.
Change password1 Press ENT		By pressing the ENT key it is possible to change the installer level password (level 1) (default 001).

9.10. 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
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).

9.11. 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.

9.11.1. Minimum frequency stop

Parameter Min motor frequency ca 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:

$$f\min = f\max \cdot \sqrt{\left(\frac{H\min}{H\max}\right)} + 2 \qquad (1)$$

• 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.

9.11.2. 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.

9.11.3. 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.

9.12. 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

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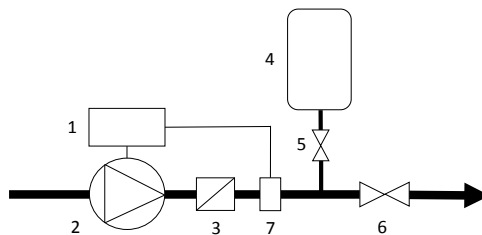
1: Inverter; 2: Pump; 3: Check valve; 4: Pressure vessel; 5: Gate valve; 6: Gate valve; 7: Pressure sensor

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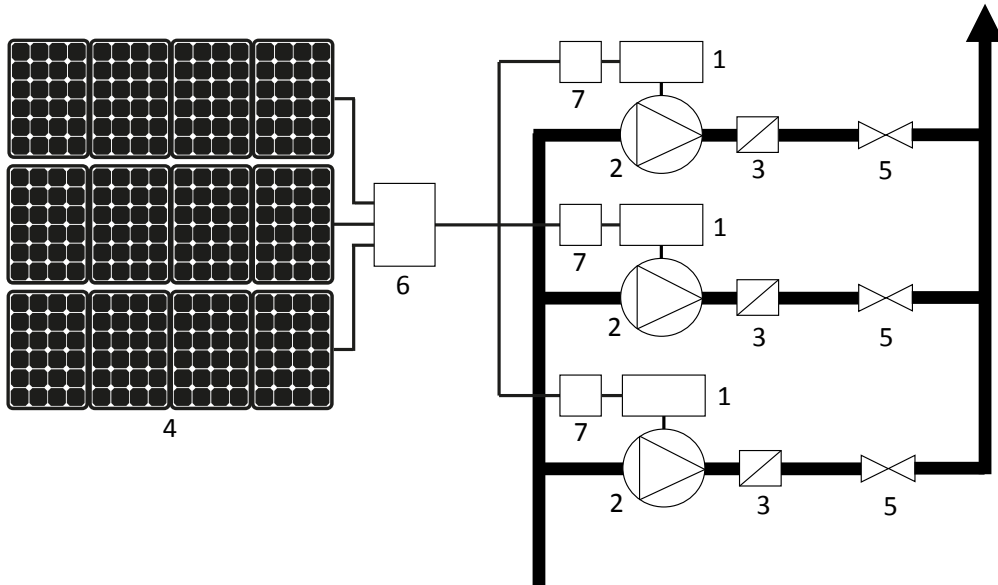
1: Inverter; 2: Pump; 3: Check valve; 4: PV system; 5: Gate valve; 6: Strings combiner with protections; 7: DC disconnector

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.
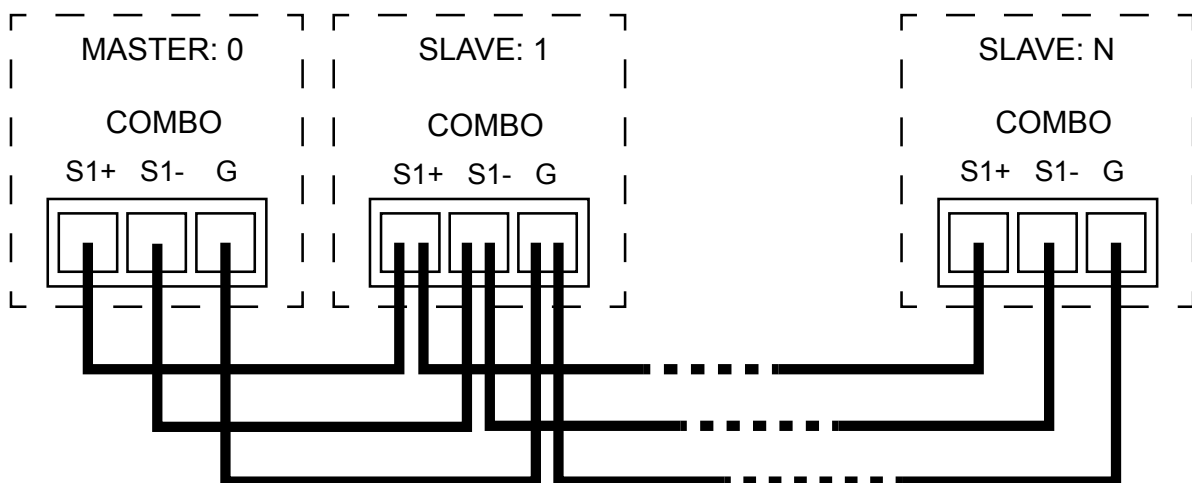
> ⚠️ **WARNING**
> Respect the polarity of the connections.

