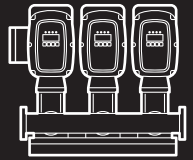


BOOSTER PUMP SYSTEM **NSQ**



Booster Pump System User Manual

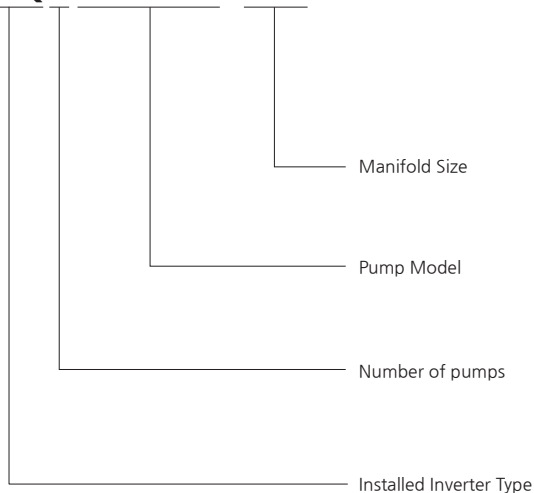
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Model Code

NSQ 3 XRL 10-6 - 80A



* Inverter Specifications

Category	Description
Model	NSQ-Drive
Features	Integrated Inverter with Dedicated Pump Controller 
Technical Specifications	Power Range : 0.75~22kW Input Power : 3Øx380~440V (0.75~22kW) Output Power : 3Øx380V Frequency : 50/60Hz



Preface

- Thank you for choosing the dooch booster pump system.
This product is designed with an advanced control system for easy operation and features optimal functions for quick troubleshooting.
Please read this manual carefully to ensure the safe and efficient use of the product.
- The functions and specifications in this manual are subject to change without prior notice for product improvement.

Safety Precautions

- These safety precautions are intended to prevent accidents or hazards and ensure the safe and proper use of the product. Please read and strictly follow them.
- This user manual uses two types of safety alerts: 'WARNING' and 'CAUTION'.
- These indicators serve as warnings about the potential for misuse of the product.
- To fully understand the instructions regarding safe procedures, please read the entire manual before use.
- Please keep this manual in a location where it is easily accessible to users at any time.

Symbol	Description
 CAUTION	CAUTION : Indicates a potentially hazardous situation which, if not avoided, could result in equipment failure, serious injury, or death.
 WARNING	WARNING : Indicates a potentially hazardous situation which, if not avoided, could result in minor product damage and property loss.



Safety Guidelines

Classification	Description
 WARNING	Do not open the drive cover while the power is connected or during operation. (High-voltage terminals or DC voltage charging components are exposed, which may cause electric shock.) Do not open the drive cover even when the power is disconnected, except for wiring or inspection work. (Even when the power is disconnected, voltage may still remain in the drive's DC charging unit, potentially causing electric shock.) When performing wiring or inspection work, disconnect the input power supply and wait for at least 10 minutes. Then, use a voltage meter to confirm that the drive's DC voltage has fully discharged. (Electric shock may occur. Please perform operations only when the voltage of the DC charging unit is below DC 30V.) Do not operate switches or the drive with wet hands. (This may cause electric shock.) Do not turn on the power or operate the drive if the insulation on its input or output power cables is damaged. (This may cause electric shock.) Do not place heavy objects on the drive's input/output power cables or signal lines. (The cable insulation may be damaged, leading to electric shock.)
 CAUTION	Do not install the drive near flammable materials. (Installing on a flammable material or attaching it close to flammable substances may cause a fire.) Turn off the input power supply if the drive malfunctions. (Failing to disconnect the input power supply may lead to secondary accidents and potentially cause a fire.) Do not touch the drive while it is powered on or within a few minutes after it has been powered off. (This may cause electric shock.) Do not supply power to a drive with damaged products or components, even if installation is complete. (This may cause electric shock.) Prevent screws, metal objects, water, oil, or any other foreign substances from entering the inside of the drive. (A fire may occur.)



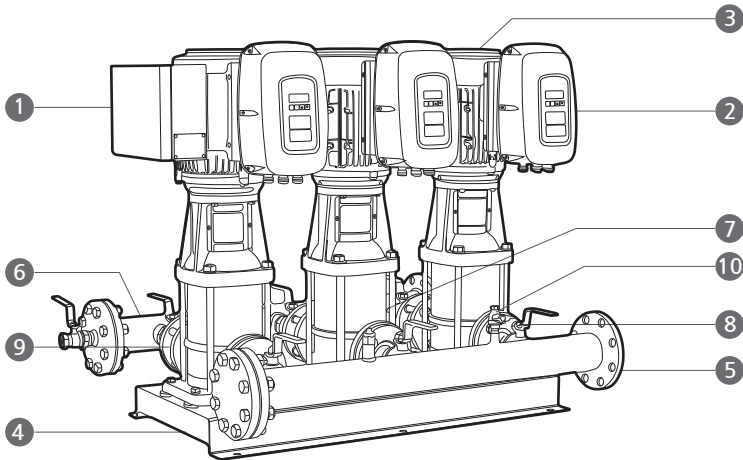
Product Features

- Application of new technology for booster pump systems
- Minimizes pressure fluctuations with a highly durable multi-inverter
- Optimal structural design achieved through a controller module
- Remote control via RS-485 serial communication and Ethernet (Optional)
- It is an advanced computer-controlled system that controls the pump rotation speed via an inverter using the latest electronic technology. It features end-pressure control technology that autonomously determines and adjusts the water supply pressure according to the water flow and consumption, along with various intelligent functions.
- It is equipped with comprehensive functions, including dry-running protection using a pressure tank, abnormal condition alarms, fully automatic sequential operation, scheduled alternating operation, operation based on cumulative power consumption, automatic skip for faulty pumps, and operation data display and storage capabilities.

Main Functions	Description
Latest PID Control	State-of-the-art PID control driven by a Micro Processor
Sequential Operation	Sequential starting and stopping of pumps
Dry-Running Protection	Stops operation and triggers an alarm when there is no water in the suction pipeline
Faulty Pump Skip	Automatically skips to the next available pump for operation if a specific pump fails
Motor Overcurrent Protection	Automatic trip if the motor starting current exceeds the set value
Self-Diagnostic Operation	Realizes optimal operation through continuous self-diagnosis
High Pressure Alarm	Pump stops and triggers an alarm if the set pressure/time is exceeded (High-pressure prevention)
Low Pressure Alarm	Triggers an alarm if the system operates below the set pressure even while all pumps are running (Low-pressure prevention)
Sensor Value Calibration	Calibrates the sensor reading when it does not match the analog gauge reading
Operation History Recording and Storage	Records and stores various operational status data
Alarm Display and Storage	Displays and stores various alarm details
Alternating Operation	Ensures even wear by rotating the main pump after a specific operating time
Cumulative Power Operation	Calculates cumulative power consumption in each controller to operate all pumps evenly based on usage
Contacts per Pump	Outputs operation and error status for each pump via external contacts
External Analog Input	Multi-functional external analog input
Fixed Hz Operation	Enables operation at a fixed frequency (Hz) in the event of a pressure sensor failure
RS-485 Communication (Option)	Supports RS-485 communication
Internet Remote Control (Option)	Monitoring and remote control using an internet modem (dedicated for dooch)



System Configuration



No.	Product Name	Quantity	Notes
1	Panel	1	-
2	Inverter	2~3	-
	Controller	2~3	-
3	Pump	2~3	-
4	Bed	1	-
5	Manifold-Suction	1	Standard Type Pipeline
6	Manifold-Discharge	1	Standard Type Pipeline
7	Pressure Transmitter	1	4 ~ 20mA
8	Suction Isolating Valve	1/Pump	-
9	Check Valve	1/Pump	-
10	Air Vent	1	-
11	Pressure Tank	1	To be adjusted according to the pump capacity.



Product Features

- Equipped with NSQ-Drive, a pump-specific inverter developed by DOOCH.
- All pumps operate at variable speeds with individual inverters.
- Uses highly reliable and durable high-efficiency pumps.
- Precise water supply pressure control via individual inverters.
- Power savings through optimized pump performance responding to load changes.
- High stability ensured by the installation of a discharge pressure sensor.
- Low noise and water hammer prevention through soft operation.
- Easy installation and user-friendly operation due to a compact structure.
- High system safety through interlocking and backup operation between pumps.
- Normal operation is possible even if a specific inverter or controller fails.

Main System Components



Built-in power panel with a
3.5" COLOR DISPLAY
(equipped with the latest GUI)

Pump-specific
inverter
NSQ-Drive

High-efficiency vertical
multistage
centrifugal pump
XR(L) Series

Manifold
125A or less: Cap type
(one-side cap applied)
150A or more:
Flange type
(both-side flanges applied)



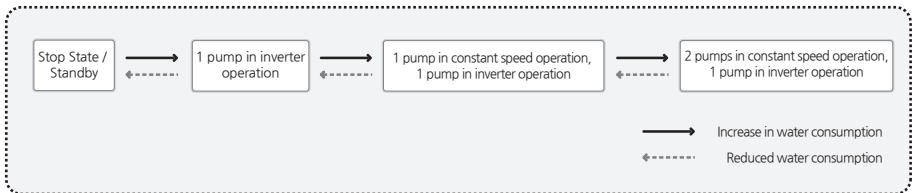
Operating Principle

Step Operating Mode

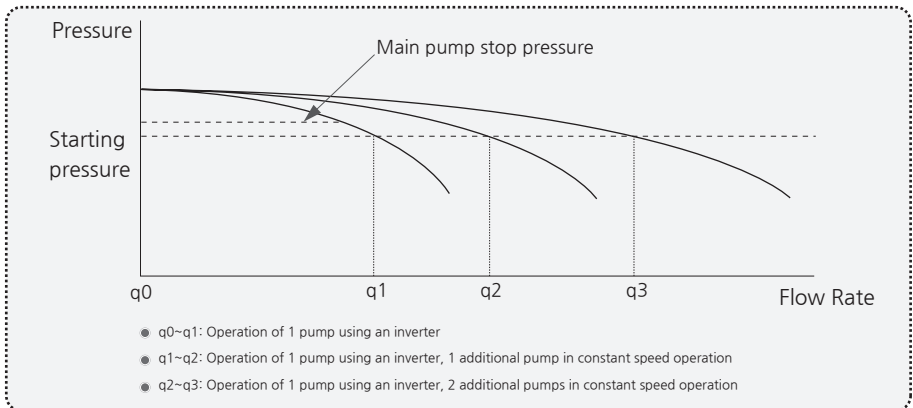
Based on the selected operation mode setting, all normal (fault-free) pumps operate evenly according to the sequential operation method. (This prevents load concentration on any specific pump.)

Based on a 3-Pump System

* Operation Flow



* Flow-Pressure Graph Description



Operating Conditions

- When the discharge pressure (current pressure) drops below the set starting pressure, the designated first pump starts operating.
- If the flow rate continues to increase, the pumps operate sequentially.
- If the flow rate decreases, the last pump that started operating will stop.
- - Once a pump starts operating, it will not stop even if the pressure exceeds the stop pressure until the set "interlocked auxiliary pump standby time" has elapsed.
- - When multiple pumps need to stop, they stop sequentially at intervals of the set "interlocked auxiliary pump standby time".
- If there is no water consumption, the last operating pump raises the system pressure to the main pump stop pressure before stopping operation.



