

IO 113

Installation and operating instructions



Other languages

<http://net.grundfos.com/qr/i/98097396>

English (GB) Installation and operating instructions

Original installation and operating instructions

These installation and operating instructions describe Grundfos IO 113.

Sections 1-4 give the information necessary to be able to unpack, install and start up the product in a safe way.

Sections 4-12 give important information about the product, as well as information on service, fault finding and disposal of the product.

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Read this document before installing the product. Installation and operation must comply with local regulations and accepted codes of good practice.

1. General information

1.1 Hazard statements

The symbols and hazard statements below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.

DANGER



Indicates a hazardous situation which, if not avoided, will result in death or serious personal injury.

WARNING



Indicates a hazardous situation which, if not avoided, could result in death or serious personal injury.

CAUTION



Indicates a hazardous situation which, if not avoided, could result in minor or moderate personal injury.

The hazard statements are structured in the following way:

SIGNAL WORD



Description of hazard

Consequence of ignoring the warning.
- Action to avoid the hazard.

1.2 Notes

The symbols and notes below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.



Observe these instructions for explosion-proof products.



A blue or grey circle with a white graphical symbol indicates that an action must be taken.



A red or grey circle with a diagonal bar, possibly with a black graphical symbol, indicates that an action must not be taken or must be stopped.



If these instructions are not observed, it may result in malfunction or damage to the equipment.



Tips and advice that make the work easier.

2. Receiving the product



CAUTION

Sharp element

Minor or moderate personal injury
- Wear protective gloves.

On receipt of the product, do the following:

- Check that the product is as ordered. If the product is not as ordered, contact the supplier.
- Check all visible parts for damage. In case of damage, contact the carrier immediately.

3. Installing the product

DANGER

Electric shock

Death or serious personal injury

- Before installing IO 113, make sure that the power supply has been switched off and that it cannot be accidentally switched on.
- Always use suitable insulated cables.
- The insulation between the cabinet and the product must have a suitable insulation resistance, or the cabinet must be connected to protective earth.
- Ensure separation between power cables and sensor cables.
- The power supply must be a limited power source or Class II.



CAUTION

Electric shock

Minor or moderate personal injury

- Check that the polarity matches the installation instructions.



3.1 General installation data

The power supply must be a limited power source or Class II.

Supply voltage:	24 VAC $\pm$ 10 %
	50 or 60 Hz
Supply current:	24 VDC $\pm$ 10 %
	Minimum size: 2.4 A*
	Maximum size: 8 A*
Power consumption:	Maximum 5 W
Ambient temperature:	-25 to +65 °C
Enclosure class:	IP20

* Peak value for power line communication.

WARNING

Electric shock

Minor or moderate personal injury

- Check that the supply voltage corresponds to the values stated on the nameplate.



3.2 Location

IO 113 is only for indoor installation.

CAUTION

Explosive environment

- Minor or moderate personal injury
- Do not install IO 113 in potentially explosive environments.

Pumps with sensors may, however, be installed in an explosive environment provided that they have the necessary product certification.

Safety information

IO 113 enclosure class is IP20.

It is designed to meet IEC-61010-2-030 concerning measurement category II.

In order to meet the requirements of Pollution Degree 2, install IO 113 in a protected environment with enclosure class IPX4 or better according to IEC 60529. The cabinet must be of a flame-retardant material.

Ambient temperature

-25 to +65 °C.

IO 113 must not be exposed to direct sunlight.

Installation altitude

Maximum 2000 m above sea level.

Relative humidity

Maximum 95 %.



ATEX/IEC Ex protection can be activated by means of DIP switch 10. This enables additional alarms, see section [4.8 ATEX/IEC Ex protection](#).

3.3 Dimensions and mounting

DANGER



Electric shock

Death or serious personal injury

- Always install the product in a suitable cabinet.

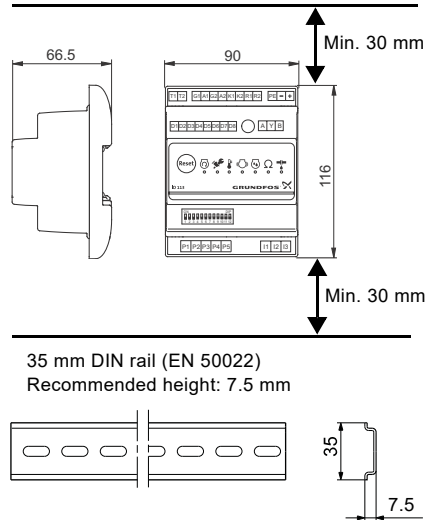


Fig. 1 Module and DIN rail

IO 113 is prepared for mounting on a 35 mm DIN rail (EN 50022).

Fit the IO 113 module by hooking the top onto the DIN rail and clicking the bottom onto the rail.

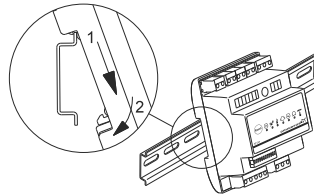


Fig. 2 Mounting on DIN rail

The IO 113 module can be removed by pushing it upwards and free of the DIN rail.

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TM05 1967 4111

3.4 EMC-compliant installation

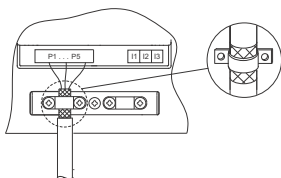


If the motor cable between the pump and any frequency converter is more than 10 metres long, we recommend that you equip the frequency converter with an output filter to prevent incorrect analog measurements.

It is especially important to ensure EMC-compliant installation of pumps with a frequency converter or when using more than one IO 113 in a cabinet.

The following rules must be observed:

- Connect the cable screen to earth.
- Do not twist screen ends as this will destroy the screening effect at high frequencies. Use cable clamps as shown in fig. 3.
- Ensure a good electrical contact from the mounting plate through the mounting screws to the metal cabinet of the frequency converter.
- Use toothed washers and a galvanically conducting mounting plate.



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Fig. 3 Screen fixed with cable clamp



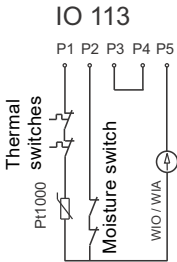
Screen both ends of the motor cable to earth. The insulating plastic layer between screen and sheath must be as close to the terminals as possible.