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.

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
LINE<->MOT INV.	Reverse the connection of the power cable and motor cable.	• Correct the connection of the power and motor cables.
A01 Overcurrent motor	The current absorbed by the motor exceeds the value set in the parameter Rated motor current. Reset mode: • Automatic reset after 10 seconds for up to 7 attempts, after which you must wait for 60 minutes. • Disconnecting the power supply.	• Verify that the value set for the parameter Rated motor current corresponds at least to the rated current of the motor according to its rating plate data. 📝 **NOTE** The voltage drop across the inverter (variable between 20 and 40 VAC) causes the motor to be powered at a slightly lower voltage than the one stated on the data plate. The current absorbed by the motor could therefore be slightly higher than the rated current indicated in data plate and, to obtain maximum performance, it is necessary to increase the parameter Rated motor current between 5% and 10%. ⚠ **WARNING** Check with the motor manufacturer the tolerability to withstand a current greater than its rated current. • Check that all the motor phases are correctly connected and that the connection is suitably configured in Star or Delta. • Check that motor parameters are correctly set. • In devices with FOC control, perform a new motor calibration. • In the presence of output filters (dV / dt or sinusoidal), check that they are correctly connected and, in devices with FOC control, check that you have correctly set the parameters PWM and FOC dynamics in relation to the length of the motor cable and the type of filter used. • Check that the pump is turning in the correct direction. • Make sure that the motor is free to rotate and check for any mechanical issues. • Adjust parameter Voltage boost
A02 Sensor fault	The current value read by the analog input is less than 4 mA. Reset mode: • Alarm reset by STOP key. • Disconnecting the power supply	• Check that the connections on the device side and on the sensor side are correct. • Check that the sensor is fed the correct power. • Check that the sensor is working properly. • If only one sensor is connected to analog input 1, try to connect it to analog input 2.

Alarm	Description	Possible solutions
A03 Over temperature inverter	The temperature reached by the device is higher than the maximum allowed value. Reset mode: • Automatic reset	• Check that the ambient temperature is within the allowed limits. • Make sure the device is protected from direct exposure to sunlight or heat sources. • Check that both the external and internal cooling fans (if present) are working properly. • Check that the dissipation channels are clean. • Check that the device is cooled as indicated in the dedicated chapter. • Reduce parameter PWM as much as possible. **NOTE** 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.
A04 Dry run cosphi	The warning W26 No water appeared 5 consecutive times following the automatic reset attempts. Reset mode: • Alarm reset by STOP key. • Disconnecting the power supply	**WARNING** 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.
A05 Under voltage	• Supply voltage below the minimum allowed value. • Insufficient input power to power the device. Reset mode: • Automatic reset if parameter Autorestart = ON	• Check the value of the power supply voltage both under no load and load conditions. • Verify that the source has enough power to power the load.
A06 Over voltage	The power supply voltage or the voltage inside the device exceeds the maximum allowed value. Reset mode: • Automatic reset if parameter Autorestart = ON	• Check the value of the power supply voltage both under no load and load conditions. • Check for regeneration from the load. • Increase parameter Ramp down • Increase parameter Ramp freq. min motor • In the case of a permanent magnet motor, check that the load is not subjected to passive movement.
A07 Max value alarm	The value read by the analog input is higher than the value set for the parameter Max alarm value. Reset mode: • Automatic reset	• Check the value set for the parameter. • Check the hydraulic causes that lead to the alarm condition. • Check that the sensor is working properly.
A08 Locked rotor	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. Reset mode: • Alarm reset by STOP key. • Disconnecting the power supply	• Check the possible solutions for the alarm A01 Overcurrent motor

