# DPC 2-3

## Installation and Operating Instructions

DPC 2-3 For Three Phase Dual Pumps up to 16A


GRUNDFOS

# SAFETY

Following are the safety instructions which must be followed by the service partners or user while installing & operating the product. If ignored, physical injury or even death may happen. Read the safety instructions before handling the system.

## ⚠ WARNING

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

- All electrical connections must be carried out by skilled and qualified personnel.
- Never connect AC power to output U, V or W terminals.
- Ensure the motor, controller and power specifications are matching.

## ⚠ CAUTION

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

- Before carrying out any installation or maintenance operation, the controller must be disconnected from the power supply.
- Don't open the cover while the pump is running.
- Don't put wire, metal bar filament etc. into the controller.

NOTE (Notes or attention to ensure safe operation)

**Important**

- The manufacturer is not liable for malfunctioning if the product is not correctly installed, damaged, modified and/or put to run beyond the working range as given in this manual.
- The manufacturer reserves the right to make any modifications to this product from time to time.

# INTRODUCTION

The digital Pump Controller model is easy to use, programmable controller and protection device for direct start with three phase two pumps with output power from 0.75kW – 7. 5kW (1.5 - 16A) each.

The controller has many operation modes for adapting different pumping applications. Important features that distinguish the DPC Series Digital Pump Controllers from other controllers are the push button calibration for overload and the ability of dry run protection without float switches. It shows pump parameter, status and faults, etc.

## APPLICATIONS:

The controller is useful in all cases where there is a need to control and protect two pump installations and managing the automatic operation by a variety of switching methods.

Typical applications:

- Water supply
- Irrigation
- Sewage
- Booster sets
- Rainwater reuse
- Stormwater

## FEATURES:

- Built-in function switch for:
  - Drainage by liquid level control through float switches
  - Boosting water supply by pressure control through pressure switch and tank
  - Transfer of water by liquid level control through float switches
- Dry run protection without float switches
- Auto/ manual switch with screen lock in AUTO mode
- Dynamic LCD displaying for pump running status
- Protect the pump against many faults
- Push button calibration
- Pump accumulative run time
- Last five fault records
- RS485 communication (Modbus)
- Starts and stops the pump in accordance with liquid levels or pressure settings
- Pump shaft anti rust features

# PARAMETERS AND SPECIFICATIONS:

Following chart shows the main technical parameters & specifications:

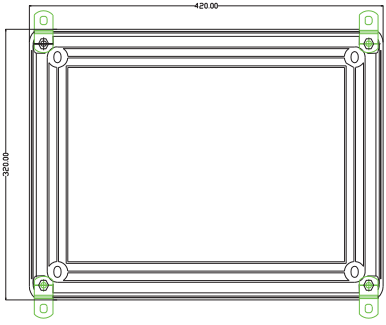
| Main Technical Characteristics | |
|---|---|
| Control characteristic | Double liquid level control |
| | Pressure control |
| Working modes | Manual / auto |
| Drainage application | By using float switch |
| Pressure Boosting application | By using pressure switch |
| Water Transfer application | By using float switch |
| **Main Technical Data** | |
| Rated output power (amperes) | 8 A, 12 A and 16 A |
| Rated input voltage | 415 V |
| Trip response time of overload | 5 sec - 5 min |
| Trip response time of open phase | < 2 sec |
| Trip response time short circuit | Less than 0.1 sec |
| Trip response time of under/over voltage | Less than 5 sec |
| Trip response time of dry run | 6 sec (or this can be set manually) |
| Recovery time of overload | 30 min (or this can be set manually) |
| Recovery time of under/over voltage | 5 min |
| Recovery time of dry run | 30 min (or this can be set manually) |
| Trip voltage of over voltage | 115 % of rated input voltage |
| Trip voltage of under voltage | 80 % of rated input voltage |
| **PROTECTIONS COVERED** | Dry run (without float/ probe) |
| | Overload (auto-calibrated or can be set) |
| | Transient surge |
| | Under voltage |
| | Over voltage |
| | Pump stalled |
| | Short circuit |
| | Phase loss (incoming & outgoing) |
| | Phase reversal |
| | Pump shaft anti rust protection |
| **Other Technical Data** | |
| Permissible ambient temperature | -5 to +50 deg C |
| Degree of protection | IP 55 |
| Installation position | Vertical |
| Unit dimensions (L X W X H) | 320 x 420 x 138 mm |
| Physical interface | RS485 bus interface: Asynchronous |
| Baud rate | 1200, 2400, 4800, 9600 bps (default) |
| Protocol type | MODBUS protocol (RTU) |

# INSTALLATION

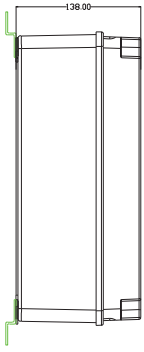
Please read this manual carefully before starting installation and operation. Any damage to the equipment caused due to failure to comply with the descriptions in this manual in installation or operation will be beyond the scope of the company's quality guarantee.

## TOOLS USED IN CONTROLLER INSTALLATION:

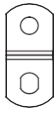
Controller installation and wire installation will need the following tools, you also can choose the right tools according to your own experience.




Back view



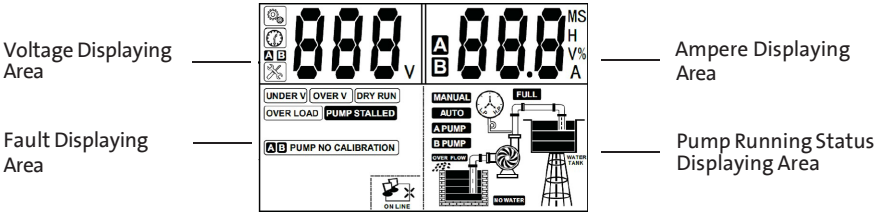

Side view



wall Mounting clamp


## CONTROLLER COMPONENTS:

### LCD SCREEN



## MEANING OF THE ICONS SHOWN ON THE LCD:

The parameter configuration icon, when this icon appears, controller is in manual parameter adjustment mode.