3.5 Electrical connection

3.5.1 Wiring diagrams

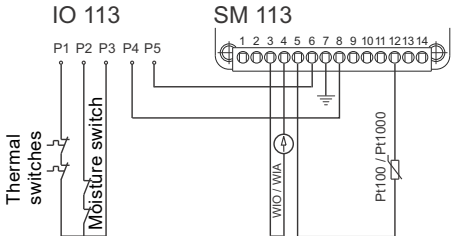
The wiring diagrams below show the regular applications of WIO/WIA sensors, moisture switch, thermal switches, Pt100/Pt1000/PTC sensors, as well as sensor monitoring board SM 113 with speed sensor, vibration sensor and components.

For information about setting the DIP switches, see section 4.2 *DIP switch configuration*.



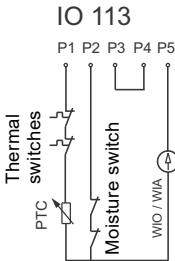
TM05 2493 0112

PA - Thermal switches, Pt1000 sensor, moisture switch, WIO/WIA sensor



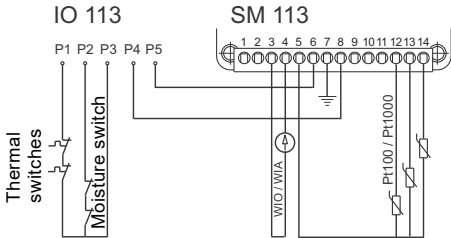
TM05 2794 0612

PB - With SM 113. Thermal switch, moisture switch, WIO/WIA sensor, Pt100/Pt1000 sensor



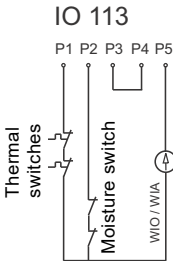
TM05 2494 0112

PA - Thermal switches, PTC sensor, moisture switch, WIO/WIA sensor



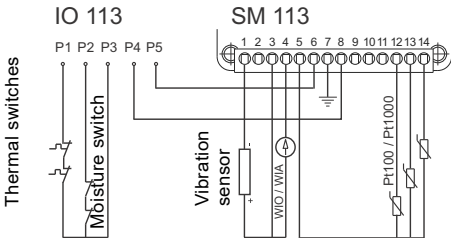
TM05 2795 0612

PB - With SM 113. Thermal switches, moisture switch, WIO/WIA sensor, Pt100/Pt1000 sensors



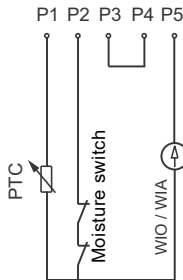
TM05 2789 0612

PA - Thermal switches, moisture switch, WIO/WIA sensor



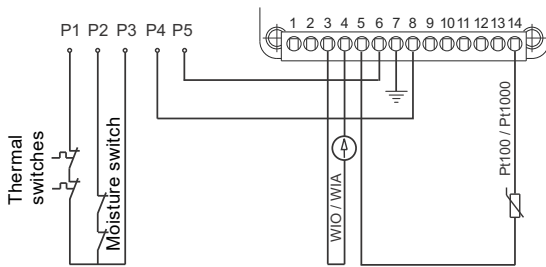
TM05 2796 0612

PB - With SM 113. Thermal switches, moisture switch, WIO/WIA sensor, Pt100/Pt1000 sensors, vibration sensor



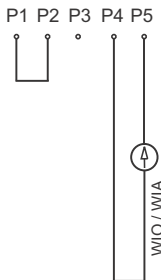
PA - PTC sensor, moisture switch, WIO sensor

TM05 2790 0612



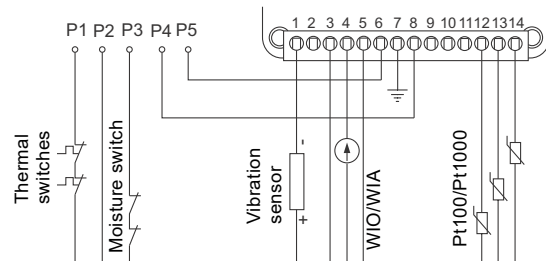
PB - With SM 113. Thermal switches, moisture switch, WIO/WIA sensor, Pt100/Pt1000 sensors

TM05 2798 0612



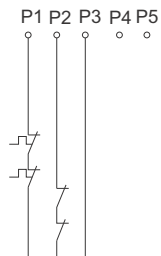
PA - WIO/WIA sensor

TM05 4507 2412



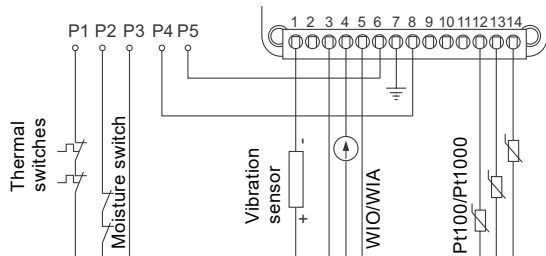
PC - IO 113 with SM 113 module

TM06 1788 2914



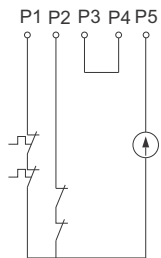
PA - IO 113 without a WIO/WIA sensor

TM06 1791 2914



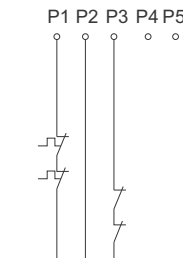
PB - IO 113 with SM 113 module

TM06 1789 2914



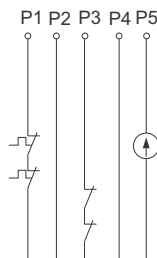
PA - With WIO/WIA sensor

TM06 1792 2914



PD - Without WIO/WIA sensor

TM06 1793 2914



PD - With WIO/WIA sensor

TM06 1790 2914

3.5.2 Electrical connection

All terminals are rated for maximum 8 A.

Terminals 1, 2, 3, 5, 10 and 11 are for wire size 0.08 - 3.3 mm² (AWG 28-12); terminal 17 is for wire size 0.08 - 1.3 mm² (AWG 28-16). For voltage rating of the individual terminals, see section [3.5 Electrical connection](#).

For terminals 5 and 17, one 3-hole socket and one 8-hole socket are provided as accessories in the package.

Terminals T1 and T2 are normally connected to 220-240 VAC. See fig. 20, pos. 1.

Terminal I3 may be connected to up to 600 VAC. See fig. 20, pos. 10 and the diagrams at the end of these instructions.



The insulation between the cabinet in which the module is fitted and the sensor input terminals must have a dielectric strength of 2210 VAC, or the cabinet must be connected to earth.



External controllers connected to the IO 113 module via the RS-485 connection must meet the requirements of IEC 60950-1 or 61010-1 (USA: UL 60950-1).



If SM 113 is used in the installation, connect a PTC sensor to IO 113.

