GI SPC

Solar Pump Controller

Electrical installation and operating instruction

English (GB) Installation and Operating instructions

Original installation and operating instructions.

CONTENTS

Warning
Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

1 Safety instructions

These installations and operating instructions contain general instructions that must be observed during the installation, operation and maintenance of the inverter.

Before installing, commissioning or using the inverter, please read the warning information contained in the Installation Manual.

Please read the following additional safety instructions carefully.

Only authorized, trained and qualified personnel are allowed to install, operate and maintain the drive

1.1 Symbols used in this document

Warning
If these safety instructions are not observed, it may result in personal injury.

Warning
If these instructions are not observed, it may lead to electric shock with consequent risk of serious personal injury or even death.

Warning
Sides of the inverter surface may be hot. Do not touch

Warning
Damage to the PCBA board may occur if related requirements are not followed.

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

Note *Notes or instructions that make the job easier and ensure safe operation.*

1.2 Danger

These warnings are intended to personnel responsible for grounding the inverter.

Ground the frequency converter to ensure personnel safety and to reduce electromagnetic interference.

After disconnecting the AC drive from the mains or from the DC input supply, wait until the indicators on the cover go out. Wait an additional 5 minutes before starting any work on the connections of Inverter. After expiration of this time, use measuring equipment to absolutely ensure that no voltage is present. Always ensure absence of voltage before starting any electrical work!

1.3 Warnings

Never work on the photovoltaic generator or inverter and its input/output cables when the inverter is connected to the mains or to the photovoltaic generator.

Before performing any measurement on the inverter, disconnect or isolate the mains supply voltage or the DC input supply.

Do not touch the components on the inverter or on the string box cabinet that have high DC voltage.

The photovoltaic generator cells exposed to light supply DC voltage even at low light intensity.

Warning
There is heavy metal in the product. Deal with it as industrial waste.

1.4 Waste disposition

Warning
When the life cycle ends, the product should enter the recycling system. Dispose of it separately at an appropriate collection point instead of placing it in the normal waste stream.

1.5 Purchase inspection before installation

If any deviation from the order is found, please contact Grundfos. Once you get the product, please perform the following inspections before installation:

Caution *Check the condition of the inverter before installation. Please do not install the inverter if the equipment appears to be damaged*

Inspection item	Inspection method
Consistency with ordered product	Inspect the product's nameplate
Damage or scratches	Inspect the product visually
Completeness of main inverter and accessories	Check carefully according to the product list
Are fastening parts, such as screws, tightened properly	Check with screwdriver, if necessary

1.6 Safety instructions for the operator/user

The safety instructions described in these instructions, existing national regulations on health protection, environmental protection and for accident prevention and any internal working, operating and safety regulations of the operator must be observed.

2 Introduction

This GI SPC User manuals describe the installation and operation of the solar pump controller, It includes all the required parameter settings and program features specific to the solar pump controller.

Warning
This manual is for qualified person. The various tasks described in this manual must be performed by qualified person only.

3 Product Overview

The GI SPC is an intelligent IP65 off-Grid solar pump controller is designed to run with Grundfos pumps.

The GI SPC solar inverter is of high conversion efficiency. The GI SPC solar inverter enables maximum power output of solar array and then drive PMSM DC Pump motor.

Fig. 1 GI SPC system with solar package module

Pos.	Description
GC	Solar panels
GI SPC	Solar Pump Controller
SP	Submersible Pumps

The grid power and the Solar Panel (GC) is connected to the Solar pump controller (GI SPC). Through the selector switch, the required input power to the solar pump controller can be selected either AC(grid power) or DC (solar Power) and the Output of the solar pump controller (GI SPC) is connected to the Submersible pump.

Note *It is responsibility of the end user to provide the correct power supply for installation (right voltage, cable sizing, etc.). Also, the installation of the solar package module, mechanical solar panels, montage of the solar panel junction box. The final connection and verification must to be performed by Grundfos or Authorized Service*

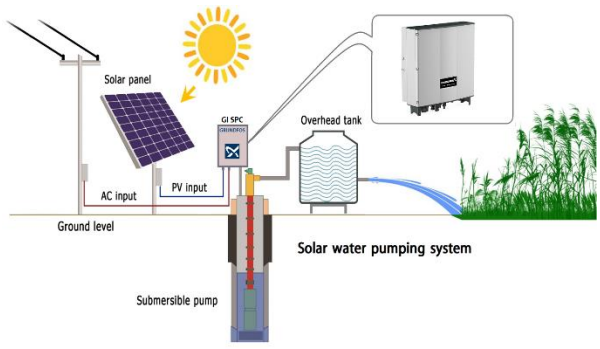


Fig. 2 Schematic layout

3.1 Features

- Soft start function
- Lighting and Reverse polarity protection
- Protection against Overvoltage, Undervoltage and overcurrent
- Advance MPPT that protect against power oscillation due to rapid cloud movement.
- Sensor less dry run protection.
- LED indication for Run, Alarm and fault.
- RS 485 Modbus communication
- The solar pump can be operate through AC/ DC.
- Selector Switch of ON/OFF.
- Natural convection cooling.

4 Technical data

4.1 Product range

4.1.1 Dimension

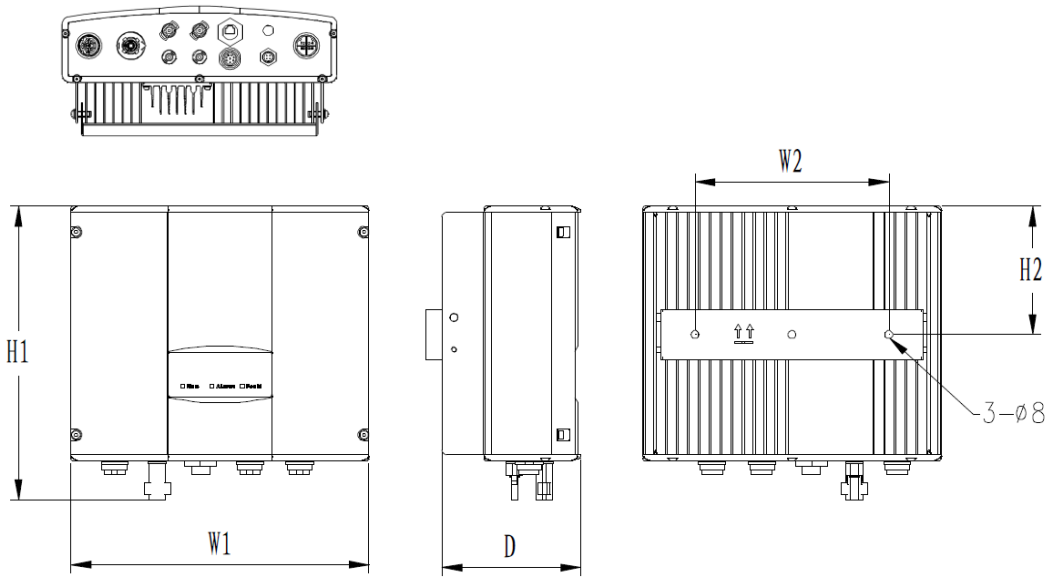


Fig. 3 Dimension for GI SPC 03 65 10

Unit : mm

Model	H1 (mm)	W1 (mm)	D (mm)	H2 (mm)	W2 (mm)	Installation hole
GI SPC 03 65 10	280	300	137	131	195	8

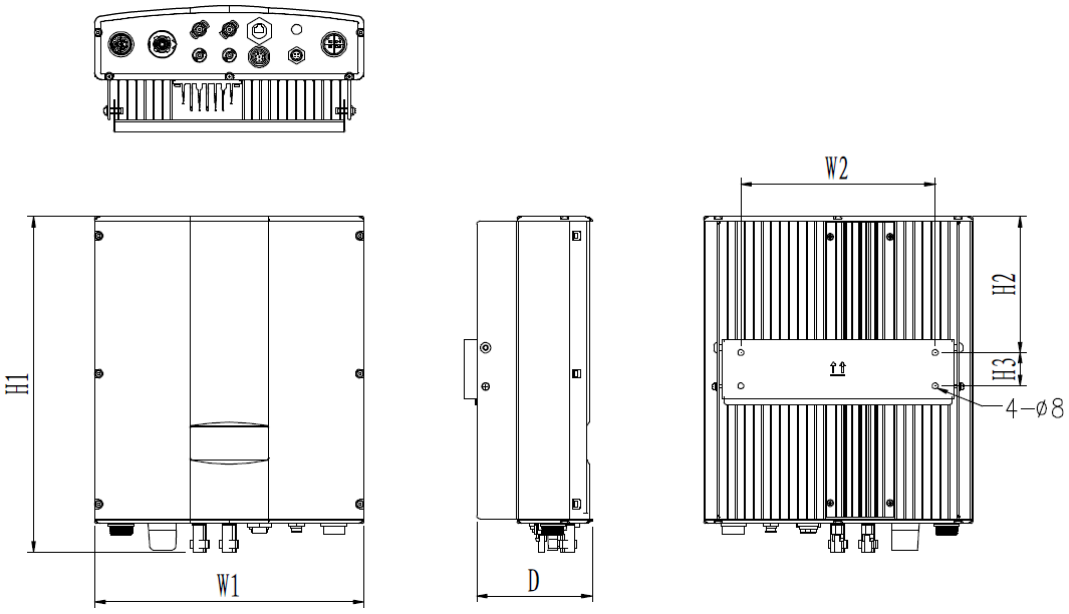


Fig. 4 Dimension for GI SPC 03 65 10 & GI SPC 7.5 65 10

Unit : mm

Model	H1 (mm)	W1 (mm)	D (mm)	H2 (mm)	W2 (mm)	Installation hole	Model
GI SPC 05 65 10	454	360	154.5	184	260	45	8
GI SPC 7.5 65 10	454	360	154.5	184	260	45	8