Time displaying icon, when this icon appears, it mean controller is displaying some parameter of time, eg: pump dry run trip time(units: seconds).

Pump fault icon, when this icon appears, it means controller is displaying some fault condition.

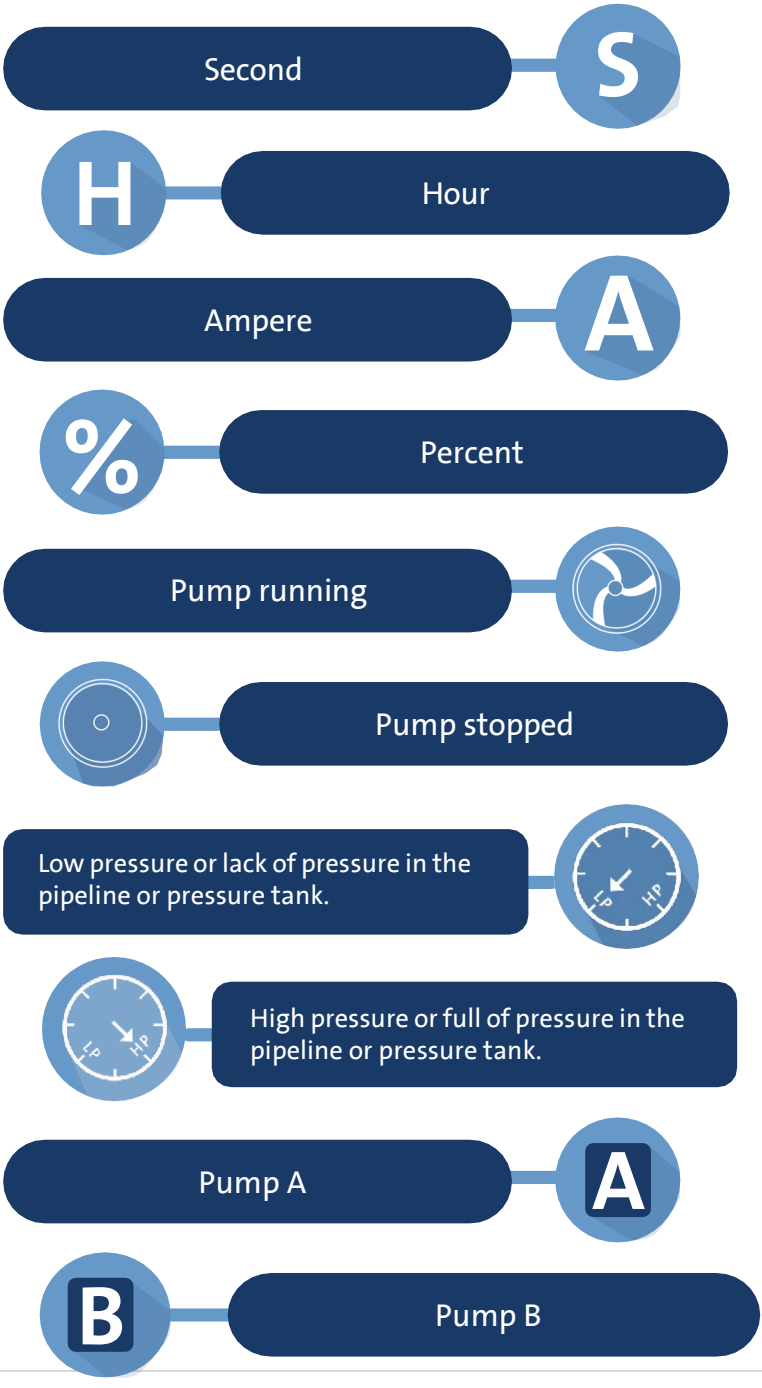
Network connection error icon, when this icon appears, it means there is no network connection or network connection error between pump controller and computer/SCADA/BMS.

Network normal connection icon, when this icon appears, it means the network connection between pump controller and computer/SCADA/BMS.

Voltage



Minute

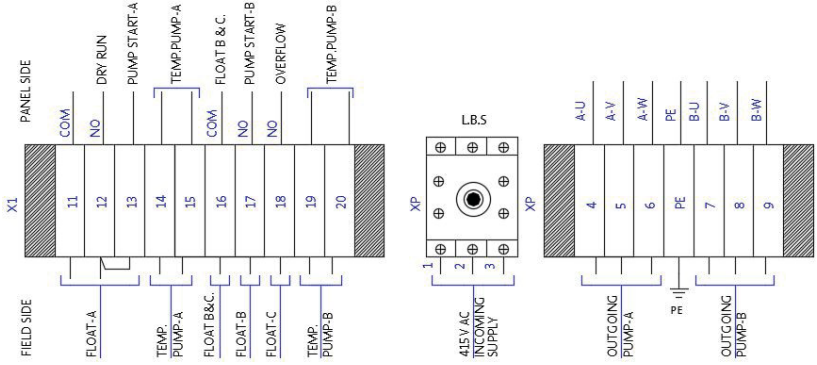

Second
S
H
Hour
Ampere
A
%
Percent
Pump running
Pump stopped
Low pressure or lack of pressure in the pipeline or pressure tank.
LP
HP
High pressure or full of pressure in the pipeline or pressure tank.
Pump A
A
B
Pump B

## INSTALLATION - DRAINAGE:

Please read this manual carefully before starting installation and operation. Any damage to the equipment caused due to failure to comply with the descriptions in this manual in installation or operation will be beyond the scope of the company's quality guarantee.