4. Configuring the product

4.1 Potentiometer

Set the warning limit for stator insulation resistance by means of a potentiometer. See fig. 20 (4). The warning limit can be set between 1 and 10 MΩ. The alarm limit is 1 MΩ.



Fig. 4 Potentiometer

4.2 DIP switch configuration

IO 113 must be configured for the connected pump by means of the DIP switches. See fig. 20 (12).



Fig. 5 Shows that all DIP switches are in OFF position

A configuration alarm will be given in the following cases:

- The configuration does not correspond to the pump connected.
- The configuration fault is of safety-related importance (see section [6.7 Approval](#)).

A configuration warning will be given if the configuration fault is of function-related importance (see section [6.7 Approval](#)).

TM03 34/15 0306

TM05 1978 4111

4.3 Pump variant

IO 113 must be configured for the connected pump.
The pump type designation indicates an A, B, C or D.

Example 1, internal wiring:

SE1 80 80 40 **A** Ex 4 5 1D

Example 2, external wiring:

SE2.90.250.2250.4.S.496.Ex.S.5.13.**C**.Q.S

The letters **A** and **C** in the examples can be found on the pump nameplate and must be referred to when setting DIP switches 1 and 2.

Pump variant	ON ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ DIP 1 2 3 4 5 6 7 8 9 10 11 12	Description
PA	ON ☒ ☐ 1 2	IO 113 without SM 113. Sensors are connected directly to IO 113. Position 1 ON Position 2 OFF
PB	ON ☐ ☒ 1 2	IO 113 with SM 113. Sensors are connected to SM 113. Position 1 OFF Position 2 ON
PC	ON ☐ ☒ 1 2	IO 113 without SM 113. For SE/SL 9-30 kW pumps only. Sensors are connected directly to IO 113. Position 1 OFF Position 2 OFF
PD	ON ☒ ☒ 1 2	IO 113 without SM 113. The WIO/WIA sensors are connected directly to the pump. Position 1 ON Position 2 ON

4.4 Address for bus communication

IO 113 can communicate with control systems via a bus connection. For the purpose of bus communication, IO 113 is slave. As a control system must be able to identify the slave units with which it communicates, the IO 113 modules must have unique addresses. An address between 32 and 231 can be selected. By default, the address is set to 231.

When an SM 113 is used together with an IO 113 as a pair, SM 113 is slave. In one control system, a maximum of seven pairs may be used. Each IO 113 must be identified by a unique address, configured by means of DIP switches 3, 4 and 5. See the below table.

Another way to set the unique address of an SM 113 in the control system is by bus. In this case, DIP switches 3, 4 and 5 must be toggled to OFF.

Address	ON DIP 1 2 3 4 5 6 7 8 9 10 11 12	Description
40	3 4 5	IO 113 address 1
41	3 4 5	IO 113 address 2
42	3 4 5	IO 113 address 3
43	3 4 5	IO 113 address 4
44	3 4 5	IO 113 address 5
45	3 4 5	IO 113 address 6
Address set by bus	3 4 5	Unique address for IO 113 set in the control system via bus. Default address: 231.

4.5 SM 113 sensor detection and address setting

The first time voltage is applied, SM 113 will check all inputs to detect which sensors are connected.

Power supply to SM 113	ON DIP 1 2 3 4 5 6 7 8 9 10 11 12	Description
Power on		The slave SM 113 detects sensor status and communicates with IO 113 to set the address.
Power off		The slave SM 113 is off.

If a valid signal is measured, SM 113 will detect that a sensor is present and save the status.

If IO 113 indicates a sensor error or configuration error, repeat the sensor detection. See section [8. Fault finding the product](#). Change DIP switch 6 on IO 113 from OFF to ON, then switch from ON to OFF. After approximately 5 seconds, SM 113 will reset and the sensor detection is completed.

! If more than one pair of IO 113 and SM 113 are used in a control system, make sure the address setting is handled pair by pair. Only one pair of IO 113 and SM 113 may be on and initialised at a time when performing settings. All other IO 113 and SM 113 modules must be off; otherwise, the address setting may fail.

Example: (six pairs)

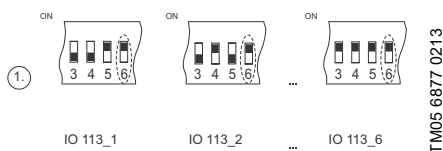


Fig. 6 DIP 6 "ON"

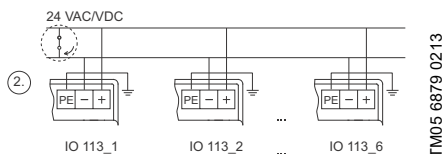


Fig. 7 Power on

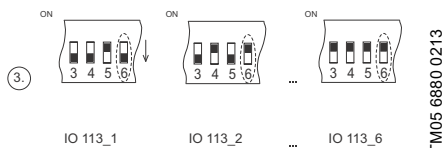


Fig. 8 IO 113_1, DIP 6 "OFF"

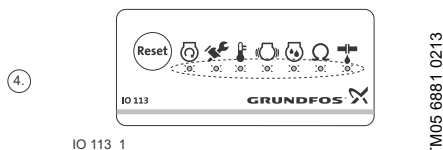


Fig. 9 All indicator lights flashing

After approximately 5 seconds:

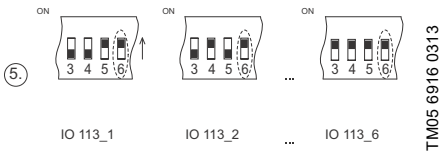


Fig. 10 IO 113_1, DIP 6 "ON"

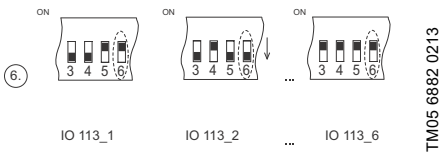


Fig. 11 IO 113_2, DIP 6 "OFF"

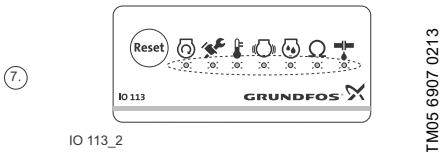


Fig. 12 All indicator lights flashing

After approximately 5 seconds:

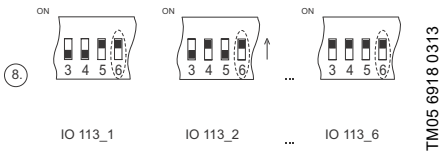


Fig. 13 IO 113_2, DIP 6 "ON"

