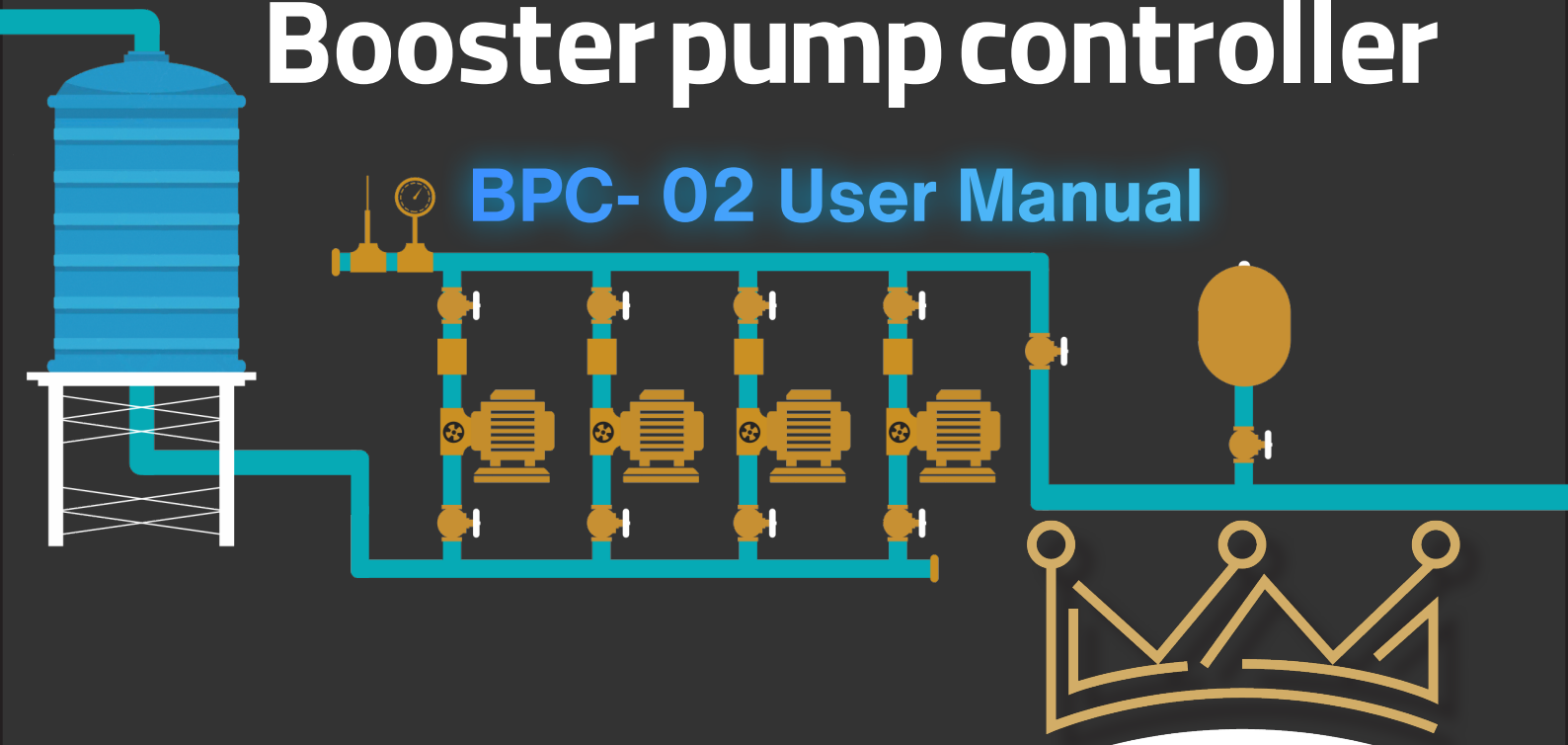
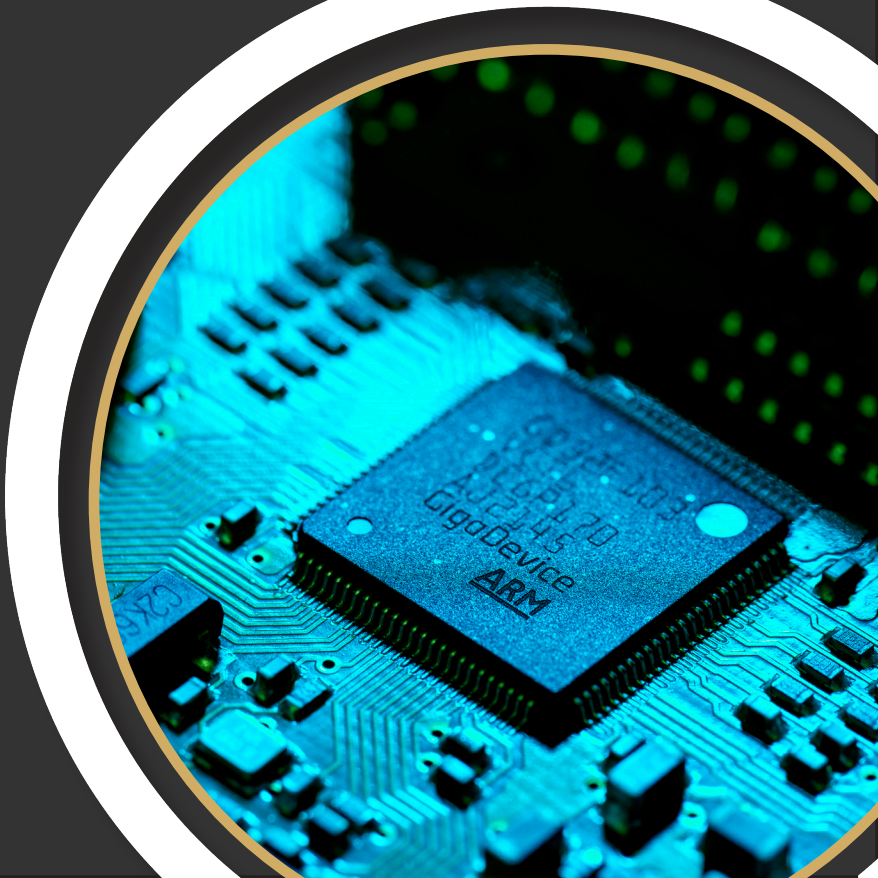
DIGITAL GOSTAR PARSIAN

Guidance
Booster pump controller

BPC- 02 User Manual





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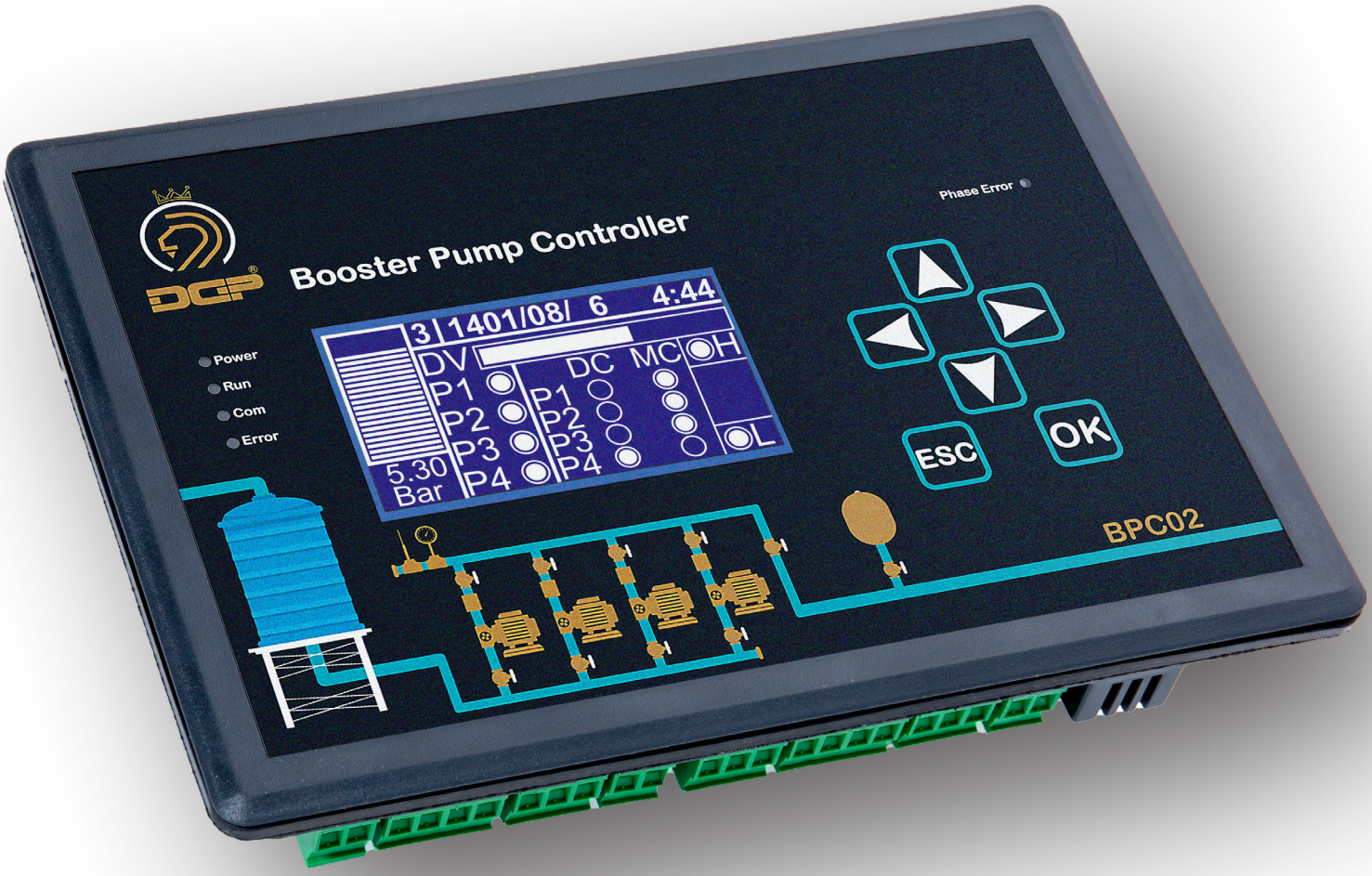


With gratitude and congratulations on your selection and joining the largest automation family in Iran, please thoroughly review this guide before utilizing the product. Incorrect configurations may potentially harm devices connected to this product. (Note that this guide may undergo changes without prior notification for the enhancement of system performance).

This controller, with precision in fluid pressure and based on pre-set parameters, strives to stabilize fluid pressure. Its primary utility lies in water supply systems, particularly in buildings. Notably, this controller›s strengths include its unrestricted capacity in terms of both the number of consumers and building floors for water supply.

In many urban areas, water pressure tends to be low in the upper floors of buildings. To overcome this challenge, booster pump systems are designed and manufactured, and their installation and commissioning are carried out by relevant specialists in these buildings. This system comprises a city water storage tank where incoming city water is stored. Subsequently, this stored water is pumped into the building pipes through pumps, taking into account the consumption rate. Within this system, a pressurized tank is present to retain a specific amount of water, thereby sustaining pressure within the building pipes.

Booster pumps equipped with pressurized tanks exhibit lower energy consumption in comparison to those without such tanks. This water pumping station, known as a booster pump system, has the capability to generate water pressure within the pipes. To initiate and optimally control water pressure, the system necessitates a controller for sampling water pressure. This controller, based on predetermined parameters and consumption, activates an appropriate number of pumps. In the context of this booster pump system, the controller assumes responsibility for this task. This guide offers a comprehensive explanation of the functionalities of this controller.

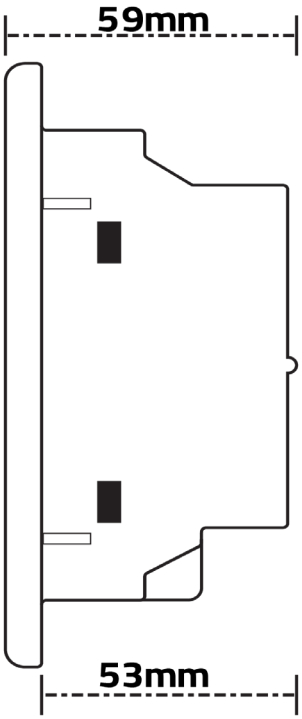
Controller Features:

- **Ability to start up 3-phase and single-phase pumps**
- **Display of city power waveform (T, S, R) on the LCD screen**
- **Internal phase control and the option to connect external phase control**
- **Adjustable high and low city power voltage from the LCD**
- **Sensitivity adjustment capability from the LCD (phase imbalance)**
- **Ability to set up the device as single-phase or three-phase**
- **Separate Delay-On and Delay-Off timers in case of errors**
- **Protection against two-phase connection to the system (phase connection instead of neutral)**
- **Digital display of frequency and voltages phase-to-phase and phase-to-neutral**
- **Display of pump and floater statuses, graphical representation of drive pressure and frequency, and display of date and time on the main screen**
- **Internal floater and the ability to connect an external floater**
- **Separate Delay-On and Delay-Off timers for the floater in case of errors**
- **Sensitivity adjustment capability for the floater from the LCD**
- **Three operating modes catering to various preferences**
- **Control of up to 6 pumps at a constant speed in Mode 1**
- **Control of up to 4 pumps at a constant speed and 2 pumps at a variable speed in Mode 1**
- **Control of up to 4 pumps at a constant speed and 1 pump at a variable speed in Mode 2**
- **Control of up to 4 pumps at a variable speed with a single drive in Mode 3**
- **Internal auto-service capability**
- **Variable speed pump control using PID and adjustable PID parameters**
- **LCD with a resolution of 8000 pixels**
- **485-RS network for displaying device information and parameter configuration**
- **4 separate inputs for external phase control, external floater, emergency flush, Pressure MAX input, Switch Pressure, and PR inputs**
- **Connection possibility for sensors 60Bar, 40Bar, 25Bar, 16Bar, 10Bar, 6Bar, PS**
- **Connection option for sensor outputs 10V-2, 10V-0, 5V-0, 20mA-0, 20mA-4**

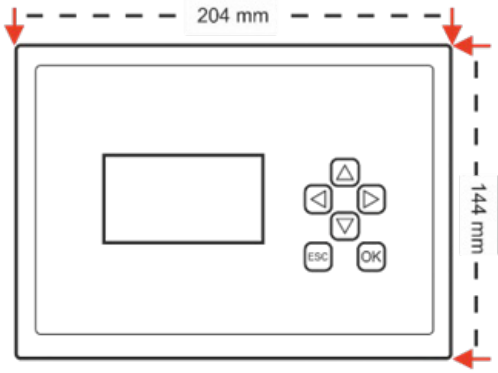
- Calibration capability for the displayed pressure number on the controller and pressure gauge on the collector
- Separate alarm and fan outputs
- DC 24V output with a maximum current of 100mA for sensor startup and feedback
- Two separate analog outputs for controlling two drives
- Over Change feature for identical pumps (constant speed – variable speed)
- Manual system startup capability
- Activation of an alarm (audible alert) during errors
- Maximum pressure setting for connection protection
- Definition of Start frequency to prevent initial pressure drop
- Definition of Stop frequency
- Definition of Load Full (detection of collector input closure, detection of pump suction and discharge blockage, detection of air intake by pumps, detection of pipe cracking at collector outlet)
- Definition of time for entering or exiting pump from the circuit
- Definition of access level for user settings Password Level User
- Fault detection of defective pumps and the ability to replace them
- Removal capability of defective pump from the system by the user (Service Pump)
- Display of all errors and their time on the History Error page
- Ability to communicate with Building Management Systems (BMS)
- Network communication via 485-RS port
- Programmable pump activities throughout the week with a maximum of six user-defined scenarios
- Over several thousand successful projects per year
- Implementation of over 80% of water supply projects with DGP Generation 4 Booster Pump Controller
- Energy consumption reduction and maintenance cost reduction
- IP65 standard compliance
- Several times longer lifespan for pumps compared to similar models
- Simplification of the control circuit
- Easier usability than similar models
- Two-year guarantee

Product Dimensions and Panel Cutout Sizes

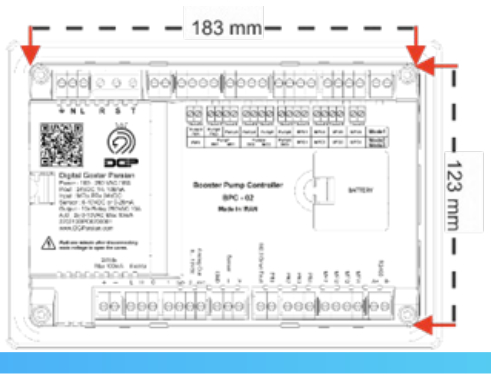
Product Depth



External Dimensions of the Product



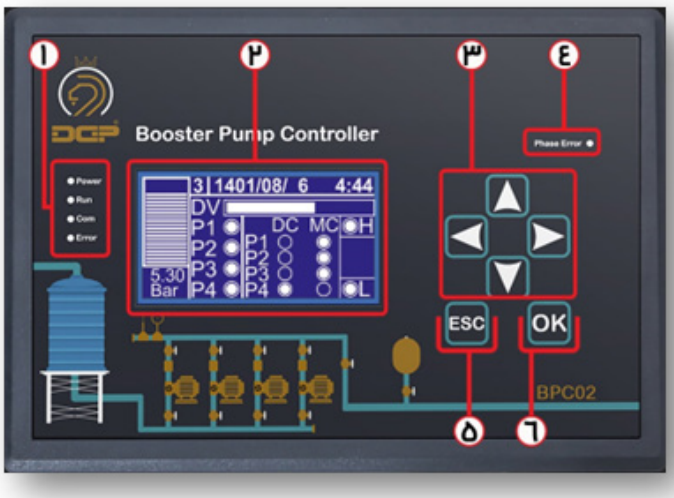
Panel Cutout Sizes



Protective Section	
Short Circuit on Analog Outputs	Protected
Volt Output-۲٤ Short Circuit on	Protected
Short Circuit on Floater Output	Protected

Permissible Values	
Input Voltage	100 - 250 V AC
Input Frequency	50 HZ / 60 HZ
Relay Output Current	10 A
24-Volt Output Current	100 mA
Digital Input Voltage	24 V
Operating Ambient Temperature	0 – 55 °C
Storage Temperature	-20 – +65 °C

Introduction of the Front Panel of the Controller



1 and 4. LED Indicators indicating the controller status from top to bottom:

Power	When the system power is connected, this LED will be on.
RUN	When the controller starts operating, this LED will be on.
Com	When the controller establishes communication with the 485-RS network, this LED will blink.
Error	If the controller encounters an error, this LED will be on.
Phase Error	If the controller is connected to 380 volts instead of 220 volts at the power supply terminal, this LED will be on.