Main Pump Alternation Method (Default Operation Mode)

- A method that ensures even operation of the pumps by alternating the main pump after a set period of operation or after all pumps have stopped.
 - The main pump alternation method starts operation sequentially from the first pump.
 - When restarting after all pumps have stopped, the system starts with the next pump in the sequence, not the initial one, to ensure alternation.
 - When the time set in Pr-54 (Alternation operation time: Factory default 12 hours) has elapsed, it forcibly switches to the next pump for operation.

Main Pump Fixed Method

- A method used in sites with high water consumption or specific locations where pumps operate continuously, maintaining constant pressure without pump alternation.
 - If Pr-54 (Alternation operation time) is set to 0, the first pump becomes the fixed main pump and starts operating.
 - The main pump does not alternate; instead, pumps operate and stop sequentially as needed.

Operation Based on Cumulative Power Consumption

- A method that calculates the cumulative power consumption at each controller to ensure an even distribution of operation among the pumps.
 - When Pr-53 (Alternation method) is set to 1, the pump with the lowest cumulative power consumption starts first.

All PID Method

- A method where the main controller uses PID control to manage all drives simultaneously.
- This applies when Pr-61 (Interlock PID type) is set to 1.



Confirming Product Specifications

- Check the nameplate to ensure it matches the product you ordered, and inspect for any damage caused during transportation.
- Ensure all accessories are included. (Refer to the Product Composition section)

Installation Location

- The booster system is designed for indoor installation by default. If outdoor installation is unavoidable, please install a separate structure to protect it from rain and wind, and provide anti-freezing measures.
- The booster system must be installed under positive pressure conditions.
- When installing the product, please install a separate strainer to prevent foreign matter from entering the suction piping.
- To prevent dry-running, the water level in the reservoir must always be maintained higher than the pump, and the system must be installed to ensure the minimum suction pressure is consistently maintained.
- Please ensure that drainage facilities are installed at the installation site to prevent flooding damage in the event of a leak caused by installation issues, pump failure, or external conditions.

Piping

- Install the piping so that no physical weight or load is applied to the suction and discharge pipes.
- Install the suction pipe as short as possible with minimal bends.
- For convenience during maintenance, we recommend installing a bypass on the discharge side, as well as valves and flexible joints on both the suction and discharge pipes.
- Water hammer may occur on the discharge side, so please install a prevention device.
- If the suction pipe is 10m or longer, or has two or more bends, severe fluctuations in discharge pressure may occur, or the low-water level sensor may activate. Therefore, the diameter of the suction pipe must be at least one size larger than the manifold of the booster system.

Electrical wiring

- Wiring connections must be performed by a legally qualified technician. To prevent voltage induction due to leakage inductance in the control panel and to prevent electric shock, a circuit breaker must be installed and grounding must be securely carried out.
- The wiring for the main components of the booster system is completed during the manufacturing process. For any additional wiring, connect the power supply (R, S, T), grounding (G), and other optional connections according to the wiring diagram.
- Precautions before applying power to the product
 - Is the capacity of the primary circuit breaker appropriate?
 - Is the wiring and connection correct, and are there any loose spots?



Installation

- **Checking the Direction of Rotation**
 - At the time of shipment, all pumps are wired identically to have the same rotation direction, and this product is set to rotate counterclockwise by default.
 - If the rotation is reversed, you must swap two of the three phases of the motor output lines or change the setting value of dr-20 (Selection of motor rotation direction) in the dr mode of the parameter settings.
- Rotating in the reverse direction may cause performance degradation and malfunction.
Ensure that the power supply lines do not come into contact with the pump, motor, or piping.

Proper Use of Accessories

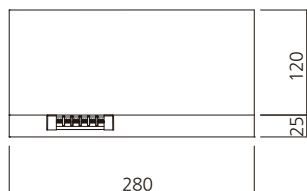
- Please install a pressure tank with an appropriate capacity on the discharge piping.
- A pressure transmitter is installed on the discharge piping to measure the discharge pressure and transmit it to the controller.

Precautions for Trial Run

- There is always a possibility of leakage from the pump and piping, and there is a risk of electric shock from high voltage in the control panel. Therefore, always keep the control panel doors closed during operation.
- The motor is cooled by a fan. To prevent fire or product damage, ensure the motor ventilation openings are not blocked.
- Set the pressure tank to approximately 70-80% of the booster system's operating pressure before use.
- Check the primary (main power) circuit breaker, protective devices, and wiring specifications, and verify the condition of the wires and connections.
- Please check the water level in the reservoir.
- Open the suction piping valve to fill the booster system with water.
- Open the air vents on the suction manifold and each pump to completely bleed the air inside the pumps, then close them.
- **Powering On**
 - Turn "ON" all circuit breakers inside the system control panel.
 - Press the "RUN" button on each inverter control panel to operate the pump for a short time to check the rotation direction.
 - If the rotation is reversed, swap two phases of the motor output lines or adjust the inverter parameters to correct it.
- For smooth operation through the inverter's control (constant pressure maintenance, speed control), please set the operating pressure.
- Since there is air trapped inside the piping during the initial operation, open the valves or faucets at the top of each branch to bleed the air.
- During operation, please check for any abnormalities such as pressure fluctuations, excessive vibration, or noise.



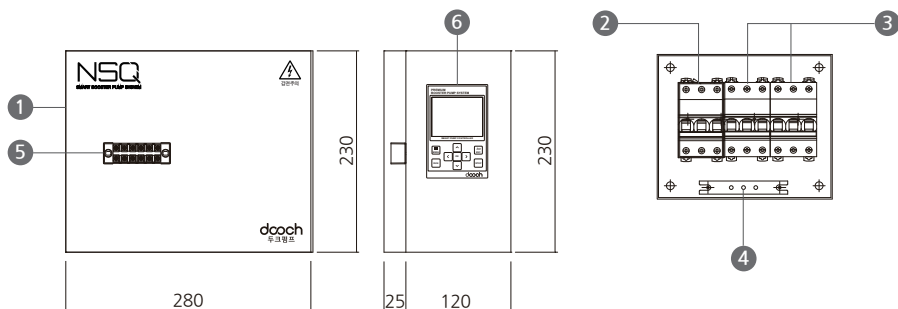
Control Panel Internal Layout



[Terminal Block Layout]

RS-485		SYSTEM STATUS		
SC+	SC-	SR10	SF10	CM10

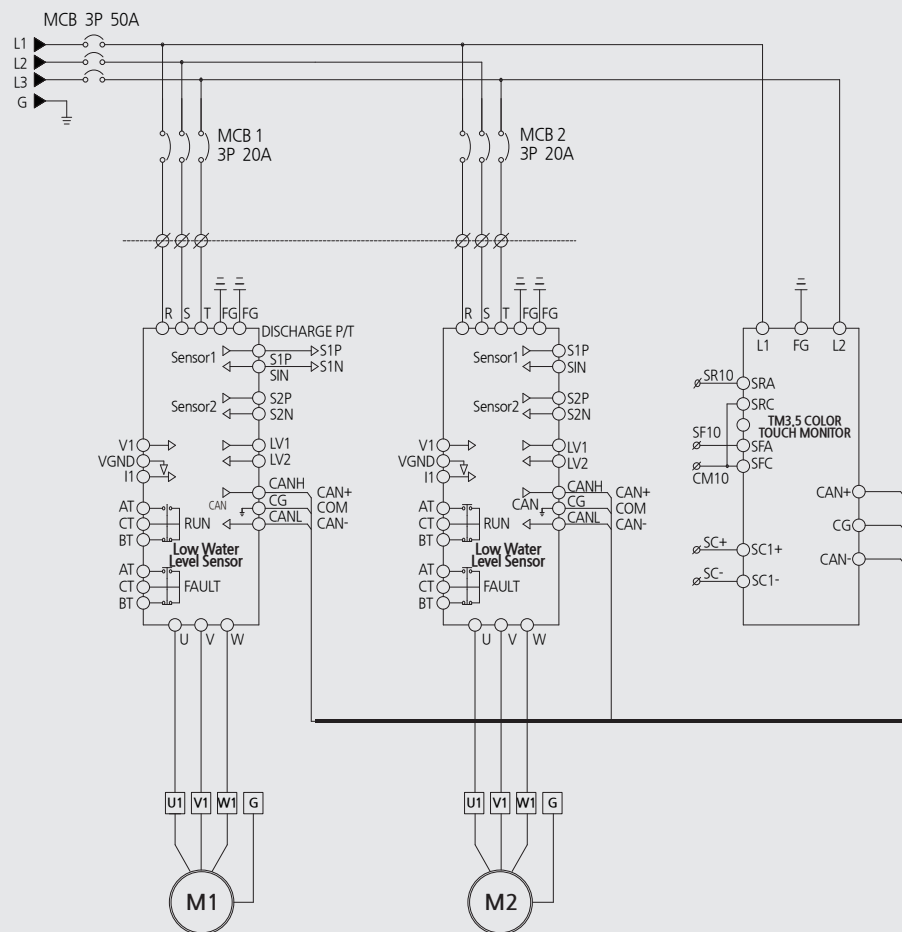
[Control Panel Layout]



No.	PARTSNAME	Q'ty	SPEC.	REMARK
①	PANEL BOX	1	SS275	
②	BREAKER-MOLD CASE	1	A9F74350	Schneider
③	BREAKER-MOLD CASE	2	A9F74320	Schneider
④	Ground Bar	1	3P	SUNGHO
⑤	Fixed Terminal	1	6P 10A	KAKON
⑥	MONITOR	1	TM3.5	
⑦	CABLE	2	KIV4SQ	DONGIL
⑧	Shield Cable	1	0.5SQ*5C	SEOJIN



System Circuit Diagram





Inspection and Maintenance

Classification	Description
 CAUTION	For safety during inspection and maintenance of this system, please ensure that all power is completely disconnected and verify that the pump has completely stopped operating before proceeding.
 WARNING	When repairs are required due to flooding or water damage, there is a risk of electric shock. Therefore, be sure to seek advice from a professional or our Customer Satisfaction Department to ensure safe repair work.

Regular Inspection

- The occurrence of abnormal phenomena such as unusual noise or vibration is a sign of product malfunction. Please refer to "Troubleshooting and Countermeasures" and resolve the issue promptly.
- If a large amount of leakage occurs from the shaft seal (mechanical seal), it must be replaced.
- Please check for leaks at other pump joints or piping connections.
- Please ensure that the power and communication cables inside the control panel are properly connected.

Winter Maintenance

- Although this booster system comes with a built-in anti-freezing function as a standard feature, if a prolonged shutdown is unavoidable, please close all valves on the suction and discharge piping, remove the drain plugs from the piping and each pump, and completely drain all water inside.

How to Recharge the Pressure Tank

If the pressure inside the pressure tank has dropped during inspection, please recharge it with air using the following method.

- When the pressure tank and the discharge piping have an integrated (direct mount) structure:
 - After closing the isolating valve connecting the pressure tank to the discharge piping, open the air valve at the top of the pressure tank and press the air release pin to completely exhaust all air from the tank.
 - Once the air is exhausted, rotate the pressure tank counterclockwise to detach it. Then, use a "Tire Air Inflator" on the air valve to recharge it to the appropriate pressure (70-80% of the operating pressure). Reassemble the pressure tank onto the piping, open the previously closed isolating valve, and resume operation.