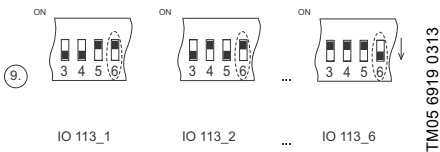


Fig. 14 IO 113_6, DIP 6 "OFF"

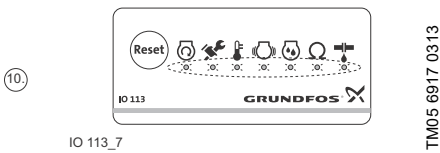


Fig. 15 All indicator lights flashing

After approximately 5 seconds:

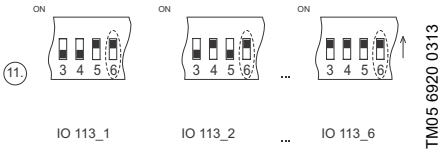


Fig. 16 IO 113_7, DIP 6 "ON"

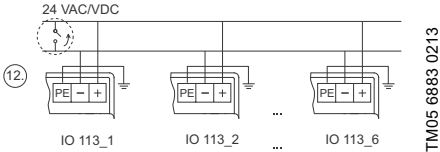


Fig. 17 Power off

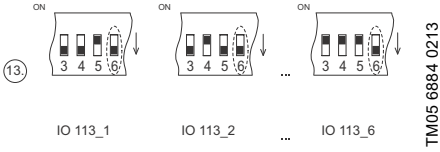


Fig. 18 DIP 6, "OFF"

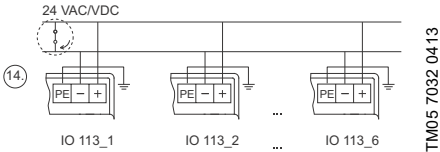
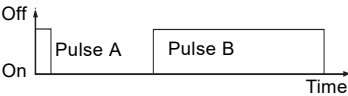


Fig. 19 Power on

4.6 Analog outputs

The analog outputs of IO 113 can be set to various types of output signal.

Analog output	ON ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ DIP 1 2 3 4 5 6 7 8 9 10	Description
Analog output 2: G2 and A2. See fig. 24 (2).		Motor temperature 4-20 mA, 0-180 °C 0 mA = no sensor
Analog output 2: G2 and A2. See fig. 24 (2)		Motor temperature Pt1000 emulator 1000-1685 Ω, 0-180 °C
Analog output 1: G1 and A1. See fig. 24 (2)		Water in oil: 4-20 mA, 0-20 % 0 mA = Water-in-oil sensor not fitted 3.5 mA = Alarm, air in oil chamber 22 mA = Warning, water content far outside the measuring range Water in air: 0 mA = Water-in-oil sensor not fitted 3.5 mA, OK 22 mA = Alarm
Analog output 1: G1 and A1. See fig. 24 (2)		Water in oil: Pulse output: 0-20 % Maximum connection: 24 V, 100 mA Status of output transistor  Pulse A, water in oil: 0.5-3.66 s = 0-20 % 10 s = Water content far outside the measuring range Pulse A, water in air: 0.5-3.66 s = OK 10 s = Water content exceeds alarm range Pulse B, insulation resistance: 0.5 s = 0 MΩ 10.5 s = 20 MΩ

4.7 Bus protocol

By setting the bus protocol, the type of bus connection can be chosen.

GENIbus is a Grundfos standard protocol for Grundfos products.

The Modbus protocol is used for communication between IO 113 and a control unit from another supplier.

Bus protocol	ON DIP 12												Description
	1	2	3	4	5	6	7	8	9	10	11	12	
GENIbus													Grundfos standard protocol for communication between Grundfos products.
Modbus													Go to the Grundfos Product Center online and search Literature for document number: 98288208 - IO 113, via Modbus.

4.8 ATEX/IEC Ex protection

ATEX/IEC Ex protection can be enabled or disabled by means of DIP switch 10.

ATEX/IEC Ex protection	ON DIP 12												Description
	1	2	3	4	5	6	7	8	9	10	11	12	
Disabled													Activation of ATEX/IEC Ex protection enables additional alarms: • Main bearing temperature too high. Default alarm temperature: 140 °C (installation with SM 113) • Support bearing temperature too high. Default alarm temperature: 140 °C (installation with SM 113)
Enabled													• Missing signal from bearing sensor (installation with SM 113) • Missing signal from WIO/WIA sensor • Communication alarm (installation with SM 113).

4.9 Product type

IO 113 must be configured for the connected pump by configuring DIP switches 11 and 12.

Product type	ON DIP 1 2 3 4 5 6 7 8 9 10 11 12												Description
Pump													Pump with WIO sensor.
Pump													Pump with WIA sensor.
n/a													Reserved for future configuration.
Pump													Pump without WIO/WIA sensor.

5. Commissioning the product

Before installation, check the following items:

- IO 113 is the variant you ordered.
- IO 113 is suitable for the supply voltage and frequency available at the installation site.
- IO 113 has not been damaged during transportation.

DANGER

Electric shock



Death or serious personal injury

- Before installing IO 113, make sure that the power supply has been switched off and that it cannot be accidentally switched on.

The installation must be carried out by authorised persons in accordance with local regulations.

All safety regulations must be observed on the installation site.

When IO 113 has been set up as described in section [2. Receiving the product](#), startup must be carried out by an authorised person.

1. Switch on the power supply to IO 113 before starting the pump.
2. IO 113 now carries out a self-test. All indicator lights on the front panel will turn on for a few seconds. If IO 113 does not detect any fault, all indicator lights will go out except those for water in oil and stator insulation resistance. If a fault is detected, an indicator light for the fault will light up.
3. Check that there are no warnings or alarms before switching on the pump.

6. Product introduction

6.1 Product description

IO 113 provides an interface between a Grundfos wastewater pump equipped with sensors and the pump controller(s). The most important sensor status information is indicated on the front panel.

One pump can be connected to one IO 113 module.

Together with the sensors, IO 113 provides a galvanic isolation between the motor voltage in the pump and the connected controller(s).

IO 113 can do the following as standard:

- protect the pump against overheating
- monitor the status of these items:
 - motor winding temperature
 - leakage (WIO/WIA)*
 - moisture in pump
- measure the stator insulation resistance
- stop the pump in case of alarm
- remotely monitor the pump via RS-485 communication (Modbus or GENIbus)
- control the pump via a frequency converter.

When IO 113 is combined with an SM 113, it is also possible to monitor the following:

- bearing temperature
- vibration in pump.
- * WIO and WIA are abbreviations for water-in-oil and water-in-air.

If SM 113 is installed, connection of the leakage sensor must be done via the SM 113 device.



IO 113 must not be used for other purposes than those specified above.