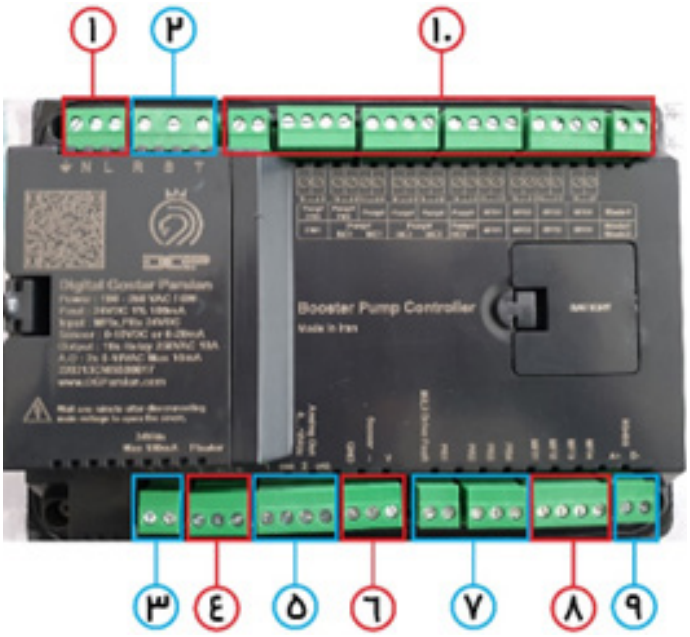
2. Controller Display: All changes made within the controller are visible and can be executed through the display.

3. Directional Keys: These keys are used for navigation in menu pages and changing values.

5. ESC Key: This key is used to return to the previous menu. A single click is used for this purpose, and holding it for three seconds stops the controller.

6. OK Key: This key is used to save information. A single click performs this action, and holding it for three seconds enters the controller menu.

Introduction to the Back Panel of the Controller:



1. Power Input (L – N)
2. Phase Control Input (T– S – R)
3. 24V Output Power Supply (up to 100mA)
4. Liquid Level Control (LOW=L, High=H, Com=C)
5. Two Analog Outputs (0-10V) for connection to drives
6. Pressure Sensor Connection: Connect a voltage pressure sensor to terminals V and GND. For a current pressure sensor, connect one end to +24 and the other end to terminal I. Note: Jump V and I in the current pressure sensor.
7. Return Feedback:
The booster pump controller has the ability to detect a faulty pump through these inputs.
- Fault Drive M2.3 Relay for drive fault in modes 2 and 3
- NO/NC: PR1 Direct pump contactor one
- NO/NC: PR2 Direct pump contactor two
- NO/NC: PR3 Direct pump contactor three
- NO/NC: PR4 Direct pump contactor four
8. MFI Configurable Inputs:
- 4 configurable inputs that can be used from the following if needed:
PR, FL, CP, EMG, MP, PS, as explained in the display.
These inputs are explained on page…
9. RS-485 Terminal:
- Use the RS-485 network to display controller information on another display according to the addressing table.
10. Controller Outputs:
- Terminals designated for relay outputs of the controller, wired according to your working mode. The controller has three operating modes, each explained separately.

Operating Modes:

- For starting pumps in variable speed, a drive is needed. The controller can control two drives separately, and two analog outputs are provided in the controller for this purpose.

- Mode 1: The controller can start a maximum of 6 pumps, with the first two pumps started in variable speed (with a drive) and the next 4 pumps started directly. In this mode, if needed, a drive can be omitted.

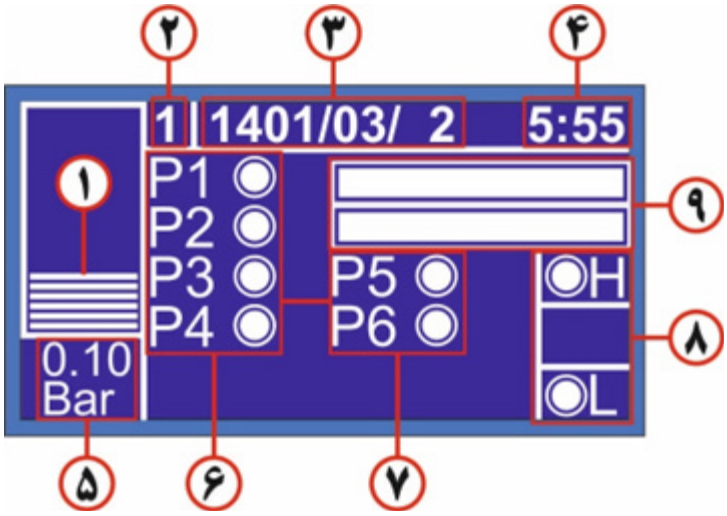
- Mode 2: The controller can start a maximum of 4 pumps, and the Changing Off feature lets the depreciation to be evenly distributed among the pumps. In this mode, when the first pump reaches its maximum speed with the drive, the next pumps are started directly. In case of a drive error or shutdown in mode 2, the controller brings the pumps into the circuit with constant speed contactors.

- Mode 3: The controller can start a maximum of 4 pumps. Using the Changing Off feature, depreciation is evenly distributed among the pumps. In mode 3, when the first pump reaches its maximum speed with the drive, the pump is disconnected from the drive and connected to the main power. Then the next pump is started with the drive. Mode 3 is designed for all pumps to enter the circuit with a single drive Using Mode 3 in heavy-duty pump scenarios reduces costs. If Mode 3 is selected, an option for more than 5.7 kilowatts is displayed. If your pumps are above 5.7 kilowatts, you should tick this option. In this term, when your drive has an error or turns off and exits the circuit, your heavy pumps above 5.7 kW will be prevented from entering the circuit with direct contactors. If your pumps are below 5.7 kW, you can uncheck this option. In this status, when the drive has an error or turns off and exits the circuit, in case of low pressure, the pumps will enter the circuit directly.

Menus

Home Page

On the home page, the controller displays the measured parameters to visualize the controller's workflow. Different sections of the home page are depicted in the figure.

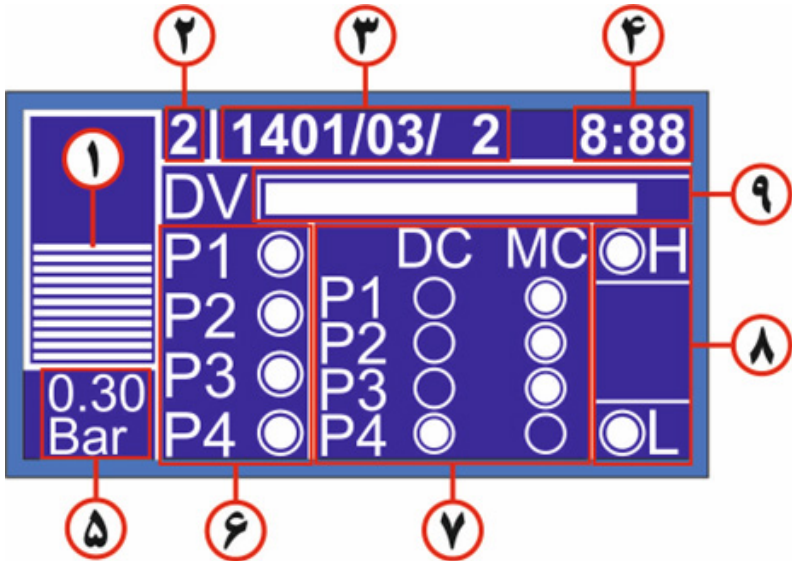


Controller Mode 1:

1. Displaying the pressure graphically
2. Operating mode of the controller
3. Adjustable Date (Gregorian/Shamsi)
4. Adjustable Time
5. Displaying the pressure Numerically

6 & 7. Number of Configured Pumps in Mode 1

8. Status of Electrodes Inside the Source
9. Frequency of Drive 1 and 2 Graphically



Controller Mode 2 & 3:

1. Displaying the pressure graphically.
2. Operating mode of the controller
3. Adjustable Date (Gregorian/Shamsi)
4. Adjustable Time
5. Displaying the pressure Numerically

6 - Number of configured pumps (In these modes, 4 pumps have been introduced to the controller.)

7 - The status of the pumps, DC or MC

8 - Status of Electrodes Inside the Source

9 - Frequency of inverter 1 in a graphical format

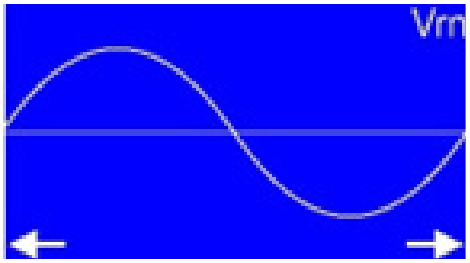
H = High Level
DC = Drive Contactor

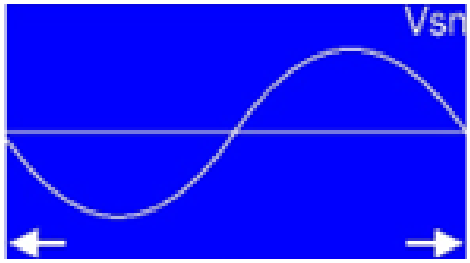
L = Low Level
M = Main Contactor

Introduction to the Functionality of Direction Keys:

Right Key:

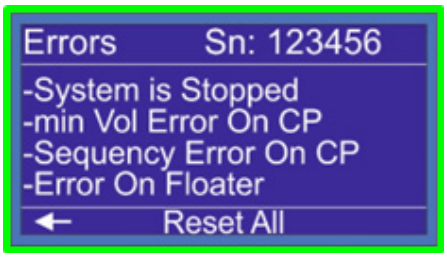
Function Description: By pressing the right key on the main screen, the values measuremed by the phase controller are displayed. In this screen, the main power frequency is shown with precision to 0.1. The first column corresponds to the voltages of each phase with neutral, and the second column corresponds to the voltage imbalance between each phase. In the single-phase mode, the controller will only display the input voltage of phase R and the frequency. By pressing the right key on the Phase Control page, we can observe the waveform of phases R, S, T separately. If any of the controller phases is disconnected, this waveform will be displayed as a straight line, making it easy to detect the phase interruption.

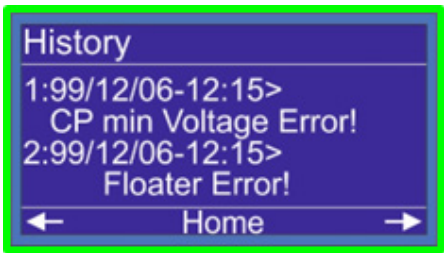




Left Key:

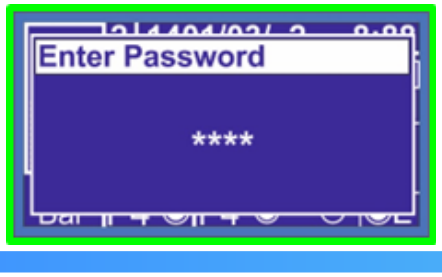
Function Description: By pressing the left key on the main screen, the user can enter the Error page and view the system errors. Depending on the type of error, the user can take corrective actions. BY pressing the left key again, user can see the history of the last 250 recent errors along with their dates and times. By selecting (pressing OK) the up and down keys in the specified area, all errors on this page can be viewed. By pressing the left key again on the History Error page, we enter the Pump Error page. If a pump has an error, a check-mark is placed next to it. By pressing OK on that pump, the error is cleared.





Down Key:

By pressing the down key on the main screen, we enter the Manual section. Initially, we encounter the password page, and the password is 2222. To enter the password, we should input the key up twice and the key right once to the end of ***2, then press the OK key to enter the Manual page. In this page, we can manually run the inverter and provide it with frequency. Also, we have the ability to connect or disconnect the direct contactors and the inverter. Additionally, the pressure value is displayed on this page.



Please note that in the Manual Settings page, the controller will exit the automatic control mode.

After exiting this page, it will return to automatic mode, and all protections will remain active.

Up Button:

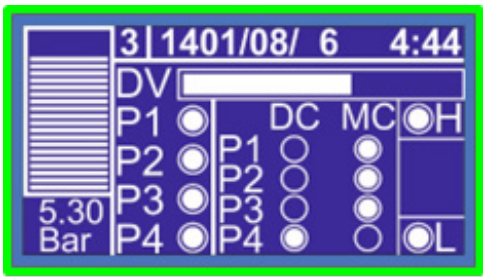
To access the Setpoint menu, press the Up button. Once inside the Setpoint page, we can adjust the Setpoint value by pressing the OK button and using the directional buttons (Up or Down).

History:

By selecting this option, we can view a pressure graph for the past 6 hours. By pressing the right button on the Setpoint page, we can enter the Status page. In this page, we can service a specific pump by removing the checkmark next to it, allowing the controller to continue its operation without considering that particular pump. After servicing the desired pump, we can return to this page to take it out of service.

Introduction to the Main Menu of the Controller:

On the main page, by holding the OK button for 3 seconds, we can access the controller's main menu. In sequence, we will see the following options:

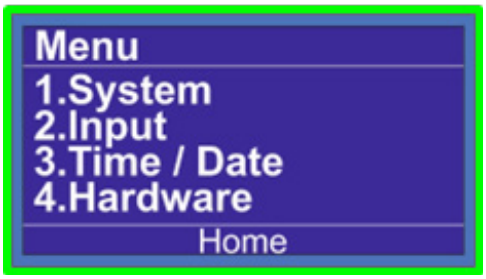


System-1

Input-2

Time/Date-3

Hardware-4



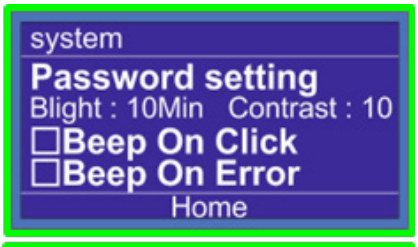
The following describes the purpose of each:

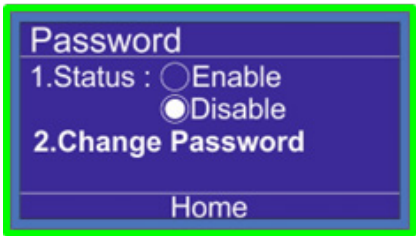
Main Menu – System – Password:

Selecting the "Password" option in the System menu will display the following screen, which includes two choices:

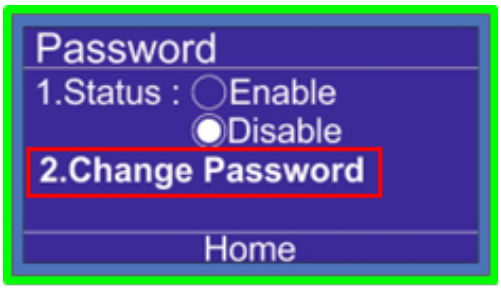
1. Status: This option is used to enable or disable the password. In the default setting, the first option is "Disable." By choosing "Enable," the controller will prompt you for the default password.