When detaching the pressure tank, the residual internal pressure may cause the tank to shoot off, potentially resulting in injury. Extreme caution is required.

- When the pressure tank and the discharge piping are connected separately by a pressure hose:
 - After closing the isolating valve at the connection point between the pressure tank and the discharge piping, open the drain valve to completely drain all the water trapped inside the pressure tank.
 - Once the water is drained, use a "Tire Air Inflator" to recharge it to the appropriate pressure (70-80% of the operating pressure). Close the drain valve, open the previously closed isolating valve, and resume operation.



Troubleshooting and Countermeasures

Symptoms	Causes	Countermeasures
No water is supplied	Valve is closed	Open the valve
	Insufficient air bleeding in pump and piping	Perform air bleeding
	Defective pump or motor	Inspect and repair
	Reverse rotation of the pump	Change power wiring, set parameters
	Low water level in the reservoir	Supply water to the reservoir
	Defective pressure sensor	Inspect and repair
	Poor power supply or faulty wiring	Supply power, rewire
	Operation mode is in "STOP" state	Set operation mode to "RUN"
	Set pressure is too low	Reset the set pressure
Pump does not stop	Set pressure is too high	Reset the set pressure
	Defective pressure sensor	Inspect and repair
	Defective control panel	Inspect and repair
	Leakage in water supply pipe or check valve	Inspect and repair
	Degraded pump performance	Inspect and repair
Pump vibration	Defective pressure tank and low air pressure	Inspect and repair, recharge air
	Pressure pulsation caused by piping	Repair piping
Water supply cuts out	Set pressure is too low	Reset the set pressure
	Insufficient capacity of the booster system	Re-evaluate specifications
	Degraded pump performance	Inspect and repair
Alternation and parallel operation fail	Defective control panel	Inspect and repair
	Defective pressure sensor	Inspect and repair
	Pump and motor failure	Inspect and repair
Control panel circuit breaker trips	Wiring short circuit between power supply and pump	Inspect and repair
	Circuit wiring short and circuit breaker burnout	Inspect and repair
	Power short circuit	Inspect and repair
Severe pressure fluctuations occur	Suction pipe is too long or air ingress	Shorten the suction pipe and increase the diameter
	Low charge pressure in the pressure tank	Check the charge pressure of the pressure tank
	Solenoid valve operates or significant flow rate changes	Install a pressure reducing valve on the discharge side



1. Features of LCD Monitor

1. Full color display
2. Easy Pressure Setting
3. Various information such as operation history and alarm history expressed with icons for user-friendly understanding
4. Multilingual Support (Korean/English/Chinese)
5. Integrated monitoring function through RS-485 communication collecting each drive's information
6. Equipped with GUI improving user recognition and operability with convenient UX
7. Mini USB PORT for convenient firmware upgrade

2. Technical Specifications

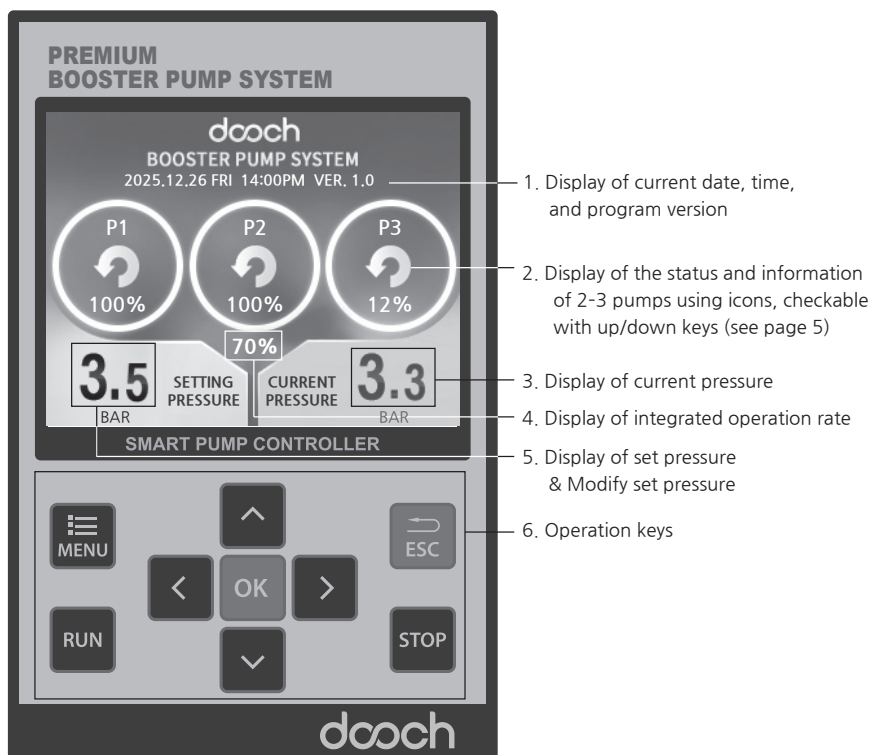
- 3.5" TFT LCD
- RS-485 PORT: 2 ports
- CAN PORT: 1 port
- Operation/Alarm status contact
- Input Power: 220~440V
- Operating Ambient Temp./Humidity: -10~40°C / ≤90%
- Mini USB PORT for firmware upgrade

3. Functions of LCD Monitor

Main Functions	Description
3.5" LCD SCREEN	Display of various information through LCD screen
Language Selection	Selectable: English (default) / Korean / Chinese
Scheduled Operation	Possible to operate with different set pressures by hour/day/month
Operation History Record & Storage	Recording and storage of various operation status
Alarm Display & Storage	Display and storage of various alarms
External Operation /Alarm Contact	System operation status and alarms can be checked externally through integrated contacts
Additional Functions	Description
CAN Communication	Internal communication protocol
RS-485 Communication	Communication support

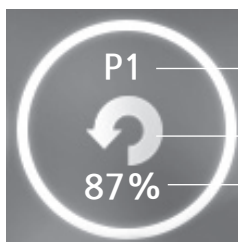


4. Configuration of Main Screen





5. Pump Status Icons



1. Pump Number

2. Status Display Icon

3. Current Status Value

Pump Information

By clicking the corresponding pump status icon, additional information can be checked sequentially.

Icon	Information	Description	Units
	Operation Rate	Displays the current operation rate of the pump	%
	Power	Displays the current power consumption of the pump	kWh
	Accumulative Power	Displays the current accumulative power consumption of the pump	MWh
	Current	Displays the current of the pump	A
	Frequency	Displays the current operating frequency of the pump	Hz
	Output Voltage	Displays the current output voltage of the pump	V

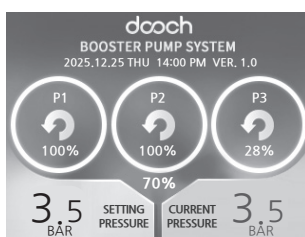


1. How to Change Set Pressure - Main Screen

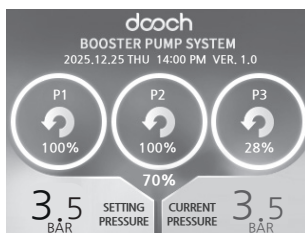
Set the target water pressure for operation.



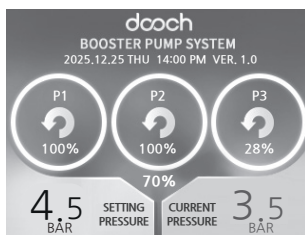
1. Press the OK button for 2 seconds.



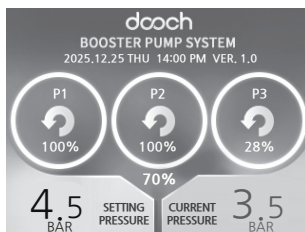
2. The first digit of the set pressure value turns red, entering pressure setting mode.



3. Use the < (Left), > (Right) keys to select the digit to be set.



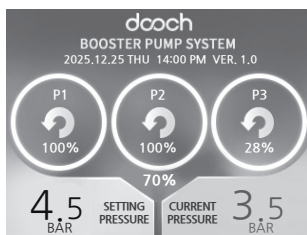
4. Use the ^ (Up), v (Down) keys to enter the desired value and press the  button.



5. The set pressure has been changed.



2. Settings



1. Press the  button on the main screen.
2. The settings screen appears.

1) Changing Set Pressure

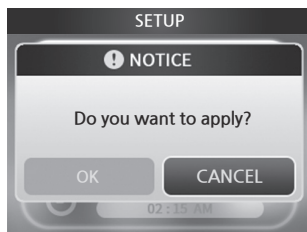
Set the target pressure for operation.

The set pressure can also be changed from the main screen. (See page 5)

The set pressure can be changed from 0.0 to 25.00 bar.



1. Press the $\wedge$, $\vee$ keys to select set pressure and press the  button.
2. Use the $\lt$, $\gt$ keys to select the digit to be changed, then use $\wedge$, $\vee$ keys to enter the desired value.

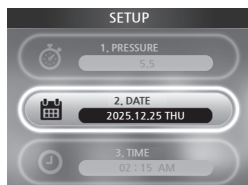


3. When input is complete, press the  button.
4. When the pop-up screen appears, press the  button to apply the changed value.



2) Date Setting

Set the current date. Run history and alarm history will be stored based on the set date.



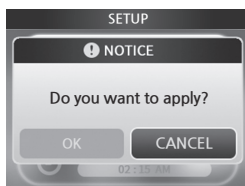
1. Press the $\wedge$, $\vee$ keys to select DATE and press the **OK** button.



2. Use the $\leftarrow$, $\rightarrow$ keys to select Year, Month, and Day, then use $\wedge$, $\vee$ keys to input the desired value.



3. When input is complete, press the **OK** button.



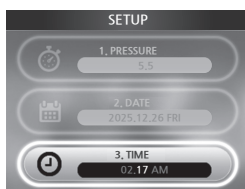
4. When the pop-up screen appears, press the **OK** button to apply the changed value.

3) Time Setting

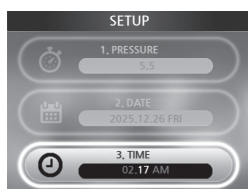
Set the current time. Run history and alarm history will be stored based on the set time.



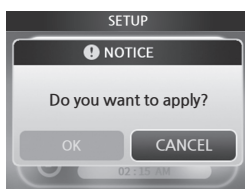
1. Press the $\wedge$, $\vee$ keys to select TIME and press the **OK** button.



2. Use the $\leftarrow$, $\rightarrow$ keys to select Hour, Minute, AM/PM, then use $\wedge$, $\vee$ keys to input the desired value.



3. When input is complete, press the **OK** button.



4. When the pop-up screen appears, press the **OK** button to apply the changed value.



4) Reservation(Scheduled Operation) Setting

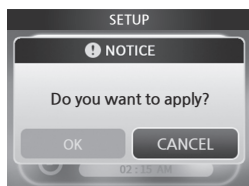
This function allows you to set the desired pressure monthly, weekly, or hourly for scheduled operation.