IO 113 V0 and V1 are not compatible with SM 113 V2. IO 113 and SM 113 V2 units are compatible, see the table below.

Compatibility list

	SM 113 V0	SM 113 V1	SM 113 V2	SM 113 V3
IO 113 V0	OK	OK	-	-
IO 113 V1	OK	OK	-	-
IO 113 V2	-	-	OK	OK

6.2 Intended use

The product is used to handle internal and external signals from pumps, sensors and controls. The product has potential-free alarm and operating relays to stop the pump in case they detect a situation that requires it to stop.

The product is intended to be placed outside Ex zones but can be used to monitor pumps placed inside Ex zones.

6.3 User interface

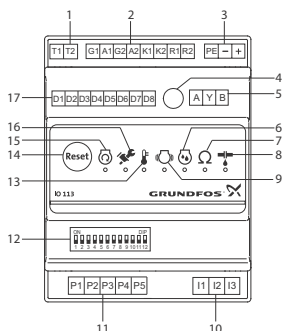


Fig. 20 IO 113 module

6.4 Indicator lights and their function

On the front, IO 113 has seven indicator lights for sensor status. Figure 21 shows the location of lights on IO 113, and the table explains their meanings.

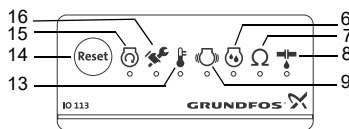


Fig. 21 Indicator lights on IO 113

TM05 1968 4111

Pos. Description

1	Terminals for alarm relay
2	Terminals for analog and digital inputs and outputs
3	Terminals for supply voltage
4	Potentiometer for setting the warning limit of stator insulation resistance
5	Terminals for RS-485 for GENIbus or Modbus
6	Indicator light for measurement of moisture
7	Indicator light for stator insulation resistance
8	Indicator light for leakage (WIO/WIA)
9	Indicator light for vibration in pump
10	Terminals for measurement of stator insulation resistance
11	Terminals for connection of pump sensors
12	DIP switch for configuration
13	Indicator light for motor temperature
14	Button for resetting alarms
15	Indicator light for motor running
16	Indicator light for service
17	Terminals for digital outputs

6.5 Description of indicator lights

Pos.	Symbol	Description
6		Moisture Red indicator light flashing for alarm in case of moisture in the motor.
7		Insulation resistance Stator insulation resistance is indicated by a green, yellow or red light. Green indicator light is on when the insulation resistance is correct, i.e. above the warning level set on the potentiometer. Yellow indicator light is permanently on when the warning limit has been reached, see 4.1 Potentiometer . Red indicator light flashing when the alarm limit has been reached, i.e. below 1 MΩ. Note: The indicator lights are only active if the conductor for contactor status is connected (K1, K2). This measurement is only correct when the motor is stopped.
8		Leakage For wastewater pumps: Green indicator light permanently on indicates leakage below 5 %. Green indicator light flashing indicates leakage between 5 and 10 %. Yellow indicator light permanently on indicates leakage between 10 and 15 %. Yellow indicator light flashing indicates that the input signal is out of range. Red indicator light flashing indicates leakage between 15 and 20 %. Red indicator light permanently on indicates leakage above 20 %, or oil chamber is empty. For SE/SL 9-30 kW: The indicator light is off when the WIO/WIA sensor is disabled. Green indicator light permanently on indicates that the pump works correctly. Red indicator light flashing indicates alarm.
9		Vibrations Yellow indicator light permanently on when vibrations are in the warning range (exceeds alarm range).
13		Temperature Red indicator light flashing for alarm when temperature is above the limit. If ATEX/IEC Ex protection is activated (DIP switch 10), this indicator light can also indicate the following: • bearing temperature too high. • missing signal from bearing sensor (with SM 113).
15		Motor running Green indicator light is permanently on when motor is running. Note: The indicator light is only active if the conductor for contactor status is connected (K1, K2).
16		Service Yellow indicator light permanently on when there is a communication problem between IO 113 and SM 113. Yellow indicator light flashing when there is a warning. Immediate service is needed.

6.6 Identification

6.6.1 Type key

Code	Meaning	IO	1	1	3
IO	Input/output unit				
11	Controller series				
3	Model number				

6.6.2 Nameplate

The nameplate is fitted on the side of IO 113.

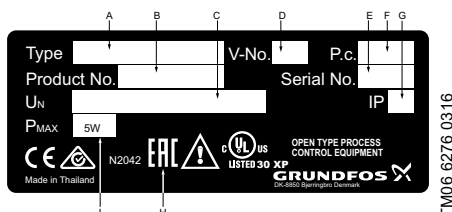


Fig. 22 Nameplate

Pos.	Description
A	Type designation
B	Product number
C	Rated voltage
D	Version number
E	Serial number
F	Production code (year and week)
G	Enclosure class
H	EAC approval logo
I	Power consumption

6.7 Approval



IO 113 is UL listed to US and Canadian safety standards.

6.8 Variants

IO 113 is available in two variants:

- without communication module (standard variant)
- with communication module.

The product number on the nameplate shows the variant:

- 98097391 = standard variant
- 98711370 = variant with communication module.

6.9 Expansion using SM 113

SM 113 may be used for the collection and transfer of additional sensor data. SM 113 works together with IO 113 (98711370) as shown below.

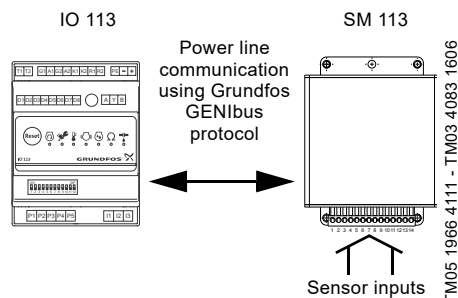


Fig. 23 IO 113 and SM 113

SM 113 can be built into a pump or mounted next to IO 113 in a control cabinet.

SM 113 can collect data from these devices:

- current sensors, 4-20 mA*
- Pt100**/Pt1000*** thermal sensors.
- * Vibration sensor, water-in-oil or water-in-air sensor (WIO or WIA)

** Maximum three Pt100 sensors

*** Maximum four Pt1000 sensors

6.10 WIO/WIA sensor

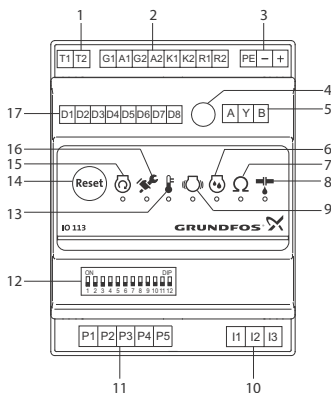


In Ex and IEC Ex applications, the maximum current supplied to the sensor must not exceed 350 mA according to EN/IEC 60079-18.