Alarm	Description	Possible solutions
A09 Overload inverter	The current absorbed by the load exceeds the rated current of the device. Reset mode: • Alarm reset by STOP key. • Disconnecting the power supply	• Check that the rated current of the motor is lower than the rated current of the device. • Make sure that the motor is free to rotate and check for any mechanical issues. • Increase the value of the parameter Ramp up time. • Increase the value of the parameter Ramp freq. min motor. • Adjust parameter Voltage boost • Check the value of the power supply voltage both under no load and load conditions. ⚠ **CAUTION** The device can supply power to the load for 10 minutes at a current consumption of 101 % of the rated current of the device, and for 1 minute at a current consumption of 110 % of the rated current of the device.
A10 IGBT trip alarm	The current absorbed by the load instantaneously exceeds the maximum current protection of the device's power module. Reset mode: • Automatic reset after 10 seconds for up to 3 attempts, after which you must wait for 60 minutes. • Disconnecting the power supply	• Check the possible solutions for alarms A01 Overcurrent motor and A09 Overload inverter. • Check for short circuits between the output phases and the ground insulation. • Check that the system is properly grounded. • Check for electrical noise from other devices connected to the system.
A11 No load	The current absorbed by the load is too low in relation to the parameter Rated motor current. Reset mode: • Alarm reset by STOP key. • Disconnecting the power supply	• Check the possible solutions for the alarm A01 Overcurrent motor
A12 Address error	In COMBO mode, multiple devices in the group have the same address. Reset mode: • Automatic reset	• Restore the correct value of parameter Address in all the devices in the group. • Verify which situation triggers the alarm. • If the alarm is triggered after a master replacement, check that the parameter Autorestart is activated. • Check the electrical connection between the slave unit and the master, and the presence of possible disturbances.
A13 No communication	In COMBO mode, the communication between the slave unit and the master has been interrupted. Reset mode: • Automatic reset	• Check the electrical connection between the slave unit and the master, and the presence of possible disturbances. • Exit the master programming menu. • Attempt a manual reset of the alarm. ⚠ **CAUTION** Keep signal cables separate and never parallel to power cables. If it is necessary to cross them, make sure that they cross perpendicularly.
A14 Min value alarm	The value read by the analog input is lower than the value set for the parameter Min alarm value. Reset mode: • Automatic reset	• Check the value set for the parameter. • Check the hydraulic causes that lead to the alarm condition. • Check that the sensor is working properly.
A15 Keyboard fault	One of the keys of the keyboard was held down for more than 30 seconds. Reset mode: • Alarm reset by STOP key. • Disconnecting the power supply	• Check that the keys are mechanically free.
A16 CPU alarm	Communication error between the control part and the power part or error in the CPU. Reset mode: • Automatic reset	• Check the value of the power supply voltage both under no load and load conditions. • Check for electrical noise from other devices connected to the system. • Check the integrity of the communication cable between the control board and the power board.

Alarm	Description	Possible solutions
A17 Brake alarm	In devices equipped with brakes, it indicates the achievement of the maximum energy that the braking resistor can withstand. Reset mode: • Automatic reset if parameter Autorestart = ON	• Check the possible solutions for the alarm A06 Over voltage .
A19 Out of step	With parameter Motor type set to Synchronous PM, the loss of motor control occurs. Reset mode: • Automatic reset with a 3-minute delay.	• Check the possible solutions for the alarm A01 Overcurrent motor
A20 Input phase loss	Absence of a power supply phase. Reset mode: • Automatic reset if parameter Autorestart = ON	• Check that all three power phases are present. • Check the balance of the power supply phases.

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
LINE<->MOT INV.	Red STAND-BY led flashing very quickly.	Reverse the connection of the power cable and motor cable.	• Correct the connection of the power and motor cables.
A01 Overcurrent motor	2 flashes of the yellow alarm led	The current absorbed by the motor exceeds the value set in the parameter Rated motor current. Reset mode: • Automatic reset after 10 seconds for up to 7 attempts, after which you must wait for 60 minutes. • Disconnecting the power supply.	• Verify that the value set for the parameter Rated motor current corresponds at least to the rated current of the motor according to its rating plate data. > 📝 **NOTE** > The voltage drop across the inverter (variable between 20 and 40 VAC) causes the motor to be powered at a slightly lower voltage than the one stated on the data plate. The current absorbed by the motor could therefore be slightly higher than the rated current indicated in data plate and, to obtain maximum performance, it is necessary to increase the parameter Rated motor current between 5% and 10%. > ⚠ **WARNING** > Check with the motor manufacturer the tolerability to withstand a current greater than its rated current. • Check that all the motor phases are correctly connected and that the connection is suitably configured in Star or Delta. • Check that motor parameters are correctly set. • In devices with FOC control, perform a new motor calibration. • In the presence of output filters (dV / dt or sinusoidal), check that they are correctly connected and, in devices with FOC control, check that you have correctly set the parameters PWM and FOC dynamics in relation to the length of the motor cable and the type of filter used. • Check that the pump is turning in the correct direction. • Make sure that the motor is free to rotate and check for any mechanical issues. • Adjust parameter Voltage boost