## TERMINALS

*Using float switch*

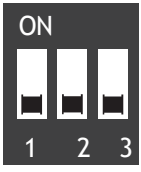



**DANGER** Electric shock risk.

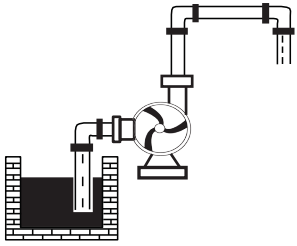
- Before carrying out any installation or maintenance operation, the controller should be disconnected from the power supply and the person should wait at least 2 minutes before opening the controller.
- Never connect AC power to output U1 V1 W1 terminals.
- Ensure the motor, controller, and power specifications match.
- The electrical and hydraulic connections must be carried out by competent, skilled, qualified personnel.

## DIP SWITCH SETTINGS

Users can set the function switch to suit different applications. Before setting the function switch, The unit should be disconnected from the power supply. After completing the settings of dip switches, Power may be applied to the unit. Following signs will be displayed in voltage displaying area on the LCD conforming to the following list:

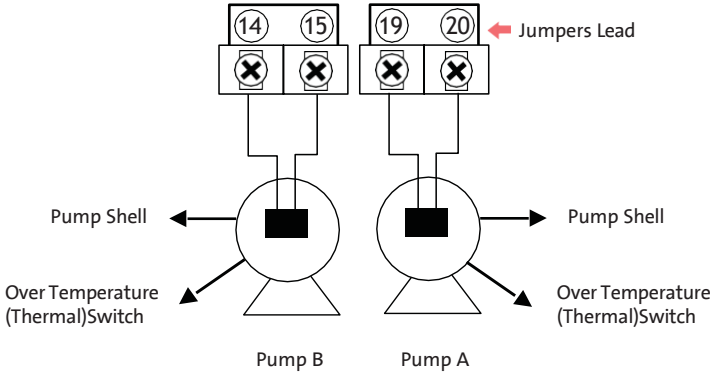



Drainage Setting Switches Down



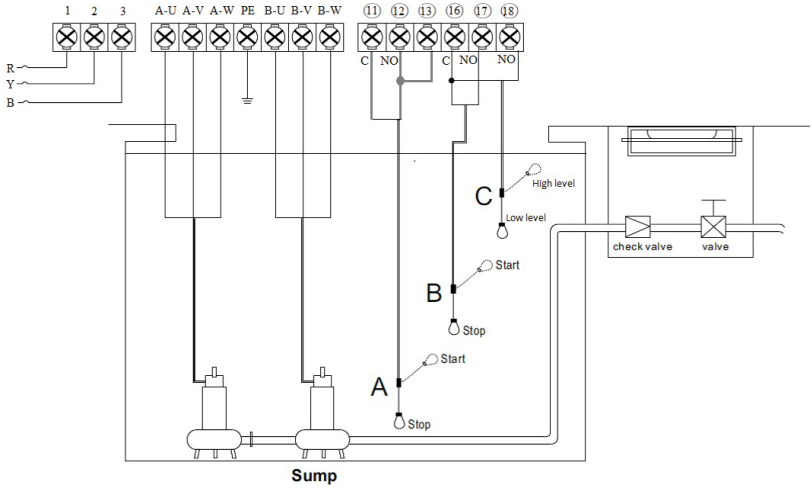
Drainage Symbol

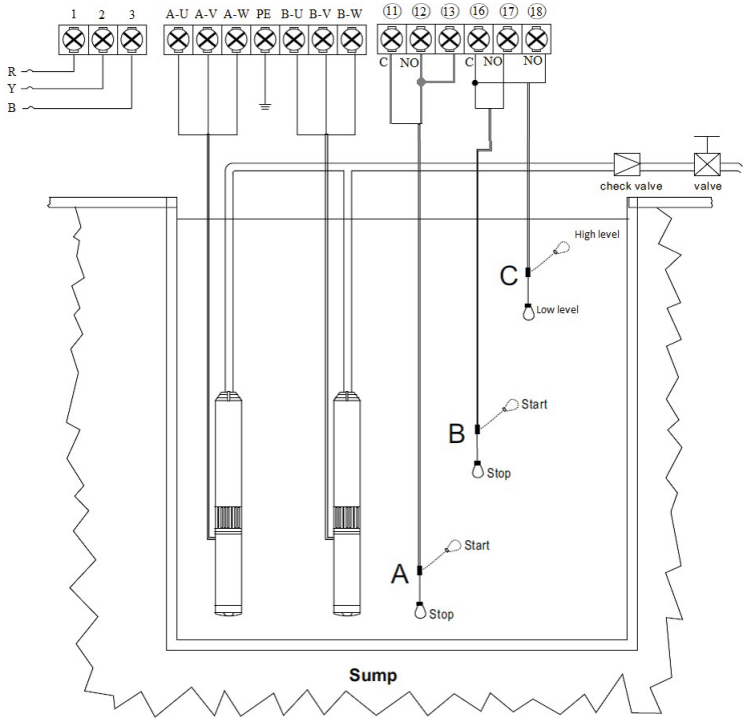
*Connections for pump over temperature protection (where supplied with pump)*




**NOTE:** To enable the pump's over temperature protection connect the pump's thermistor leads to terminals 14 and 15, 19 and 20 and remove the jumper.
If the pump is without thermistor switch, please use jumper to connect terminals 14 and 15, 19 and 20.
Do not run or lay the float switch wire, it must be inside the metal pipe. So, use PVC or PE tubing.

# ELECTRICAL CONNECTIONS



**Start Condition:** Liquid level in the sump reaches float switch A (up) the controller will start the pump and the controller will alternate the pump on every start cycle.

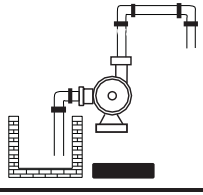
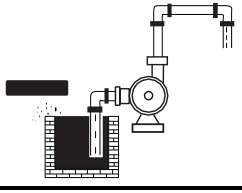
**Stop Condition:** Liquid level in the sump is reaches low level (float switch A is down) the controller will stop the pump.