4.2 Technical data

Category		Parameter		3 x 230 V	3 x 380 V
Electrical Data	DC Input	Min. MPPT Voltage	[VDC]	100	220
		Max. MPPT Voltage	[VDC]	400	750
		Max. Input Voltage	[VDC]	450	800
	AC Input	Input Voltage	[AC]	220-240	380-415
		Input Frequency	[Hz]	50	50
	Output	Output, Phase		3	3
		Output, Rated Voltage	[VAC]	220	380
		Output Frequency	[Hz]	0-400	0-400
Installation Environment		Min. Ambient Temperature	[°C]	-25	-25
		Max. Ambient Temperature	[°C]	60	60
		Max. Relative Humidity	[%]	95	95
Communication		RS 485			
Enclosure class		IP65			

4.2.1 Low Voltage Range (3 x 230 V)

Power [KW]	Power [HP]	Product Model	Electrical Data				Weight [Kg]
			Max.P2 [KW]	Rated Input DC Current [A]	Rated Input AC Current [A]	Rated Output Current [A]	
2.2	3	GI SPC 03 65 10	2.2	12	24	10	7

4.2.2 High Voltage Range (3 x 380 V)

Power [KW]	Power [HP]	Product Model	Electrical Data				Weight [Kg]
			Max.P2 [KW]	Rated Input DC Current [A]	Rated Input AC Current [A]	Rated Output Current [A]	
3.7	5	GI SPC 05 65 10	3.7	20	13.5	10	14.1
5.5	7.5	GI SPC 7.5 65 10	5.5	20	19.5	14	14.1
7.5	10	GI SPC 10 65 10	7.5	31	25	18	15

5 Installation

Warning

Before starting the installation, ensure the following points:

- Check the GI SPC carefully first for damage during transportation, if any problem is found, please contact Grundfos Pumps India Pvt Ltd or the transportation company.
- All electrical connections must be in accordance with local electrical installation criteria.
- Don't touch other parts in the cabinet except the connecting terminals in installation.
- Make sure that, the circuit breaker at DC side (PV Panels) is in open state before carrying out electrical connection.

Make sure that the circuit breaker at DC side (PV Panels) is open. At least 5 minutes later, use a multimeter to measure the voltage at DC side before carrying out equipment maintenance to ensure that the maintenance must be conducted with no voltage at DC side

Note *Ensure that the packing list consists of the following.*

Model	GI SPC 03 to 5 HP	GI SPC 7.5 to 10 HP
Pump Controller	1	1
Installation bracket	1	1
Operation manual	1	1
Expansion bolts	3 (M6 x 60)	4 (M6 x 60)
DC connector	1	2
Communication connector	1	1
AC connector	1 (2)	1 (2)
Keypad	1	1
Network cable	1	1

5.1 Installation Example

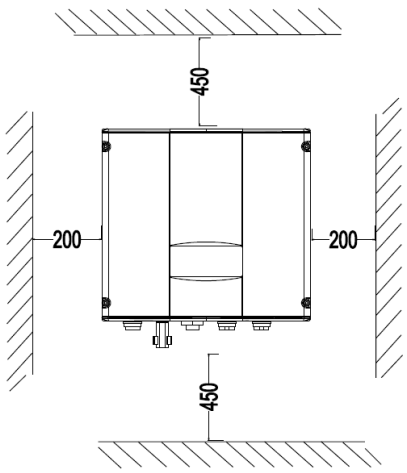


Fig. 5 Installation example showing the required clearance for mounting the product.

- The environment temperature is between -25°C and 60°C.
- The installation surface is perpendicular to the horizontal line. Refer to the Fig 6.

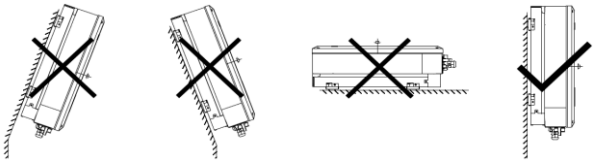


Fig. 6 Installation example showing the required clearance for mounting the product.

5.2 Cable Specification

Select AC and DC cables based on the following specification requirements.

Model	DC Side	AC Input Side	AC Output Side	Communication
	mm²	mm²	mm²	mm²
GI SPC 03 65 10 GI SPC 05 65 10	4mm2 /12 AWG	4mm2 /12 AWG	2.5mm2 /14 AWG	0.52mm2 / 20 AWG
GI SPC 7.5 65 10 GI SPC 10 65 10	4mm2 /12 AWG	6mm2 /10 AWG	4mm2 /12 AWG	0.52mm2 / 20 AWG

Recommended crimp tools and insertion and removal tools for cables

	AC Input Side	AC Output Side	Communication Cable
Tool	Cross screwdriver		Crimp tools: CT-P20/28 Insertion and removal tools: RT-1.0

5.3 Mechanical Installation

Note *It is recommended to install the solar pump controller on the firm wall or metal bracket vertically. Take the typical installation environment as the example given below.*

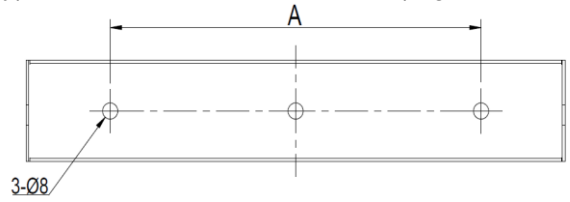


Fig. 7 Installation bracket for GI SPC 03 65 10

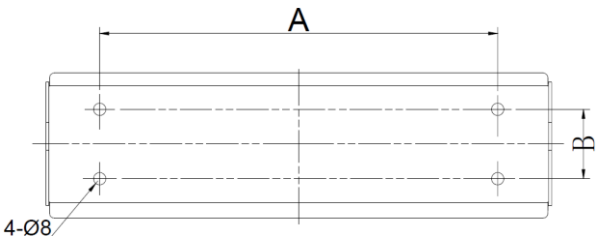


Fig. 8 Installation bracket for GI SPC 05 65 10 , GI SPC 7.5 65 10 & GI SPC 10 65 10.

Sizes of installation brackets

Model	A (mm)	B (mm)
Installation bracket 1	195	-
Installation bracket 12	260	45

Installation steps of a PV pumping inverter:

- Take the installation bracket from the pump controller by only removing the M5 screws.
- Then use expansion bolts to fix the installation bracket at the proper location of a wall.
- Lift the inverter to suspend it on the installation bracket through the M8 screws.
- Finally, fasten the M5 screws to fix the inverter on the bracket.

Warning

For firm installation, the operators cannot release the device until the pump controller is installed on the bracket firmly.

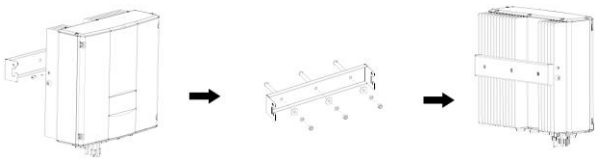


Fig. 9 Pump Controller installation.

5.4 Electrical Installation

5.4.1 Control circuit wiring

The COM interfaces are the control circuit interfaces, including one 485 communication channel and three digital input channels. Figure 10 shows the wiring. For interface definitions and specifications.

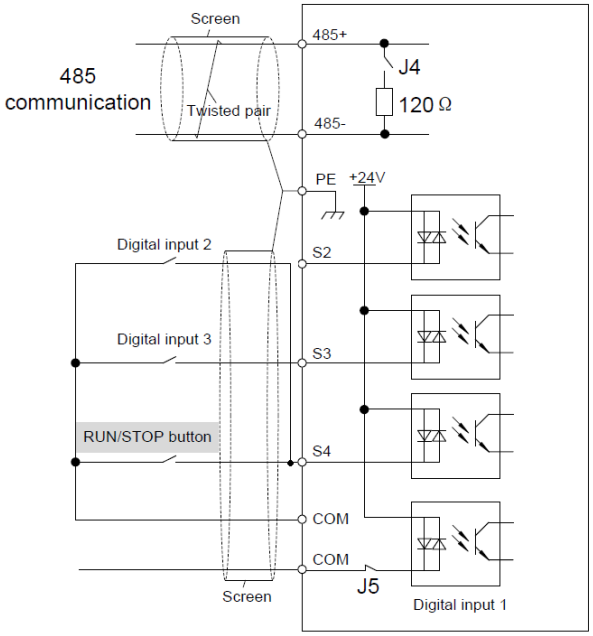


Fig. 10 Control circuit wiring diagram.