Note: In the booster pump controller, the default password for this section is set to 1111.

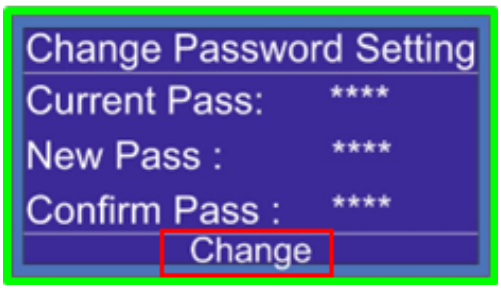




2. Change Password: By selecting this option, we will enter a new page where we need to enter the old password in the first row and the new password in the next two rows. For example, to change the system password, we should follow these steps:



Current Pass: 1111
New Pass: 2222
Confirm Pass: 2222

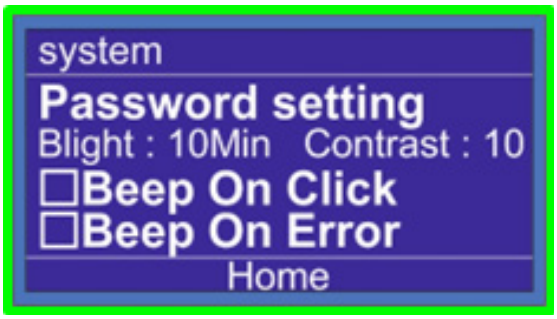


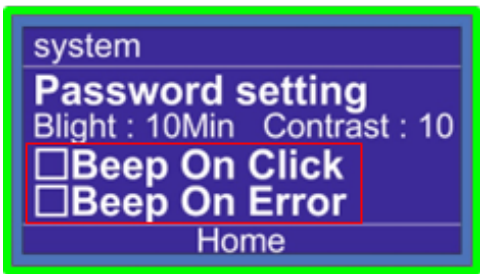
Note: To save the changes, select the "Change" option at the end.

Main Menu – System – System:

Blight: This option allows us to specify the duration after which the controller will reduce the screen brightness. We can set it between 0 to 99 minutes

Contrast: With this option, we can adjust the intensity of the screen display brightness within a range of 0 to 20 levels.





Main Menu – System – System:

The last options in this menu include:

Beep on Click: By enabling this option, a beep sound will be heard whenever any key on the controller is pressed.

Beep on Error: By enabling this option, the controller produces a beep sound whenever an error is displayed on the screen.

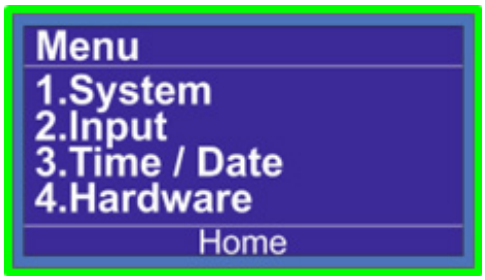
These two options are responsible for providing audio alerts. If they have a checkmark on the left, you the beep sound will be heard, and if they are unchecked, the controller will operate silently.

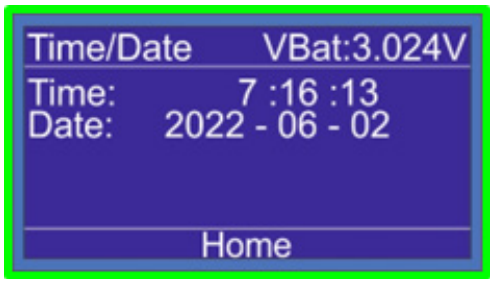
Main Menu – System – Input:

By selecting "Input," we can inspect and verify the wiring of the system's input connections. The "Input" option is used for addressing and troubleshooting wiring issues in the system.

Main Menu – Time/Date:

By selecting the third option from the menu, “Time/Date,” we can configure the time and date. In the “Time” section, we can set the time, and in the “Date” section, we can set the date.

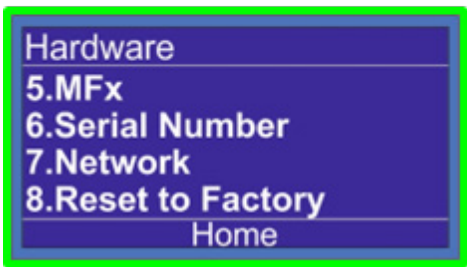




Main Menu – Hardware:

The fourth option in the main menu is the “Hardware” section, which contains 8 separate parts. Below, we provide a brief title for each, followed by a complete explanation:

1. Control Phase
2. Floater
3. Sensor
4. Control
5. MFx
6. Serial Number
7. Network
8. Reset To Factory

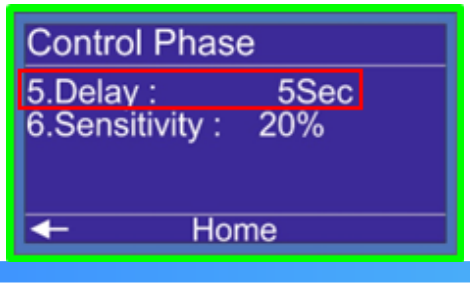


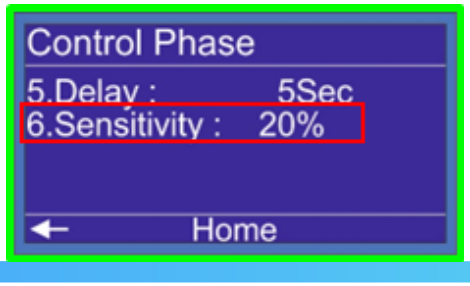
Main Menu – Page1 - Control Phase:

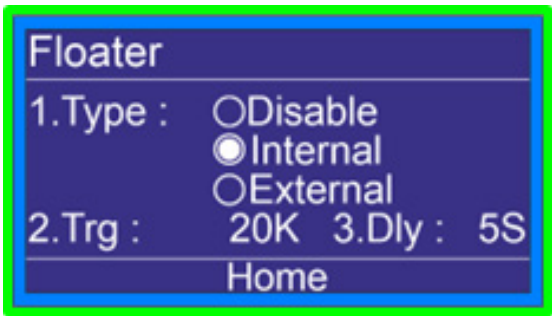
The first option in the Hardware settings is Control Phase. Within this section:
1. Status 1: You can enable or disable the internal control of the controller in this setting.
2. Type: This option allows you to define whether the controller should protect and control a single-phase (1P) or three-phase (3P) system.
3. Min Voltage: Specifies the minimum voltage for each phase.
4. Max Voltage: Specifies the maximum voltage for each phase.

Main Menu – Control Phase - Page 2:

On the Control Phase page, you can see the right arrow at the bottom of the screen. By pressing the right button, you can access the following options:
Option 5: Delay: Specify the delay time for alarm notifications
Option 6: Phase Discrepancy: Set the allowable phase discrepancy between phases.







Main Menu – Page 1 - Floater - Hardware:

The second option in the Hardware menu is “Floater,” which is used for controlling water level.

1. Type: We have three options for controlling water level:
   - Disable: If we don’t need water level control, we can disable this feature on the controller.
   - Internal: We choose this option if we want to use the controller’s internal water level control.
   - External: If we prefer to use an external water level control, we select this option. In this method, electrodes are connected to the external water level control, and a 24-volt input is connected from MFI1 to MFI4, which controls the external water level control (FL).

2. Trg (Trigger): This option is for adjusting the floater’s performance under different water hardness levels. By reducing the Trg value, we can configure the internal controller floater for conditions with higher water hardness.

3. Dly (Delay): we can determine the time at which the floater error is triggered by changing this option. For example, if it’s set to 5 seconds, the floater error will appear on the screen 5 seconds after the water source runs dry.

The third option in the Hardware menu is “Sensor,” which pertains to sensor settings.

1. Sensor Type: On the first page, we can specify the type of sensor:

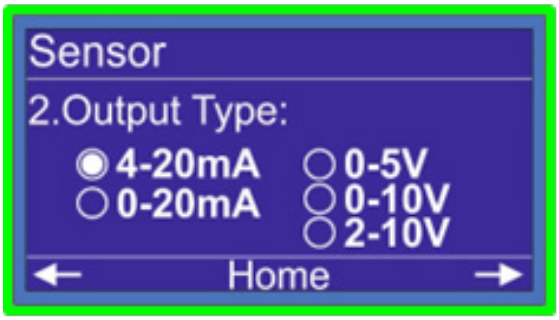
- **6Bar**
- **10Bar**
- **16Bar**
- **25Bar**
- **40Bar**
- **60Bar**
- **PS (Pressure Switch)**

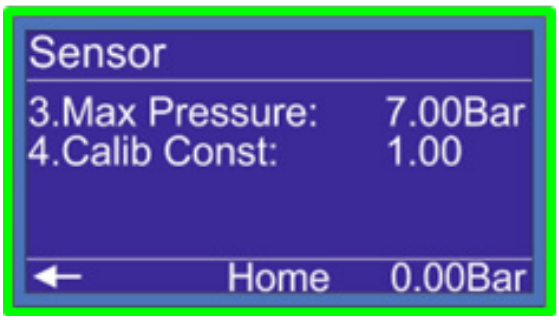
2. Output Type: On the second page, we define the output type of the sensor:

- **4-20mA**
- **0 - 20mA**
- **0 - 5 V**
- **0 - 10 V**
- **2 - 10 V**

3. Max Pressure: The third page allows us to set the maximum pressure, which can range from 0.2 to 0.5 bar higher than the Setpoint.

4. Calib Const: If there is a discrepancy between the displayed pressure on the controller and the gauge on the collector, you can use the calibration constant to eliminate this difference.





Main Menu – Page 1-2 - Control - Hardware:

On the first page, in the “Pump” section, we can set the number of pumps. The controller supports up to 4 pumps in modes 2 and 3, which are changeover modes. In mode 1, we can use up to 6 pumps, with the first two being drivable and the remaining four being directly operated.

- Drive Ready Relay: To receive feedback on the drive’s status, a wire has connected the Drive Ready relay to the controller. This allows the controller to detect drive malfunctions and halt the system. For connecting the Drive Ready relay to the controller, we have two options:

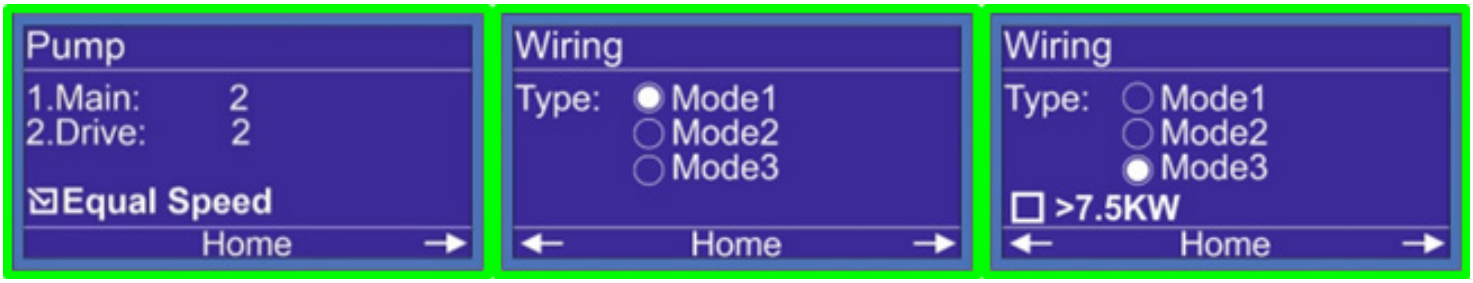
Option 1: If the project is being conducted in Mode 1, we should connect the Drive Ready relay to PR1. If the system has two drives, the second drive should be connected to PR2.

Option 2: If the project is in Mode 2 or 3, we should connect the Drive Ready relay to the M2.3 Drive Fault terminal

- Equal Speed: In mode 1, enabling drive mode 2 (Full Drive mode) ensures that if the first pump fails to reach its setpoint and the second pump is needed, both pumps will enter the circuit with the same frequency.

- Number 2 (Drive): We can specify the number of drives. The controller has two analog outputs and can operate two inverters in mode 1, with variable speed control.

On the second page, “Wiring,” we can change the system mode. The controller has three operating modes. Mode 2 and Mode 3 are changeover modes. If we are using pumps with a power rating higher than 7.5 kW, we can select Mode 3.
Mode 3 is designed for all pumps to enter with one inverter, reducing the costs for heavy-duty pumps. When we select Mode 3, we’ll be shown the option “More than 7.5 kW.” If the pumps are above 7.5 kW, we must tick this option. This means that when the inverter has an error and goes out of the circuit, the pumps won’t enter the circuit directly because they are heavy and over 7.5 kW. If the pumps are under 7.5 kW, we can remove the tick. This means that if the inverter has an error and goes out of the circuit, the pumps will enter the circuit directly, while the pressure drops.



Main Menu – Hardware- Control -Page 3-4:

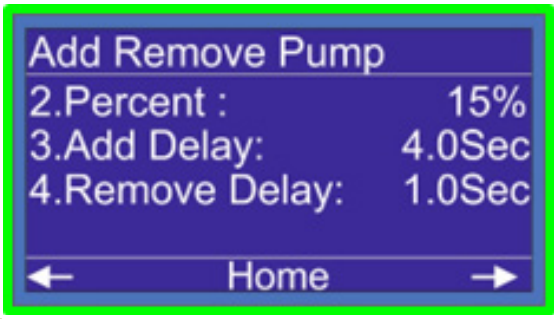
Page 3 - Status:

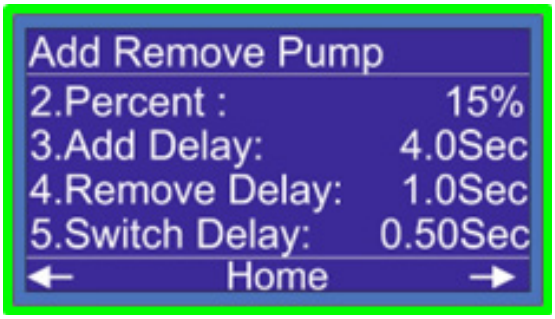
On this page, we can remove the checkmark next to the desired pump to exclude it from the system. The controller continues its operation without considering that pump. To re-enable the pump, we should return to this page and check the pump again.

Page 4 - Control:

By default, the Status option on the control page is inactive. We can use this option to stop the system. When we disable this option, the "System Stopped" error is displayed. To resolve the error, we should toggle this option to On, Off, or PID.
Dir: If this option is set to UP, the controller increases the pressure to reach the Set point pressure, which should always be set to UP for high-rise projects. If set to Down, the controller reduces the pressure to reach the Set point.

Main Menu – Hardware- Control -Page 5:
Page 5 - Add Remove Pump:
On the fifth page, you will find the "Add Remove Pump" option. In the "Percent" setting, we can specify the percentage of the next pump's capacity that is needed. This means that if the first pump cannot reach the setpoint pressure at maximum speed, and by adding the second pump, the pressure exceeds the setpoint, the second pump will enter and exit. This process may cause pressure oscillation in the system. In the "Percent" option, you can determine the percentage of the next pump's capacity that needs to be added. Set the "Percent" to 15%.
The "Add Delay" option allows you to specify the time it takes for the second pump to enter. Set this option to 4 seconds.
In the "Remove Delay" section for an active pump, you can configure the time it takes to remove the pump. This setting allows for a gradual exit, potentially reducing energy consumption. In this option, you can set the duration after which the pump should be removed from the circuit. Set it to 1 second.
If we have selected Mode 3 in the controller, at the bottom of this page, we will see the "Switch Delay" option. In this option, we can set the time it takes to switch or move the pump from the driver contactor to the power grid. This time is adjusted based on the kilowatts of the pumps. You can set this time from 35 milliseconds to 50 milliseconds.