As IO 113 is equipped with this current limitation, no further protection is required when using IO 113.

For more information about the WIO/WIA sensor, see the installation and operating instructions at <http://net.grundfos.com/qri/i/96591899>.

7. Control functions

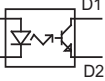
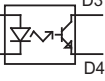
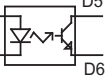
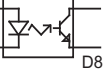


TM05 1881 3811

Fig. 24 IO 113 module

Pos.	Terminal	Description	Data	Function	Diagram
1	T1	Terminal for alarm relay	Max. 250 VAC	All alarms trip the alarm relay. The alarm relay is closed during normal operation. In case of alarm or if IO 113 is not connected to the power supply, the relay opens and breaks the connection between T1 and T2.	
	T2	Terminal for alarm relay	Max. 250 VAC		
2	G1	GND for analog output 1	1) 0 V 2) 0 V	Analog output 1 has two functions set via DIP switch 8. See section 4.6 Analog outputs . 1. 4-20 mA for content of water in the oil. Load resistance: max. 250 Ω. 2. Pulse output for content of water in the oil and stator insulation resistance.	
	A1	Terminal for analog output 1	1) 15 VDC 2) 24 VDC, max. 100 mA		
	G2	GND for analog output 2	1) 0 V 2) 0 V		
	A2	Terminal for analog output 2	1) 15 VDC 2) 24 VDC, rated 1 mA		
	K1	GND connection	0 V	Feedback from motor contactor whether the pump is running or not. Short-circuit the input when the pump is running. The signal is used by IO 113 for filtering measuring signals and for analysis during fault indication.	
	K2	Terminal for conductor for contactor status	Digital input		
	R1	GND connection	0 V		
	R2	Terminal for resetting	Digital input		

Pos.	Terminal	Description	Data	Function	Diagram
3	PE	Earth	Earth	Supply voltage to IO 113	
	-	GND for supply voltage	0 VDC 24 VAC + 10 %/- 10 %		
	+	Positive for supply voltage	24 VAC + 10 %/- 10 % 24 VDC + 10 %/- 10 %		
5	A	RS-485 A	Bus input	RS-485 communication connection (9600 baud)	
	Y	RS-485 GND	0 V		
	B	RS-485 B	Bus input		
10	I1	Earth	Earth	The insulation resistance between stator windings and earth is measured. The measurement is only correct when the motor is stopped. Measurement voltage: 10 VDC.	
	I2	Not connected	-		
	I3	Terminal for measurement of stator insulation resistance	CAT II 600 V		
11	P1	Terminal for sensors in the pump	Sensor input	Thermal switch or PTC sensor according to DIN 44081 and 44082. P1 to P5 are used for the connection of sensors in the pump. All sensors in contact with phase voltage must be double insulated according to UL/ IEC/EN 61010-1.	
	P2	Terminal for supply voltage to sensors in the pump	15 V		
	P3	Terminal for sensors in the pump	Sensor input		
	P4	Terminal for supply voltage to sensors in the pump	15 V		
	P5	Terminal for sensors in the pump	Sensor input		

Pos.	Terminal	Description	Data	Function	Diagram
	D1	Terminal for alarm in case of too high stator temperature	Digital output 24 VDC Min. impedance 10 kΩ Max. rated current 2.4 mA	Alarm for temperature too high in the stator windings. The output is closed during normal operation. If an alarm occurs, the connection is broken between D1 and D2.	
	D2	GND for alarm in case of too high stator temperature	0 V		
	D3	Terminal for alarm in case of moisture in the pump	Digital output 24 VDC Min. impedance 10 kΩ Max. rated current 2.4 mA	Alarm for moisture in the motor part of the pump. The output is closed during normal operation. If an alarm occurs, the connection is broken between D3 and D4.	
	D4	GND for alarm in case of moisture in the pump	0 V		
17	D5	Output for alarm in case of insulation fault	Digital output 24 VDC Min. impedance 10 kΩ Max. rated current 2.4 mA	Alarm for too low insulation value between stator windings and earth. The output is closed during normal operation. If an alarm occurs, the connection is broken between D5 and D6.	
	D6	GND for alarm in case of insulation fault	0 V		
	D7	Terminal for warning	Digital output 24 VDC Min. impedance 10 kΩ Max. rated current 2.4 mA	Warning: The output is closed during normal operation. If a warning occurs, the connection is broken between D7 and D8. The following warnings can occur: – communication warning – configuration warning – too much water in the oil – stator insulation resistance below warning limit. See section 8. Fault finding the product	
	D8	GND for warning	0 V		

8. Fault finding the product

WARNING

Electric shock

Death or serious personal injury

- Before any fault finding, make sure that the fuses have been removed or the main switch has been switched off. It must be ensured that the power supply cannot be accidentally switched on. OBS: terminals T1 and T2 are normally connected to 220-240 VAC. Terminal I3 may be connected to up to 600 VAC.



Fault	Cause	Remedy
 Green indicator light is off when the pump is running.	Conductor for contactor status has not been connected to terminals K1 and K2.	Connect the conductor.
 Yellow indicator light is flashing at startup.	This indicates configuration setting conflicts. The DIP switch settings are incorrect.	Reset the DIP switches.
 Yellow indicator light is permanently on.	The connection between IO 113 and SM 113 is interrupted, or the setting of DIP switches 1 and 2 is incorrect.	Re-establish the connection or reconfigure DIP switches 1 and 2.
 Red indicator light is flashing.	Motor winding or bearing temperature is too high, or missing signal from bearing sensor.	Check connection to SM 113.
 Yellow indicator light is permanently on.	The warning limit for stator insulation resistance is too low.	Set a higher limit using the potentiometer. See section 4.1 Potentiometer .
 New oil does not show 4 mA on analog output 1.	The oil in the oil chamber has not been changed completely, or it was changed to another type.	Calibrate IO 113 for the new oil, see section 10. Calibration .
 The water-in-oil sensor previously indicated water in the oil, but now it indicates less than 5 % water in the oil.	The power supply to IO 113 has been interrupted.	Let the pump run for some time and check again.
 Yellow indicator light is flashing.	• WIO sensor is disconnected. • WIO sensor is defect. • WIO sensor short circuit. • Wrong configuration (only applications with SM 113).	Reconnect the sensor or replace the sensor. For SM 113, choose the correct setting of the DIP switches.
SM 113 cannot detect the sensor. Only applicable to non-Ex applications with DIP switch 10 in the OFF position.	Fault in signal from sensor.	Re-establish the signal, e.g. by changing the setting of DIP switch 9 or by securing the wire connection from sensor to SM 113.