Note *The Run/Stop button on the enclosure corresponds to the S4 terminal,*

5.4.2 Terminal arrangement

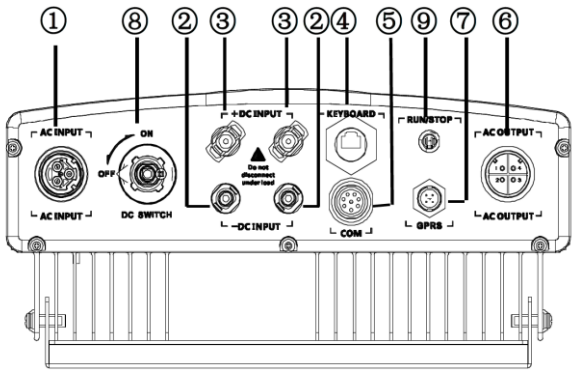


Fig. 11 GI SPC terminals

No.	Terminal name		Pin definition
1	AC input terminal	GI SPC 03 65 10 Model	1. L
			2. N
			3. PE
		GI SPC 05 65 10 GI SPC 7.5 65 10 GI SPC 10 65 10 Model	1. R
			2. Y
			3. B
			4.PE
2	PV input terminal-		-DC INPUT
3	PV input terminal+		+DC INPUT
4	External keypad terminal		RJ45
5	Function terminal		1. 485+
			2. 485-
			3. S2 Note*
			4. S3
			5. COM
			6. S4 Note*
			7. COM
			8. PE
6	AC output terminal		1. V
			2. W
			3. U
			4. PE
7	GPRS connection terminal		1. + 24V
			2. 485+
			3. 485-
			4. GND
8	DC switch		/
9	RUN/STOP button		/

Note*: Pin6 does not provide any functions and Pin3 is linked with Pin6 internally

5.4.3 Terminal arrangement Description of function terminals

Terminal Name	Description
PE	Grounding terminal
COM	+24V common terminal
S2	Digital input 2 • Internal impedance: 3.3kΩ • Applicable to 12–30V voltage input • Supporting NPN wiring • Max. input frequency: 1 kHz • All are programmable digital input terminal. Users can set terminal functions through function codes. • S1 is short circuited with COM in the inverter by default and it is not connected externally.
S3	Digital input 3 (Used by the RMC for RUN/STOP through SMS)
S4	Digital input 4 (Used by the RUN/STOP button)
485+	**485 communication interface** If it is a standard 485 communication interface, use twisted pairs or shielded cables.
485-	

5.4.4 Electrical wiring

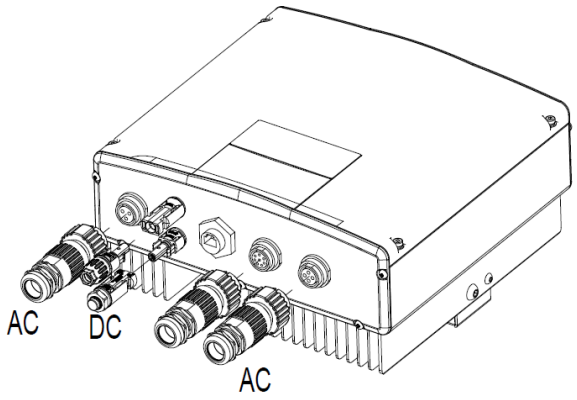


Fig. 12 Electrical wiring of the pump controller

Note *Steps of electrical connection:*

- If the distance between the solar inverter and the motor is longer than 50 meters, it is recommended to install the output choke to avoid the frequent overcurrent protection and the motor isolation damage. For models of choke, consult Grundfos.
- Connect the DC output, AC input, AC output and the communication wire to the males, and then plug them to the females of the inverter. Tighten up to ensure the proper connection.

AC input and output connections

Follow the below steps for the connecting AC cable.

- Unscrew the terminal of all components.

Fig. 13 Connector disassembly

- Strip the cable insulation layer by about 10 mm.
- Route the cable through the connector as per fig. 14

Fig. 14 Connector disassembly

- Insert the bared wires ends as per the fig. 15

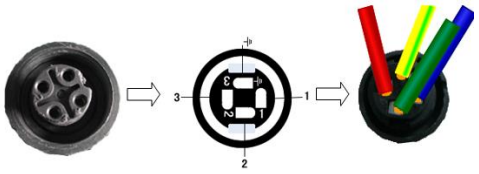


Fig. 15 Connection details

- Tighten the connection part on the left side of the connector.

Fig. 16 Connector assembly

DC input connections

Warning

Before starting the installation, ensure the following points:

- The circuit breaker between the solar panel combiner box and solar pump controller (GI SPC) is in OFF position.
- The solar pump controller (GI SPC) is in OFF position.

Note *Make sure that the DC input voltage from the solar PV array* to the solar pump controller does *not exceed 750 VDC.*

Note *Check the solar PV array's positive and negative terminal in multimeter, make sure that the polarity is correct as shown in the fig. 17.*

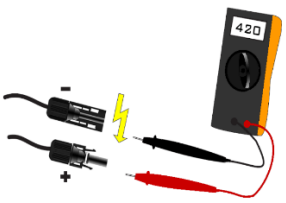


Fig. 17 Multimeter – Polarity checking

Follow the below steps for the connecting DC cable

- Unscrew the fastening nuts from the connector.

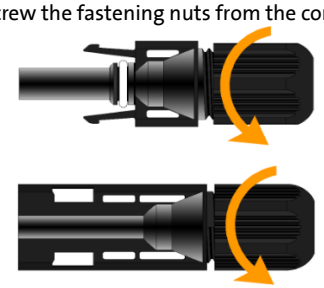


Fig. 18 Connector disassembly

- Strip off the insulation from the DC cable, the length of stripped insulation is approximate 7mm.

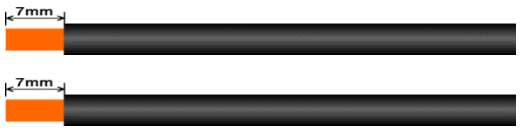


Fig. 19 DC cable stripping

- Crimp the exposed core part to the connector tube core with crimping pliers.

Fig. 20 DC cable crimping

Fig. 21 Crimped DC cable

- Plug cable with tube core part through the fastening nut.

Fig. 22 DC cable assembly

- Plug the tube core into the wiring trough until a sound indicating inserted in place is heard. Tighten the nut in a opposite direction.

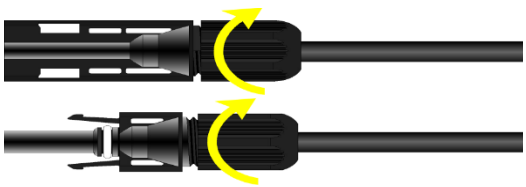


Fig. 23 Connector assembly

Communication cable connections

Follow the below steps for the connecting communication cable.

- Plug the cable into the pin and the stripping length is 5.5 mm.

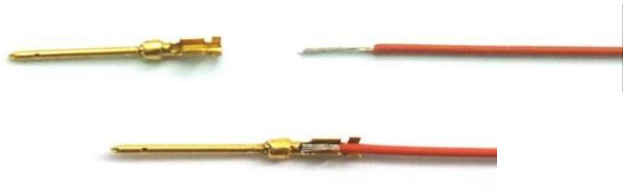


Fig. 24 Connector disassembly

- Select the corresponding position and note the position of the jaw and thimble

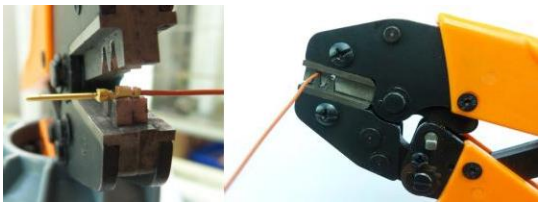


Fig. 25 Cable crimping

- Crimp the thimble as shown in the fig. 26.

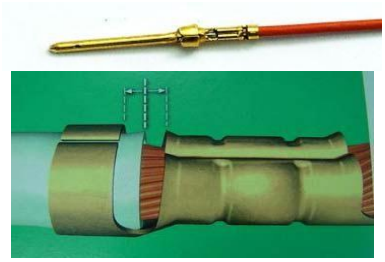


Fig. 26 Crimped cable

- Push the thimble directly in to the connector with the help of the tools as shown in the fig. 27

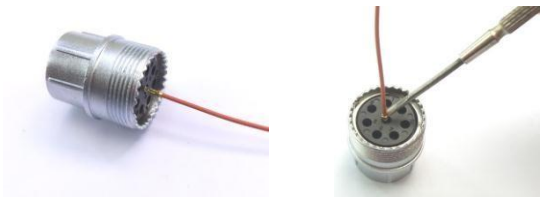


Fig. 27 Inserting the crimped cable in the connector

Note *To remove the crimped cable thimbles from the connector, press the notch with the thumb and pull out.*

Fig. 28 Removing the Inserted crimped cable from the connector.

6 Keypad Operation Procedure

6.1 Keypad introduction

The keypad is used to control the solar pump controller to read data and adjust parameters.

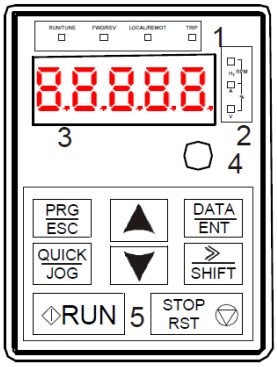


Fig. 29 External Keypad

Sl,No	Name		Description
1	Status indication	RUN/TUNE	**Running status indication.** LED OFF - The pump controller is in the stopping state. LED Blinking - The pump controller is in the parameter autotuning state. LED ON - The pump controller is in the running state.
		FWD/REV	**FED/REV indication.** LED OFF – The pump controller is in the forward rotation state. LED ON - The pump controller is in the reverse rotation state
		LOCAL/REMOT	**LED for keypad operation, terminals operation and remote communication control.** LED OFF - The pump controller is in the keypad operation state. LED Blinking - The pump controller is in the terminal's operation state. LED ON - The pump controller is in the remote communication control state.
		TRIP	**Fault indication.** LED ON – The pump controller is in the fault state. LED OFF – The pump controller is in the normal state. LED Blinking - The pump controller is in the overload pre-alarm state.
2	Unit indication	Indicating the unit of the displayed digits	
		Hz	Unit of frequency
		A	Unit of current
		V	Unit of voltage
		RPM	Unit of rotating speed
		%	Percentage
3	Code display zone	5-digit LED display, displaying various monitoring data and alarm code such as set frequency and output frequency.	