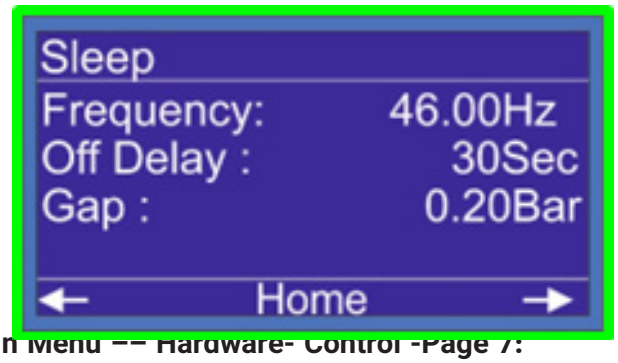


Main Menu – Hardware- Control -Page 6: Sleep frequency = Start frequency + 2Hz

Page 6 – Sleep

In the sixth page, we'll find the Sleep menu where we configure the sleep frequency. To obtain the Sleep frequency, first, we need to determine the Start frequency. Assuming the system requires a pressure of 5 bars, close the collector output completely and increase the driver frequency until the pressure is reached. Assuming that we can achieve a pressure of 5 bars with a frequency of 44Hz, our start frequency is set to 44Hz. For the sleep frequency, we add 2Hz to the start frequency, resulting in a sleep frequency of 46Hz.

The second option is Off Delay. When the Sleep conditions are met, the controller will execute the Sleep mode after the Off Delay time. The third option is Gap. One of the Sleep conditions is Gap. If the oscillation on the Setpoint is less than the set Gap value, the controller initiates Sleep. Set Gap to 0.20Bar.



Main Menu –– Hardware- Control -Page 7:

Page 7- Wake Up:

1. Differential:
   -Adjusts how much below the Setpoint the pressure should drop for the pumps to turn on. A suitable value could be 0.5 bars.
2. On Delay:
   - Specifies the delay time after reaching the start frequency before enabling the PID. This time is set between 3 to 5 seconds, depending on the configured time in the ACC drive.
3. Start Frq:
   - Allows you to set the obtained start frequency. To determine the Start Frequency:

Assuming the required system pressure is 5 bars, start by fully closing the collector output and gradually increasing the driver frequency until the pressure is achieved. For example, if a frequency of 42Hz can attain a pressure of 5 bars, then 42Hz will be the Start Frequency.

The Start Frequency is configured to prevent an initial pressure drop when the pumps are turned on.

4. Stop Frequency:
   - For shutting down the pumps, there›s no need to bring the frequency down to 0Hz. Instead, we can remove the pump from the circuit at a frequency where it is not effective. Set the Stop Frequency between 20 to 25Hz.

Main Menu – Hardware- Control -Page 8:

Page 8 - Change Over:

In the main menu, Page 8 covers the "Change Over" settings. This option controls the pumps switching:

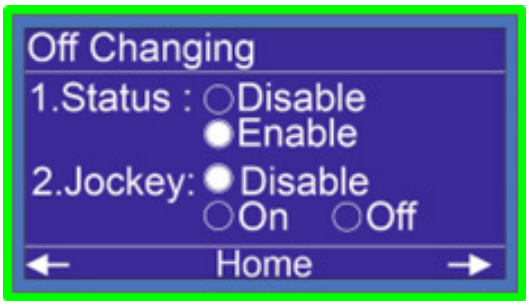
1. If the "Enable" option is selected, the pumps will switch with each on/off cycle.

If "Disable" is chosen, the changeover feature is deactivated.

2. The "Jockey" setting determines the behavior of the primary pump:

- When set to "On," the primary pump always enters the circuit first. Even with the addition of subsequent pumps, the primary pump remains in the circuit.

- When set to "Off," after the entry of additional pumps, the primary pump exits the circuit.



Main Menu – Hardware- Control -Page 9:

Page 9 - Time Changing

On Page 9, under "Time Changing," if the "Enable" option is selected, and the pump's operating time reaches the "Time Changing" duration, the controller will turn off the current pump. The next pump in line will replace it after the set "Off Time" period.

The "Off Time" corresponds to the time configured in the DCC timer in your drive.

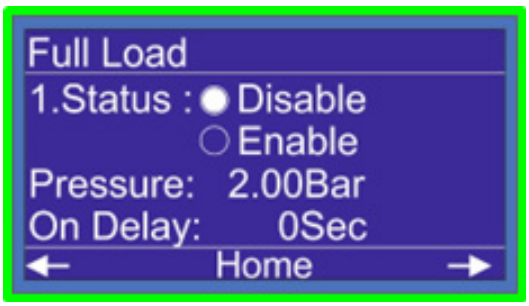
Main Menu –– Hardware- Control -Page 10:

Page 10 - Reserve Automatic

On Page 10, in the "Reserve Automatic" section, the pump booster controller can detect a faulty pump. By enabling this option, when a defective pump is detected, another pump will replace it in the circuit, and the error of the faulty pump will be displayed.

Additionally, in this option, you can specify the type of contact of the contactor. If you are using a closed-blade contactor, set it to NC, and if you are using an open-blade contactor, set it to NO.

Note: it's better to use the NO blade for the contactor.



Main Menu –– Hardware- Control -Page 11:

Page 11 - Full Load:

BY pressing the right key for Automatic Reserve, we enter the Full Load page. This option serves as excellent protection for pumps, preventing them from burning out in various scenarios such as air intake, reverse pump rotation, pump suction and source suction being closed, or lack of water in the water storage source. We can enable or disable this option based on the conditions.

If Full Load is enabled, in the Pressure option, you can set a pressure protection. When the last pump in the circuit reaches its maximum speed and the pressure protection is not achieved, the controller will stop your system after the set time in On Delay. You can set this pressure protection value to be 1.5 bars lower than the Setpoint, and set the On Delay time to 40 seconds.

Main Menu – Hardware- Control -Page 12:

Page 12 - Auto Service:

Using the Auto Service option, the controller, by default, checks the time the pumps are off. To prevent the pumps from seizing when they are off, the controller momentarily turns on the pump for a user-defined period. This action rotates the pump, preventing sedimentation and pump seizing.

If the service time for your pumps is uniform, you can set the pumps to turn on with a few minutes of difference between them.

Main Menu – Hardware- Control -Page 13:

Page 13 – PID:

On Page 13, you delve into PID, which stands for Proportional, Integral, Derivative. It's a closed-loop control method used to control pressure in the system based on feedback. The controller adjusts the pump speeds proportionally to the consumption level. In simpler terms, it keeps your pressure constant, and only the pump speeds change relative to low or high consumption.

The values set for PID generally don't need much adjustment and work well for about 95% of projects.

P=250 I=80 D=0

Main Menu –– Hardware- MFx -Page 1 - 4: MFI:

Page 1-4 introduces you to the MFI controller hardware, where you can define four inputs based on your needs. Here are the options:

1. PS (Pressure Switch):

By selecting this option, you can use a digital pressure sensor (pressure switch) instead of an analog pressure sensor (pressure transmitter) in your project. The switch operates between two set levels, high and low.

2. MP (Max Pressure):

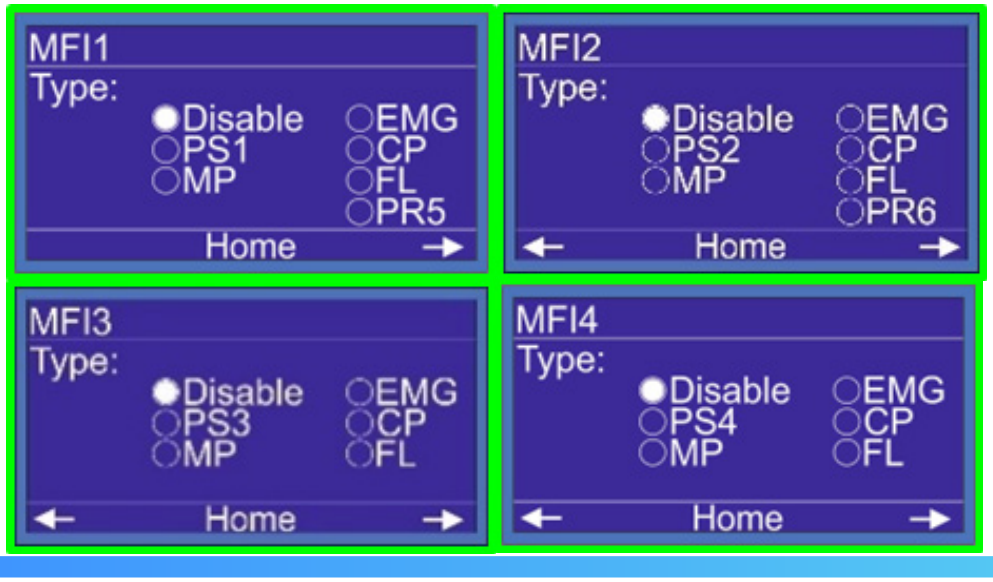
This option, short for Max Pressure, responds when the pressure goes above the set point. It acts as a safeguard, triggering a system halt.

3. EMG (Emergency):

EMG is connected to the emergency stop key. When this key is activated, an EMG error is displayed on the controller, and the system shuts down.

4. CP (External Phase Control):

To utilize an external phase controller, connect the external level control to one of the multi-function inputs and choose the title CP.



5. FL:

To use external level control, you need to select the “External” option on the Floater page. Then, by going to the MFX page, place one of the multi-function inputs on “FL” and connect the control wire for external level control to the same input.

6. PR:

To receive feedback on the proper operation of the direct power contactors for pumps 3 and 4, connect the command contacts of the contactors to the multi-function inputs, and place that multi-function input on “PR.”

*Note: These steps can be defined for each of the four controller inputs.

Main Menu –– Hardware- MFx -Page 5 - 8: MFO:

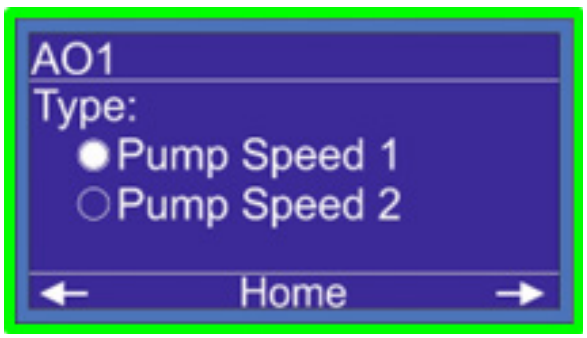
By pressing the right key on the multi-function inputs, you enter the multi-function outputs page, where these outputs are relay outputs that can be defined based on your needs, such as fan, alarm, or, if your system has three or four pumps, define the direct contactor of pump 3 or MC3, and if it’s four pumps, DC4 or the driver contactor of pump 4 and the direct contactor of pump four or MC4.

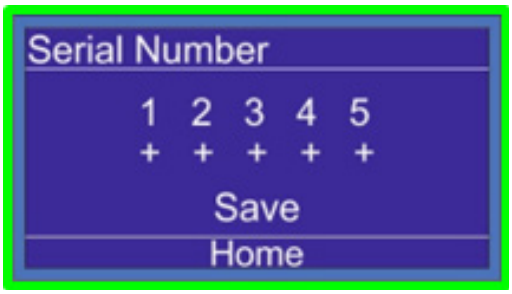
This controller has four definable outputs that can be used according to your needs.

- MC: By placing the multi-function output on MC, the power contactors of the motor are commanded by this output.
- DC: By placing the multi-function output on DC, the drive motor contactor is commanded by this output.
- Fan: By placing the multi-function output on Fan, the corresponding output is activated along with the drive turning on.
- E.valve: By performing auto-service on the multi-function output set to E.valve, it becomes active.
- Ready: When the controller is in an active state, this output becomes active.
- P.Run: This output becomes active when the first motor is turned on.

Main Menu –– Hardware- MFx -Page 9 - 10: AO:

At the end of the MFI and MFO pages, we see the AO1 and AO2 pages. In case the first analog encounters a problem, by referring to this page, we can activate the second analog by wiring it to AO2 to resolve the system issue.



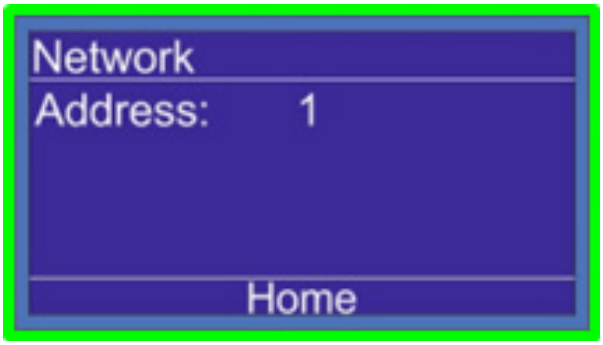


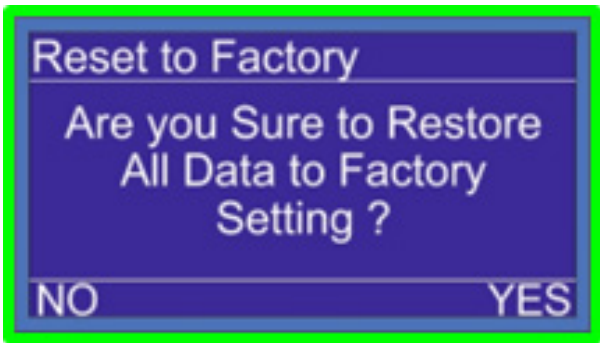
Main Menu –– Hardware - Serial Number:

You can define a serial number for the controller, and this serial number will be displayed at the top of the error pages..

Main Menu –– Hardware - Network:

This page in 7th menu of the controller is used for configuring the RS485 network address. The network protocol is ModBus_ RTU, and the network settings are as follows:
- Baud rate: 9600 bps
- Data: 8
- Parity: (N)
- Stop Bit: 1





Main Menu –– Hardware – Reset to Factory:

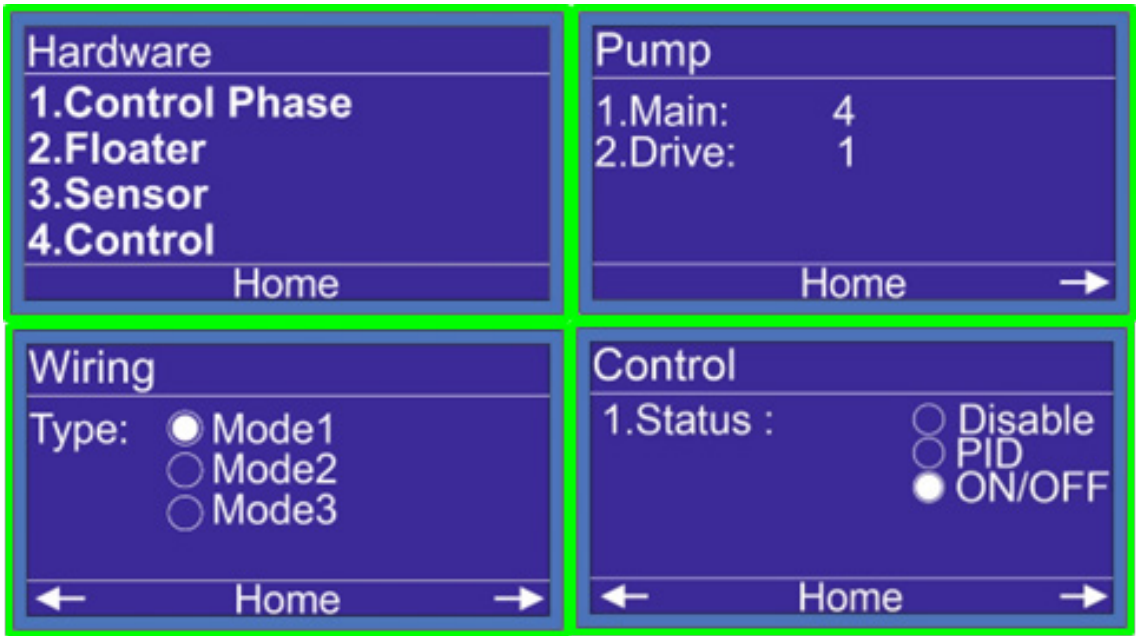
In the eighth option of the Hardware menu, “Reset Factory,” users can restore all settings to their default values. By selecting the option “YES,” all settings will be reverted to the factory defaults.

Booster Pump Controller in Firefighting Projects

To set up the DGP booster pump controller for firefighting projects, you need to hold down the OK button for 3 seconds to enter the settings. After entering the settings page, navigate to the Hardware section and select the fourth option, Control. Enter the pump settings page.

In this page, specify the number of pumps and drives, then proceed to the next page. In the Modes page, set the controller mode to Mode 1, and go to the Control page. Set the status to On/Off.

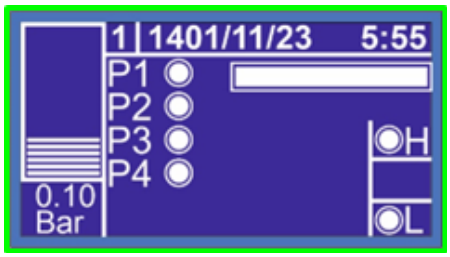
Go to the Off changing page, turn on Jockey, and then press the ESC key to return to the main page.

