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## Estimated Terminal Pressure Constant Control of Water Supply Unit NX-VFC-e Multiple pump control

### Important Notice



Thank you very much for purchasing our direct-connecting booster pump unit.

In order to use the product appropriately, do not operate, maintain, or inspect the direct-connecting booster pump unit until you have read and fully understood this instruction manual.

For safety purpose, observe the cautions and warnings in this instruction manual and those on the labels affixed on the unit.

Retain this manual where it can be consulted at any time of operation, maintenance and inspection of the direct-connecting booster pump unit.

### To whom is performing the utility work:

Please submit this manual to the customer performing the operation, maintenance and inspection of the direct-connecting booster pump unit.

## Limited warranties

1. In the event of failure or breakage under proper use of the product during the warranty period, equipment supplied by TERAL INC. shall be repaired or replaced free of charge within the scope of the relevant part, provided that such failure or breakage is attributable to inadequacy of the design or workmanship of the equipment.
2. The warranty mentioned in the above clause shall be only the mechanical warranty of the defective part, and shall not cover any expenses or other damage arising from the failure or breakage.
3. In the event of the following failures and breakage, the costs of the repairs and consumables (i.e. parts whose consumption or wear is expected at the beginning of purchase) shall be borne by the user.
  - (1) Failures and breakage attributable to equipment that was not delivered by TERAL INC.
  - (2) Failures and breakage after the expiration of the warranty period
  - (3) Failures and breakage caused by disasters or force majeure, such as fire, acts of God or earthquakes
  - (4) Failures and breakage resulting from repairs, disassembly or modifications made without the consent of TERAL INC.
  - (5) Failures and breakage when parts other than those designated by TERAL INC. are used
  - (6) Failures and breakage caused by any use outside the specification limit of the equipment
4. TERAL INC. shall not be liable for any damage caused by incorrect or reckless use of the water supply unit even if such damage occurs within the warranty period. Cost and expenses incurred for sending engineer(s) in such a case shall be borne by the user.
5. If the cause of the failure is unclear, necessary actions shall be determined through mutual consultation.
6. In order to improve performance, some parts and/or components of the product may be changed without prior notice.  
In addition, upon repairs of the product, TERAL INC. may use recycled parts that conform to our quality standards or may use substitutes that are functionally equivalent.

## Purpose of this manual / Notice to users

1. The purpose of this manual is to provide the user with detailed information necessary to operate, maintain and inspect the water supply unit (or "the unit") properly.  
This manual does not cover work that requires highly specialized knowledge (disassembly, repairs, etc.). If the unit needs to be repaired, be sure to contact TERAL INC.
2. This manual is intended for:
  - persons experienced in the operation of water supply units, or those who have been trained by such experienced operators
  - qualified persons, such as licensed electrical engineers, for the content regarding electric wiring work
3. This manual mainly covers standard products. If you have purchased a customized product, some part of this manual may not be applicable to your unit. In such a case, refer to other documents such as the delivery specifications to confirm the product specifications.
4. The product specifications and information in this manual are subject to change without prior notice.
5. In the illustrations of this manual, some part of the product is omitted or simplified to make it easy to understand. Therefore, the illustrations may look different from the actual product you use.

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## 1. Safety precautions




Before using the unit, thoroughly read this “Safety precautions” to properly use the product. Information described below is vital to safe and proper use of the unit and prevention of hazard and/or damage.

### 1.1 Explanation of safety indications and graphic symbols











This instruction manual divides safety indications into four categories according to the level of hazard (the extent of damage/losses and the urgency). In addition, the type of user instructions is indicated with a graphic symbol.

This manual uses the following signs. Fully understand these terms and symbols before reading this manual further.

#### ■ Explanation of the safety indications

Indications	Meaning
 <b>Danger</b>	Indicates an imminently hazardous situation. Failure to observe this will result in death or serious injury.
 <b>Warning</b>	Indicates a potentially hazardous situation. Failure to observe this will result in death or serious injury.
 <b>Caution</b>	Indicates a potentially hazardous situation. Failure to observe this will result in minor or moderate injury or property damage.
<b>Note</b>	Indicates information that is in particular to be noted or emphasized.














#### ■ Explanation of the graphic symbols























				
Don'ts	Do not touch	Do not disassemble	Do not touch with wet hand	Do not expose to water
These graphic symbols indicate prohibited actions (that must not be done).				
				