**2nd Pump Start Condition:** Liquid level in the sump reaches float switch B (up) the controller will run the second pump. Pumps run simultaneously until liquid level reaches low level (float switches A and B down).

**Alarm Condition:** While pumping, if the liquid level rises in the sump to high level (float switch C up), the controller will sound the alarm to warn the user to take further action.

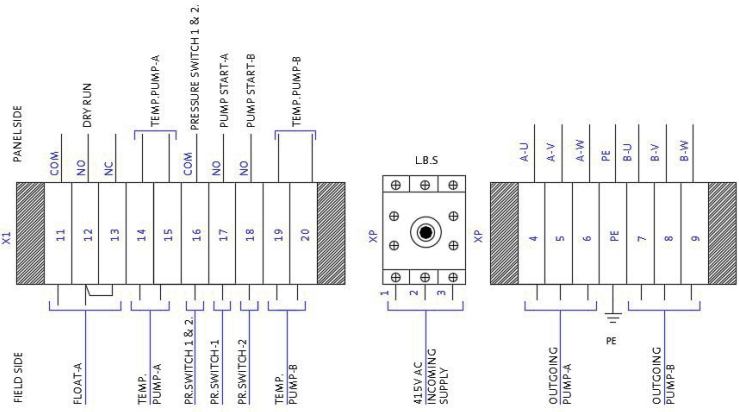
**Auto Antirust function:** Under Auto mode, if controller observes that pumps didn't run for ten days then the controller will run the pump A for 3 seconds and stop, after 10 seconds interval, controller will run pump B for 3 seconds and stop. Auto antirust can prevent pump rusting and jamming of impeller due to pumps not running for a long time.

## Meanings of the messages & graphic shown on the LCD screen

| Messages & Graphics | |
|---|---|
|  | Lack of water in sump |
|  | Overflow in sump |

## INSTALLATION - BOOSTING:

### TERMINALS



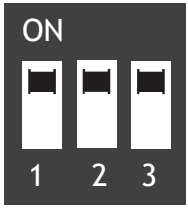

### DANGER Electric shock risk.

- Before carrying out any installation or maintenance operation, the controller should be disconnected from the power supply and the person should wait at least 2 minutes before opening the controller.
- Never connect AC power to output U1 V1 W1 terminals.
- Ensure the motor, controller and power specifications match.
- The electrical and hydraulic connections must be carried out by competent, skilled, qualified personnel.

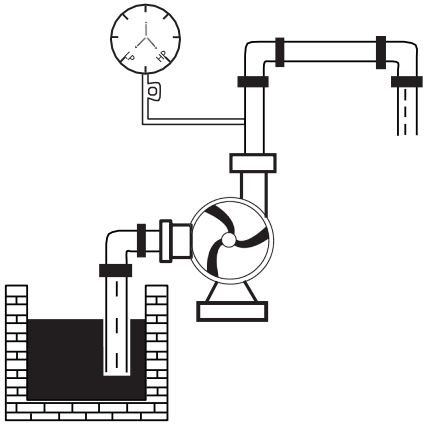
### DIP SWITCH SETTINGS

Users can set the function switch to meet different applications. Before setting the function switch, the controller should be disconnected from the power supply.

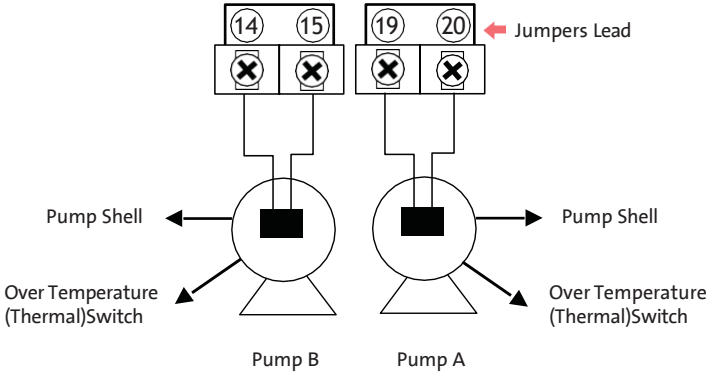
After completing the setting, apply power to the controller and observe the application sign displayed on the LCD conforming to the BOOSTING symbol.