9. Overview of alarms and warnings

IO 113 has two categories of fault:

- 1. **Alarm.** The pump stops. The fault is related to a primary functionality (e.g. motor temperature too high). The relay opens and breaks the connection between T1 and T2 in case of alarm or if IO 113 is not connected to the power supply. An alarm is shown by the indicator lights on the front panel of IO 113 and via the four digital outputs. See fig. 20 (17).
- 2. **Warning.** The pump does not stop. The fault is related to a secondary functionality (e.g. too much water in the oil). A warning is shown by the indicator lights on the front panel of IO 113. The warning status can be read via the digital outputs D7 and D8. See fig. 20 (17).

Fault	Standard		ATEX/IECEx protection activated	
	Warning	Alarm	Warning	Alarm
Stator winding temperature too high	•	•	•	•
Moisture in top cover		•		•
Moisture in stator housing		•		•
Moisture in bottom of motor		•		•
Water in air		•		•
Missing signal from water-in-air sensor		•		•
Water in the oil exceeds limit	•		•	
Missing signal from water-in-oil sensor	•			•
Insulation resistance too low	•	•	•	•
Configuration conflict	•	•	•	•
Main bearing temperature too high*	•		•	•
Support bearing temperature too high*	•		•	•
Missing signal from bearing sensor*	•			•
Communication fault*	•			•
Time for service	•		•	
Internal fault	•		•	
Vibrations exceed limit	•	•	•	•

* Pump with SM 113

9.1 Alarm resetting

Alarms can be reset by means of terminals R1 and R2.

Manual resetting

Alarms can be reset by short-circuiting R1 and R2. The reset button also short-circuits R1 and R2. Never press the reset button for more than 2 seconds to reset alarms. See section 10. Calibration.

Automatic resetting

If you make a permanent short circuit between R1 and R2, alarms will automatically be reset when the cause of the alarm has disappeared.

10. Calibration

After an oil change, the measurement of water in the oil must be calibrated for the new oil:

1. Let the pump run for at least one minute.
2. Press the reset button for more than five seconds.
3. 4 mA can now be read between terminals A1 and G1 of analog output 1. See fig. 20 (2). (4 mA = 0 %).



If this is done with used oil, the measurement of water in the oil may be incorrect.

11. Maintenance and service

IO 113 cannot be serviced, nor does it need maintenance. If the module is faulty, it must be replaced.

12. Disposing of the product

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.



The crossed-out wheeled bin symbol on a product means that it must be disposed of separately from household waste. When a product marked with this symbol reaches its end of life, take it to a collection point designated by the local

waste disposal authorities. The separate collection and recycling of such products will help protect the environment and human health.

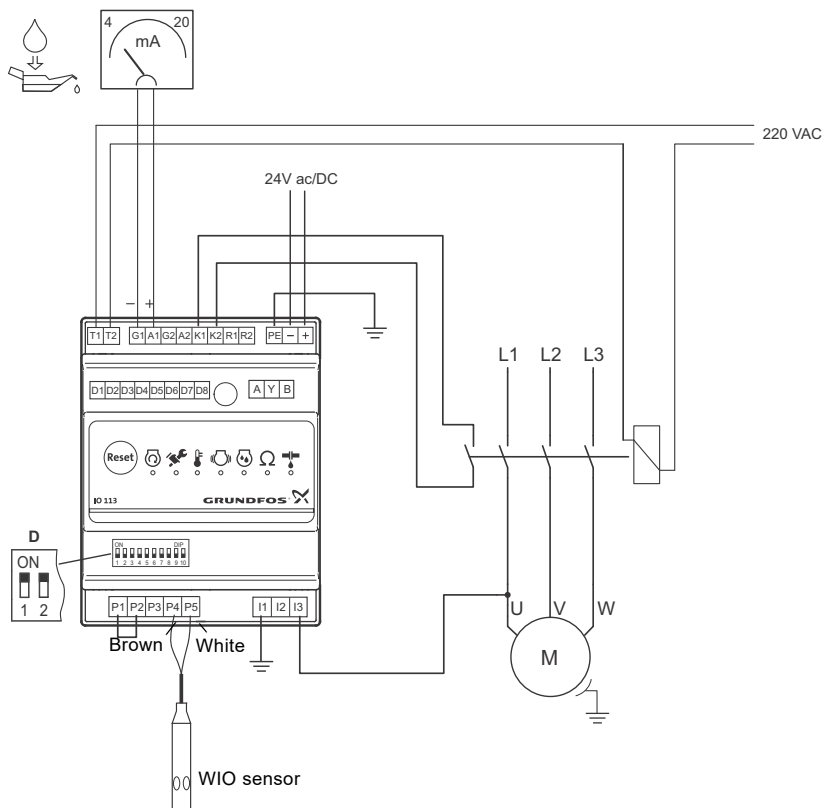
You can look up your product on:

www.grundfos.com/products/product-sustainability/product-recycling.html

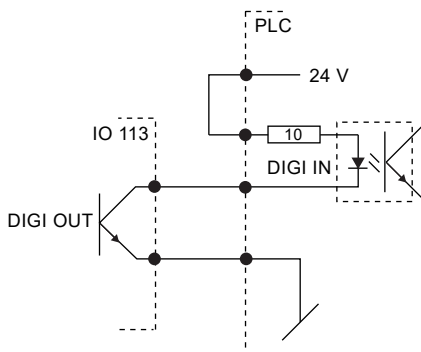


Appendix

External WIO sensor and stator insulation resistance measurement



Connection example DIGI-OUT IO111

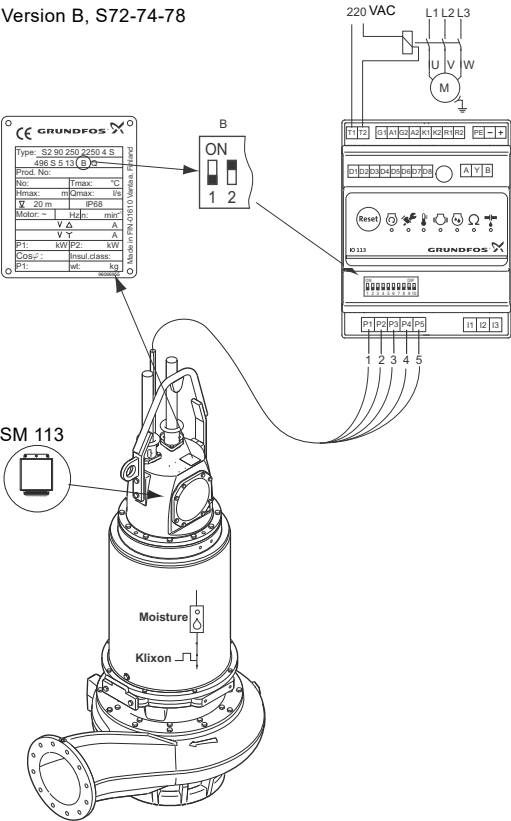


* The 10 kΩ resistor is the minimum impedance required. The maximum current is 2.4 mA.