Displayed character	Corresponding character	Displayed character	Corresponding character	Displayed character	Corresponding character
0	0	1	1	2	2
3	3	4	4	5	5
6	6	7	7	8	8
9	9	A	A	b	b
C	C	d	d	E	E
F	F	H	H	I	I
L	L	N	N	n	n
O	O	P	P	r	r
S	S	t	t	U	U
v	v	.	.	-	-

4	Analog potentiometer	Corresponds to AI1.		
5	Buttons	PRC ESC	Programming key	Enter or escape from the first level menu and remove the parameter quickly
		DATA ENT	Entry key	Enter the menu step-by-step Confirm parameters
		▲	UP key	Increase data or function code progressively
		▼	DOWN key	Decrease data or function code progressively
		» SHIFT	Right-shift key	Move right to select the displaying parameter circularly in stopping and running mode. Select the parameter modifying digit during the parameter modification
		RUN	Run key	This key is used to run the inverter in key operation mode
		STOP RST	Stop/ Reset key	This key is used to stop the inverter when it is in running state and it is limited by function code P07.04. And it is used to reset all control modes in the fault alarm state
		QUICK JOG	Quick key	The function of this key is determined by function code P07.02.

6.2 Keypad display

The display status of GI SPC series solar pump controller keypads includes stop state parameter display, running state parameter display, function code parameter display, fault and alarm state display.

6.2.1 Stop state parameter display

When the pump controller is in the stop state, the keypad displays stop state parameters. The stop state parameters displayed by default parameter such as the set frequency, bus voltage, input and output state. Press >>/SHIFT to shift the display of the selected parameter from left to right.

6.2.2 Running state parameter display

After receiving a valid running command, the pump controller enters the running state and the keypad displays the running state parameters. The RUN/TUNE indicator on the keypad is on, while the state of FWD/REV is determined by the current running direction.

In the running state, the parameters displayed by default include the running frequency, set frequency, bus voltage, output voltage, output current, and pump rotating speed. Press >>/SHIFT to shift the display of the selected parameters form left to right and press QUICK/JOG (P07.02=2) to shift from right to left.

6.2.3 Fault state display

If the pump controller detects a fault signal, it enters the fault pre-alarm display state. The keypad displays the fault code and the TRIP indication on the keypad is on. When a fault occurs, the pump controller attempts to perform auto reset for five times by default. If the fault persists, the fault code remains displayed. The user can reset the pump controller through the key, control terminal, or communication command.

6.2.4 Function code editing state display

In the state of stopping, running or fault, press to enter the editing state (if there is a password, see P07.00). The editing state is displayed on two levels of menu and the order is: function code group/function code number→ function code parameter.

Press DATA/ENT to enter the function parameter display state. In this state, press to save the parameter settings or press PRG/ESC to exit.

Fig. 30 Display - Stop state

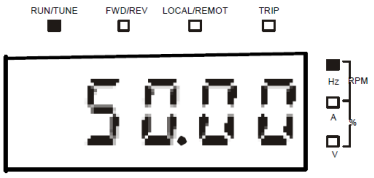


Fig. 31 Display – Running state

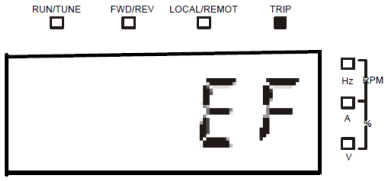


Fig. 32 Display – Fault state

6.3 Keypad operation

Operate the pump controller via operation panel. For the detailed structure description of function codes, see section 7.

6.3.1 Function code modification.

The PV pumping inverter has three levels of menus, which are:

- Group number of function code (first-level menu)
- Tab of function code (second-level menu)
- Set value of function code (third-level menu)

Note

Press both the PRG/ESC *and the* DATA/ENT *can return to the second-level menu from the third-level menu. The difference is that pressing* PRG/ESC *will save the parameter settings into the control panel and then return to the second-level menu and shift to the next function code automatically, while pressing* PRG/ESC *will directly return to the second-level menu without saving the parameter settings and keep staying at the current function code.*

Under the third-level menu, if the parameter is not blinking, it means the function code cannot be modify. The possible reasons could be:

- This function code is not modifiable parameter, such as actual detected parameter, operation records and so on.
- This function code is not modifiable in running state but modifiable in stop state.

Example: Set function code P00.01 from 0 to 1.

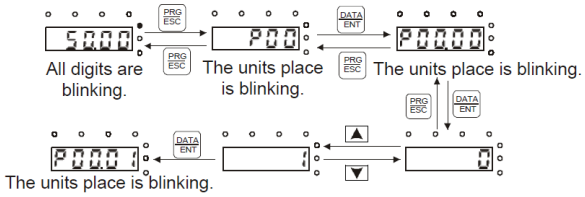


Fig. 33 Parameter modification

Note *Press* SHIFT *and* ▼ + ▲ *to modify the value.*

6.3.2 Password Setting

GI SPC series pump controller provide password protection function to users.

Set P7.00 for the password protection. Press PRG/ESC *for* the function code editing state, "0.0.0.0.0" will be displayed. Set the required password.

Set P7.00 to 0 to cancel password protection function.

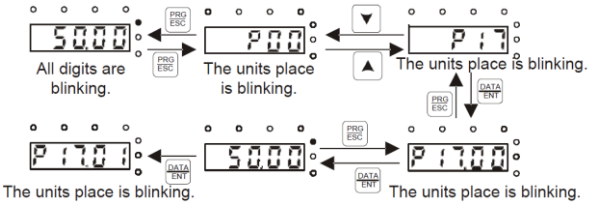


Fig. 34 Password Setting.

Note *Press* SHIFT *and* ▼ + ▲ *to modify the value.*

6.3.3 Monitoring Pump controller state

GI SPC series pump controller provide group P17 as the monitoring group. Users can enter into P17 directly to view the value.

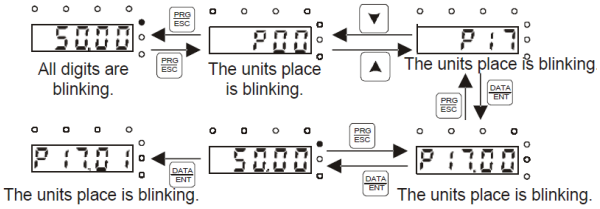


Fig. 35 Parameter Monitoring

Note *Press* SHIFT *and* ▼ + ▲ *to modify the value.*

7 Parameters

The instruction of the function code is listed below in the table.

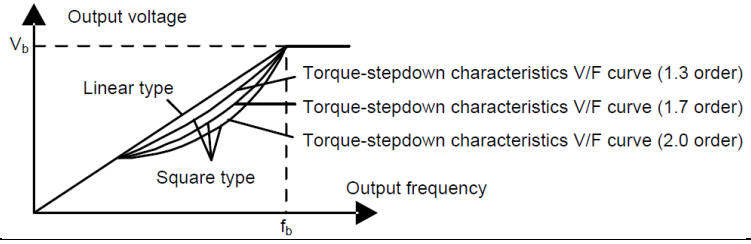
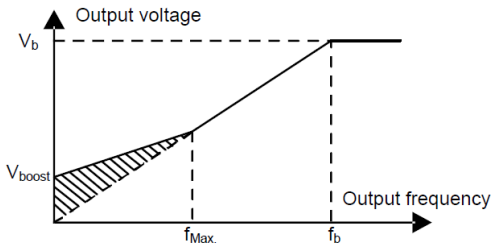
Note

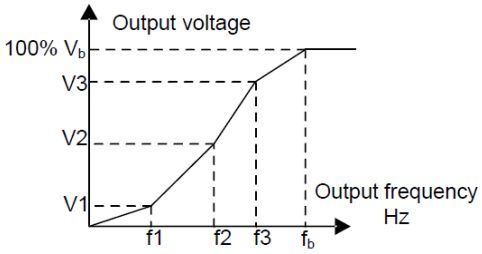
"○": The set value of the parameter can be modified on stop and running state.
"◎": The set value of the parameter cannot be modified on the running state.
"●": The value of the parameter is the real value which cannot be modified.

Function code	Name	Detailed description	Default	Modify
P00 Group: Basic function group				
P00.00	Speed control mode	**0: SVC 0** Suitable for the applications which need low frequency, big torque for high accuracy of rotating speed and torque control. **1: SVC 1** Suitable for the applications which need small power and high performance cases with the advantage of high accuracy of rotating speed and torque. It does not need to install pulse encoder. **2: SVPWM control** Suitable for the applications which do not need high control accuracy, such as the load of fan and pump.	1	◎
P00.01	Run command channel	The control command of the inverter includes: start, stop, forward/reverse rotating, jogging and fault reset. **0:** "LOCAL/REMOTE" Carry out the command control by RUN, STOP/RST on the keypad. Set the multi-function key QUICK/JOG to FWD/REVC shifting function (P07.02=3) to change the running direction, press RUN and STOP/RST simultaneously in running state to make the pump controller to stop. **1:** "LOCAL/REMOTE" Carry out the running command control by the forward rotation, reverse rotation and forward jogging and reverse jogging. **2:** "LOCAL/REMOTE" The running command is controlled by the upper monitor via communication	1	○
P00.03	Max. output frequency	This parameter is used to set the maximum output frequency of the pump controller. **Setting range:** P00.04–400.00Hz *Note : It is the foundation of the frequency setting and the speed of acceleration and deceleration.*	140.00Hz	◎
P00.04	Upper limit of the running frequency	This parameter is used to set the upper limit running frequency of the pump controller, which is lower than or equal to the maximum frequency. **Setting range:** P00.05–P00.03 (Max. output frequency)	140.00Hz	◎
P00.05	Lower limit of the running frequency	This parameter is used to set the lower limit running frequency of the pump controller.The inverter runs at the lower limit frequency if the set frequency is lower than the lower limit. **Note:** Max. output frequency ≥ Upper limit frequency ≥ Lower limit frequency **Setting range: 0**.00Hz–P00.04 (Upper limit of the running frequency)	0.00Hz	◎