Boosting Setting Switches UP

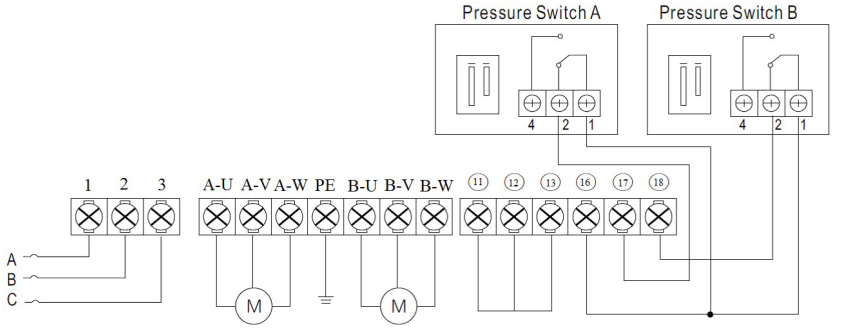

Boosting Symbol

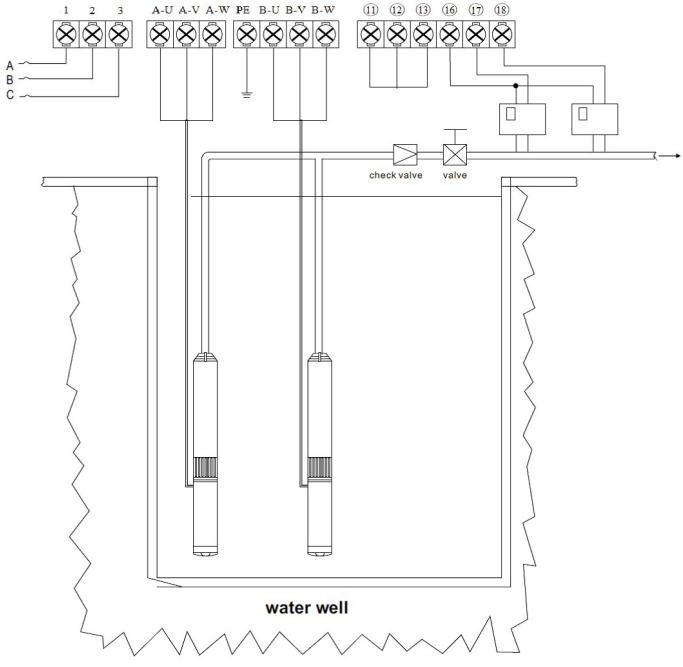
*Connections for pump over temperature protection (where supplied with pump)*



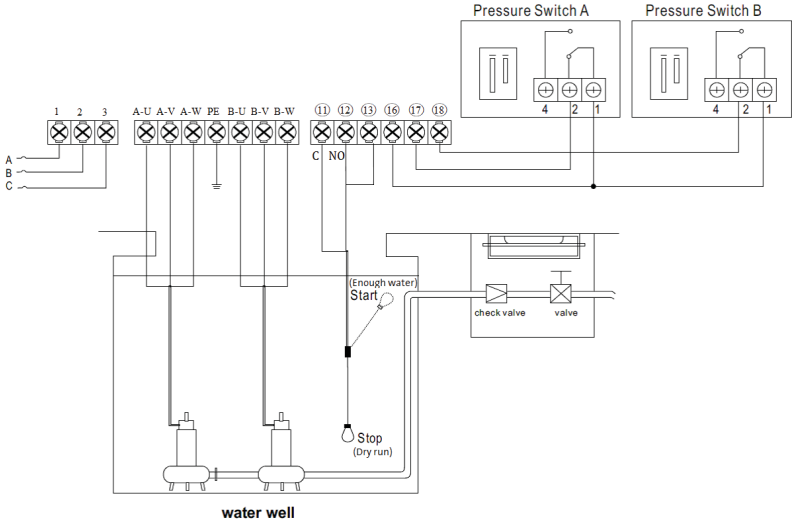

NOTE: To enable the pump's over temperature protection, connect the pump's thermistor leads to terminals 14 and 15, 19 and 20 and remove the jumper.
If the pump is without thermistor switch, please use jumper to connect terminals 14 and 15, 19 and 20.

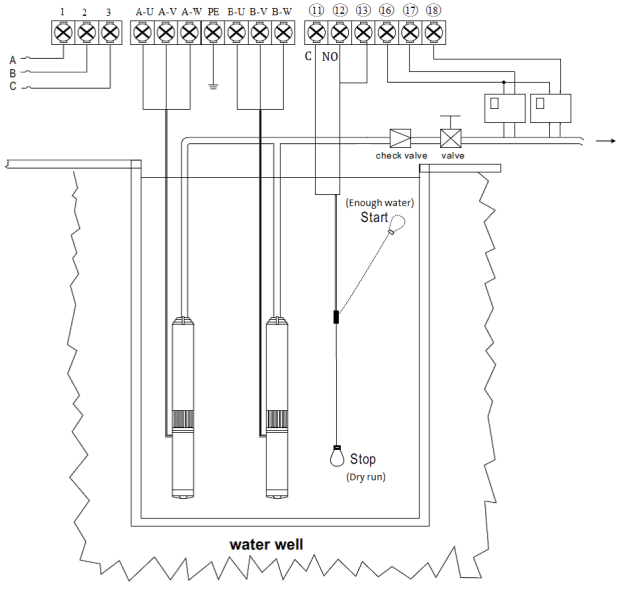
## WATER SUPPLY BY USING PRESSURE CONTROL THROUGH PRESSURE SWITCH



# WATER SUPPLY BY PRESSURE CONTROL THROUGH PRESSURE SWITCH AND DRY RUN THROUGH FLOAT SWITCH



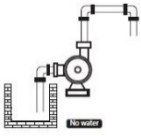
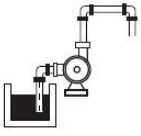



**Normal Demand:** When pressure in the pipeline is lower than the pressure switch B setting, controller will order single pump to run; pressure in the pipeline reaches the pressure switch B setting, single pump stops running; controller will alternate double pumps running automatically when pressure in the pipeline varies in the range of pressure switch B.

**Extra Demand:** When single pump is running, pressure in the pipeline still decrease to the pressure switch A setting, controller will give command to second pump to run simultaneously, till pressure in the pipeline reaches the pressure switch B setting, both pumps will not stop unless the pressure in the pipe line reaches the pressure switch A setting.