Alarm	Notification LED	Description	Possible solutions
A02 Sensor fault	3 flashes of the yellow alarm led	The current value read by the analog input is less than 4 mA. Reset mode: • Alarm reset by STOP key. • Disconnecting the power supply	• Check that the connections on the device side and on the sensor side are correct. • Check that the sensor is fed the correct power. • Check that the sensor is working properly. • If only one sensor is connected to analog input 1, try to connect it to analog input 2.
A03 Over temperature inverter	4 flashes of the yellow alarm led	The temperature reached by the device is higher than the maximum allowed value. Reset mode: • Automatic reset	• Check that the ambient temperature is within the allowed limits. • Make sure the device is protected from direct exposure to sunlight or heat sources. • Check that both the external and internal cooling fans (if present) are working properly. • Check that the dissipation channels are clean. • Check that the device is cooled as indicated in the dedicated chapter. • Reduce parameter PWM as much as possible. **NOTE** 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.
A04 Dry run cosphi	1 flash of the yellow alarm led	The warning W26 No water appeared 5 consecutive times following the automatic reset attempts. Reset mode: • Alarm reset by STOP key. • Disconnecting the power supply	**WARNING** 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.
A05 Under voltage	Flashing red STAND-BY led	• Supply voltage below the minimum allowed value. • Insufficient input power to power the device. Reset mode: • Automatic reset if parameter Autorestart = ON	• Check the value of the power supply voltage both under no load and load conditions. • Verify that the source has enough power to power the load.
A06 Over voltage	Red STAND-BY LED and yellow ALARM LED flashing.	The power supply voltage or the voltage inside the device exceeds the maximum allowed value. Reset mode: • Automatic reset if parameter Autorestart = ON	• Check the value of the power supply voltage both under no load and load conditions. • Check for regeneration from the load. • Increase parameter Ramp down • Increase parameter Ramp freq. min motor • In the case of a permanent magnet motor, check that the load is not subjected to passive movement.
A07 Max value alarm	7 flashes of the yellow alarm led	The value read by the analog input is higher than the value set for the parameter Max alarm value. Reset mode: • Automatic reset	• Check the value set for the parameter. • Check the hydraulic causes that lead to the alarm condition. • Check that the sensor is working properly.
A08 Locked rotor	2 flashes of the yellow alarm led	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. Reset mode: • Alarm reset by STOP key. • Disconnecting the power supply	• Check the possible solutions for the alarm A01 Overcurrent motor