1. Press the $\wedge$, $\vee$ keys to select RESERVATION and press the **OK** button.



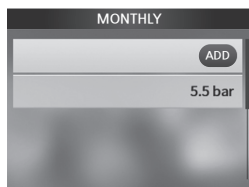
2. Press the $\wedge$, $\vee$ keys to select the desired scheduled operation method and press the **OK** button.



3. When the pop-up screen appears, press the **OK** button to apply the scheduled operation.



4. Once scheduled operation is set, press the $\rightarrow$ key to activate the detailed item move button, then press the **OK** button.



5. Press the $\wedge$, $\vee$ keys to select an ADD and press the **OK** button.



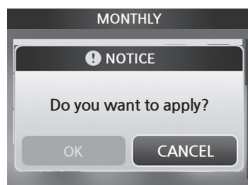
6. Press the $\wedge$, $\vee$ keys to select the scheduled item/set pressure and press the **OK** button.



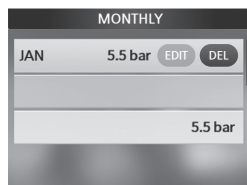
7. Use the arrow keys to input the desired value and press the **OK** button.



8. Use the arrow keys to select the ADD button and press the **OK** button.

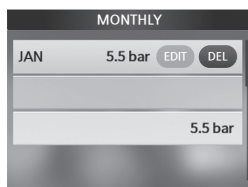


9. When the pop-up screen appears, press the  button to apply the set value.

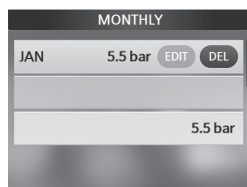


10. The setting value has been applied.

Change and Delete Scheduled Operation Items



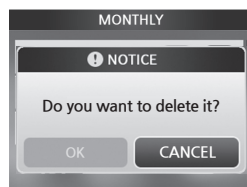
1. Press the $\wedge$, $\vee$ keys to select the item to be modified or deleted.



2. Press the $\leftarrow$, $\rightarrow$ keys to select EDIT or DEL, then press the  button.



3. For modification, follow the same method as steps 6-8 of Scheduled Operation.

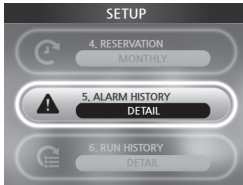


4. For deletion, select Delete and press the  button. A confirmation pop-up will appear. Press the  button to complete deletion.



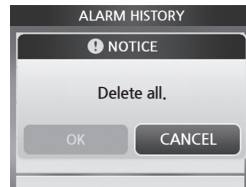
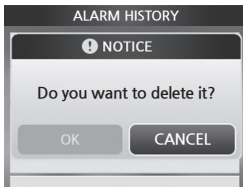
5) Alarm History

Check the alarm history generated during system operation.



1. Press the $\wedge$, $\vee$ keys to select ALARM HISTORY, then press the **OK** button.

2. The log of occurred alarms will be displayed.

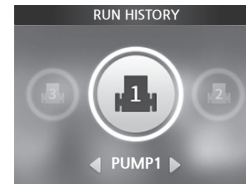
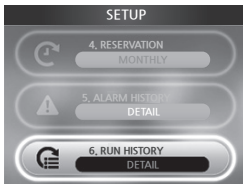


3. Press the $\wedge$, $\vee$ keys to select an alarm log item and press the **OK** button to delete the alarm log.

4. On the alarm log page, press and hold the **OK** button to delete all alarm occurrence history.

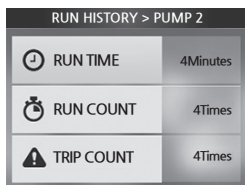
6) Run History

Check the past run history.

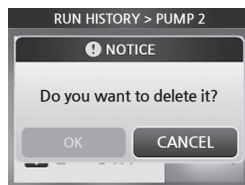


1. Press the $\wedge$, $\vee$ keys to select RUN HISTORY, then press the **OK** button.

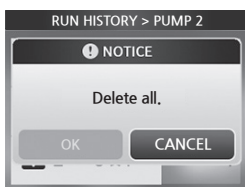
2. Press the $\leftarrow$, $\rightarrow$ keys to select the pump of which run history you want to check, then press the **OK** button.



3. The past run history appears.



4. Press the $\wedge$, $\vee$ keys to select a run history item and press the **OK** button to delete it.



5. On the run history page, press and hold the **OK** button to delete all run history records.

7) Unit

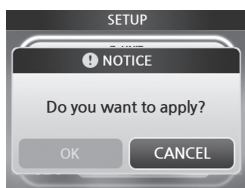
Change the pressure display unit.



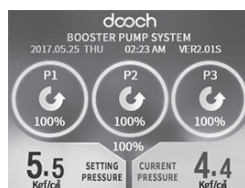
1. Press the $\wedge$, $\vee$ keys to select Unit and press the **OK** button.



2. Press the $\wedge$, $\vee$ keys to select the desired unit and press the **OK** button.



3. When the pop-up screen appears, press the **OK** button to apply the changed value.



4. The pressure unit on the main screen has been changed.



8) CAN Communication Setting

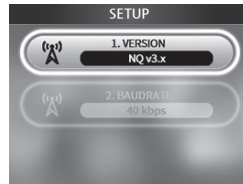
Set the CAN communication speed and mode. Check the drive's communication speed and set accordingly. Factory default settings are recommended.

※CAN Communication Mode Setting

Be sure to set the correct drive version. If mismatched, communication mode may differ and malfunction may occur.

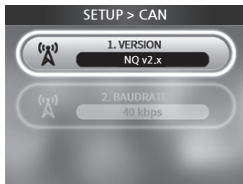


1. Press the $\wedge$, $\vee$ keys to select CAN and press the **OK** button.

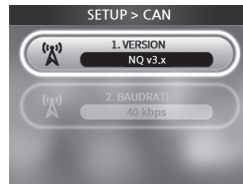


2. The CAN setting screen appears.

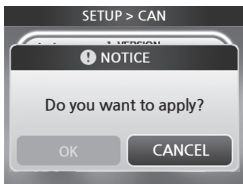
8-1) VERSION Setting



1. Press the $\wedge$, $\vee$ keys to select CAN and press the **OK** button.



2. Press the $\wedge$, $\vee$ keys to select the drive version and press the **OK** button.



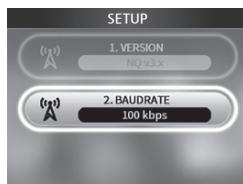
3. When the pop-up screen appears, press the **OK** button to apply the changed value.



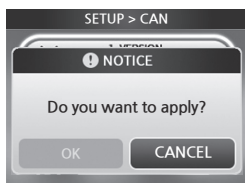
8-2) Communication Speed (BAUD RATE) Setting



1. Press the $\wedge$, $\vee$ keys to select BAUD RATE and press the **OK** button.



2. Press the $\wedge$, $\vee$ keys to select the communication speed and press the **OK** button.



3. When the pop-up screen appears, press the **OK** button to apply the changed value.



9) RS-485 Communication Setting

Configure RS-485 communication for external device connection.
This product supports two external RS-485 ports.



1. Press the $\wedge$, $\vee$ keys to select RS-485 and press the **OK** button.



2. The RS-485 setting screen appears.
TM3.5 supports two RS-485 ports; CH1 and CH2 indicate the respective port numbers.

9-1) Serial Number Setting

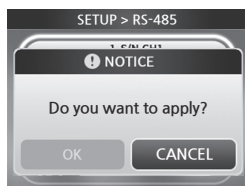
The serial number is used to connect with a dedicated Internet modem (OPTION).
Enter the same serial number as the dedicated modem.



1. On the RS-485 setting screen, press the $\wedge$, $\vee$ keys to select S/N and press the **OK** button.



2. Use the $\langle$, $\rangle$ keys to select the digit to change, then press the $\wedge$, $\vee$ keys to input the desired value and press the **OK** button.



3. When the pop-up screen appears, press the **OK** button to apply the changed value.

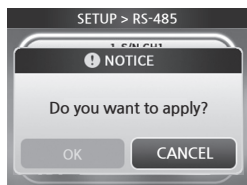


9-2) Communication ID Setting

Set the communication ID to match the external device to be connected.



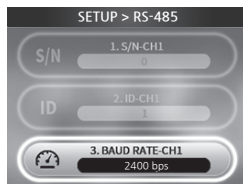
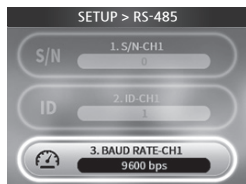
1. On the RS-485 setting screen, press the $\wedge$, $\vee$ keys to select ID and press the  button.
2. Use the $\leftarrow$, $\rightarrow$ keys to select the digit to change then press the $\wedge$, $\vee$ keys to input the desired value and press the  button.



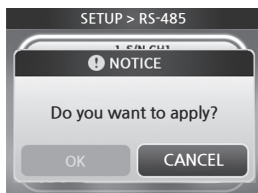
3. When the pop-up screen appears, press the  button to apply the changed value.

9-3) Communication Speed Setting

Set the RS-485 communication speed. The recommended speed is 9600bps.



1. On the RS-485 setting screen, press the $\wedge$, $\vee$ keys to select BAUD RATE and press the  button.
2. Press the $\wedge$, $\vee$ keys to select the desired communication speed and press the  button.



3. When the pop-up screen appears, press the **OK** button to apply the changed value.

9-4) DELAY TIME Setting

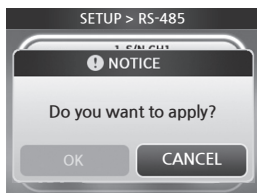
Set the data transmission delay time. When a data request protocol is received, the data is sent after the delay time. The transmission delay time can be set from 1 to 9999 ms.



1. On the RS-485 setting screen, press the $\wedge$, $\vee$ key to select DELAY and press the **OK** button.



2. Use the $\leftarrow$, $\rightarrow$ keys to select the digit to change then press the $\wedge$, $\vee$ keys to input the desired value and press the **OK** button.



3. When the pop-up screen appears, press the **OK** button to apply the changed value.

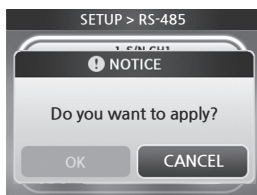


9-5) RS-485 Communication Address Offset

Communication address offset adjusts the communication address when the device's address range exceeds or falls short of the product's range, ensuring alignment. The communication address offset can be set from 0 to 65535.



1. On the RS-485 setting screen, press the $\wedge$, $\vee$ key to select ADDRESS OFFSET and press the **OK** button.
2. Use the $\leftarrow$, $\rightarrow$ keys to select the digit to change then press the $\wedge$, $\vee$ keys to input the desired value and press the **OK** button.



3. When the pop-up screen appears, press the **OK** button to apply the changed value.



10) Language Setting

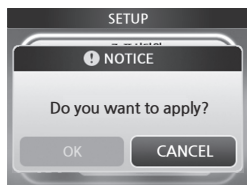
Select the language to be used. The default languages supported are Korean, English, and Chinese.



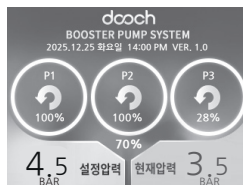
1. Press the $\wedge$, $\vee$ keys to select the language and press the **OK** button.