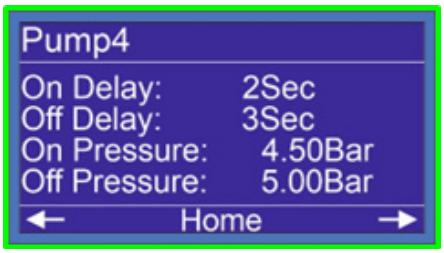


After returning to the main page, press the up key to enter the Setpoint page. On the Setpoint page, you can specify the cut-off and turn-on time and pressure for each pump.

For example, in the current settings, we configured 4 pumps, and for each of the 4 pumps, you need to adjust the settings related to pressure, cut-off time, and turn-on time.

The main settings for firefighting projects are as shown in the image and explained. Other settings, such as auto-service, automatic reserve, full load, etc., are similar to the settings for Mode 1 controller for water supply, as explained in previous pages.





Troubleshooting Table for the Booster Pump Controller

Errors	Fault Finding
Pump 1,2,3,4 Error	Bi-metal or thermal switch has operated. Check motor current and bi-metal. Check wiring according to the diagram at terminals PR1~PR4.
Drive Error	Drive has an error, check the error code on the drive LCD. Check wiring according to the diagram at terminals M2.3 Drive Fault, and drive fault relay.
Sensivity Error	Phase differences R, S, T exceed the set limit. Check sensitivity settings on the phase control page.
Minimum Voltage	Input voltage has decreased below the set limit. Check controller settings on the controller page.
Maximum Voltage	Input voltage has increased above the set limit. Check controller settings on the controller page.
Disconnected Sensor	Sensor connection to the controller is disconnected. Check sensor cable and sensor-controller connections.
Maximum Pressure Error	Water pressure has exceeded the set limit. With repeated consumption, the error will be resolved.
Full Load Error	The set limit in the controller has been exceeded. Check water source, pump suction and discharge valves, check for air intake in pumps. Check pump rotation.
Floater Error	Water level in the water source is below the specified level. Check the water source.
sequence Error	Input panel phases R, S, T have been swapped.
All Pump Fault	All pumps present have faults.

Important Points in Booster Pump Startup:

- **The maximum pressure set in SetPoint should be 1 bar lower than the maximum pump height.**
- **Usually, Max Pressure is set between 0.2 ~ 0.5 bar higher than the SetPoint pressure.**
- **Using a twisted pair wire for communication between the pressure sensor and the booster pump controller is mandatory.**
- **Make sure to connect motor and drive earth connections to the panel.**
  - **In modes 1 and 2, set the ramp-up (ACC) and ramp-down (DCC) in the drive between 3 to 5 seconds.**
  - **In mode 3, set the controller's ramp-up (ACC) between 3 to 5 seconds and ramp-down (DCC) to "zero."**

Attention!

1. Set the desired pressure in SetPoint.

2. In the manual section, check the speed of all pumps with the drive (DC1, DC2, DC3, DC4) at a low frequency of about 3Hz.

3. In the manual section, check the speed of all pumps by activating the contactors (MC1, MC2, MC3, MC4).

4. Close the collector output completely. Manually increase the frequency until it reaches the pressure set in SetPoint.

• Set the obtained frequency in the Frequency Start section.

• Increase the obtained frequency by 2 Hz and set it in the Frequency Sleep section.

ModBus Controller Addresses:

Porotocol : ModBus-RTU

Com Port Setting : 9600 8-N-1

Bit Address

No	Description	Address	Value
1	Output 0 Status	0	0:OFF 1:ON
2	Output 1 Status	1	0:OFF 1:ON
3	Output 2 Status	2	0:OFF 1:ON
4	Output 3 Status	3	0:OFF 1:ON
5	Output 4 Status	4	0:OFF 1:ON
6	Output 5 Status	5	0:OFF 1:ON
7	Output 6 Status	6	0:OFF 1:ON
8	Output 7 Status	7	0:OFF 1:ON
9	Output 8 Status	8	0:OFF 1:ON
10	Output 9 Status	9	0:OFF 1:ON
11	DR Status	10	0:OFF 1:ON
12	PR1 Status	11	0:OFF 1:ON
13	PR2 Status	12	0:OFF 1:ON
14	PR3 Status	13	0:OFF 1:ON
15	PR4 Status	14	0:OFF 1:ON
16	MFI1 Status	15	0:OFF 1:ON
17	MFI2 Status	16	0:OFF 1:ON
18	MFI3 Status	17	0:OFF 1:ON
19	MFI4 Status	18	0:OFF 1:ON
20	Pumpl Status	19	0:OFF 1:ON
21	Pump2 Status	20	0:OFF 1:ON
22	Pump3 Status	21	0:OFF 1:ON
23	Pump4 Status	22	0:OFF 1:ON

24	Pump5 Status	23	0:OFF
25	Pump6 Status	24	1:ON 0:OFF
26	Drive Fail	25	1:ON 0:Normal 1:Failed
27	Pump1 Fail	26	0:Normal 1:Failed
28	Pump2 Fail	27	0:Normal 1:Failed
29	Pump3 Fail	28	0:Normal 1:Failed
30	Pump4 Fail	29	0:Normal 1:Failed
31	Pump5 Fail	30	0:Normal 1:Failed
32	Pump6 Fail	31	0:Normal 1:Failed
33	Floater L Level	32	0:Not Co1111ected 1:Con11ected
34	Floater H Level	33	0:Not Connected 1:Connected
35	Output 0 Manual	50	0:OFF 1:ON
36	Output 1 Manual	51	0 OFF 1:ON
37	Output 2 Manual	52	0:OFF 1:ON
38	Output 3 Manual	53	0:OFF 1:ON
39	Output 4 Manual	54	0:OFF 1:ON
40	Output 5 Manual	55	0:OFF 1:ON
41	Output 6 Manual	56	0:OFF 1:ON
42	Output 7 Manual	57	0:OFF 1:ON
43	Output 8 Manual	58	0:OFF 1:ON
44	Output 9 Manual	59	0:OFF 1 ON
45	Pump 1 Activation	4096	0:Disable 1:Enable
46	Pump 2 Activation	4097	0:Disable 1:Enable
47	Pump 3 Activation	4098	0:Disable 1:Enable
48	Pump 4 Activation	4099	0:Disable 1:Enable

49	Pump 5 Activation	4100	0:Disable 1:Enable
50	Pump 6 Activation	4101	0:Disable 1:Enable
51	Control Phase Activation	4106	0:Disable 1:Enable
52	OFF Changging Activation	4107	0:Disable 1:Enable
53	Time Changging Activation	4108	0:Disable 1:Enable
54	Reserve Automatic Activation	4109	0:Disable 1:Enable
55	Reserve Automatic Type	4110	0:NO 1:NC

Word Address

No	Description	Address	Value		Unit
1	Displaved Paoe Number	0			
2	Svstem Pressure	2			0.0lBar
3	Vrn	3			Volt
4	Vsn	4			Volt
5	Vtn	5			Volt
6	Vrs	6			Volt
7	Vst	7			Volt
8	Vtr	8			Volt
9	Frequency	9			0.01Hz
10	Drive Frequency	10	0-1600		
11	Pumpl Work Time in Sec	34			Sec
12	Pumpl Work Time in Min	35			Min
13	Pump1 Work Time in Hour	36			Hour
14	Pump2 Work Time in Sec	37			Sec
15	Pump2 Work Time in Min	38			Min
16	Pump2 Work Time in Hour	39			Hour
17	Pump3 Work Time in Sec	40			Sec
18	Pump3 Work Time in Min	41			Min
19	Pump3 Work Time in Hour	42			Hour
20	Pump4 Work Time in Sec	43			Sec
21	Pump4 Work Time in Min	44			Min
22	Pump4 Work Time in Hour	45			Hour
23	Analoq Output 0 Manual	50	0-500		0.1Hz
24	Analoo Output 1 Manual	51	0-500		0.1Hz
25	System Error	80	Error Description	Bit	
			Floater Error	3	
			Max Pressure Error	4	
			Pressure Sensor Disconnected	5	
			Control Phase Sensivity Error	6	
			Control Phase **Max** Voltage Error	7	
			Control Phase Min Voltaqe Error	8	
			Control Phase Sequency Error	9	
			Pumpl Error	10	

56	Control Status	4173	0-1		
57	Sleep Gap	4175	1-100		0.01Bar
SB	Auto Service Offlime	4177	1-9999		Hour
59	Auto Service On Time	417B	1-999		0.1Sec
60	Auto Service Interval	4179	1-99		Min
61	MFI1Type	41B0	Disable PS MP EMG CP FL	0 1 2 3 4 5	
62	MFI2Type	4181	Refer to MFI1		
63	MFI3Type	4182	Refer to MFI1		
64	MFI4 Type	4183	Refer to MFI1		
65	MF01 Type	4184	Disable E Valve Fan Alarm DC3 MC3	0 1 2 3 4 5	
66	MF02 Type	4185	Refer to MF01		
67	MF03Type	4186	Refer to MF02		
68	ModBus Address	4195	1		

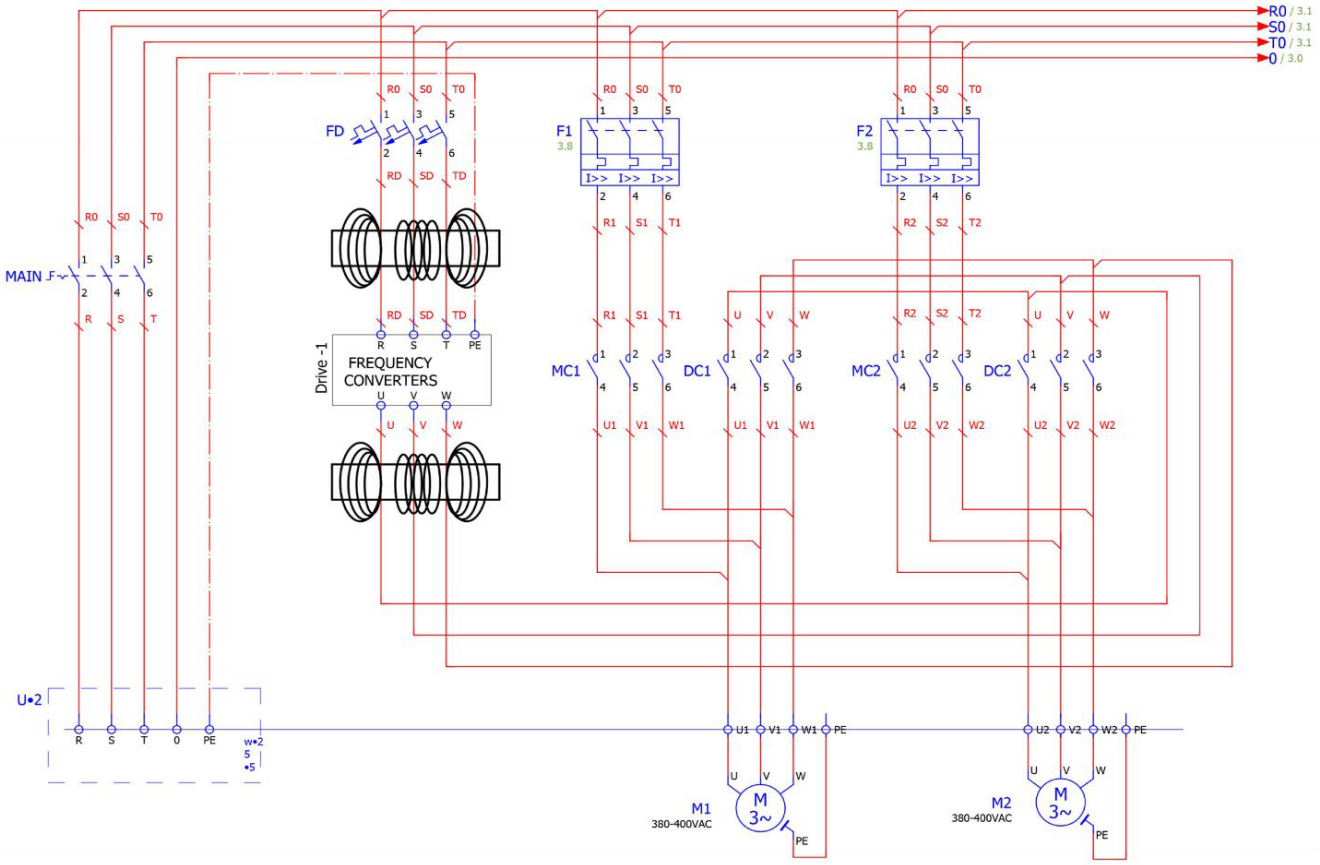
Attention: Settings from number 25 onward pertain to hardware configurations. Incorrect changes may damage the booster pump hardware.

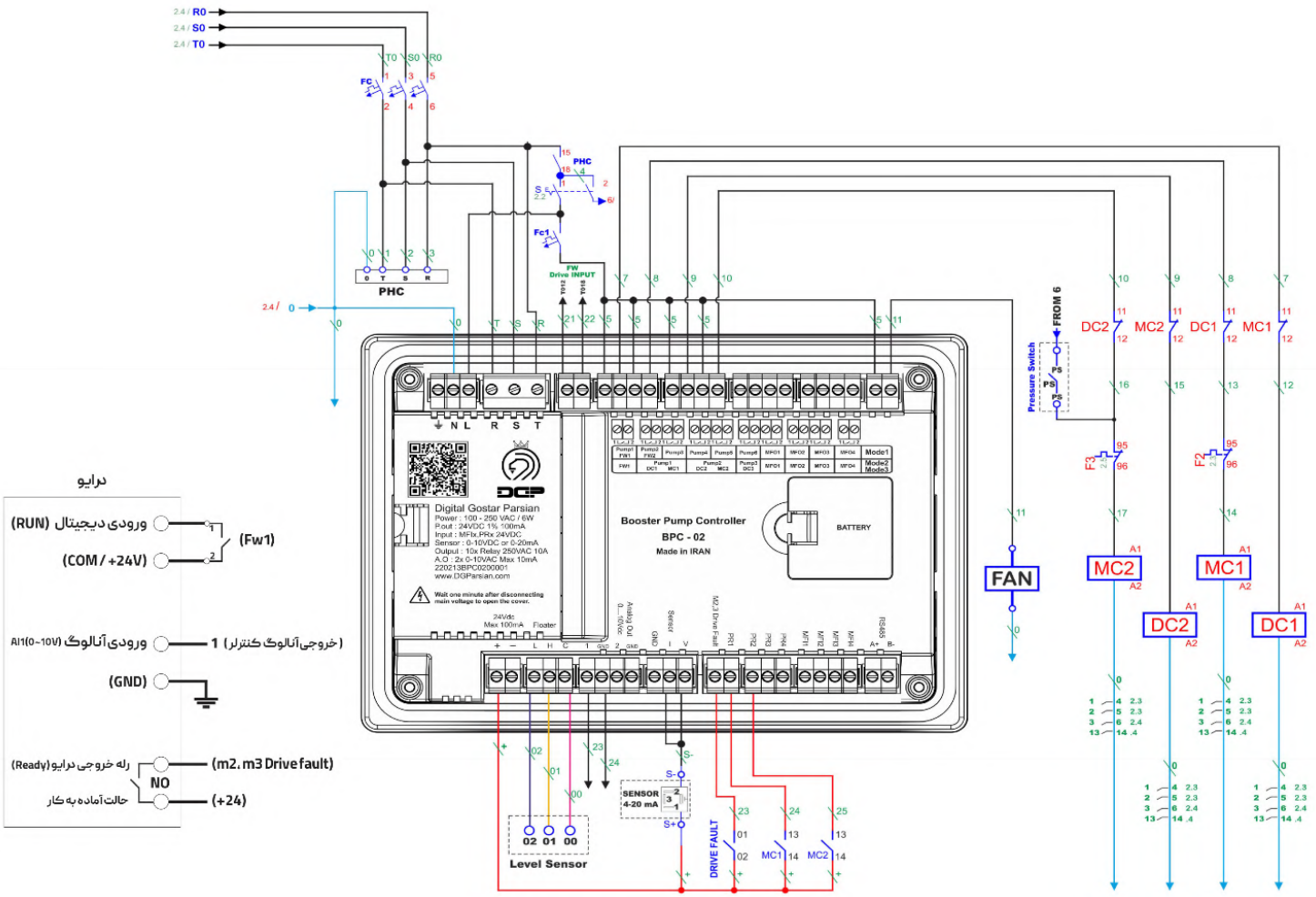
For manual mode, set the value 1234 in the Multi-Function Register at address 99. The system will enter manual mode. To turn the controller on or off, use bits from address 50 to 59. To change the pump speed, use the word at addresses 50 and 51. Setting zero in the Multi-Function Register exits manual mode, and the system operates automatically.