**NOTE:** Pressure Switch A = Low Pressure Switch, Pressure Switch B = High Pressure Switch.

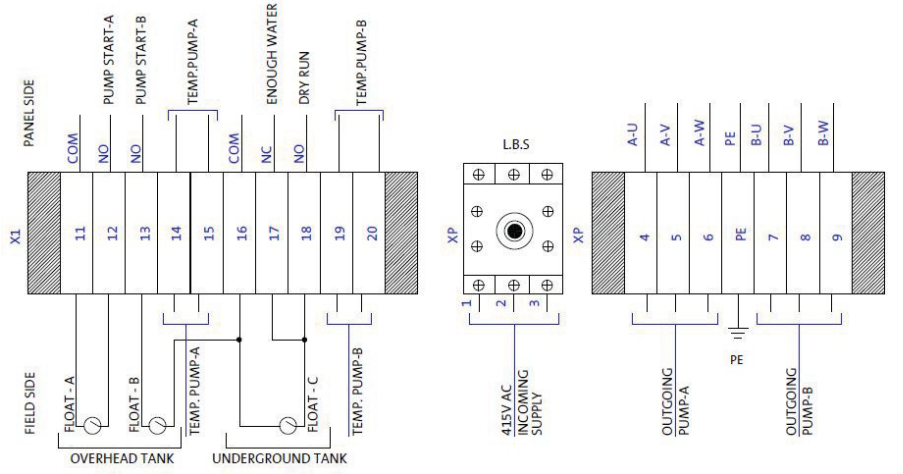
## Meanings of the messages & graphic shown on the LCD screen

| Messages & Graphics | Description |
|---|---|
|  | Low water level in source tank |
|  | Enough water in source tank |
|  | High pressure in pipeline or pressure tank |
|  | Low pressure in pipeline or pressure tank |

## INSTALLATION - WATER TRANSFER:

### TERMINALS

*Using float switch*

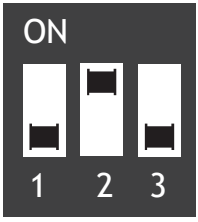



**DANGER** Electric shock risk.

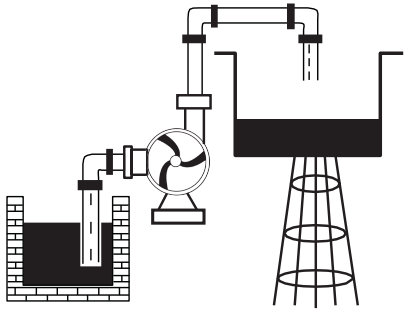
- Before carrying out any installation or maintenance operation, the controller should be disconnected from the power supply and one should wait at least 2 minutes before opening the controller.
- Never connect AC power to output U1 V1 W1 terminals.
- Ensure the motor, controller and power specifications.
- The electrical and hydraulic connections must be carried out by competent, skilled, qualified personnel.

## DIP SWITCH SETTINGS

Users can set the function switch to meet different applications. Before setting the function switch, the controller should be disconnected from the power supply.
After completing the setting, apply power to the controller and observe the application sign displayed on the LCD conforming to the TRANSFER symbol.

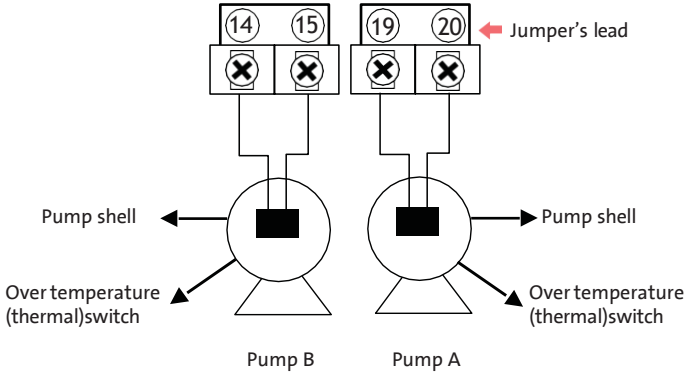



Transfer Setting



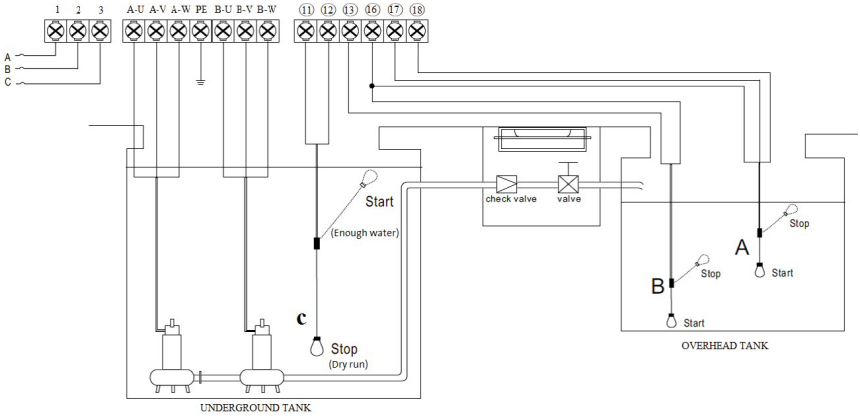
Transfer Symbol

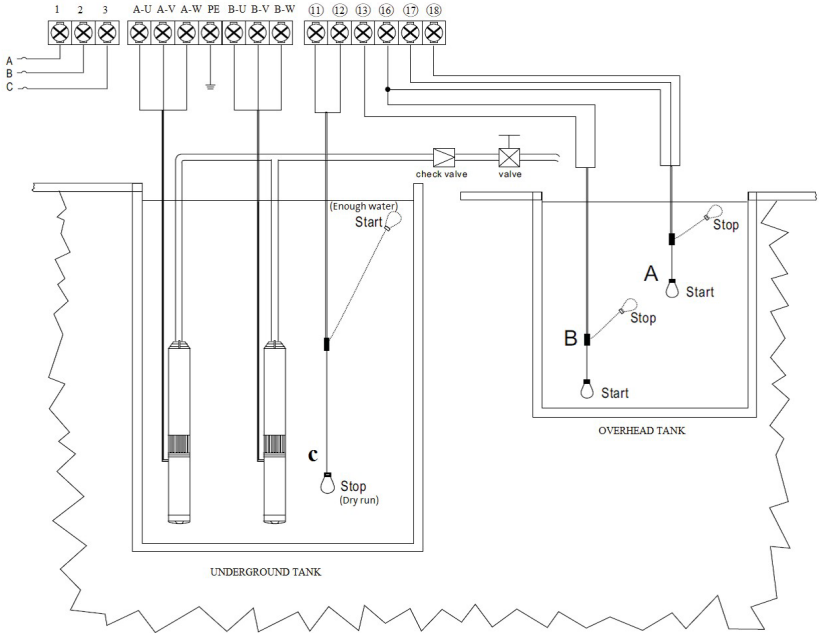
*Connections for pump over temperature protection (where supplied with pump)*




NOTE: To enable the pump's over temperature protection connect the pump's thermistor leads to terminals 14 and 15, 19 and 20 and remove the jumper.
If the pump is without thermistor switch, please use jumper to connect terminals 14 and 15, 19 and 20.