2. Press the $\wedge$, $\vee$ keys to select the desired language and press the **OK** button.



3. When the pop-up screen appears, press the **OK** button to apply the changed value.

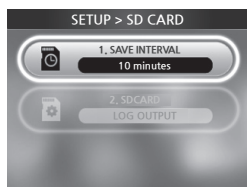


4. After reboot, the system will switch to the selected language.

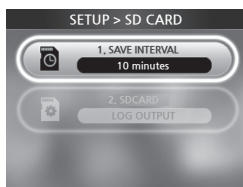
11) SD Card Setting

Configure the SD card storage function.

Please refer to the **SD card storage contents** on page 36 for the log data stored on the SD card.



1. Press $\wedge$, $\vee$ keys to select the SD card and press the **OK** button.



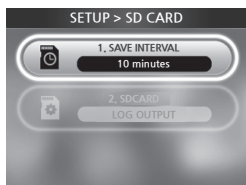
2. Enter the SD card setting mode.



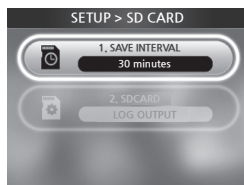
11-1) Save Interval

Select the interval for saving log data. The save interval can be set from 1 to 120 minutes. (If set to 0 minutes, the storage function will not be used.)

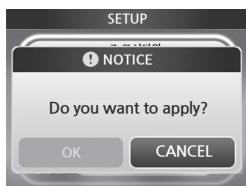
※ The SD card supports up to 32GB.



1. Select the save interval and press the **OK** button.



2. Press the $\wedge$, $\vee$ keys to select the desired value and press the **OK** button.



3. When the pop-up screen appears, press the **OK** button to apply the changed value.

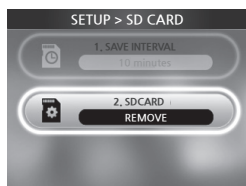
11-2) SD Card Setting

11-2-1) SD Card Remove

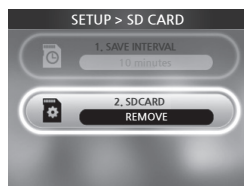
To safely remove the SD card, stop the SD card function.

Be sure to perform the eject operation before removing the SD card.

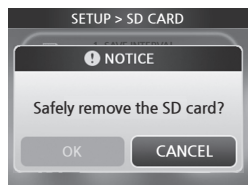
※ If you remove the SD card without performing the eject operation, the data may be damaged, so please be careful.



1. Press the $\wedge$, $\vee$ keys to select SD CARD and press the **OK** button.



2. Press the $\wedge$, $\vee$ keys to select REMOVE and press the **OK** button.



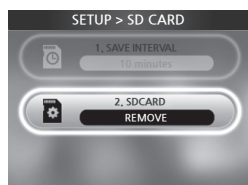
3. When the pop-up screen appears, press the **OK** button to stop the SD card function and remove the SD card.

11-2-2) SD Card Format

Formats the SD card.

※ Never turn off the power while formatting the SD card.

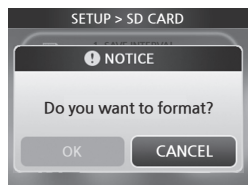
Since formatted data cannot be recovered, please take caution.



1. Press the **^**, **v** button to select SD CARD and press the **OK** button.



2. Press the **^**, **v** keys to select FORMAT and press the **OK** button.



3. When the popup screen appears, press the **OK** button, the SD card will be formatted.



12) Password Setting

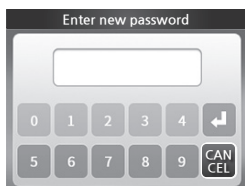
Set and change the user password.



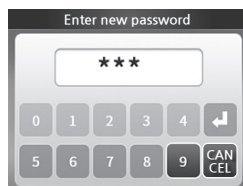
1. Press the $\wedge$, $\vee$ keys to select Password Setting and then press the **OK** button.



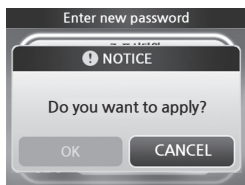
2. Press the $\wedge$ key to select SETUP and then press the **OK** button.



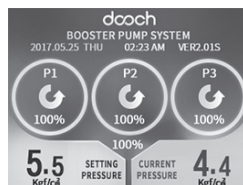
3. Press the $\wedge$, $\vee$, $\>$ keys to enter the desired number, and then press the **OK** button. Enter a 4-digit number using the same method.



4. When the password confirmation window appears, enter the password again using the same method.



5. When the pop-up screen appears, press the **OK** button to apply the changes.



6. On the main screen with the applied password, press the **MENU** button.

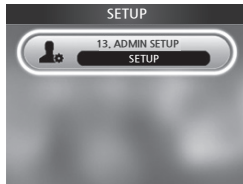


7. The password input screen will appear.



13) Administrator Setting

In Administrator Setting, you can configure the number of pumps connected to the booster pump system and the LCD backlight duration.



1. Press the $\wedge$, $\vee$ keys to select ADMIN ETUP and then press the **OK** button.



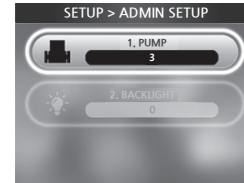
2. The Administrator Setting screen will appear.

13-1) Pump Quantity Setting

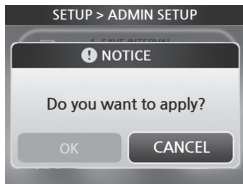
Set the number of connected pumps. TM 3.5 can connect 2-3 pumps.



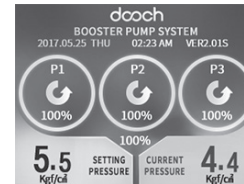
1. Press the $\wedge$, $\vee$ keys to select PUMP and then press the **OK** button.



2. Press the $\wedge$, $\vee$ keys to select the number of connected pumps and then press the **OK** button.



3. When the pop-up screen appears, press the **OK** button to apply the changes.

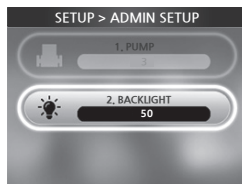
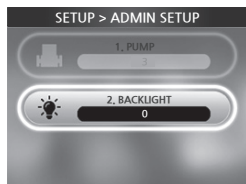


4. After rebooting, the configured pump quantity will be displayed on the screen.

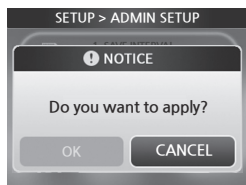


13-2) Backlight Duration Setting

Set the brightness of the backlight. The backlight duration function automatically turns off the backlight after the set time has elapsed. It can be set from 0 to 600 minutes, and if set to 0, the backlight remains on continuously. After the backlight turns off following the set duration, pressing any button will turn it on again.



1. Press the $\wedge$, $\vee$ keys to select Backlight and then press the **OK** button.
2. Press the $\wedge$ key to increase the value and the $\vee$ key to decrease it. After entering the desired brightness, press the **OK** button.

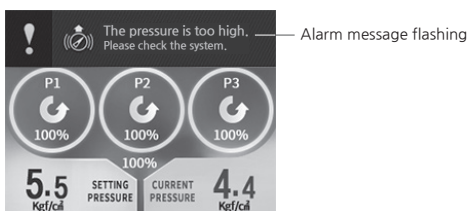


3. When the pop-up screen appears, press the **OK** button to apply the changes.



3. Alarm

If an abnormality occurs that prevents the system from operating normally, an alarm message will flash at the top of the screen. The alarms displayed on the screen include High Pressure Alarm, Low Pressure Alarm, Pressure Sensor Failure, Water Level Alarm, and Inverter Failure (total of 5). If two or more alarms occur simultaneously, the messages will appear sequentially. Once the system and drive inspection confirm normal operation, the alarm will automatically clear.



Past alarm history can be checked under Settings → Alarm History. (See page 12)



FND

- The FND features five 7-segment displays and four LED lamps to display various settings and status indicators, along with four buttons for operating the drive or entering configuration parameters.





Functional Description of Each Section

- LED Lamp Section

The LED lamp section consists of Run, Stop, Alarm 1, and Alarm 2, and their functions are as follows:

- Lamp Functions

Function	Description
RUN	Lit in standby, flashes during drive output
STOP	Lit when stopped
ALARM 1	Lit for high-pressure/low-pressure/sensor error/low water level alarms
ALARM 2	Lit when a drive error occurs

- The Run and Stop LEDs indicate the status of the drive.

- The Alarm 2 lamp lights up when there is a drive error.

The Alarm 1 lamp lights up for alarms related to the pump system.

- FND Section

The FND consists of five 7-segment displays and shows the status values of the drive and pumps, as well as parameter settings. The FND display is divided into St group (Status group), Pr group (Pump control group), and dr group (Drive group).

- Button Section

The button section consists of 4 buttons, used for parameter settings and navigation.

Button	Description
	Used for setting target pressure, entering parameter settings, or resetting alarms.
	Starts or stops the drive. The Run lamp lights up when the run state is selected.
	Used to change parameter items or adjust parameter settings. ▲ increases the value, and ▼ decreases it. After changing a setting, you must press  to save the final value.
	Pressing ▲ and ▼ simultaneously for 2 seconds navigates to the parameter groups.



Pressure Setting Method

Drive

ex) When changing the operating pressure from 3.0bar to 3.5bar



Press the button to check the set value.

Press the button for 1 second to change to d 3.0, and the number (3.0) will blink.

Change the set pressure using the button.
[Example (3.5) : button 5 times]

Press the button to complete the setting.

Setting is completed when '- End -' appears.

Press the button to check the set value.



Status Display Checking Method

Displays current status in the order of P-S-H-o-U-A each time the button is pressed.

	Current Pressure	Displays the currently measured pressure value		Setting Pressure	Displays the pressure value set by the user
	Output Frequency	Displays the current drive output in Hz		Output Rate	Displays the current drive output in %
	DC Link Voltage	Displays the DC Link voltage		Output Current	Displays the current output current value



- St Mode: Standard display group
As the initial screen, P-S-H-O-U-A changes each time the  button is pressed.
- Pr Mode: Pump control-related group
As the operation control group for the booster system, you can change settings for the pressure sensor, high-pressure alarm, low-pressure alarm, low-water-level alarm, etc.
- dr Mode: Drive-related group
As a group related to each drive control, you can change and check settings such as acceleration time, deceleration time, cumulative power, etc.



St Mode (Initial screen)



Successfully entered Pr Mode



Successfully entered dr Mode



St Mode (Initial screen)



Press the buttons simultaneously for 1 second to enter Pr Mode.



Press the buttons simultaneously for 1 second to enter dr Mode.



Press the buttons simultaneously for 1 second to return to the initial state.