Do's				
This graphic symbol indicates mandatory actions (that must be done).				
				
Caution	Electric shock hazard	Rotation hazard		
These graphic symbols indicate existing hazards to beware of.				










### 1.2 Safety precautions

























The following are important instructions about safety. Be sure to observe these precautions.

 <b>Danger</b>	
 	Once the main power is turned on, do not touch any live parts inside or outside the control panel. A high voltage applied to live parts causes a serious electric shock.

 <b>Warning</b>	
 Properly move the unit according to lifting instructions. Otherwise, the unit may fall, resulting in injury and/or damage.	 Do not carry out any work by/on the water supply unit that is being lifted. Otherwise, the unit may fall, resulting in injury and/or damage.
 Only those who are authorized by the site manager may operate the water supply unit. Operation by unskilled personnel may lead to an unforeseen accident.	 Only those who are trained to handle the water supply unit may install, maintain, and inspect it. Operation by unskilled personnel may lead to an unforeseen accident.
  Only qualified personnel, such as licensed electrical engineers, are allowed to carry out any electric work. Otherwise, it may lead to an electric shock, fire, failures, and/or other problems.	  Use the wiring equipment and devices compliant with the use conditions, and carry out wiring work safely and securely according to the technical standards for electrical facilities, as well as the indoor wiring regulations. Otherwise, it may lead to an electric shock, fire, and/or other problems.
  Before starting wiring work, be sure to turn off the main power and confirm that the pilot lamp is turned off. Take measures to prevent erroneous power supply. Otherwise, it may lead to an electric shock.	  At the power supply source, be sure to install a ground fault interrupter dedicated to this unit. Otherwise, it may lead to an electric shock, fire, and/or other problems.

 <b>Warning</b>	
  <p>Securely install the ground wire and ensure to carry out grounding work. Otherwise, it may lead to an electric leak and/or electric shock.</p>	 <p>Do not connect the ground wire to a gas pipe or water pipe. Such a connection is illegal and leads to an electric shock, explosion and/or fire.</p>
 <p>Ensure that all electric wires are securely connected. Otherwise, it may lead to fire and/or an electric shock.</p>	  <p>Before starting the maintenance or inspection work, be sure to stop the pump and turn off the main power of the panel board. Otherwise, it may lead to an electric shock, injury, damage, water leakage, and/or other problems.</p>
 <p>Before starting the unit or carrying out maintenance/inspection work, ensure that all the relevant workers are informed of the operation and that there are no workers in the dangerous zone around the unit. Otherwise, it may lead to an unforeseen accident.</p>	 <p>Before rotating the pump shaft by hand to check its smooth rotation, be sure to disconnect the main power supply. Otherwise, it may lead to injury and/or damage.</p>
  <p>After turning on the power, do not touch any parts of the water supply unit other than those required for operation. Otherwise, it may lead to an electric shock, injury, and/or other problems.</p>	  <p>Ensure to keep the cover of the control panel closed during operation. Otherwise, it may lead to an electric shock, fire, and/or other problems.</p>
  <p>Do not put your fingers or foreign objects into any openings or rotating part of the motor during operation. Otherwise, it may lead to injury and/or damage.</p>	 <p>Do not perform shutoff operation for more than one minute continuously. Otherwise, the temperature and pressure will increase inside the pump, which may damage the pump and/or cause steam to blow off.</p>
 <p>Do not operate the unit if abnormal condition is observed in any actions and movement or in any parts, components, and others. Otherwise, it may lead to injury, failures and/or various accidents.</p>	  <p>If you need to carry out work that requires disassembly of the unit—such as replacement of parts, repairs, or inspection, contact TERAL INC. If unskilled personnel carry out the work that requires special knowledge, it may lead to an accident and/or failures.</p>
 <p>Regularly inspect your equipment and perform maintenance on each component. Otherwise, you cannot prevent potential failures, thus leading to a higher risk of accidents.</p>	 <p>Motors and control panels should not be used beyond a certain period of time. Otherwise, it may cause ignition or other accidents due to aging deterioration.</p>
 <p>Keep the ambient temperature at 0 to 40°C with sufficient ventilation to prevent damage to the equipment and deterioration of its life. Avoid dust, corrosive or explosive gases, salinity, humidity, condensation. For indoor installations avoid direct sunlight or wind and rain. Electric motor or control panel insulation degradation may result in electric leakage, electric shock, or fire.</p>	