Alarm	Notification LED	Description	Possible solutions
A09 Overload inverter	5 flashes of the yellow alarm led	The current absorbed by the load exceeds the rated current of the device. Reset mode: • Alarm reset by STOP key. • Disconnecting the power supply	• Check that the rated current of the motor is lower than the rated current of the device. • Make sure that the motor is free to rotate and check for any mechanical issues. • Increase the value of the parameter Ramp up time. • Increase the value of the parameter Ramp freq. min motor. • Adjust parameter Voltage boost • Check the value of the power supply voltage both under no load and load conditions. ⚠ **CAUTION** The device can supply power to the load for 10 minutes at a current consumption of 101 % of the rated current of the device, and for 1 minute at a current consumption of 110 % of the rated current of the device.
A10 IGBT trip alarm	5 flashes of the yellow alarm led	The current absorbed by the load instantaneously exceeds the maximum current protection of the device's power module. Reset mode: • Automatic reset after 10 seconds for up to 3 attempts, after which you must wait for 60 minutes. • Disconnecting the power supply	• Check the possible solutions for alarms A01 Overcurrent motor and A09 Overload inverter. • Check for short circuits between the output phases and the ground insulation. • Check that the system is properly grounded. • Check for electrical noise from other devices connected to the system.
A11 No load	Yellow alarm LED on and alarm display via App.	The current absorbed by the load is too low in relation to the parameter Rated motor current. Reset mode: • Alarm reset by STOP key. • Disconnecting the power supply	• Check the possible solutions for the alarm A01 Overcurrent motor
A12 Address error	9 flashes of the yellow alarm led	In COMBO mode, multiple devices in the group have the same address. Reset mode: • Automatic reset	• Restore the correct value of parameter Address in all the devices in the group. • Verify which situation triggers the alarm. • If the alarm is triggered after a master replacement, check that the parameter Autorestart is activated. • Check the electrical connection between the slave unit and the master, and the presence of possible disturbances.
A13 No communication	6 flashes of the yellow alarm led	In COMBO mode, the communication between the slave unit and the master has been interrupted. Reset mode: • Automatic reset	• Check the electrical connection between the slave unit and the master, and the presence of possible disturbances. • Exit the master programming menu. • Attempt a manual reset of the alarm. ⚠ **CAUTION** Keep signal cables separate and never parallel to power cables. If it is necessary to cross them, make sure that they cross perpendicularly.
A14 Min value alarm	8 flashes of the yellow alarm led	The value read by the analog input is lower than the value set for the parameter Min alarm value. Reset mode: • Automatic reset	• Check the value set for the parameter. • Check the hydraulic causes that lead to the alarm condition. • Check that the sensor is working properly.
A15 Keyboard fault	Yellow alarm LED on and alarm display via App.	One of the keys of the keyboard was held down for more than 30 seconds. Reset mode: • Alarm reset by STOP key. • Disconnecting the power supply	• Check that the keys are mechanically free.

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: • Automatic reset	• Check the value of the power supply voltage both under no load and load conditions. • Check for electrical noise from other devices connected to the system. • Check the integrity of the communication cable between the control board and the power board.
A19 Out of step	Yellow alarm LED on and alarm display via App.	With parameter Motor type set to Synchronous PM, the loss of motor control occurs. Reset mode: • Automatic reset with a 3-minute delay.	• Check the possible solutions for the alarm A01 Overcurrent motor
A20 Input phase loss	Yellow alarm LED on and alarm display via App.	Absence of a power supply phase. Reset mode: • Automatic reset if parameter Autorestart = ON	• Check that all three power phases are present. • Check the balance of the power supply phases.

14. Warnings

Warning	Description	Possible solutions
W01 Digital input active 1	Digital input 1 has been activated.	• Check the configuration and connections to digital input 1.
W02 Digital input active 2	Digital input 2 has been activated.	• Check the configuration and connections to digital input 2.
W03 Digital input active 3	Digital input 3 has been activated.	• Check the configuration and connections to digital input 3.
W04 Digital input active 4	Digital input 4 has been activated.	• Check the configuration and connections to digital input 4.
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.	• Check that the parameters Full scale solarimeter and Min stop irradiationare set correctly.
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.	• Check that the parameters Flow Measure and Min stop floware set correctly.
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.	• Check the correct configuration of digital input 2. • Check the correct operation of the flow switch and the connection to digital input 2. • Check the value of parameter Dig. input 2/3 delay.
W20 Temp. derate	The inverter is limiting the maximum motor frequency to keep the inverter temperature below the maximum limit.	• Check the possible solutions for the alarm A03 Over temperature inverter.
W21 Overload 15V	15V power supply overload.	• Check the absorption of the loads and any short circuits connected to the 15V power supply
W22 EEPROM COM.	No communication with EEPROM	• Contact the technical support service.
W23 EEPROM fault	Failure in EEPROM	• Contact the technical support service

Warning	Description	Possible solutions
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.	• Check the available photo voltaic power in relation to the motor and pump power. • Check the series and parallel connections of the photovoltaic panels. • Check the photovoltaic system open circuit voltage and short circuit current. • Check the short-circuit current of the photovoltaic system. The short-circuit current is proportional to the available irradiation. • Check the available power in relation to the available irradiation. • Check that the surface of all panels is clean and free from shading (even partial). • 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%. • Check the other motor parameters.
W25 Alarm slave X	In control mode COMBO, the master has detected an alarm in the X slave.	• Check the status of the XX slave unit indicated by the master.
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.	• Check that the pump is properly primed. • Check that the pump is turning in the correct direction. • Check that the parameter Dry run cosphi is set correctly.
W27 START/STOP block	The START/STOP buttons have been locked.	• Press the START or STOP button for at least 5 seconds to release the lock.