Parameter	Description	Setting Range	Default	PARA. Interlock	Change during Operation	3Φ Application
Pr-03	Sensor 1 Capacity Setting	1.0~25.0[bar]	16.0	X	X	
Pr-04	Sensor 1 Calibration Setting	-1.0~1.0[bar]	0.0	X	○	
Pr-11	Freeze Protection Function	0~1	0	○	○	
Pr-12	Start-up Pressure Deviation	0~2.0[bar]	0.3	○	○	
Pr-13	Zero-flow Detection Time	0~200[sec]	30	○	○	
Pr-40	485 Communication Mode	0~1	0	X	X	
Pr-41	485 Communication Station No.	0~250	1	○	X	
Pr-42	485 Communication Speed	1~5	4	○	X	
Pr-43	485 Communication Delay Time	1~9999[ms]	5	○	X	
Pr-51	Communication ID	0~6	0	X	X	
Pr-53	Alternation Method	0~2	0	○	○	
Pr-54	Alternation Operation Time	0~24[hour]	12	○	○	
Pr-55	Interlocked Aux. Pump Standby Time	1~100[sec]	5	○	X	
Pr-61	Interlocked PID Type	0~1	0	○	X	
Pr-64	ALL PID Start-up Output Ratio	70~100[%]	100	○	○	
Pr-70	High Pressure Alarm Level	0~Sen1 Pressure[bar]	20.0	○	○	
Pr-71	Low Pressure Alarm Level	0~10.0[bar]	0.5	○	○	
Pr-72	High Pressure Alarm Time	0~100[sec]	5	○	○	
Pr-73	Low Pressure Alarm Time	0~200[sec]	20	○	○	
Pr-74	Pressure Sensor Low Water Level Trip Time	0~250[sec]	20	○	○	
Pr-75	Low Water Level Trip Pressure Level	0~1.0[bar]	0.3	○	○	
Pr-90	Initialization Code	0~1	0	X	X	
Pr-92	S/W Version	-	-	X	X	

- PARA. Interlock: Whether it applies to all Drives via communication
(Applied to all Drives when set on one Drive)
- Change during Operation: Whether it can be changed while the Drive is in operation



Pr-03: Sensor 1 Capacity Setting

- Enter the maximum value that the pressure sensor can measure.
- By entering the capacity of the pressure sensor attached to the drive in use, the current measured pressure can be displayed.
Example: Enter 10.0 if the pressure sensor in use is 10bar.
Enter 16.0 if the pressure sensor in use is 16bar.
- Please enter the rating of the pressure sensor you intend to use for normal pump operation.

Pr-04: Sensor 1 Calibration Setting

- This function calibrates the deviation between the analog or digital pressure gauge installed on the pipe and the drive FND display pressure.

Pr-11: Freeze Protection Function

- Sets the freeze protection mode.
- This function prevents the pump from freezing at low temperatures (below zero) using information from the internal ambient temperature sensor of the drive. The function operates on a 1-minute cycle: it operates at a frequency that does not generate pressure for 0-10 seconds and maintains a stopped state from 11-59 seconds. This function is unrelated to preventing the freezing of pipes; it prevents the pump from freezing by generating frictional heat through rotation within the pump.

Setting Data	Function Description
0 (Factory Default)	Disable Freeze Protection
1	Enable Freeze Protection

Pr-12: Start-up Pressure Deviation

- Sets the start-up deviation pressure value. In other words, for the drive to start operation, the current pressure must be lower than the set pressure by at least the start-up deviation.
- It will not operate if an alarm occurs.

Pr-13: Zero-flow Detection Time

- After the pump pressure reaches the set pressure, if the pressure is maintained for longer than the set time, it starts to decelerate. If a pressure difference as much as the start-up deviation occurs during deceleration, the pump starts operation again; if there is no pressure difference, it stops.

Setting Data	Function Description
0	Disable No-flow Detection
1 ~ 200[sec]	Set No-flow Detection Time (Factory Default 30[sec])



Pr-40 : 485 Communication Mode

- Sets whether to use 485 communication.

Setting Data	Function Description
0 (Factory Default)	Disable 485 Communication
1	Enable 485 Communication

Pr-41 : 485 Communication Station No.

- Sets the 485 communication station number.

Setting Data	Function Description
1 ~ 250 (Factory Default 1)	Set communication station number. If the station number differs in the data request protocol, data will not be transmitted.

Pr-42 : 485 Communication Speed

- Sets the 485 communication speed.

Setting Data	Function Description
1	1200 bps
2	2400 bps
3	4800 bps
4 (Factory Default)	9600 bps
5	19200 bps

Pr-43 : 485 Communication Delay Time

- Sets the 485 communication delay time.

Setting Data	Function Description
1 ~ 9999[msec]	Upon receiving a data request protocol, data is transmitted after the communication delay time. (Factory Default 5[msec])



Pr-51: Communication ID Setting

- This is the CAN communication ID during linked operation.
- Ensure that the ID does not duplicate when setting.

Setting Data	Function Description		
0 (Factory Default)	Standalone Mode		
1~6	Linked Mode Communication ID Number	Related Functions	
		dr-02	Target Frequency Input Method
		Pr-52	CAN Communication Speed
		Pr-53	Alternating Operation Method
		Pr-54	Alternating Operation Time
		Pr-55	Linked Operation Auxiliary Pump Standby Time
		Pr-61	Linked PID Type

Pr-53 : Alternating Method

- Determines the priority for Drive operation and alternating stop during linked operation.

Setting Data	Function Description
0 (Factory Default)	Sequential Operation Mode
1	Operation Mode based on Cumulative Power Consumption
2	Half-pump Operation Mode

- Available only in Ver 1.3x
- If Pr-50 CAN communication mode is 0, the alternating method is fixed to 0.

Pr-54 : Alternating Operation Time

- In alternating operation, the main pump is forcibly switched even during operation when the user-set time has elapsed.

Setting Data	Function Description
0	Disable Alternating Operation
1 ~ 24(hour)	Set Alternating Operation Time (Factory Default: 12 hours)



Pr-55 : Linked Operation Auxiliary Pump Standby Time

- This is the standby time for the auxiliary pump to operate during linked operation. If the auxiliary pump starts operating before the main drive reaches the maximum frequency, the pressure may increase rapidly, so this standby time is to prevent this.

Pr-61Linked PID Type

- Controls all drives by performing PID control from the main controller.

Setting Data	Function Description		
0 (Factory Default)	Master Control		
1	ALL PID Control	Related Functions	
		Pr-64	ALL PID Start Output Ratio

- Master Control: Only one unit performs PID control by the main controller.

Pr-64 : ALL PID Start Output Ratio

- This is the output ratio applied to ALL PID control during linked operation to drive the next drive. In other words, if the output ratio of the operating drive is above the setting range, the next linked drive starts operating.

Factory Default	Input Range
100[%]	70~100[%]

Pr-70 : High Pressure Alarm Level

- Sets the reference pressure value for generating a high-pressure alarm.
- When setting the set pressure, it is automatically set to the set pressure + 2bar.

Pr-71 : Low Pressure Alarm Level

- Sets the reference pressure value for generating a low-pressure alarm.

Pr-72 : High Pressure Alarm Time

- Sets the high-pressure alarm level maintenance time for generating a high-pressure alarm. That is, if the current pressure remains at or above the high-pressure alarm level (Pr-70) for the set time, a high-pressure alarm is displayed and the operating unit stops.



Pr-73 : Low Pressure Alarm Time

- Sets the low-pressure alarm level maintenance time for generating a low-pressure alarm.
That is, if the current pressure remains at or below the low-pressure alarm level (Pr-71) for the set time, a low-pressure alarm is displayed and the operating unit stops.

Pr-74 : Low Water Level Trip Time

- Sets the low water level trip level maintenance time for generating a low water level trip.
That is, if the current pressure remains at or below the low water level trip pressure level (Pr-75) for the set time, a low water level trip alarm is displayed and the operating unit stops.

Pr-75 : Low Water Level Trip Pressure Level

- Sets the reference pressure value for generating a low water level trip.

Pr-90 : Initialization Code

- Initializes to factory default settings.

Setting Data	Function Description
0 (Factory Default)	Maintain Current Settings
1	Initialize to Factory Default Settings

Pr-92 : S/W Version

- Displays the program version.



★ Factory default setting varies by drive capacity.

☆ Factory default setting based on induction motor.

Code	Description	Setting Range	Factory Default	PARA. Linked	Change During Run	3φ Application
dr-01	Command Source Setting	0~1	0	X	X	
dr-02	Target Frequency Input Method Setting	0~3	0	X	X	
dr-03	Target Frequency Setting	0~60[Hz]	30.0	X	X	
dr-12	Motor Rated Current	1.0~100.0[A]	☆	X	X	
dr-20	Motor Rotation Direction Selection	0~1	0	X	X	
dr-22	Acceleration Time	1.0~600.0[sec]	3.0	X	○	
dr-23	Deceleration Time	1.0~600.0[sec]	6.0	X	○	
dr-37	Number of Auto-Restart Attempts after Trip	0~50	3	X	○	
dr-38	Auto-Restart Wait Time after Trip	1~250[sec]	10	X	○	
dr-53	Cumulative Mega Wh Display	0~9999[MWh]	-	X	-	
dr-54	Cumulative Kilo Wh Display	0~9999[kWh]	-	X	-	
dr-89	Reset Cumulative Power	0~1	0	X	X	
dr-90	Initialization Code	0~1	0	X	X	

- PARA. Linked: Applies to all drives via communication (setting in one drive applies to all).
- Change During Run: Whether the setting can be changed while the drive is operating.

**dr-01 : Command Input Location Setting**

- Sets the operation command location.
- When FND is selected, the operation command is possible with the keys on the drive body.
When terminal block is set, the operation command is possible via external input (P1).

Setting Data	Function Description
0 (Factory Default)	Operation command from FND (run/stop button)
1	Operation command from terminal block (P1)

dr-02 : Target Frequency Input Method Setting

- Sets the method for the drive's target frequency input.

Setting Data	Function Description		
0 (Factory Default)	Set by internal PID calculation		
1	Setting for fixed frequency usage on FND drive body	Related Functions	
		dr-03	Target Frequency Value
2	External voltage V1 (0~10V)		
3	External current I1 (4~20mA)		

dr-03 : Target Frequency Setting

- Can set the target frequency value when using fixed frequency.
Target frequency input method (dr-02) must be set to FND.

Factory Default	Input Range
30.0[Hz]	0 ~ 60[Hz]

dr-12 : Motor Rated Current

- Sets the motor rated current (RMS). Use the motor nameplate data as the principle.

dr-20 : Motor Rotation Direction Selection

- Sets the pump rotation direction.
- Please ensure to check the rotation direction of the pump for normal operation.
As the rotation direction may change depending on the wiring, please make sure to verify.

Setting Data	Function Description
0 (Factory Default)	CCW (Counter Clockwise)
1	CW (Clockwise)



dr-22 : Acceleration Time

- Time to reach maximum frequency from 0[Hz].
- If the acceleration time is too short, an overcurrent fault may occur when starting the motor.

dr-23 : Deceleration Time

- Time to decelerate from maximum frequency to 0[Hz].
- If the deceleration time is too short, an overvoltage fault may occur when decelerating the motor.

dr-37 : Auto-Restart Count after Trip

- The number of times the drive can automatically restart after a trip occurs. If a trip occurs more than the set number of times, it will not restart.
- If no trip occurs for a certain period, the previous trip count is deleted.
- Depending on the error code, restart may not be possible.

dr-38 : Auto-Restart Standby Time after Trip

- Restarts after the set time has passed after a trip.

dr-53 ~ 54 : Accumulated Power Display

- Displays the drive's accumulated power in Mega or Kilo Wh units.
The displayed accumulated power may have errors compared to the actual value.

Parameter	Function Description
dr-53	Mega Wh Display
dr-54	Kilo Wh Display

**dr-89 : Accumulated Power Initialization**

- Initializes accumulated power.