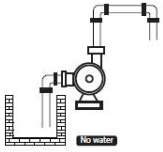
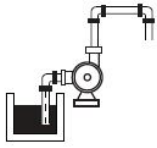
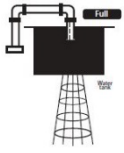
# ELECTRICAL CONNECTIONS



**Normal Demand:** when the liquid level in the overhead water storage tank is lower than (float switch A: Down), controller will order single pump to run; Liquid level reaches tank full level (float switch A: Up), pump stops running; controller will alternate both pumps on every start cycle.

**Extra Demand:** When single pump is running and liquid level is still decreasing to low level in overhead tank (Float Switch B: Down), controller will command second pump to run simultaneously, until liquid level reaches tank full level (Float Switch A & B: Up), both pumps will now stop.

| Messages & Graphics | Description |
|---|---|
|  | Low water level in source tank |
|  | Enough water in source tank |
|  | Low level in overhead tank |
|  | Overhead tank full |

# OPERATION

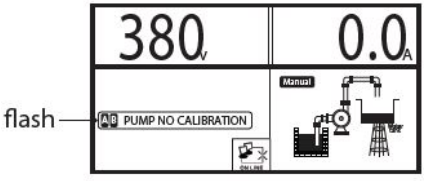
## BEFORE YOU START - Parameter calibration and erasing

To achieve best level of protection of the pump, it is essential that parameter calibration be done immediately after successful pump installation or pump maintenance.

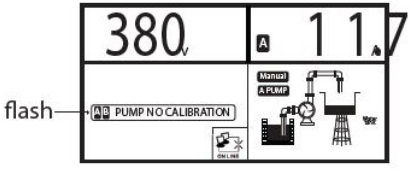
## PARAMETER CALIBRATION:

Pump/s must be able to pump water to enable correct calibration. If pumps are calibrated without water, overload and pump stalled errors may occur

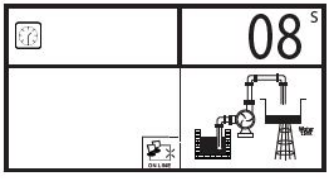
1. Press the MODE key to switch to manual mode. If the controller is locked press MODE and STORE keys at the same time to unlock and go into manual mode. Make sure that the pump is not running, and LCD screen is displaying:




2. Press the A START key to run pump A, confirm the pump and all pipe network is in normal working state (including voltage, amps etc.) with LCD screen displaying:

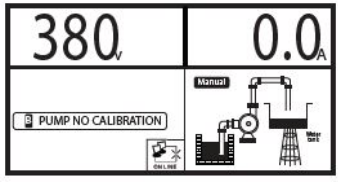



3. Press the A START key. The controller makes a "beep" and a countdown starts with the LCD displaying: Controller now counts down from 8 seconds:




5. Pump A is ready for running.

4. The pump stops running and parameter calibration is completed with LCD displaying:



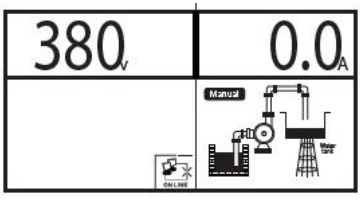

6. Press the B START key to repeat calibration for pump B. And follows the same procedure.

## ERASING FORMER PARAMETERS:

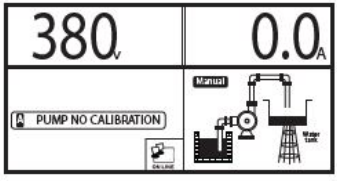
When pump is reinstalled after maintenance or a new pump is installed, user must erase the former calibration and a new calibration must be done.

## ERASING THE PARAMETER CALIBRATION:

1. Press the MODE key to switch to manual mode. If the controller is locked press MODE and STORE keys at the same time to unlock and go into manual mode. Make sure that the pump is not running and LCD screen is displaying:




2. Press the A STOP key for 3 seconds; the controller makes a "beep" sound, and the controller recovers the default factory setting and A PUMP no calibration flashing will appear in the LCD displays:




3. Repeat for pump B by using the B STOP key for 3 seconds.

## SWITCHING TO AUTO MODE:

To switch between MANUAL and AUTO mode press MODE key. AUTO mode automatically locks controller. Under AUTO mode the controller will run or stop the pump according to the signal from the float switch.

## NOTE:

- Under AUTO mode, if the pump is running and user wants to stop the pump, press the MODE key to switch to MANUAL mode and the pump stops.
- Under AUTO mode, if the input power is cut off and resumed, the controller will come into operating state after a 10 seconds countdown.
- No matter if the controller is AUTO or MANUAL state, if the input power is cut off and resumed again, the control panel will resume its operation in the same state as before the power being cut off.

## SWITCH TO MANUAL MODE:

To switch between AUTO and MANUAL model press MODE and STORE keys at the same time to unlock and go into MANUAL mode. Press the START key to start the pump and the STOP key to stop the pump.

## ALARM TEST:

Under MANUAL mode and pump/s not operating press STORE for 3 seconds to test the alarm.