P00.11	ACC time 1	ACC time - The time needed if the pump controller speeds up from 0Hz to the Max. output frequency (P00.03). DEC time - The time needed if the pump controller speeds down from the Max. Output frequency to 0Hz (P00.03).	5.0s	○
P00.12	DEC time 1	GI SPC series pump controller have four groups of ACC/DEC time which can be selected by P05. The factory default ACC/DEC time of the inverter is the first group. **Setting range** of P00.11 and P00.12:0.0–3600.0s	5.0s	○
P00.13	Running direction selection	**0:** Runs at the default direction, the pump controller runs in the forward direction. FWD/REV indicator is off. **1:** Runs at the opposite direction, the pump controller runs in the reverse direction. FWD/REV indicator is on. *Note : Modify the function code to shift the rotation direction of the motor. This effect equals to the shifting the rotation direction by adjusting either two of the motor lines (U, V and W). The motor rotation direction can be changed by QUICK/JOG on the keypad. Refer to parameter P07.02.* **2:** Forbid to run in reverse direction, It can be used in some special cases if the reverse running is disabled.	0	○
P00.18	Function restore parameter	0: No operation 1: Restore the default value 2: Clear fault records *Note :* • *The function code will restore to 0 after finishing the operation of the selected function code.* • *Restoring to the default value will cancel the user password, please use this function with caution.*	0	◎
P01 Group: Start Up and Stop Control				
P01.08	Stop mode	0: Decelerate to stop The pump controller decelerates to reduce the output frequency during the set time. When the frequency decreases to 0Hz, the pump controller stops. 1: Coast to stop: The pump ceases the output immediately and the load coasts to stop at the mechanical inertia.	0	○
P01.18	Operation protection	0: Command is invalid when powering on. 1: Command is valid when powering on.	1	○
P01.21	Restart after power off	0: Disabled 1: Enabled	1	○
P02 Group: Motor 1				
P02.00	Motor type	0: 3PH motor 1: 1PH motor	Depend on model	◎
P02.01	Rated power of asynchro-nous motor	0.1–3000.0kW	Depend on model	◎
P02.02	Rated frequency of asynchronous motor	0.01Hz–P00.03	50.00Hz	◎
P02.03	Rated speed of asynchronous motor	1–36000rpm	Depend on model	◎

Set the parameter of the asynchronous motor.
In order to ensure the controlling performance, set the P02.01–P02.05 according to the name plate of the asynchronous motor.
Pump controller provide the function of parameter autotuning.

P02.04	Rated voltage of asynchronous motor	0–1200V	*Note: When resetting the rated power of the motor (P02.01), initialize the motor parameter of P02.02–P02.10.*	Depend on model	◎
P02.05	Rated current of asynchronous motor	0.8–6000.0A		Depend on model	◎
P04 Group: SVPWM Control					
P04.00	V/F Curve Setting	These function codes define the V/F curve of motor to meet the need of different loads. 0: Straight line V/F curve, applying to the constant torque load 1: Multi-dots V/F curve 2: 1.3th power torque-stepdown V/F curve 3: 1.7th power torque-stepdown V/F curve 4: 2.0th power torque-stepdown V/F curve Curves 2–4 apply to the torque loads such as fans and water pumps. Users can adjust according to the features of the loads to get the best performance. 5: Customized V/F (V/F separation) in this mode, V can be separated from f and f can be adjusted through the frequency given channel set by P00.06 or the voltage given channel set by P04.27 to change the feature of the curve. *Note: Vb in the below picture is the motor rated voltage and fb is the motor rated frequency.*  	4	◎
P04.01	Torque boost	• Torque boost is for the output voltage for the features of low frequency torque. P04.01 is for the Max. output voltage Vb.		0.0%	○
P04.02	Torque boost close	• P04.02 defines the percentage of closing frequency of manual torque to fb. • Torque boost should be selected according to the load. The bigger the load is, the bigger the torque is. Too big torque boost is inappropriate because the motor will run with over magnetic and the current of the pump controller will increase to add the temperature of the pump controller and decrease the efficiency. • When the torque boost is set to 0.0%, the pump controller is automatic torque boost. • Torque boost threshold: below this frequency point, the torque boost is valid, but over this frequency point, the torque boost is invalid.  *Setting range of P04.01: 0.0%:(automatic) 0.1%–10.0%* *Setting range of P04.02: 0.0%–50.0%*	20.0%	○

P04.03	V/F frequency point 1	If P04.00 =1, the user can set V//F curve by P04.03–P04.08 V/F is set to the motor load. *Note*: V1＜V2＜V3, f1＜f2＜f3. If the low-frequency voltage is high, overtemperature and burning may occur and the overcurrent stall and protection may occur to the solar pump controller.  	0.00Hz	○
P04.04	V/F voltage point 1		00.0%	○
P04.05	V/F frequency point 2		00.00Hz	○
P04.06	V/F voltage point 2		00.0%	○
P04.07	V/F frequency point 3		00.00Hz	○
P04.08	V/F voltage point 3	Setting range of P04.03: 0.00Hz–P04.05 Setting range of P04.04: 0.0%–110.0% (rated voltage of motor1) Setting range of P04.05: P04.03–P04.07 Setting range of P04.06: 0.0%–110.0% (rated voltage of motor1) Setting range of P04.07: P04.05–P02.02(rated frequency of motor1) or P04.05–P02.16(rated frequency of motor1) Setting range of P04.08: 0.0%–110.0% (rated voltage of motor1)	00.0%	○
P04.09	V/F slip compensation gain	This function code is used to compensate the change of the rotation speed caused by load during compensation SVPWM control to improve the rigidity of the motor. It can be set to the rated slip frequency of the motor which is counted as below: △ f=fb-n*p/60 Of which, fb is the rated frequency of the motor, its function code is P02.02; n is the rated rotating speed of the motor and its function code is P02.03; p is the pole pair of the motor. 100.0% corresponds to the rated slip frequency △f. Setting range: 0.0–200.0%	0.0%	○
P04.34	2PH control of 1PH motor	Ones: 2PH control mode 0: Disabled 1: Enabled Tens: Voltage of the secondary winding (V phase) reverse 0: Not reversed 1: Reversed The setting range: 0–0x11	0x00	◎
P04.35	Voltage ratio of V and U	0.00–2.00	1.00	○

P05 Group: Input terminals				
P05.01	S1 terminals function selection	0: No function 1: Forward rotation operation 2: Reverse rotation operation 3: 3-wire control operation	1	◎
P05.02	S2 terminals function selection	4: Forward jogging 5: Reverse jogging 6: Coast to stop	0	◎
P05.03	S3 terminals function selection	7: Fault reset 8: Operation pause 9: External fault input 10: Increasing frequency setting (UP) 11: Decreasing frequency setting (DOWN)	0	◎
P05.04	S4 terminals function selection	12: Cancel the frequency change setting 13: Shift between A setting and B setting 14: Shift between combination setting and A setting 15: Shift between combination setting and B setting	1	◎
P05.09	HDI terminals function selection	16: Multi-step speed terminal 1 17: Multi-step speed terminal 2 18: Multi-step speed terminal 3 19: Multi- stage speed terminal 4 20: Multi- stage speed pause 21: ACC/DEC time 1 22: ACC/DEC time 2 23: Simple PLC stop reset 24: Simple PLC pause 25: PID control pause 26: Traverse Pause (stop at the current frequency) 27: Traverse reset (return to the center frequency) 28: Counter reset 29: Torque control prohibition 30: ACC/DEC prohibition 31: Counter trigger 32: Reserve 33: Cancel the frequency change setting temporarily 34: DC brake 35: Reserved 36: Shift the command to the keypad 37: Shift the command to the terminals 38: Shift the command to the communication 39: Pre-magnetized command 40: Clear the power 41: Keep the power 42: PV disabled 43: PV voltage reference 44: Switch between solar input and power frequency input 45: Full-water signal 46: Non-water signal 47–63: Reserved	0	◎
P05.10	Polarity selection of the input terminals	If the bit is 0, the input terminal is positive. If the bit is 1, the input terminal is negative. BIT4 BIT3 BIT2 S4 S3 S2 The setting range: 0x000–0x1FF	0X000	◎