Data cannot be recovered after initialization.

Setting Data	Function Description
0 (Factory Default)	Maintain Settings
1	Initialize Accumulated Power for dr-53, dr-54

dr-90 : Initialization Code

- Initializes to factory default settings.

Setting Data	Function Description
0 (Factory Default)	Maintain Settings
1	Initialize to Factory Settings



Control Terminal Block Function Table

Category		Terminal Symbol	Name	Description
input signal	Pump Control Function	S1P, S1N	Pressure Sensor 1	Pressure sensor 1 connection terminal
		S2P, S2N	Pressure Sensor 2	Pressure sensor 2 connection terminal (used for differential pressure control)
		LV1, LV2	Low Water Level Sensor	Low water level sensor connection terminal
	Contact Operation Function	P1	Run Command	Run/Stop terminal
		EST	Emergency Stop	Cuts off the drive output when the EST signal is ON
		24V	Contact Op. Common	Common terminal for PNP contact input
	Analog Frequency Setting	CG	Contact Op. Common	Common terminal for NPN contact input
		V1	Frequency Setting (Voltage)	Set frequency when DC 0~10V is input
		I1	Frequency Setting (Current)	Set frequency when DC 4~20mA is input
output signal	Relay contact	RUN (AT,CT,BT)	Run Signal Output	Outputs a signal when the drive starts running (AC250V 5A or less, DC30V 5A or less)
		FAULT (AT,CT,BT)	Fault Signal Output	Outputs a signal when the system and drive protection functions are activated and the output is cut off (AC250V 5A or less, DC30V 5A or less)
communication signal	CAN	CANH, CANL	CAN Signal	CAN signal line terminal
		CG	CAN Common	Common terminal for CAN communication grounding
	RS485 (Option)	TX,RX (SC-, SC+ AUX1, AUX2)	RS485 Signal	RS485 signal line terminal
		CG, AUXG	RS485 Common	Common terminal for RS485 communication power grounding



FND Display	Description	Restart	Ref. Page
Er-01	Pressure Sensor Error	O	57
Er-02	High Pressure Alarm	O	
Er-03	Low Pressure Alarm	O	
Er-04	Low Water Alarm	O	58
Er-05	Drive Arm Short Trip	X	-
Er-06	Drive H/W Overcurrent Trip	O	
Er-07	Drive H/W Overcurrent Suppression Trip	O	
Er-08	Motor Overheat	O	
Er-09	Drive Overtemperature Trip	O	
Er-10	DC-Link Undervoltage Trip	O	
Er-11	DC-Link Overvoltage Trip	O	
Er-12	Overload Operation Trip	O	
Er-13	Drive Overload Operation Trip	O	
Er-14	Ground Fault Trip	X	
Er-15	Communication ID Duplicate Trip	X	
Er-16	Communication Error	X	
Er-17	Input Phase Loss	X	
Er-18	Output Phase Loss	X	
Er-20	External Fault Input	X	
Er-21	Allowed Time Elapsed	X	

- Depending on the restart availability, it stops if the same fault history occurs after restarting as many times as set (dr-37).
- Please contact the A/S center (1588-5993) if an error occurs from Er-05 to 21.



How to Clear Faults and Alarms

-  Press the [Input Set] key twice consecutively to clear the alarm.
- However, for Er-01 to 04, the error is automatically cleared and restarted when the clear condition is met. If you clear the alarm when the condition is not met, the alarm will reoccur.
- It automatically restarts after the Auto-restart time (dr-38) when a trip occurs. If the Auto-restart count (dr-37) is exceeded, it will not restart further to protect the motor and drive.

Troubleshooting Table

Er-01 (Pressure Sensor Fault)	
Cause	Solution
Sensor Fault	Replace sensor
Drive Fault	Replace drive
Sensor Terminal Wiring	Check sensor terminal wiring

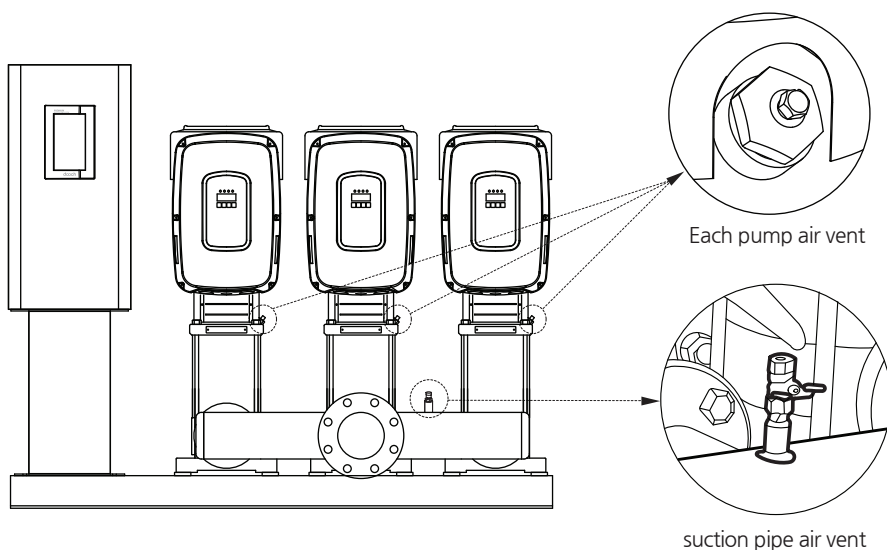
Er-02 (High Pressure Alarm)	
Cause	If the current pressure exceeds the set pressure by more than 2bar for longer than the High Pressure Alarm Time (Pr-72) during operation, the operation stops and an alarm occurs. May occur during installation site or test run.
Solution	Open the discharge valve and drain water until the alarm is cleared. Check the set pressure and High Pressure Alarm Level (Pr-70) and change the pressure to an appropriate level. The drive will automatically recover if the current pressure drops below the high-pressure alarm level.

Er-03 (Low Pressure Alert)	
Cause	If the current pressure drops below the Low Pressure Alarm Level (Pr-71) for longer than the Low Pressure Alarm Time (Pr-73), the operation stops and an alarm occurs.
Solution	Please check if there is enough water in the water tank (sump). Check for leaks in the piping. Open all air vents and check if water comes out. Press the  key to clear the error and the  key to start the pump.



Er-04 (Low Water Level Alarm)

Cause	This alarm occurs when the pump is started without water on the suction side. It triggers a low water level alarm when operating below the Low Water Level Trip Pressure (Pr-75) for longer than the Low Water Level Trip Time (Pr-74).
Solution	- Please check if there is sufficient water in the water tank (sump) - Open all air vents to check if water comes out. - Press the  key to clear the error, then press the  key to start the pump.



- In case of errors from Er-05 to 21, please contact the service center at obd@doochpump.com.



- Communication Specifications

Item	Specification
Baud rate	Select from 1200/2400/4800/9600/19200 bps
Control Procedure	Asynchronous communication
Communication System	Half duplex system
Character System	8 bit
Stop bit	1 bit
Error Check(CRC16)	1 byte
Parity Check	None

- Communication Protocol (Using ModBus - RTU Protocol)

Code	Name
0 X 03	Read Hold Register
0 X 06	Preset Single Register

READ

- Query (Example of reading set pressure)

Start	Slave ID		Function		Add Hi		Add Lo		No Hi		No Lo		CRC				END
3.5 byte Time	X	X	0	3	2	0	0	2	0	0	0	1	X	X	X	X	3.5 byte Time Hex

- Response

Start	Slave ID		Function		Byte Count		Data Hi		Data Lo		CRC				END
3.5 byte Time	X	X	0	3	0	2	0	0	3	7	X	X	X	X	3.5 byte Time Hex

Single Write

- Query (Example of reading set pressure)

Start	Slave ID		Function		Add Hi		Add Lo		Data Hi		Data Lo		CRC				END
3.5 byte Time	X	X	0	6	2	0	0	2	0	0	3	7	X	X	X	X	3.5 byte Time Hex

- Response

Start	Slave ID		Function		Add Hi		Add Lo		Data Hi		Data Lo		CRC				END
3.5 byte Time	X	X	0	6	2	0	0	2	0	0	3	7	X	X	X	X	3.5 byte Time Hex



- Troubleshooting: If communication is not connected

Checklist	Remarks
Check if the NQ Drive is correctly connected to the master, such as a computer or FA device.	
Check the RS485 communication usage setting.	Pr-40 485 Communication Mode
Check the RS485 communication speed setting.	Pr-42 485 Communication Speed
Check the RS485 communication ID.	Pr-41 485 Communication ID
Check the CAN communication ID.	Pr-51 CAN Communication ID. Must be set as it is communication with the master of the pump system.
Check if the master (computer or FA device) has started communication.	
Check the data format of the user program.	



● RS-485 Communication Address Table

Address	Parameter	Scale	Unit	R/W	Content
0×2000	Program Version	0.01		R	0~65535
0×2001	System Operation Status			R	0: STOP 1: READY (inverter EN and output zero) 2: RUN (inverter EN and output non zero) 3: Fault (System Fault)
0×2002	Set Pressure	0.01	bar	R/W	0~10000
0×2003	Discharge Pressure (Diff. Pressure)	0.01	bar	R	0~10000
0×2004	Run Enable (STOP) Inverter			R	Bit Content Bit 0: No.1 Bit 1: No.2 Bit 2: No.3 Bit 3: No.4 Bit 4: No.5 Bit 5: No.6
0×2005	Run Enable (Ready) Inverter			R	Bit Content Bit 0: No.1 Bit 1: No.2 Bit 2: No.3 Bit 3: No.4 Bit 4: No.5 Bit 5: No.6
0×2006	Run Enable (RUN) Inverter			R	Bit Content Bit 0: No.1 Bit 1: No.2 Bit 2: No.3 Bit 3: No.4 Bit 4: No.5 Bit 5: No.6
0×2007	System Fault History				Bit Content Trip description Bit 0: Sensor Bit 1: High Pressure Bit 2: low pressure Bit 3: Low Water Level
0×2006	Run Enable (RUN) Inverter			R	Bit Content Bit 0: No.1 Bit 1: No.2 Bit 2: No.3 Bit 3: No.4 Bit 4: No.5 Bit 5: No.6



Address	Parameter	Scale	Unit	R/W	Content
0×2010	Inverter 1 Output	0.1	%	R	0~1000
0×2011	Inverter 2 Output	0.1	%	R	0~1000
0×2012	Inverter 3 Output	0.1	%	R	0~1000
0×2013	Inverter 4 Output	0.1	%	R	0~1000
0×2014	Inverter 5 Output	0.1	%	R	0~1000
0×2015	Inverter 6 Output	0.1	%	R	0~1000
0×2016	Inverter 1 Start Count	1	times	R	0~65535
0×2017	Inverter 2 Start Count	1	times	R	0~65535
0×2018	Inverter 3 Start Count	1	times	R	0~65535
0×2019	Inverter 4 Start Count	1	times	R	0~65535
0×201A	Inverter 5 Start Count	1	times	R	0~65535
0×201B	Inverter 6 Start Count	1	times	R	0~65535
0×201C	Inverter 1 Run Time	1	hour	R	0~65535
0×201D	Inverter 2 Run Time	1	hour	R	0~65535
0×201E	Inverter 3 Run Time	1	hour	R	0~65535
0×201F	Inverter 4 Run Time	1	hour	R	0~65535
0×2020	Inverter 5 Run Time	1	hour	R	0~65535
0×2021	Inverter 6 Run Time	1	hour	R	0~65535
0×2022	Inverter 1 Trip Count	1	times	R	0~65535
0×2023	Inverter 2 Trip Count	1	times	R	0~65535
0×2024	Inverter 3 Trip Count	1	times	R	0~65535
0×2025	Inverter 4 Trip Count	1	times	R	0~65535
0×2026	Inverter 5 Trip Count	1	times	R	0~65535