## PUMP PROTECTION:

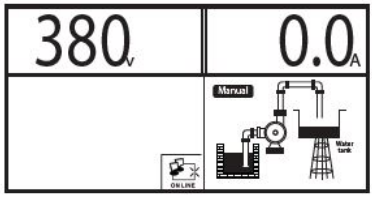
During pump running, if dry run, overload, over voltage, etc. failures occur, the controller will immediately shut down the running pump and automatically execute a check for restarting conditions after a built-in time delay has elapsed. The controller will not recover automatically until all the abnormal situations have been cleared. If pump stalled, open phase or other serious failure has occurred, pump user must immediately check pump and motor.

## LAST FIVE FAILURE RECORD:

The control panel can memorize the last five failures of pump, so it is very convenient for the users to analyze the pump running conditions.

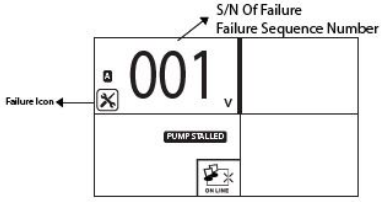
### DISPLAYING THE LAST FIVE:

1. Press the MODE key to switch to MANUAL mode, make sure the pump is not running and the LCD screen is displaying:




2. Press and hold A STOP key and MODE key, the controller makes a “beep” sound and displays pump A failure record.

3. Press the A STOP key to quit the failure record display:



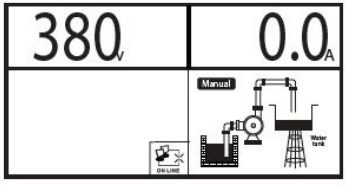

NOTE: The failure displayed above is PUMP STALLED. Repeat for pump B by using B STOP key.

## PUMP ACCUMLATIVE RUNNING TIME:

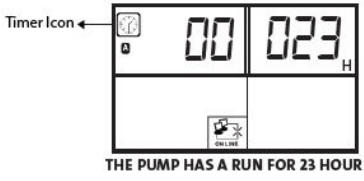
The controller can memorize how many hours that pump has run, so it is very convenient for the pump user to analyze the pump running conditions and do maintenance.

## DISPLAYING THE PUMP ACCUMLATIVE RUNNING TIME:

1. Press the MODE key to switch to manual mode, make sure that the pump is not running and the LCD screen is displaying:




2. Press and hold the STORE key and A STOP key. The controller makes a "beep" sound and displays the accumulative run time. The pump has run for 23 hours.




3. Press the A STOP key to quit the accumulative running time display.

4. Repeat for pump B by using B STOP key.

# COMMUNICATION LINK

The controller has communication interface, between the pump controller and computer/SCADA/BMS, users can realize a long-distance monitoring function.

This function applies to where the controller is installed in the basement or pumping room, but users require to monitor and control the pump on the ground or in a control room.

## BASIC FUNCTION:

Computer/SCADA/BMS (Optional) with communication interface can realize long distance monitoring. In the control room, users can realize all the functions of the master controller through the slave controller, except parameter calibration and adjusting.

## SPECIAL APPLICATION:

As adopting communication interface, the communication distance through wire is less than 1200 meters. whereas for a longer communication distance like mine, water tower, across railway road and bridge etc., users can adopt RS485 extender.

## TECHNICAL PARAMETER:

The following chart shows main technical parameters of communication between the pump controller and Computer/SCADA/BMS.

| **Main Technical Data** | |
|---|---|
| Physical interface | RS485 Bus Interface: asynchronous semi duplex |
| Data format | 1 start bit, 8 data bit, 1 stop bit, no verify |
| | 1 start bit, 8 data bit, 2 stop bit, no verify |
| | Default: 1 start bit, 8 data bit, 1 stop bit, no verify |
| Baud rate | 1200,2400,4800,9600 bps (default 9600bps) |
| | Setting range of controller address: 1-126 |
| | 127: broadcast address, host computer broadcasting, |
| | slave machine response forbidden |
| Protocol type | MODBUS protocol (RTU) |
| Rated input voltage for SC | AC 240V/50Hz, single phase |
| **Main Installation Data** | |
| Wire communication distance | 1200 meters max by shield twisted pair cable (STP) for RS485 & CAN |
| | 5000 meters max by shield twisted pair cable (STP) and RS485 extender |
| STP | STP-120U one pair 20AWG for RS485 & CAN |
| RS485 extender | 5000 meters (9600bps) |

# TROUBLE SHOOTING GUIDE

| Fault message | Possible cause | Solutions |
|---|---|---|
| Flashing of **UNDER V** | The real running voltage is lower than the set voltage, pump is in under voltage protection state. | Report low line voltage to the power supply company. |
| | | Control will attempt to restart the pump every 5 min until line voltage is restored to normal. |
| Flashing of **OVER V** | The real running voltage is higher than the set voltage, pump is in over voltage protection state. | Report high line voltage to the power supply company. |
| | | Controller will attempt to restart the pump every 5 min until line voltage is restored to normal. |
| Flashing of **OVERLOAD** | The real running ampere is higher than the calibrated/set running ampere, pump is in overload protection | Controller will attempt to restart the pump every 30 min until running ampere is restored to normal. |
| | | Inspect pump and motor winding. |
| Flashing of **PUMP NO CALIBRATION** | Parameter calibration not completed. | Refer to parameter calibration setting. |
| Flashing of **DRY RUN** | Liquid level in the well/ sump is below the pump intake, pump stops running. | Controller will attempt to restart the pump every 30 min until liquid level is above the pump. |
| Flashing of **PUMP STALLED** | Pump running amps exceeded normal run amps by more than 200%. | Cut off power supply and repair or replace pump. |
| Flashing of REPEATED START | Pump starts more than 5 times per minute. | • Check pressure tank pre charge<br>• Check pressure tank bladder<br>• Check pressure switch settings<br>• Check pressure switch for defects. |
|  ON LINE | No communication link between SC / computer and control. | Connect the control to SC / computer to realize long distance monitoring. |

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