P06 Group: Output terminals				
P06.03	Relay RO1 output selection	0: Invalid 1: In operation 2: Forward rotation operation 3: Reverse rotation operation 4: Jogging operation 5: The inverter fault 6: Frequency degree test FDT1 7: Frequency degree test FDT2 8: Frequency arrival 9: Zero speed running 10: Upper limit frequency arrival 11: Lower limit frequency arrival 12: Ready for operation 13: Pre-magnetizing 14: Overload pre-warning 15: Underload pre-warning 16: Completion of simple PLC stage 17: Completion of simple PLC cycle 18: Setting count value arrival 19: Defined count value arrival 20: External fault valid 21: Reserved 22: Running time arrival 23: MODBUS communication virtual terminals output 24–26: Reserved 27: Weak light 28: Switching to PV power frequency input (threshold-based) 29: Switching to PV power frequency input (S input-based) 30: Switching to power frequency (threshold- or S input-based) *Note: Function 30 is relay output combining the functions 29 and 28. When one of the two conditions is met, the relay output frequency is high.*	30	○
P06.04	Relay RO2 output selection		5	○
P06.10	Switch-on delay of RO1	0.000–50.000s	10.000s	○
P06.11	Switch-off delay of RO1	0.000–50.000s	10.000s	○
P06.12	Switch-on delay ofRO2	0.000–50.000s	0.000s	○
P06.13	Switch-off delay of RO2	0.000–50.000s	0.000s	○
P07 Group: Human Machine Interface				
P07.01	Function parameter copy	Used to set the parameter copying mode. 0: No operation 1: Upload function parameters from the pump controller to keypad 2: Download function parameters (including the motor parameters) from the keypad to pump controller 3: Download function parameters (excluding motor parameters of the P02 group) from the keypad to pump controller 4: Download function parameters (only motor parameters of the P02 group) from the keypad to pump controller *Note:* *After the parameter is set to 1, 2, 3 or 4, and the operation is executed, the parameter is automatically restored to 0.*	0	○

P07.27	Type of the current fault	0: No fault 1: Inverter unit U phase protection (OUt1) 2: Inverter unit V phase protection (OUt2) 3: Inverter unit W phase protection (OUt3) 4: ACC overcurrent (OC1) 5: DEC overcurrent (OC2) 6: Constant-speed overcurrent (OC3) 7: ACC overvoltage (OV1) 8: DEC overvoltage (OV2) 9: Constant-speed overvoltage (OV3) 10: Bus undervoltage fault (UV) 11: Motor overload (OL1) 12: The inverter overload (OL2) 13: Input side phase loss (SPI) 14: Output side phase loss (SPO) 15: Rectifier module overheat (OH1) 16: Inverter module overheat (OH2) 17: External fault (EF) 18: 485 communication fault (CE) 19: Current detection fault (ItE) 20: Motor antotuning fault (tE) 21: EEPROM operation fault (EEP) 22: PID feedback disconnection fault (PIDE) 23: Brake unit fault (bCE) 24: Running time arrival (END) 25: Electrical overload (OL3) 26–31: Reserved 32: Short-to-ground fault 1 (ETH1) 33: Short-to-ground fault 2 (ETH2) 34: Speed deviation fault (dEu) 35: Maladjustment (STo) 36: Underload fault (LL) 37: Hydraulic probe damage (tSF) 38: PV reverse connection fault (PINV) 39: PV overcurrent (PVOC) 40: PV overvoltage (PVOV) 41: PV undervoltage (PVLV) *Alarm:* Weak light alarm (A-LS) Underload alarm (A-LL) Full-water alarm (A-tF) Water-empty alarm (A-tL)		•
P07.28	Type of the last fault			•
P07.29	Type of the last but one fault			•
P07.30	Type of the last but two fault			•
P07.31	Type of the last but three fault			•
P07.32	Type of the last but four fault			•

P08 Group: Enhanced functions				
P08.28	Number of fault resets	0–10	5	○
P08.29	Automatic fault reset interval	0.1–3600.0s	10.0s	○

7.1 Special function parameters

Function code	Name	Detailed description	Default	Modify
P11 Group: Protective parameters				
P11.00	Phase loss protection	0x000–0x111 **LED one's place:** 0: Input phase loss protection disabled 1: Input phase loss protection enabled **LED tens place:** 0: Output phase loss protection disabled 1: Output phase loss protection enabled **LED hundreds place:** 0: Input phase loss hardware protection disabled 1: Input phase loss hardware protection enabled -SS2 models: 0x000 -S2/-2 models: 0x010 -4 models: 0x110	11	○
P11.01	Frequency decreasing at sudden power loss	0.00–1.00 (When the voltage degree is 400V, the corresponding power loss frequency down voltage point of 0.85 is 460V)	0.85	◎
P11.02	Frequency decreasing ratio at sudden power loss	Setting range: 0.00–P00.03 Hz/s After the power loss of the grid, the bus voltage drops to the sudden frequency-decreasing point, the controller begins to decrease the running frequency at P11.02, to make the controller generate power again. The returning power can maintain the bus voltage to ensure a rated running of the controller until the recovery of power.	2.00Hz/s	○
P15 Group: Special function parameters for PV inverters				
P15.00	PV inverter selection	0: Invalid 1: Enable 0: The function is invalid and the group of parameters cannot be used 1: The function is enabled and P15 parameters can be adjusted	1	◎
P15.01	VMPP voltage reference	0: Voltage reference 1: Max. power tracking 0 : Apply voltage reference mode. The reference is a fixed value and given by P15.02. 1 : Apply the reference voltage of Max. power tracking. The voltage is changing until the system is stable. **Note**: If terminal 43 is valid, the function is invalid.	1	◎
P15.02	VMPP voltage keypad reference	0.0–6553.5V DC If P15.01 is 0, the reference voltage is given by P15.02. (During test, reference voltage should be lower than PV input voltage; otherwise, the system will run at lower limit of frequency)	250.0V	○
P15.03	PI control deviation	0.0–100.0% (100.0% corresponds to P15.02) If the ratio percentage of real voltage to reference voltage, which is abs (bus voltage-reference voltage) *100.0%/ reference voltage. If the value exceeds the deviation limit of P15.03, PI adjustment is available, otherwise, there is no PI adjustment and the value is defaulted to be 0.0% abs: the absolute value	0.0%	○
P15.04	Upper frequency limit of PI output	P15.05–100.0% (100.0% corresponds to P00.03) P15.04 is used to limit the Max. value of target frequency, 100.0% corresponds to P00.03. After PI adjustment, the target frequency cannot exceed the upper limit.	100.0 %	○
P15.05	Lower frequency limit of PI output	0.0%–P15.04(100.0% corresponds to P00.03) P15.05 is used to limit the Min. value of target frequency, 100.0% corresponds to P00.03. After PI adjustment, the target frequency cannot exceed the lower limit.	20.0%	○
P15.06	KP1	0.00–100.00 The proportion coefficient 1 of the target frequency The bigger the value is, the stronger the effect and faster the adjustment.	8.00	○

P15.07	KI1	0.00–100.00 The integral coefficient 1 of the target frequency the bigger the value is, the stronger the effect and faster the adjustment.	8.00	○
P15.08	KP2	0.00–100.00 The proportion coefficient 2 of the target frequency the bigger the value is, the stronger the effect and faster the adjustment.	40.00	○
P15.09	KI2	0.00–100.00 The integral coefficient 2 of the target frequency the bigger the value is, the stronger the effect and faster the adjustment.	40.00	○
P15.10	PI switching point	0.0–6553.5V DC If the absolute value of bus voltage minus the reference value is bigger than P15.10, it will switch to P15.08 and P15.09, otherwise it is P15.06 and P15.07.	20.0V	◎
P15.11	Water-level control	0: Digital input of the water-level control 1: AI1(the water-level signal is input through AI1, not supported currently) 2: AI2 (the water-level signal is input through AI2, not supported currently) 3: AI3 (the water-level signal is input through AI3, not supported currently) If the function code is 0, the water-level signal is controlled by the digital input. See 43 and 44 functions of S terminals in group P05 for detailed information. If the full-water signal is valid, the system will report the alarm (A-tF) and sleep after the time of P15.14. During the alarm, the full-water signal is invalid and the system will clear the alarm after the time of P15.15. If the empty-water signal is valid, the system will report the alarm (A-tL) and sleep after the time of P15.16. During the alarm, the empty -water signal is invalid and the system will clear the alarm after the time of P15.17. If the function code is 1–3, it is the reference of water-level control analog signal. For details, see P15.12 and P12.13.	0	◎
P15.12	Water-level threshold	0.0–100.0% This code is valid when P15.11 water level control is based on analog input. If the detected water level control analog signal is less than the water level threshold P15.12 and keeps in the state after the delay time P15.14, the system reports A-tF and sleeps. If the delay time is not reached, the signal is bigger than the water level threshold, the time will be cleared automatically. When the measured water level control analog signal is less than the water level threshold, the delay time will be counted again. 0 is full water and 1 is no water. During the full-water alarm, if the detected water level signal is higher than the threshold of P15.12 and the delay counts, the alarm is cleared after the time set by P15.15 is reached in this continuous state continues. During the non-continuous application, the delay timing will clear automatically.	25.0%	○
P15.13	Empty-water level threshold	0.0–100.0% This code is valid when P15.11 water level control is based on analog input. If the detected water level control analog signal is greater than the water level threshold P15.13 and keeps in the state after the delay time P15.16, the system reports A- tL and sleeps. If the delay time is not reached (that means non-continuous), the delay time is automatically cleared. When the detected water level control analog signal is less than the water level threshold, the delay counts. During the empty-water alarm, if the detected water level control analog signal is less than the water level threshold P15.13 and delay counts, the empty-water alarm is cleared after the delay time set by P15.17 in this continuous state. In the non-continuous state, the delay time is automatically Cleared.	75.0%	○