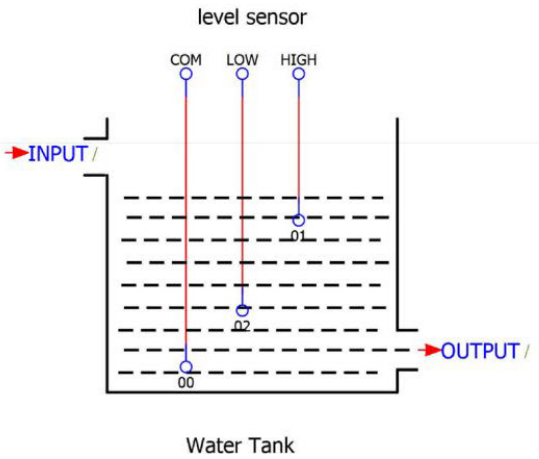
Wiring Diagram (2 Pumps, 1 Drive – Mode 3)

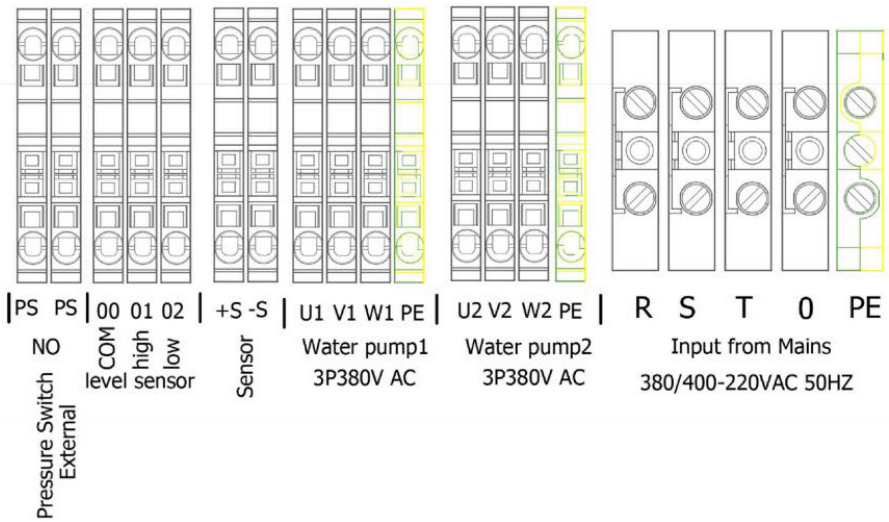
Customer	:	
Plant designation	:	
Drawing number	:	
Commission	:	
Manufacturer (company)	:	
Path (x\eplan8\p)	:	
Project Serial Number:	:	
Project Name:	:	
Project Type:	:	2 Line, 1 Variable Line (Water Pump)
Mounting site	:	
Responsible for project	:	
Part feature	:	

Changed on: 12/23/2019 from (Abbreviation): Number of pages : 4




درایو
ورودی دیجیتال (RUN)
(COM / +24V)
(Fw1)
ورودی آنالوگ AI1(0~10V)
1 (خروجی آنالوگ کنترلر)
(GND)
رله خروجی درایو(Ready)
NO
حالت آماده به کار
(m2. m3 Drive fault)
(+24)
Digital Gostar Parsian
Booster Pump Controller
BPC - 02
Made in IRAN
BATTERY
FAN
MC2
MC1
DC2
DC1
Level Sensor
SENSOR 4-20 mA
DRIVE FAULT
Pressure Switch
FROM 6
PHC
FW Drive INPUT

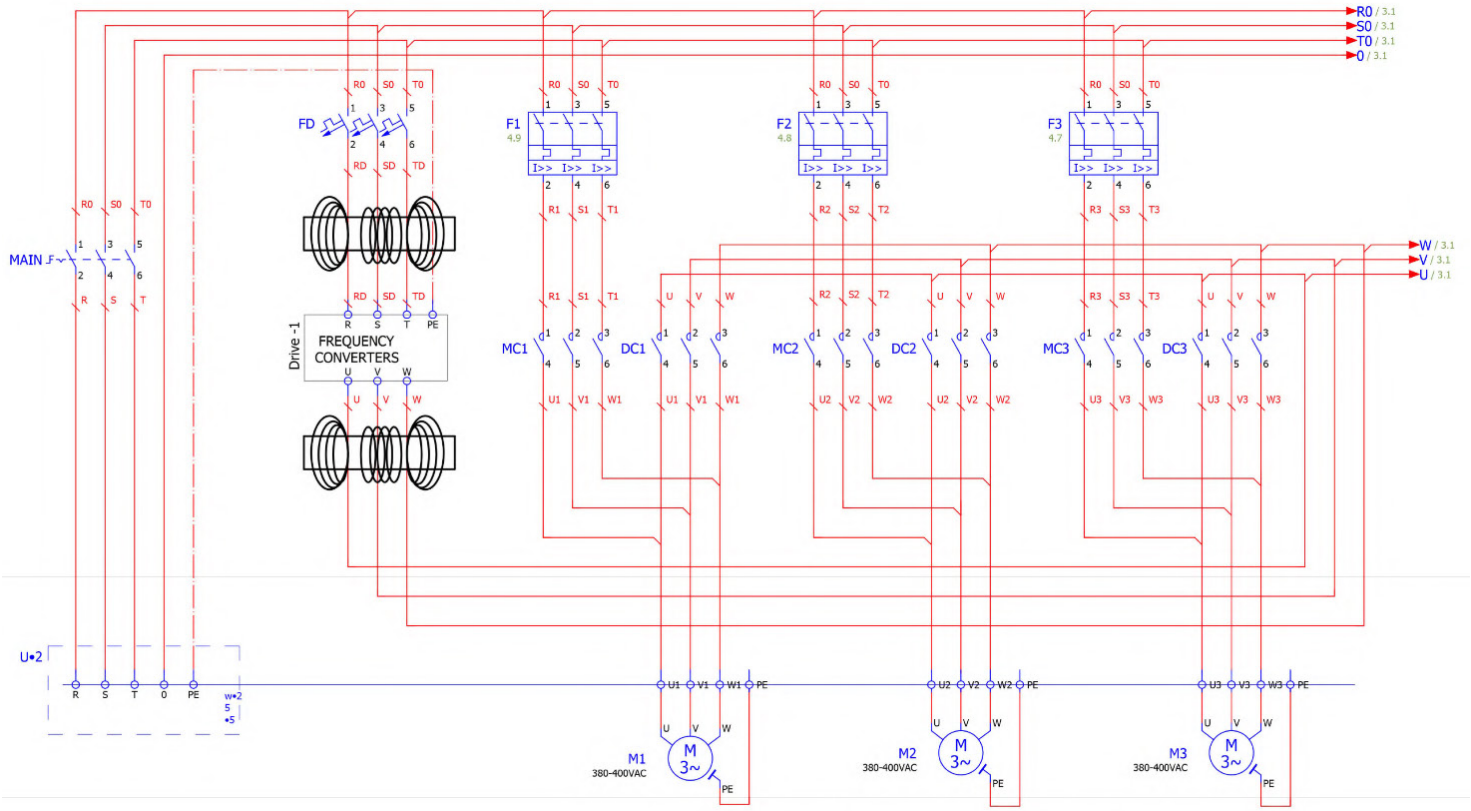

level sensor
COM
LOW
HIGH
INPUT
01
02
00
OUTPUT
Water Tank

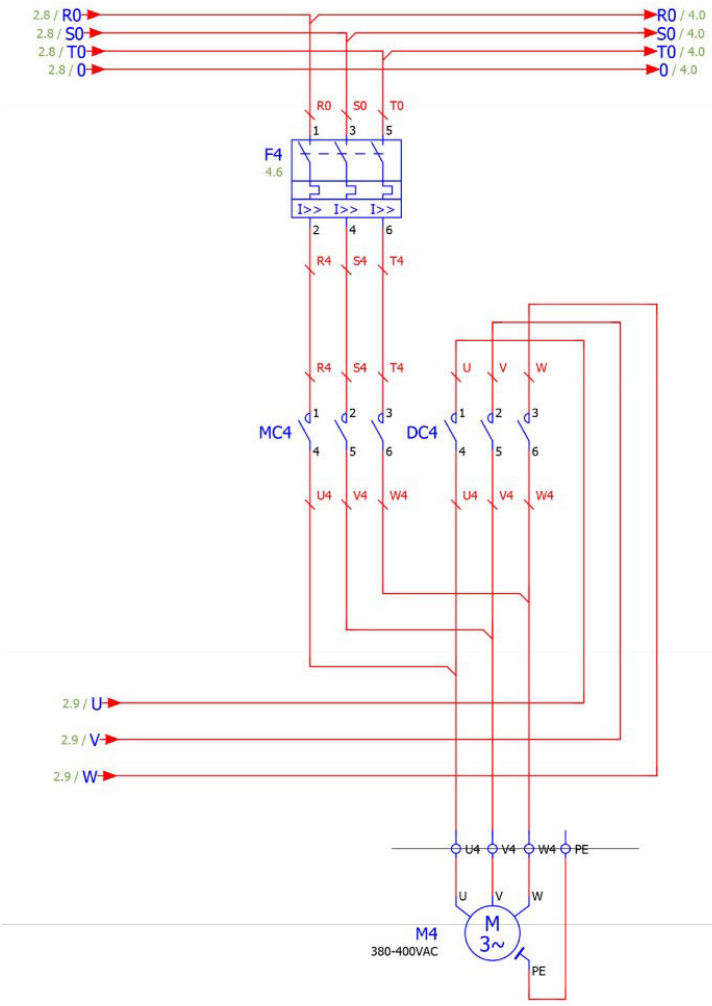

PS PS
NO
Pressure Switch External
00 01 02
COM high low
level sensor
+S -S
Sensor
U1 V1 W1 PE
Water pump1
3P380V AC
U2 V2 W2 PE
Water pump2
3P380V AC
R S T 0 PE
Input from Mains
380/400-220VAC 50HZ

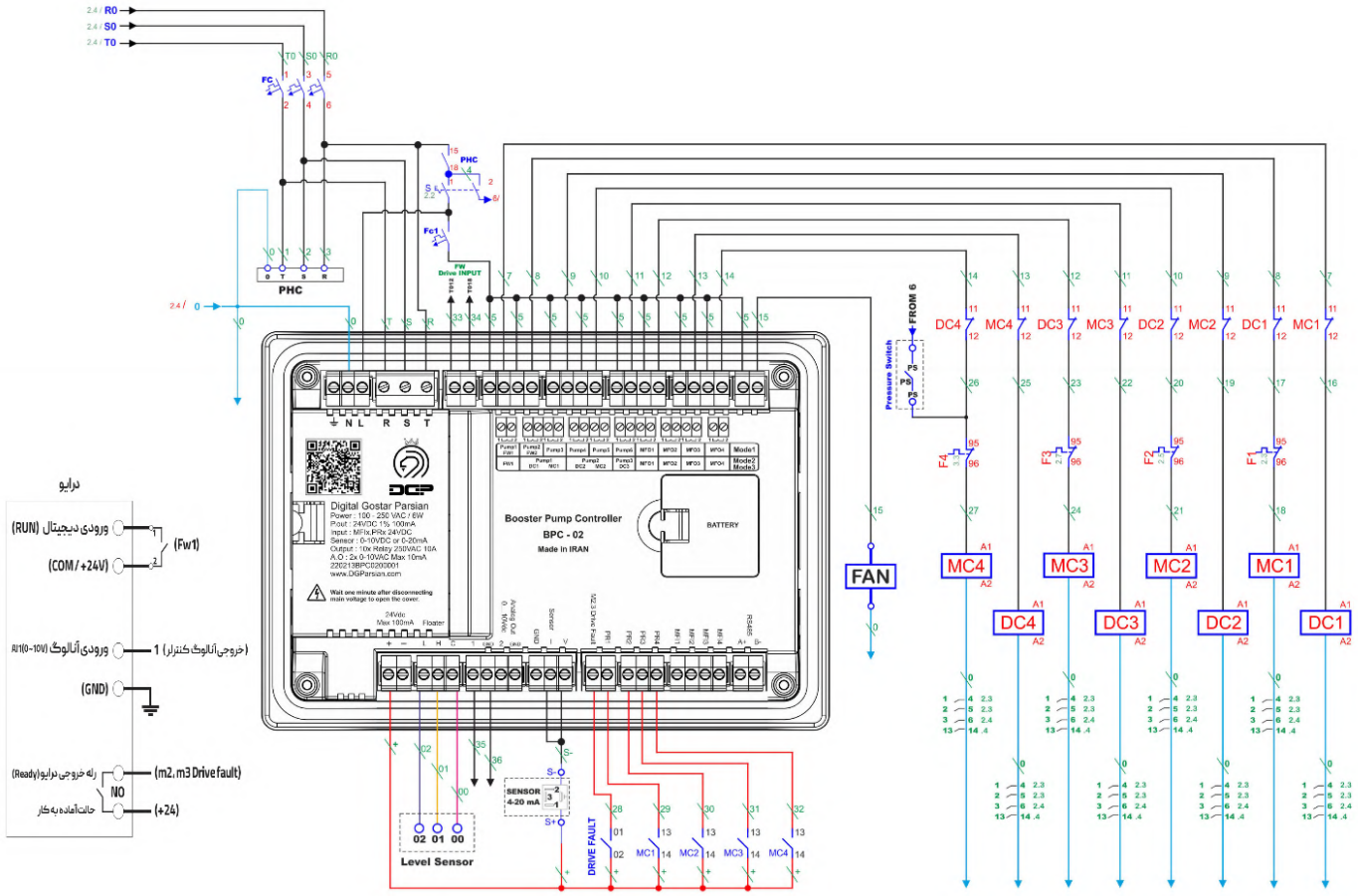
Wiring Diagram (4 Pumps, 1 Drive – Mode 3)

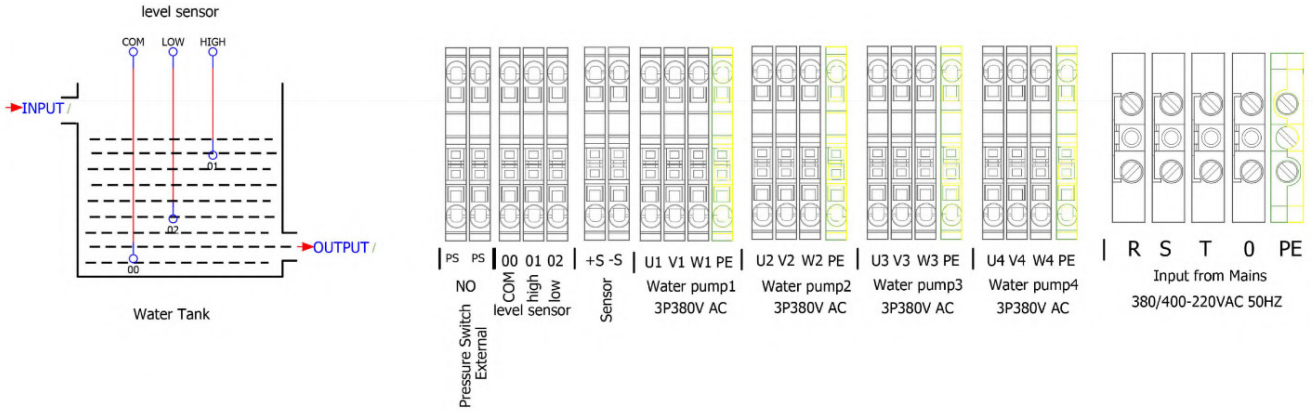
Customer	:
Plant designation	:
Drawing number	:
Commission	:
Manufacturer (company)	:
Path (x\eplan8\p)	:
Project Serial Number:	:
Project Name:	:
Project Type:	: 4 Line, 1 Variable Line (Water Pump)
Mounting site	:
Responsible for project	:
Part feature	:

Changed on: 12/23/2019 from (Abbreviation): Number of pages : 5




2.8 / R0
2.8 / S0
2.8 / T0
2.8 / 0
R0 / 4.0
S0 / 4.0
T0 / 4.0
0 / 4.0
F4
4.6
MC4
DC4
M4
380-400VAC
2.9 / U
2.9 / V
2.9 / W
PE