NOTE

With three-phase asynchronous motors, the correct value to which parameter Dry run cosphi is to be set depends on:

- The type of motor (construction and winding data). Generally, three-phase surface motors have a higher rated cosphi than submersible motors having the same power rating.
- The type of pump (hydraulic performance and power consumption curve).
- The power supply characteristics (voltage and frequency).

In general, the parameter Dry run cosphi may be set to 60% of the nominal cosphi shown on the pump's data plate.

Parameter Dry run cosphi must also be determined empirically at the end of the installation. In the presence of centrifugal pumps with three-phase asynchronous motor, a simple method consists in starting the pump at the rated frequency and, paying attention to the sustainability of the system, completely closing the delivery and then reading the measured cosphi value on the display (or on the App). Parameter Dry run cosphi must therefore be set to 10% less than the cosphi value read under closed flow condition.

CAUTION

The electronic water shortage protection based on parameter Dry run cosphi works correctly only with centrifugal pumps equipped with three-phase asynchronous motors.

In the presence of permanent magnet motors it is not possible to base the water shortage protection on the cosphi reading; it must be based on the absorbed power, instead.

When parameter Motor type is set to Synchronous PM, parameter Dry run cosphi takes on the meaning of a percentage of the absorbed power.

In the presence of other types of pumps and motors, it is advisable to contact the technical support service.

WARNING

If parameter Dry run cosphi is set too low, the electronic water shortage protection may no longer be effective.

Typically, it is recommended not to go below the value of 0.5 with centrifugal surface pumps and 0.4 with centrifugal submersible pumps equipped with asynchronous three-phase motor.

Setting parameter Dry run cosphi to 0 completely excludes the water shortage protection.

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.	• Check the configuration and connections to digital input 1.
W02 Digital input active 2	Fast flashing yellow alarm LED	Digital input 2 has been activated.	• Check the configuration and connections to digital input 2.
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.	• Check that the parameters Full scale solarimeter and Min stop irradiationare set correctly.
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.	• Check that the parameters Flow Measure and Min stop floware set correctly.
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.	• Check the correct configuration of digital input 2. • Check the correct operation of the flow switch and the connection to digital input 2. • Check the value of parameter Dig. input 2/3 delay.

NOTE

With three-phase asynchronous motors, the correct value to which parameter Dry run cosphi is to be set depends on:

- The type of motor (construction and winding data). Generally, three-phase surface motors have a higher rated cosphi than submersible motors having the same power rating.
- The type of pump (hydraulic performance and power consumption curve).
- The power supply characteristics (voltage and frequency).

In general, the parameter Dry run cosphi may be set to 60% of the nominal cosphi shown on the pump's data plate.

Parameter Dry run cosphi must also be determined empirically at the end of the installation. In the presence of centrifugal pumps with three-phase asynchronous motor, a simple method consists in starting the pump at the rated frequency and, paying attention to the sustainability of the system, completely closing the delivery and then reading the measured cosphi value on the display (or on the App). Parameter Dry run cosphi must therefore be set to 10% less than the cosphi value read under closed flow condition.

CAUTION

The electronic water shortage protection based on parameter Dry run cosphi works correctly only with centrifugal pumps equipped with three-phase asynchronous motors.

In the presence of permanent magnet motors it is not possible to base the water shortage protection on the cosphi reading; it must be based on the absorbed power, instead.

When parameter Motor type is set to Synchronous PM, parameter Dry run cosphi takes on the meaning of a percentage of the absorbed power.

In the presence of other types of pumps and motors, it is advisable to contact the technical support service.

WARNING

If parameter Dry run cosphi is set too low, the electronic water shortage protection may no longer be effective.

Typically, it is recommended not to go below the value of 0.5 with centrifugal surface pumps and 0.4 with centrifugal submersible pumps equipped with asynchronous three-phase motor.

Setting parameter Dry run cosphi to 0 completely excludes the water shortage protection.

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:

MIDA Solar

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 50581:2012

Barbarano Mossano
15/11/2018
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:

MIDA Solar

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 50581:2012

Barbarano Mossano
02/03/2022
Ing. Marco Nassuato
Managing Director