TM03 3832 1007

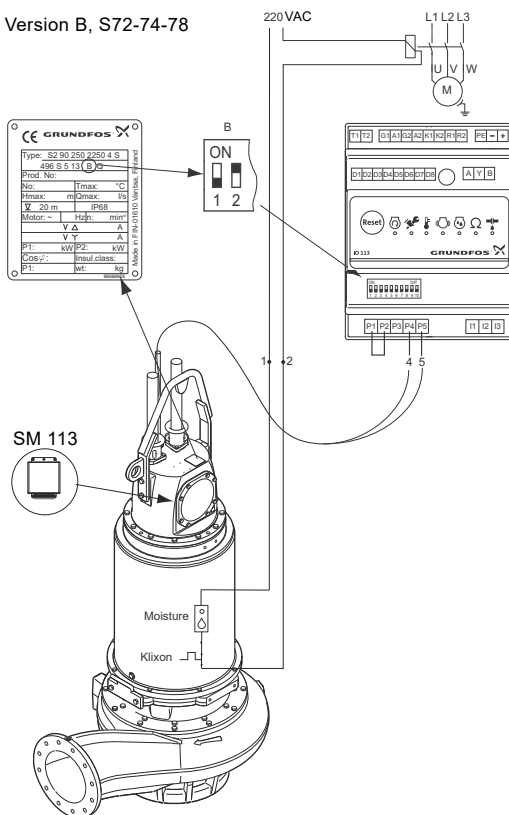
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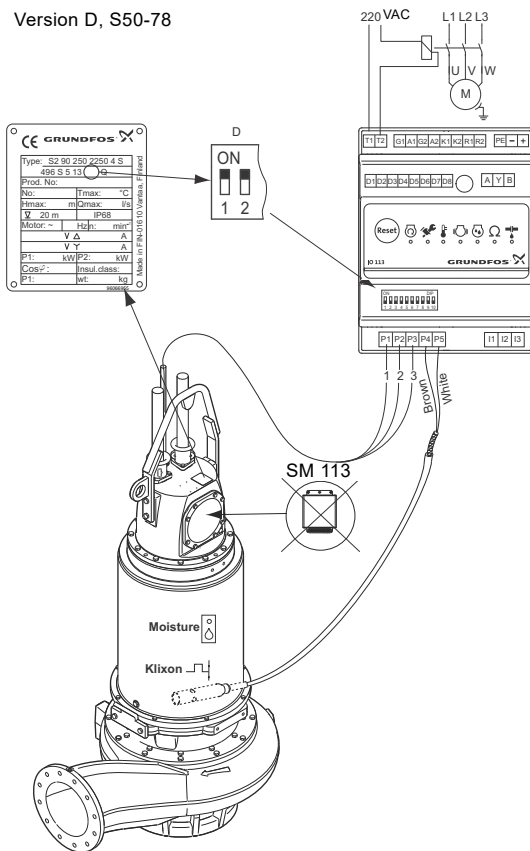
Version B, S72-74-78

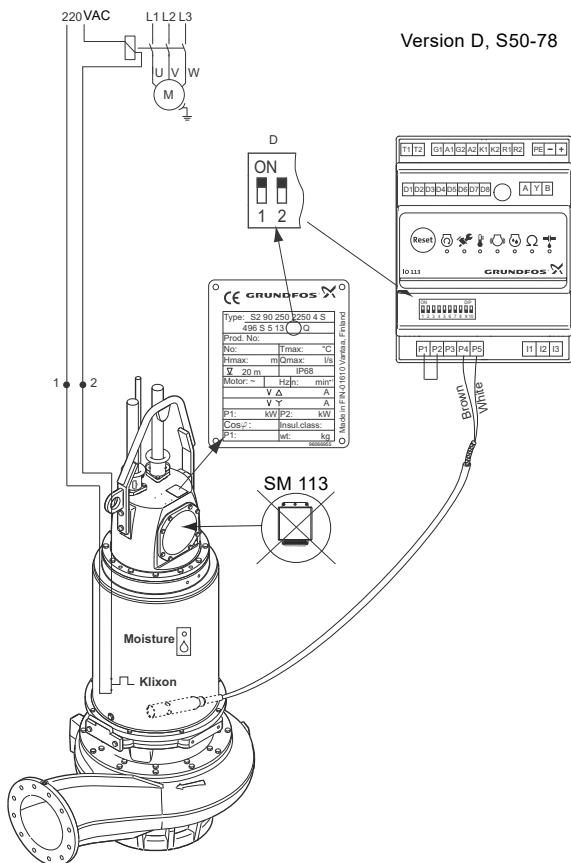


TM03 3830 1007

Version B, S72-74-78

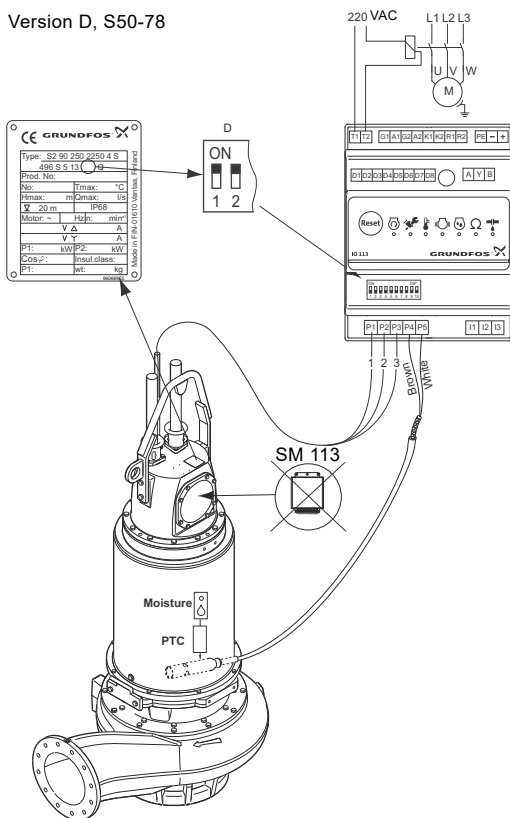






TM03 3836 1007

Version D, S50-78



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