Address	Parameter	Scale	Unit	R/W	Content
0×2027	Inverter 6 Trip Count	1	times	R	0~65535
0×2100 ~ 0×2127	Trip Inverter No.	1	No.	R	1~6
	Inverter Trip History 1-10: Year	1	year	R	0~99
	Inverter Trip History 1-10 Month/Day	1	month /day	R	Low byte date : 1~31 High byte Month : 1~12
	Inverter Trip History 1-10: Hour/Min	1	hour /min	R	Low byte Min. : 0~59 High byte hour : 1~23
0×2128	Total High Pressure Occurrence Count	1	times	R	0~65535
0×2129 ~ 0×2146	High Pressure Occurrence History 1-10: Year	1	year	R	0~99
	High Pressure Occurrence History 1-10: Month/Day	1	month /date	R	Low byte date : 1~31 High byte Month : 1~12
	High Pressure Occurrence History 1-10: Hour/Min	1	hour /min	R	Low byte Min. : 0~59 High byte hour : 1~23
0×201D	Total Low Pressure Occurrence Count	1	times	R	0~65535
0×2148 ~ 0×2165	Low Pressure Occurrence History 1-10: Year	1	year	R	0~99
	Low Pressure Occurrence History 1-10: Month/Day	1	month /date	R	Low byte date : 1~31 High byte Month : 1~12
	Low Pressure Occurrence History 1-10: Hour/Min	1	hour /min	R	Low byte Min. : 0~59 High byte hour : 1~23
0×2166	Total Low Water Level Occurrence Count	1	times	R	0~65535
0×2167 ~ 0×2184	Low Water Level Occurrence History 1-10: Year	1	year	R	0~99
	Low Water Level Occurrence History 1-10: Month/Day	1	month /date	R	Low byte date : 1~31 High byte Month : 1~12
	Low Water Level Occurrence History 1-10: Hour/Min	1	hour /min	R	Low byte Min. : 0~59 High byte hour : 1~23



Address	Parameter	Scale	Unit	R/W	Content
0x2185	Total Sensor Failure Occurrence Count	1	times	R	0~65535
0x2186 ~ 0x21A3	Sensor Failure History 1~10: Year	1	year	R	0~99
	Sensor Failure History 1~10: Month/Day	1	Month/ Date	R	Low byte date : 1~31 High byte Month : 1~12
	Sensor Failure History 1~10: Hour/Min	1	Hour /Min.	R	Low byte Min. : 0~59 High byte Hour : 1~23



● Additional Protocol

Protocol available from drive S/W version 1.3x.

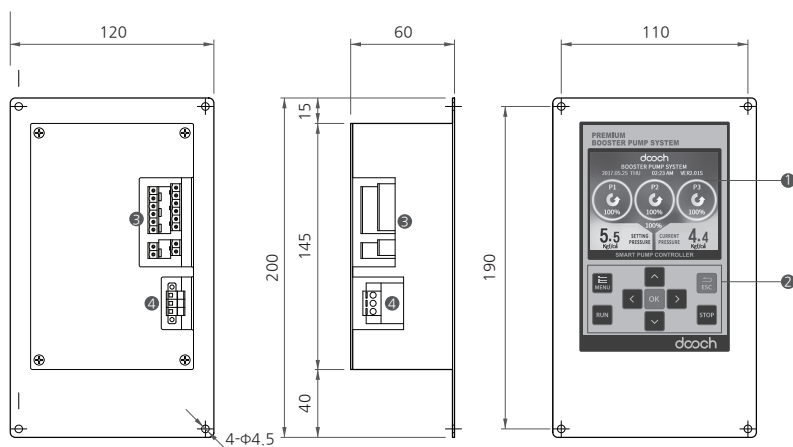
Method in CAN settings must be set to NQ V1.3x or higher.

Address	Parameter	Scale	Unit	R/W	Content
0×2028	Inverter 1 Output Freq.	0.1	Hz	R	0~600
0×2029	Inverter 2 Output Freq.	0.1	Hz	R	0~600
0×202A	Inverter 3 Output Freq.	0.1	Hz	R	0~600
0×202B	Inverter 4 Output Freq.	0.1	Hz	R	0~600
0×202C	Inverter 5 Output Freq.	0.1	Hz	R	0~600
0×202D	Inverter 6 Output Freq.	0.1	Hz	R	0~600
0×202E	Inverter 1 Output Current	0.1	A	R	0~1000
0×202F	Inverter 2 Output Current	0.1	A	R	0~1000
0×2030	Inverter 3 Output Current	0.1	A	R	0~1000
0×2031	Inverter 4 Output Current	0.1	A	R	0~1000
0×2032	Inverter 5 Output Current	0.1	A	R	0~1000
0×2033	Inverter 6 Output Current	0.1	A	R	0~1000
0×2034	Inverter 1 DC Link Voltage	1	V	R	0~9999
0×2035	Inverter 2 DC Link Voltage	1	V	R	0~9999
0×2036	Inverter 3 DC Link Voltage	1	V	R	0~9999
0×2037	Inverter 4 DC Link Voltage	1	V	R	0~9999
0×2038	Inverter 5 DC Link Voltage	1	V	R	0~9999
0×2039	Inverter 6 DC Link Voltage	1	V	R	0~9999
0×203A	Inverter 1 Output Power	0.1	kW	R	0~10000
0×203B	Inverter 2 Output Power	0.1	kW	R	0~10000
0×203C	Inverter 3 Output Power	0.1	kW	R	0~10000

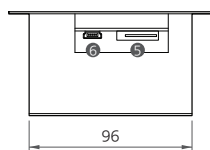


Address	Parameter	Scale	Unit	R/W	Value
0×203D	Inverter 4 Output Power	0.1	kW	R	0~10000
0×203E	Inverter 5 Output Power	0.1	kW	R	0~10000
0×203F	Inverter 6 Output Power	0.1	kW	R	0~10000
0×2040	Inverter 1 Accumulated Power MWh	1	MWh	R	0~10000
0×2041	Inverter 2 Accumulated Power MWh	1	MWh	R	0~10000
0×2042	Inverter 3 Accumulated Power MWh	1	MWh	R	0~10000
0×2043	Inverter 4 Accumulated Power MWh	1	MWh	R	0~10000
0×2044	Inverter 5 Accumulated Power MWh	1	MWh	R	0~10000
0×2045	Inverter 6 Accumulated Power MWh	1	MWh	R	0~10000
0×2046	Inverter 1 Accumulated Power kWh	0.1	kWh	R	0~10000
0×2047	Inverter 2 Accumulated Power kWh	0.1	kWh	R	0~10000
0×2048	Inverter 3 Accumulated Power kWh	0.1	kWh	R	0~10000
0×2049	Inverter 4 Accumulated Power kWh	0.1	kWh	R	0~10000
0×204A	Inverter 5 Accumulated Power kWh	0.1	kWh	R	0~10000
0×204B	Inverter 6 Accumulated Power kWh	0.1	kWh	R	0~10000

External View and Names of Each Part

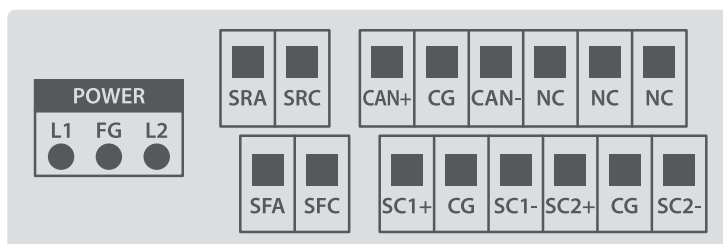


No.	Part Names
①	FULL COLOR LCD DISPLAY
②	Operation Keys
③	Terminal Block
④	Power Supply Terminal
⑤	SD Card Slot
⑥	Mini USB Port for Firmware Upgrade



TM 3.5 Terminal Block

Terminal Block Description



POWER	L1	AC 208~440V 50/60Hz
	FG	
	L2	

1st row	SRA	System Operation: Relay A Contact
	SRC	System Operation: Relay Common Terminal
	CAN+	High Terminal for CAN Signal
	CG	Common Terminal for Power Ground
	CAN-	Low Terminal for CAN Signal
	NC	Spare Terminal
	NC	Spare Terminal
2nd row	NC	Spare Terminal
	SFA	System Error Relay A Contact
	SFC	System Error Relay Common Terminal
	SC1+	RS 485 High Terminal of Communication 1
	CG	Common Terminal for Power Ground
	SC1-	RS 485 Low Terminal of Communication 1
	SC2+	RS 485 High Terminal of Communication 2
	CG	Common Terminal for Power Ground
	SC2-	RS 485 Low Terminal of Communication 2

[illegible]

Product Warranty Certificate

This product is guaranteed to have passed our rigorous quality control processes and final inspections.
If a failure acknowledged as our responsibility occurs within 1 year of purchase, we will repair it free of charge according to the stated warranty terms.

Product Name	NSQ Booster Pump	Warranty Period	1 year
Model Name		Date of Purchase	
Place of Purchase		Warranty Expiry	
Address		Phone Number	

Warranty Terms

1. If this product fails, we provide free repairs for one full year from the date of purchase please contact our A/S service center or the dealer where you purchased it.
2. The following cases are excluded from warranty coverage, even within the warranty period.
 - Failure due to user misuse (operation other than what is stated in the manual)
 - Failure due to repairs, modifications, or disassembly at locations other than those designated by us
 - Failure due to fire or natural disasters
 - Failure due to improper storage
(unsuitable locations such as high temperature/humidity, or areas with organic solvents)
 - Absence of this warranty certificate
 - If details such as the dealer, purchase date, etc., have been altered
 - Accessories and consumable parts are not covered by the warranty.
 - We do not compensate for any incidental losses arising from the failure of this product.

Cautions

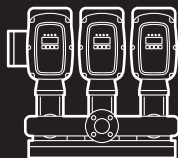
1. This warranty guarantees free or paid repairs according to the terms above and does not limit the customer's legal rights.
2. If you have any questions regarding the contents of this warranty, please contact our dealer or A/S center.
3. Please ensure the dealer name and purchase date are filled out on this warranty.
4. This warranty will not be reissued, so please keep it in a safe place.

dooch

Global Business Center : 2~4F, 162, LS-ro, Gunpo-si, Gyeonggi-do, Korea
TEL: 031)831-1243 FAX: 031)831-1240

Factory : 332, Hwagok-ro, Jangam-myeon, Hwaseong-si, Gyeonggi-do, Korea
Customer center : 1588-5993

Website : www.doochpump.com



NSQ *BOOSTER PUMP SYSTEM*



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※ please contact your local agent for more information.