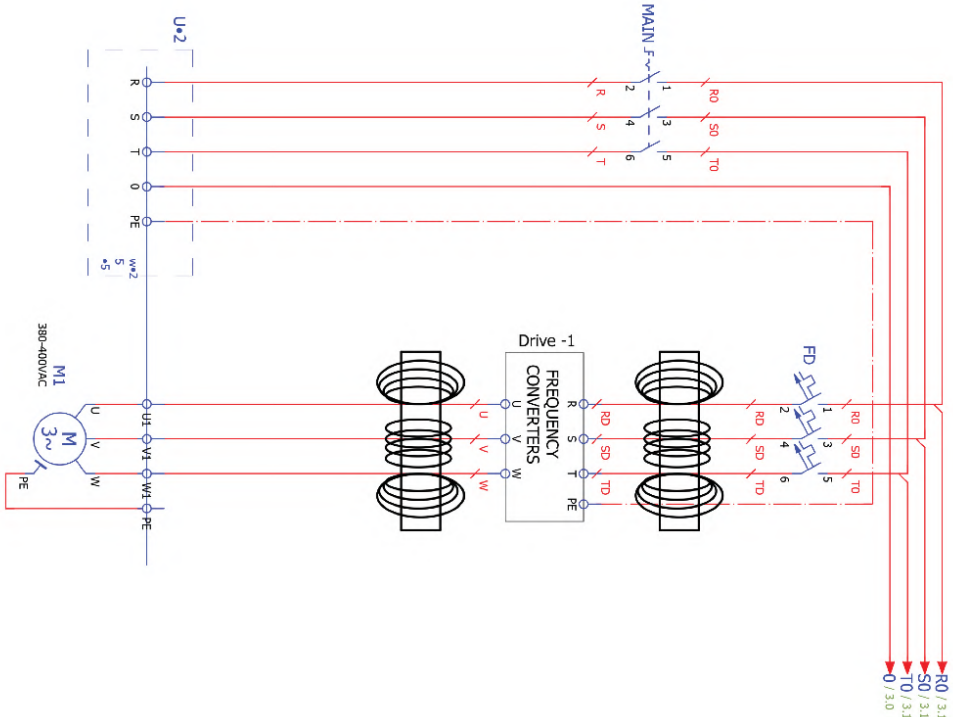

Digital Gostar Parsian
Booster Pump Controller
BPC - 02
Made in IRAN
BATTERY
FAN
PHC
Level Sensor
SENSOR
4-20 mA
DRIVE FAULT
Pressure Switch
FROM 6
درایو
ورودی دیجیتال (RUN)
(COM / +24V)
(Fw1)
ورودی آنالوگ (0-10V) AI1
(خروجی آنالوگ کنترلر) 1
(GND)
رله خروجی درایو (Ready)
NO
حالت آماده به کار
(m2, m3 Drive fault)
(+24)

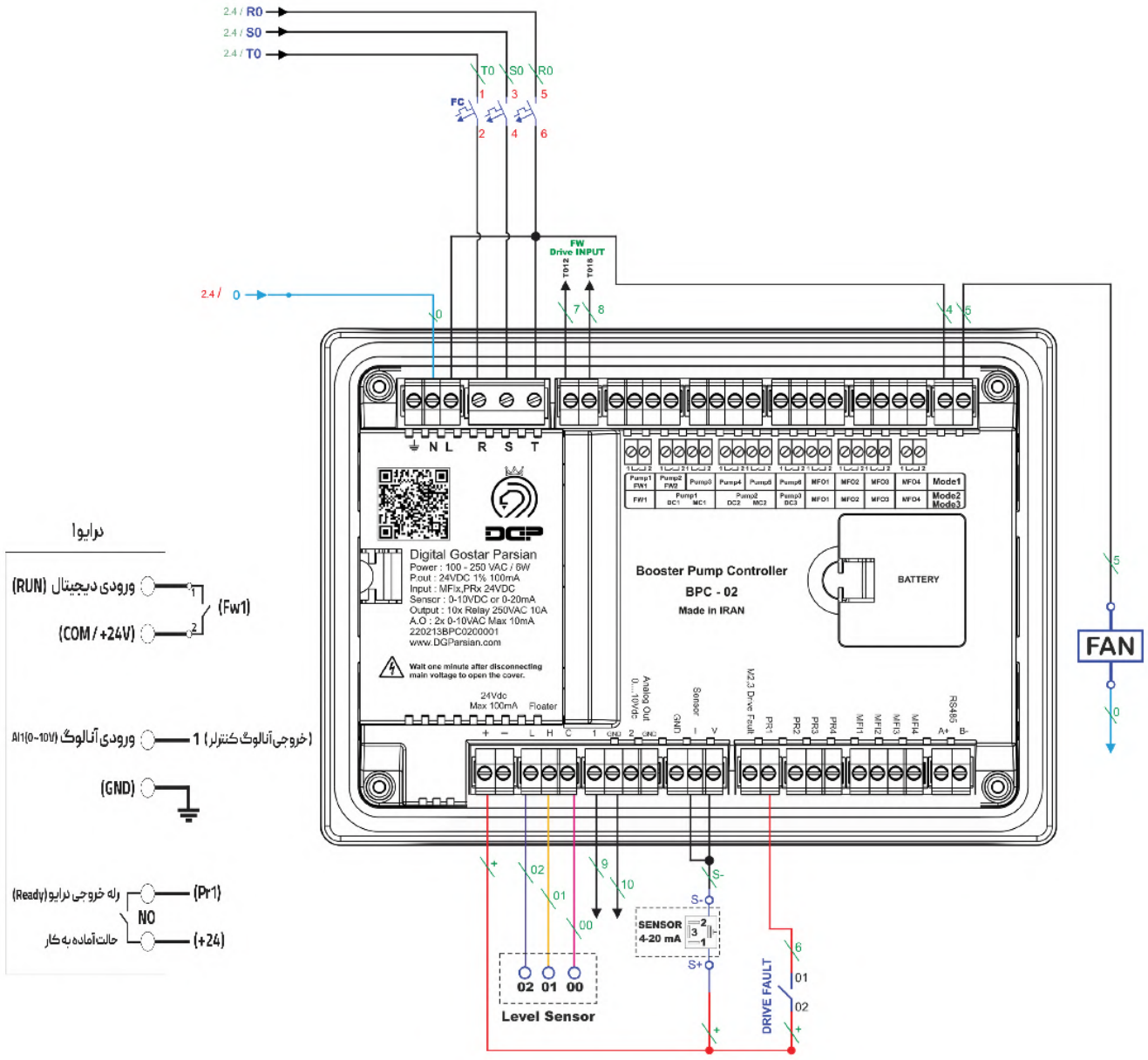


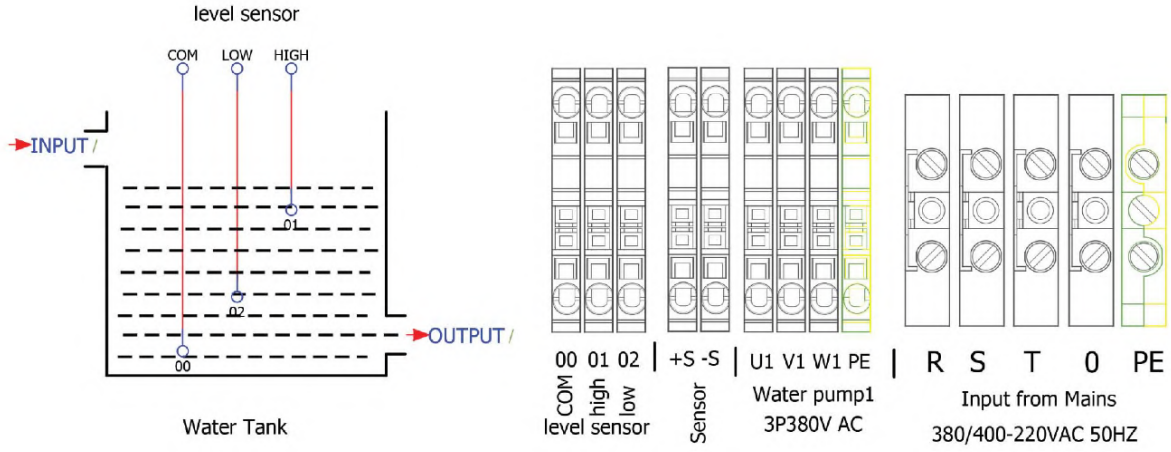
Wiring Diagram (1 Pumps, 1 Drive – Mode 1)

Customer	:	
Plant designation	:	
Drawing number	:	
Commission	:	
Manufacturer (company)	:	
Path (x\eplan8\p)	:	
Project Serial Number:	:	
Project Name:	:	
Project Type:	:	1 Line, 1 Variable Line (Water Pump)
Mounting site	:	
Responsible for project	:	
Part feature	:	

Changed on: 12/23/2019 from (Abbreviation): Number of pages : 4



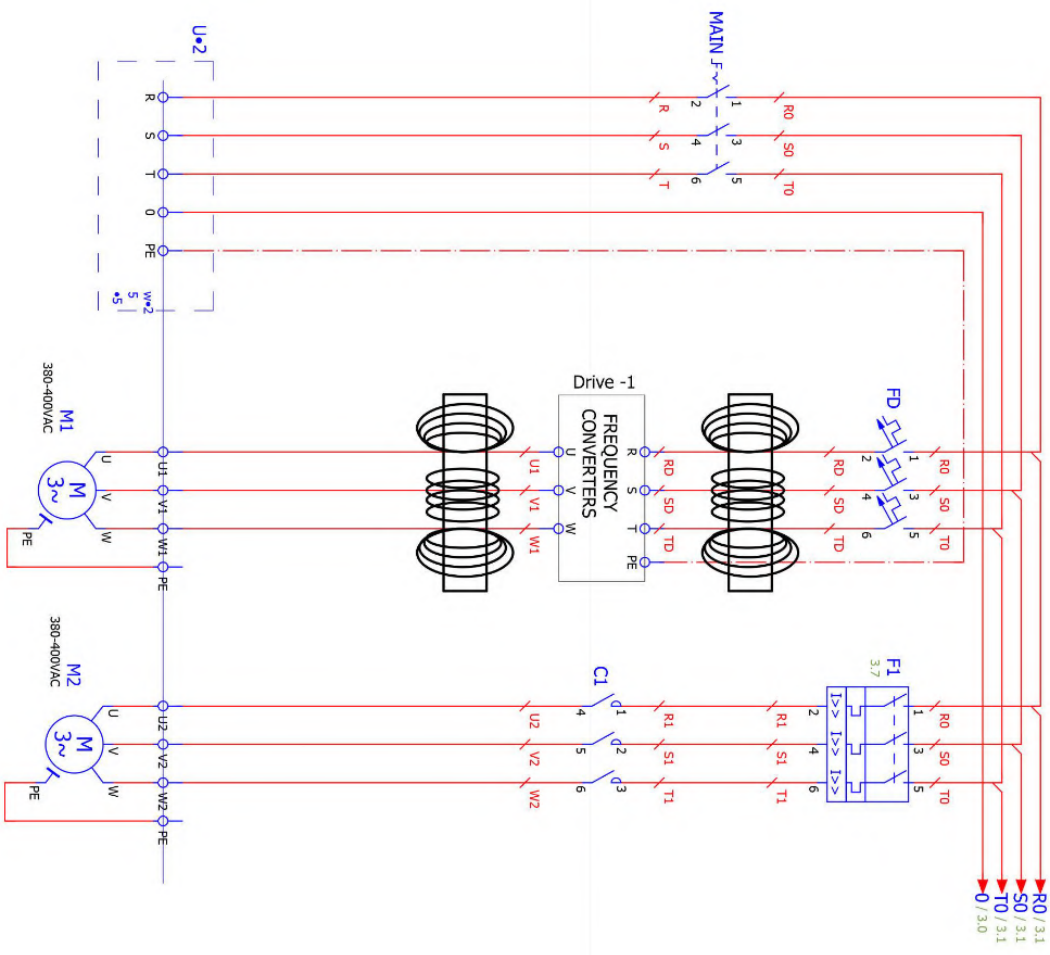

2.4 / R0
2.4 / S0
2.4 / T0
T0 S0 R0
1 3 5
FC
2 4 6
FW
Drive INPUT
T012
T016
2.4 / 0
7 8
4 5
N L R S T
Digital Gostar Parsian
Power : 100 - 250 VAC / 6W
P.out : 24VDC 1% 100mA
Input : MFIx,PRx 24VDC
Sensor : 0-10VDC or 0-20mA
Output : 10x Relay 250VAC 10A
A.O : 2x 0-10VAC Max 10mA
220213BPC0200001
www.DGParsian.com
Wait one minute after disconnecting main voltage to open the cover.
24Vdc Max 100mA
Floater
Booster Pump Controller
BPC - 02
Made in IRAN
BATTERY
Mode1
Mode2
Mode3
FAN
5
0
درایو
ورودی دیجیتال (RUN)
(Fw1)
(COM / +24V)
ورودی آنالوگ (AI1(0~10V
(خروجی آنالوگ کنترلر) 1
(GND)
رله خروجی درایو (Ready)
(Pr1)
NO
حالت آماده به کار
(+24)
02 01 00
Level Sensor
SENSOR
4-20 mA
S-
S+
DRIVE FAULT
6
01
02

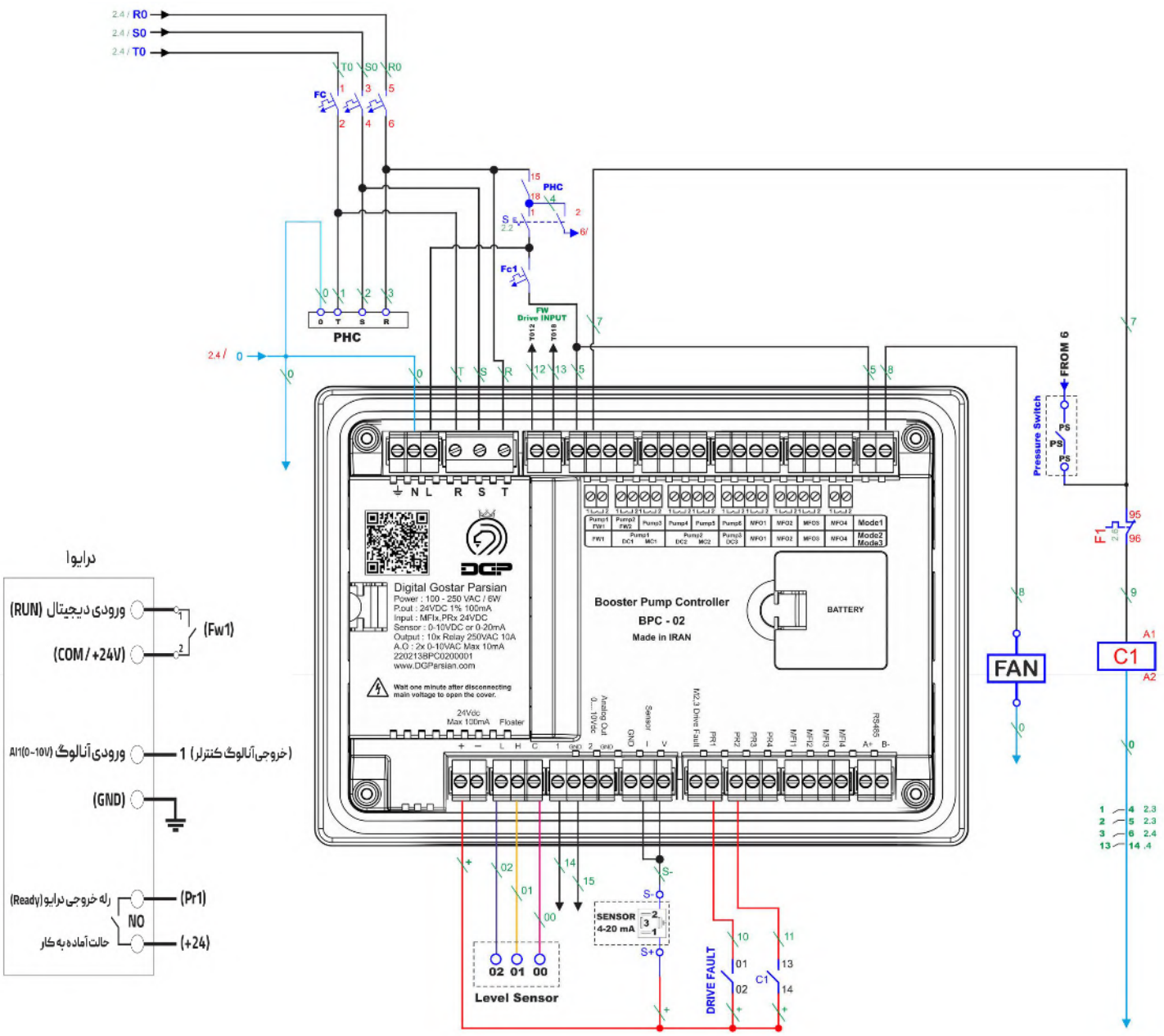

level sensor
COM
LOW
HIGH
INPUT /
01
02
00
OUTPUT /
Water Tank
00 01 02
COM
high
low
level sensor
+S -S
Sensor
U1 V1 W1 PE
Water pump1
3P380V AC
R S T 0 PE
Input from Mains
380/400-220VAC 50HZ