P15.14	Full water delay	0–10000s Time setting of full water delay (This function code is still valid when the digital indicates the full-water signal.)	20s	○
P15.15	Wake-up delay in full water state	0–10000s Time setting of wake-up delay in full-water state (This function code is still valid when the digital indicates the full-water signal.)	20s	○
P15.16	Empty-water delay	0–10000s Time setting of empty-water delay (This function code is still valid when the digital indicates the empty-water signal.)	5s	◎
P15.17	Wake-up delay in empty-water state	0–10000s Time setting of wake-up delay in empty-water state (This function code is still valid when the digital indicates the empty-water signal.)	20s	◎
P15.18	Hydraulic probe damage	0.0–100.0% 0.0%: Invalid. If it is not 0.0%, when the signal is longer than P15.18, it will report tSF fault directly and stop.	0.0%	◎
P15.19	Operation time of water pump underload	0.0–1000.0s This parameter is used to set the operation time of water pump underload. Under the continuous underload operation, underload pre alarm (A-LL) will be reported if the operation time is reached.	60.0s	○
P15.20	Current detection value of underload operation	0.0%: Automatic underload detection 0.1–100.0% If it is 0.0%, it is determined by the underload detection of the water pump controller . If it is not 0.0%, it is determined by P15.20. 100.0% corresponds to the rated current of the motor. If the target frequency and the absolute value of the ramp frequency is less than or equal to P15.22, and the current is less than P15.20, after the time set by P15.19, underload fault is reported. Otherwise, it will be operated normally. If the state is not continuous, the delay counting will be cleared automatically.	15.00%	○
P15.21	Underload reset delay	0.0–1000.0s This parameter is used to set the underload reset delay. The operation time and reset time are counted at the same time during underload, and it is generally bigger than P15.19 so as to ensure underload prealarm is reported after underload delay operation time is reached. After the time set by P15.21-P15.19, it is reset. If the value is the same as P15.19, it is automatically reset when underload Prealarm is reported.	120.0s	○
P15.22	Lag frequency threshold	0.00–200.00Hz P15.22 is the lag frequency threshold for the analysis of underload operation. If the target frequency and the absolute value of the ramp frequency is less than or equal to P15.22, the current will be compared.	0.30Hz	○
P15.23	Delay time of weak light	0.0–3600.0s Delay time of weak light If the output frequency is less than or equal to the lower limit of PI output frequency and the state lasts for the set value, it will report A-LS and sleep. If the state is not continuous, the delay counting will be cleared automatically. *Note: If the bus voltage is lower than the undervoltage point or the PV voltage is lower than 70V, it will report the weak light alarm without any delay time.* *If P15.32=0, the system will switch to the power frequency input when the light is weak.*	100.0s	○
P15.24	Delay time of wake-up at weak light	0.0–3600.0s Delay time of wake-up at weak light During the weak light warning, if the PV voltage is higher than the starting voltage, after the delay time, the warning will be cleared and it will run again. When P15.32=0, if the PV voltage is higher than P15.34. After the delay time, it will switch to solar input mode.	300.0s	○

P15.25	Initial reference voltage display	0.0–2000.0V		●
P15.26	Mini voltage reference of Max. power tracking	0.0–P15.27 Valid in MPPT Max. tracking voltage, the Mini. tracked voltage Track in the range of P15.26–P15.27. P15.27 needs to be bigger than P15.26. The less the difference, the faster the tracking But the Max. voltage needs to be in the range. P15.26 and P15.27 can be adjusted according to site operation. The default value depends on model. ***For models of 220V:*** 0.75kW: 80.0V 1.5kW, 2.2kW and 4kW: 100.0V ***For models of 380V:*** 2.2kW–5.5kW: 220.0V	Depend on model	○
P15.27	Max. voltage reference of Max. power tracking	P15.26–P15.28 Valid in MPPT Max. tracking voltage, the Max. tracked voltage The default value depends on model. ***For models of 220V:*** 0.75kW: 80.0V 1.5kW, 2.2kW and 4kW:100.0V ***For models of 380V:*** 2.2kW–5.5kW: 220.0V	Depend on model	○
P15.28	Adjustment of initial reference voltage	0.0–200.0V MPPT begins to change from the reference voltage Initial reference voltige =PV voltage-P15.28 For models of 220V, the default value is 5.0V. For models of 380V, the default value is 10.0V.	Depend on model	○
P15.29	Upper and lower limit time of VMPPT	0.0–10.0s When P15.29 is set to 0.0, the automatic adjustment is invalid. If it is not 0.0, the upper and lower limit of Vmppt will be adjusted automatically after the time set by P15.26. The medium value is the current bus voltage and the limit is P15.30. Maximum / Minimum reference voltage=Current bus voltge±P15.30 and it will update to P15.26 and P15.27 at the same time	0.0s	○
P15.30	Upper and lower limit of VMPPT	20.0–100.0V The adjustment of the upper and lower limit	30.0V	○
P15.31	Maximum value of VMPPT	P15.27–6553.5V The upper limit cannot exceed the P15.31 when VMPPT is the maximum value. The default value depends on model. For models of 380V, the default value is 750.0V. and for other models, the default value is 400.0V.	Depend on model	○
P15.32	PV input and power frequency input selection	0: Automatic input 1: Forced power frequency input 2: Forced PV input If the value is 0, the system will switch between PV and power frequency according to the detected PV voltage and threshold. If the value is 1, the system will force to switch to power frequency input. If the value is 2, the system will force to switch to PV input. ***Note:*** *When the terminal input 44 is valid, the function code will be invalid.*	2	◎
P15.33	Threshold setting for switching to power frequency	0.0V–P15.34 If the PV voltage is lower than the threshold or the light is weak, it can be switched to power frequency input through relay output. (Note: The minimum operation voltage of the system is 60V.) If the value is 0, the function is disabled. The default value depends on model. ***For models of 220V:*** 0.75kW: 60.0V 1.5kW, 2.2kW and 4kW: 80.0V ***For models of 380V:*** 2.2kW–5.5kW: 180.0V	Depend on model	○

P15.34	Threshold setting for switching to PV input	P15.33–400V If PV voltage is higher than the threshold, after the delay time of P15.24, it can be switched to PV input through relay output. In order to avoid repeated switching, the threshold needs to be higher than the threshold of P15.33. If the value is 0.0, the function is disabled. The default value depends on model. ***For models of 220V:*** 0.75kW: 100.0V 1.5kW, 2.2kW and 4kW: 120.0V ***For models of 380V:*** 2.2kW–5.5kW: 240.0V	Depend on model	○
P15.35	Rated pump flow	The pump flow is QN if the pump runs at the rated pump frequency and rated lift. Unit: cubic meter/hour.	0.0	○
P15.36	Rated pump lift	The pump lift is HN if the pump runs at the rated frequency and rated current. Unit: meter	0.0	○
P15.37	Voltage setting at PV undervoltage point	When the PV voltage is less than the preset voltage, the system reports the PV undervoltage (UV) fault. The default value depends on the model. Setting range: 0.0–400.0	Depend on model	○
P17 Group: Monitoring				
P17.38	Current of the main winding	Current of the main winding when applying the capacitance-removed mode to control the 1PH motor 0.00–100.00A	0.00A	●
P17.39	Current of the secondary winding	Current of the secondary winding when applying the capacitance-removed mode to control the 1PH motor. 0.00–100.00A	0.00A	●
P18 Group: Parameters of Monitoring controller state				
P18.00	PV reference voltage	MPPT is set at the controller side. This value is specified at the controller side.		●
P18.01	Current PV voltage	It is the PV input voltage provided by the boost module.		●
P18.02	Bus voltage reference	It is used to set the reference voltage of the bus when PV input is adopted. For models of 220V, the default value is 330.0V. and for models of 380V, the default value is 570.0V. Setting range: 220.0V–600.0V	Depend on model	●
P18.07	PV input power	Reserved. Unit: W		●
P18.10	Device configuration display	0: PV power supply 1: AC grid power supply		●
P18.11	Current flow of pump	$Q=Q_N * f / f_N$, unit: m^3/h	0.0	●
P18.12	Current lift of pump	$H= 0.9H_N*(f // f_N)^2$, unit: m	0.0	●
P18.13	MSB of pump total flow	Displaying the most significant 16 bits of the total flow of the pump. Unit: m^3	0	●
P18.14	LSB of pump total flow	Displaying the least significant 16 bits of the total flow of the pump. Unit: m^3 Total flow of pump = P18.13 x 65535 + P18.14	0.0	●

P18.15	Pump total flow reset	When P18.15 is set to 1, the total flow of the pump is reset and P18.13 and P18.14 are reset to zero to re-calculate the flow. After the reset, P18.15 is automatically modified to 0.	0	◎
P19 Group: Voltage Boost				
P19.06	Bus voltage reference	It is used to set the reference voltage of the bus when PV input is adopted. For models of 220V, the default value is 330.0V. and for models of 380V, the default value is 570.0V. Setting range: 220.0V–600.0V	Depend on model	◎
P19.08	Boost start voltage	When the PV voltage reaches the start voltage, the boost circuit is started. Setting range: 60.0V–300.0V The default value depends on power level. ***For models of 220V:*** 0.75kW: 80.0V 1.5kW, 2.2kW and 4kW: 100.0V ***For models of 380V:*** 2.2kW–5.5kW: 220.0V	Depend on model	◎
P19.10	Rated flow of pump	Flow Q_N of the pump at the rated frequency and rated lift. unit: m^3/h	0.0	○
P19.11	Rated lift of pump	Lift H_N of the pump at the rated frequency and rated flow. unit: m	0.0	○

Note

- *The time when the pump controller operated to the lower limit of PI output frequency after starting is determined by the ACC time.*
- *If the delay time counting conditions of various faults, such as weak light, full-water and underload are met, the pump controller counts the delay time separately. After the delay time of a fault is reached, an alarm is reported and the delay time of the other two faults are still counted. After the alarm is restored, if the conditions of the other two faults are met, the counting of the delay time is continued. If the conditions of a fault are not met, the fault delay time is reset to zero.*