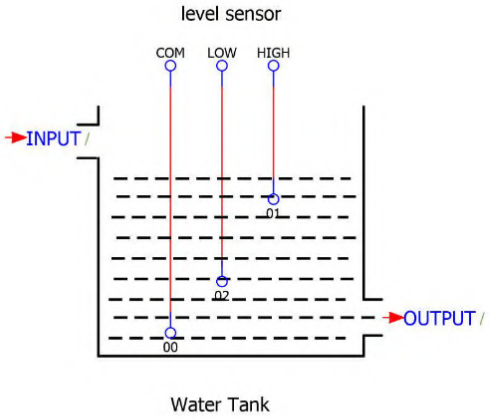
Wiring Diagram (2 Pumps, 1 Drive – Mode 1)

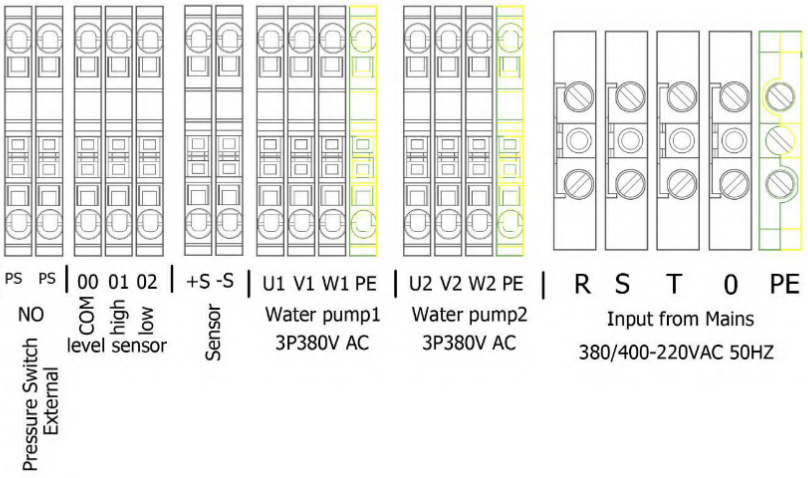
Customer	:
Plant designation	:
Drawing number	:
Commission	:
Manufacturer (company)	:
Path (x\eplan8\p)	:
Project Serial Number:	:
Project Name:	:
Project Type:	: 2 Line, 1 Variable Line (Water Pump)
Mounting site	:
Responsible for project	:
Part feature	:

Changed on: 12/23/2019 from (Abbreviation): Number of pages : 4




2.4 / R0
2.4 / S0
2.4 / T0
T0 S0 R0
FC
PHC
Fc1
FW
Drive INPUT
PHC
0 T S R
2.4 / 0
N L R S T
Digital Gostar Parsian
Power : 100 - 250 VAC / 6W
P.out : 24VDC 1% 100mA
Input : MFIx,PRx 24VDC
Sensor : 0-10VDC or 0-20mA
Output : 10x Relay 250VAC 10A
A.O : 2x 0-10VAC Max 10mA
2202138PC0200001
www.DGPersian.com
Booster Pump Controller
BPC - 02
Made in IRAN
BATTERY
Wait one minute after disconnecting main voltage to open the cover.
24Vdc Max 100mA
Floater
Analog Out 0...10Vdc
Sensor
MX.3 Drive Fault
RS485
FROM 6
Pressure Switch
PS
FAN
C1
A1
A2
F1
95
96
درایو
ورودی دیجیتال (RUN)
(Fw1)
(COM / +24V)
ورودی آنالوگ AI1(0-10V)
(خروجی آنالوگ کنترلر) 1
(GND)
رله خروجی درایو (Ready)
حالت آماده به کار
NO
(Pr1)
(+24)
SENSOR 4-20 mA
S+
S-
02 01 00
Level Sensor
DRIVE FAULT

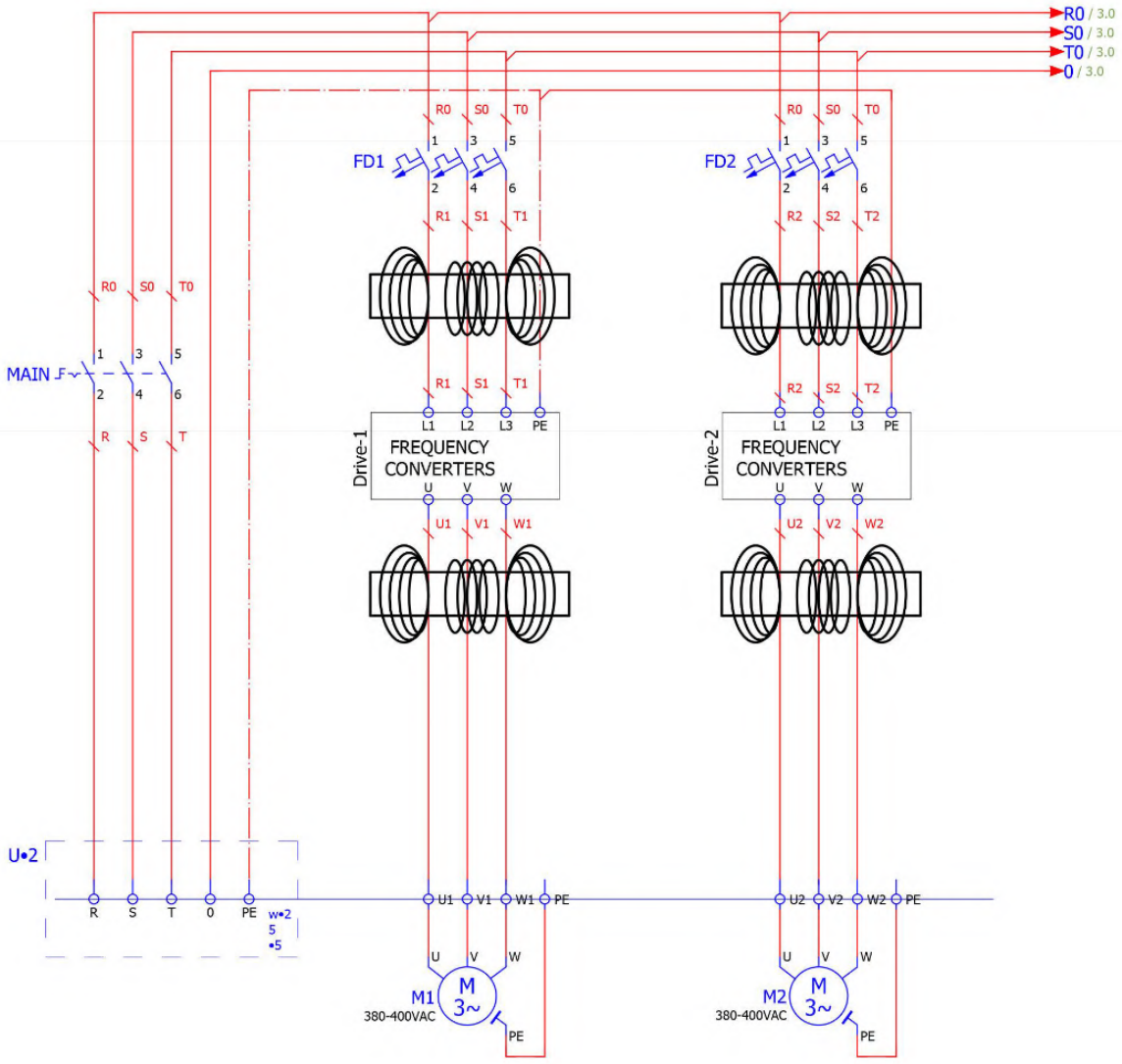

level sensor
COM
LOW
HIGH
INPUT
OUTPUT
01
02
00
Water Tank

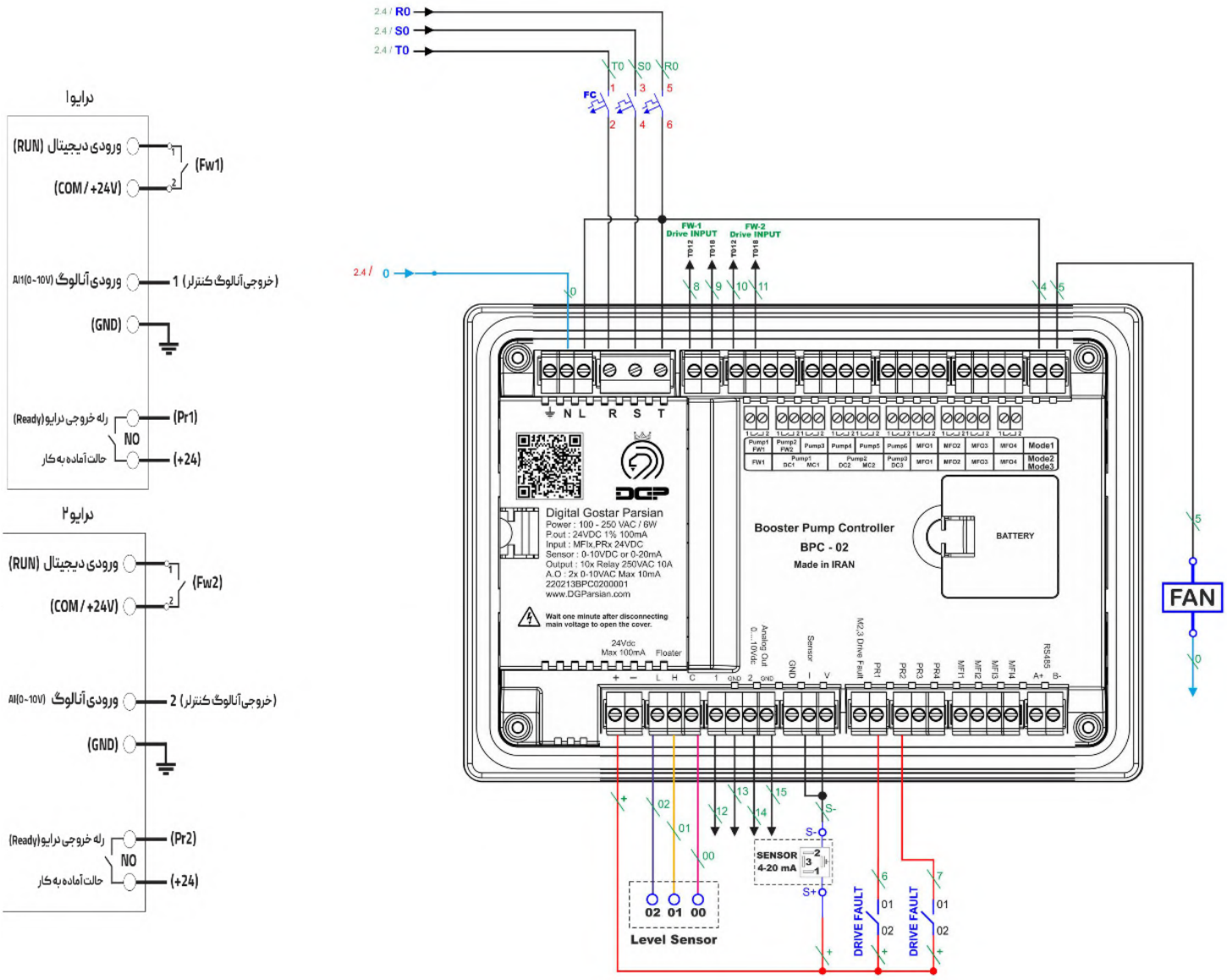

PS PS
NO
Pressure Switch External
00 01 02
COM
high
low
level sensor
+S -S
Sensor
U1 V1 W1 PE
Water pump1
3P380V AC
U2 V2 W2 PE
Water pump2
3P380V AC
R S T 0 PE
Input from Mains
380/400-220VAC 50HZ

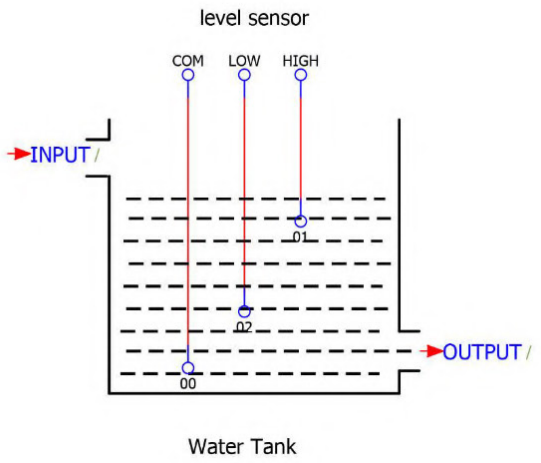
Wiring Diagram (2 Pumps, 2 Drive – Mode 1)

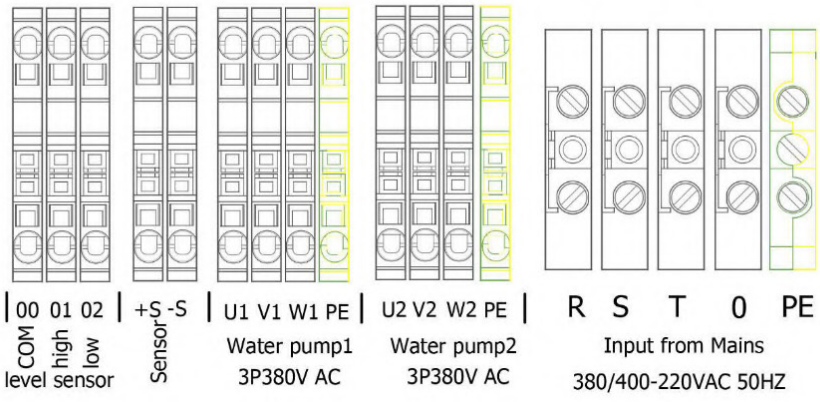
Customer	:	
Plant designation	:	
Drawing number	:	
Commission	:	
Manufacturer (company)	:	
Path (x\eplan8\p)	:	
Project Serial Number:	:	
Project Name:	:	
Project Type:	:	2 Line, 2 Variable Line (Water Pump)
Mounting site	:	
Responsible for project	:	
Part feature	:	

Changed on: 12/23/2019 from (Abbreviation): Number of pages : 4




درایو۱
ورودی دیجیتال (RUN)
(COM / +24V)
(Fw1)
ورودی آنالوگ AI1(0-10V)
(خروجی آنالوگ کنترلر) 1
(GND)
رله خروجی درایو(Ready)
NO
حالت آماده به کار
(Pr1)
(+24)
درایو۲
ورودی دیجیتال (RUN)
(COM / +24V)
(Fw2)
ورودی آنالوگ AI(0-10V)
(خروجی آنالوگ کنترلر) 2
(GND)
رله خروجی درایو(Ready)
NO
حالت آماده به کار
(Pr2)
(+24)
2.4 / R0
2.4 / S0
2.4 / T0
FC
FW-1 Drive INPUT
FW-2 Drive INPUT
2.4 / 0
N L R S T
Digital Gostar Parsian
Power : 100 - 250 VAC / 6W
P.out : 24VDC 1% 100mA
Input : MFIx,PRx 24VDC
Sensor : 0-10VDC or 0-20mA
Output : 10x Relay 250VAC 10A
A.O : 2x 0-10VAC Max 10mA
220213BPC0200001
www.DGParsian.com
Wait one minute after disconnecting main voltage to open the cover.
24Vdc Max 100mA Floater
Booster Pump Controller
BPC - 02
Made in IRAN
BATTERY
FAN
SENSOR 4-20 mA
Level Sensor
02 01 00
DRIVE FAULT
DRIVE FAULT


level sensor
COM
LOW
HIGH
INPUT /
OUTPUT /
01
02
00
Water Tank


00 01 02
COM
high
low
level sensor
+S -S
Sensor
U1 V1 W1 PE
Water pump1
3P380V AC
U2 V2 W2 PE
Water pump2
3P380V AC
R S T 0 PE
Input from Mains
380/400-220VAC 50HZ

NOTE

NOTE

NOTE

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