8 Fault finding

8.1 Fault codes and remedies

Fault Code	Fault type	Possible cause	Remedy
OV1	Overvoltage when acceleration	1. The input voltage is abnormal. 2. There is large energy feedback. 3. No brake components. 4. Braking energy is not open.	1. Check the input power. 2. Check if the DEC time of the load is too short or the pump controller starts during the rotation of the motor or it needs to increase the energy consumption components. 3. Install the brake components. 4. Check the setting of related function codes.
OV2	Overvoltage when deceleration		
OV3	Overvoltage when constant speed running		
OC1	Overcurrent when acceleration	1. The acceleration or deceleration is too fast. 2. The voltage of the grid is too low. 3. The power of the inverter is too low. 4. The load transients or is abnormal. 5. The grounding is short circuited, or the output is phase loss. 6. There is strong external interference. 7. The overvoltage stalls 8. protection is not open.	1. Increase the ACC time. 2. Check the input power. 3. Select the pump controller with a larger power. 4. Check if the load is short circuited (the grounding short circuited or the wire short circuited) or the rotation is not smooth. 5. Check the output configuration. 6. Check if there is strong interference. 7. Check the setting of related function codes.
OC2	Overcurrent when deceleration		
OC3	Overcurrent when constant speed running		
UV	Bus undervoltage	1. The voltage of the power supply is too low. 2. The overvoltage stalls 3. protection is not open.	1. Check the input power of the supply line. 2. Check the setting of related function codes.
OL1	Motor overload	1. The voltage of the power supply is too low. 2. The motor setting rated current is incorrect. 3. The motor stall or load transients are too strong.	1. Check the power of the supply line. 2. Reset the rated current of the motor. 3. Check the load and adjust the torque lift.
OL2	Inverter overload	1. The acceleration is too fast. 2. The rotating motor is reset. 3. The voltage of the power supply is too low. 4. The load is too heavy. 5. The motor power is too small.	1. Increase the ACC time. 2. Avoid the restarting after stopping. 3. Check the power of the supply line. 4. Select an pump controller with bigger power. 5. Select a proper motor.
SPI	Input phase loss	Phase loss or fluctuation of input R, S, T	1. Check input power. 2. Check installation distribution.
SPO	Output phase loss	U, V, W phase loss output (or serious asymmetrical three phase of the load)	1. Check the output distribution. 2. Check the motor and cable.
OH1	Rectifier overheat	1. Air duct jam or fan damage 2. Ambient temperature is too high. 3. The time of overload running is too long.	1. Dredge the wind channel or change the fan. 2. Decrease the environment temperature.
OH2	IGBT overheat		

EF	External fault	SI external fault caused by actions of input terminals	Check the external device input.
CE	485 Communication error	1.The baud rate setting is incorrect. 2.Fault occurs to the communication wiring. 3.The communication address is wrong. 4.There is strong interference to the communication. 5.	1.Set proper baud rate. 2.Check the communication connection distribution 3.Set proper communication address. 4.Change or replace the connection distribution or improve the anti-interference capability.
ItE	Current detection fault	1.The control panel connector is in poor contact. 2.The Hall component is damaged. 3.The magnifying circuit is abnormal.	1.Check the connector and rewire. 2.Replace the Hall component. 3.Replace the main control panel.
EEP	EEPROM fault	1.Error occurs in writing or reading control parameters. 2.EEPROM is damaged.	1. Press **STOP/RST** to reset. 2. Replace the main control panel.
PIDE	PID feedback fault	1.PID feedback is offline. 2.The PID feedback source disappears.	1. Check the PID feedback signal line. 2. Check the PID feedback source.
END	Running time reached	The actual running time of the pump controller is longer than the preset running time.	Contact grundfos to adjust the preset running time.
OL3	Electrical overload	The pump controller will report overload pre-alarm according to the set value.	Check the load and the overload pre-alarm points.
dEu	Velocity deviation fault	The load is too heavy or stalled.	1.Check the load and ensure it is normal. Increase the detection time. 2.Check whether the control parameters are normal.
STo	Maladjustment fault	1.The control parameters of the synchronous motors not set properly. 2.The autotuning parameter is not correct. 3.The controller is not connected to the motor.	1.Check the load and ensure it is normal. 2.Check whether the control parameter is set properly or not. 3.Increase the maladjustment detection time.
LL	Electronic underload fault	The controller will report the underload pre-alarm according to the set value.	Check the load and the underload pre-alarm points.
tSF	Hydraulic probe damage	The hydraulic probe is damaged.	Replace the hydraulic probe.
PINV	PV reverse connection fault	The PV wiring is not properly performed.	Identify the positive and negative PV terminals and rewire.

PVOC	PV overcurrent	1.The ACC/DEC is too fast. 2.The controller power is too low. 3.The load suddenly changes or is abnormal 4.The grounding is short circuited.	1.Increase the ACC/DEC time. 2.Use an controller with greater power. 3.Check whether the grounding or cable connection is short circuited or whether the rotation is blocked.
PVOV	PV overvoltage	The solar panel input voltage is too high or the model is 380V but set to 220V.	1.Reduce the serially connected solar panels. 2.Check and reset the model.
PVLV	PV undervoltage	1.The power of the connected solar panels is too low or it is rainy and cloudy. 2.The starting current of the motor is too high.	1.Increase solar panels or test it again under normal sunlight. 2. Replace the motor.
A-LS	Weak light alarm	The sunlight is weak or too few solar panels are configured.	1.The device automatically operates after the sunlight gets stronger and no processing is needed. 2.Check whether solar panels are properly configured.
A-LL	Underload alarm	The water pumping tank is empty.	Check the water pumping tank.
A-tF	Water full alarm	The water storing tank is full.	If the water full alarm function is enabled, the device automatically stops after the water full alarm remains for a certain period. If the water full alarm function is not enabled, check whether there are terminal connections.
A-tL	Water empty alarm	The water pumping tank is empty.	If the water empty alarm function is enabled, the device automatically stops after the water empty alarm remains for a certain period. If the water empty alarm function is not enabled, check whether there are terminal connection.

8.2 Fault codes reset

When a fault appears and the GI SPC stops, the fault will auto reset as per the reset time in the parameter P15.21.

Examine the cause of fault, perform the actions advised in section 8.1 and reset the fault as instructed below.

- A long (1 s) press on the Reset button on the keypad.
- By reading the fault code on the keypad display and perform the diagnoses

8.3 Fault history

The pump controller will record the four most recent fault codes. Searching this information in P07.32 will help investigate the fault cause. Fault information is stored together with additional information in the fault history menu.

Caution *Check the fault cause thoroughly and remedy it before resetting. If it cannot be reset or persists after resetting, check the cause again as continuous resetting will damage the pump controller.*

8.4 LED Indications

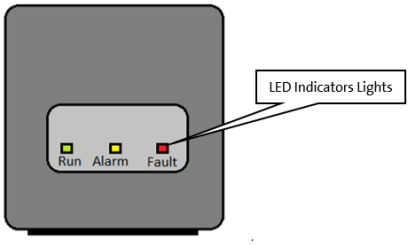


Fig. 36 Display – LED Indications

LED Indication	Color	Description
Run	Green	Pump Controller is powered up in a normal condition or in running state.
Alarm	Yellow	Pump controller is in alarm state.
Fault	Red	Pump controller is in fault state.

9 Service and maintenance

Warning

- Maintenance and inspection must be performed by a qualified electrician. Do not dismantle the pump controller when it is running.
- The pump controller must be powered off at least 5 minutes before conducting maintenance and inspection.
- It is absolutely forbidden for unauthorised persons to repair the pump controller as this can cause personal injury or equipment damage.

Note *Any service performed on the pump controller by unqualified staff will void the warranty.*

9.1 Routine inspection

To ensure the pump controller runs stably, carry out an annual inspection.

Warning

The inspection must be performed by trained and qualified technical staff.
Disconnect the power supply to the pump controller before starting inspection.

Inspection frequency		Inspection issue	Inspection item	Criteria or requirement
Routine[1)]	Regular[2)]			
✓		Running environment	1. Temperature. 2. Humidity. 3. Gas. 4. Dust.	1. Temperature < 50 °C. 2. Humidity < 90 %, no condensation. 3. No flammable, explosive gas. 4. Non-corrosive environment.
	✓	Cooling system	1. Installation environment.	1. Good ventilation in installation environment.
✓		Inverter cabinet	1. Vibration. 2. Temperature rise. 3. Noise. 4. Leads, terminals	1. A vibration that appears steady and normal 2. Normal temperature. 3. No abnormal noise. 4. Leads and terminals fastened properly.
✓		Motor	1. Vibration. 2. Temperature rise. 3. Noise.	1. Steady running. 2. Normal temperature. 3. No abnormal noise.
✓		Input and output parameters	1. Input voltage. 2. Output current.	1. Input voltage within limit. 2. Output current under the rated value.

1. Every 1000 running hours.
2. Every month

9.2 Storage and warranty

9.2.1 Storage

If the product is stored for a long time after purchasing, comply with the following requirements:

1. Avoid placing the pump controller in high-temperature or humid areas or areas with vibration and metal dust. Ensure ventilation.
2. The performance of the capacitor inside the pump controller can be reduced if the equipment is not used for a long period of time. It is thus necessary to start up the equipment every two years to restore the performance of the capacitor and inspect the pump controller function at the same time. The voltage must be increased gradually through a DC power supply with power-on time being not less than 5 hours.

9.2.2 Warranty

The following situations are not covered by the warranty:
• Faults caused by failure to comply with this manual or standard specifications.
• Faults caused by self-repairing and modification without permission.
• Faults caused by poor storage and maintenance.
• Faults caused by abnormal use of the pump controller.
• Damage caused by fire, salt corrosion, gas corrosion, earthquake, storm, flooding, lightning, abnormal voltage or another force majeure situation.

10 Disposal

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.

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