 <b>Caution</b>	
 <p>Do not use the unit outside the range of the product specifications. Otherwise, it may lead to an electric shock, fire, water leakage, failures, and/or other problems.</p>	 <p>Do not use the unit at the power voltage other than the specification. An incorrect voltage may damage the control panel.</p>
 <p>Do not use a single unit as the only means of directly operating key facilities or sustaining life. In the event of a failure, the water supply may stop. Ensure to make a backup unit readily available.</p>	 <p>Do not use the unit to deliver pure water. Otherwise, pure water may be contaminated with impurities.</p>
 <p>Pay special attention to nails when opening the delivered container. Otherwise, it may lead to injury and/or damage.</p>	 <p>As for the installation environment of the unit, strictly observe the installation instructions. Otherwise, it may lead to premature failure.</p>
 <p>Ensure that the floor at the unit's installation place is waterproofed and fitted with drainage. Otherwise, it may lead to serious damage in the event of leakage.</p>	 <p>Only after detaching a companion flange from each pump, screw a pipe into it. Otherwise, it may lead to damage or water leakage.</p>

 <b>Caution</b>	
 Do not merge suction pipes. Otherwise, it may hinder the normal operation.	 Do not use any piping materials that are prone to rust. Otherwise, it may damage the unit.
 Do not install different or other cables or control wires in one pipe or duct. Otherwise, it may damage the unit and/or other equipment.	 Provide a ground electrode dedicated to the inflow solenoid valve. Otherwise, it does not function normally.
 Do not step on the control panel, pump, or pipes. Otherwise, it may lead to injury, damage, and/or other problems.	 Try to prevent the control panel and the motor from being sprayed water. Otherwise, it may lead to an electric shock, electric leak, failures, and/or other problems.
 Implement each operation carefully. Otherwise, it may lead to injury and/or damage.	 Properly make each setting of the control panel depending on the conditions of use. Otherwise, it may hinder the normal operation.
 Before operation, thoroughly clean (flush) the inside of the piping. Otherwise, the piping system may be contaminated with foreign matter, thus leading to an accident or a pump failure.	 Do not run the pump without priming. Otherwise, it may damage the sliding parts inside the pump.
 Do not perform automatic operation without water flowing to the pressure transmitter. Otherwise, it may hinder the normal operation and damage the unit.	 Do not touch the motor body or the cooling fins for the control panel while the unit is running or immediately after the unit has stopped. Otherwise, you may get burns from the hot surface.
 Do not cover the motor or the control panel with cloths or other objects. Otherwise, it may lead to overheat and/or ignition.	 Do not place anything on the water supply unit or do not step on the unit. Otherwise, it may lead to injury and/or damage.
 In the event of an alarm or abnormal condition that cannot be resolved, immediately contact TERAL INC. Otherwise, it may lead to an accident.	 Ensure to carry out inspection according to the maintenance checklist. Otherwise, you cannot prevent potential failures, thus leading to a higher risk of accidents.
 Replace the packing and O-rings during inspection involving disassembly. Otherwise, it may lead to water leakage.	 Before disassembling, shut the suction and discharge sluice valves, and then discharge pressured water from the pump and the piping. Otherwise, water may spurt out, thus leading to an accident.
 Do not perform an insulation resistance test on the control panel. (Before performing an insulation resistance test on the motor, disconnect electric wires and cables from the control panel.) Otherwise, it may damage the control panel.	 If you do not use the unit for a long time, turn off the power, drain water from the inside, and then store the unit. Otherwise, it may lead to insulation degradation, freeze cracking, and/or other problems.
 If the water supply unit is used outdoors, select "with outdoor cover" as a special specification and install the outdoor cover before use. Otherwise, it may cause malfunction.	 If negative suction is necessary, adopt the unit specified for negative suction. Failure to observe this may cause discharge pressure drop and lead to a water cutoff.
 Do not fit an advance phase capacitor to the secondary wiring in the control panel. Otherwise, it may cause malfunction.	 To operate the pump, close the bypass of the check valve. If not followed, the check valve will not function.

## 2. Before using the water supply unit



**Caution**



Make sure that the delivered package is placed right-side up before unpacking. Pay special attention to nails especially when opening a wooden crate or you may get injured.

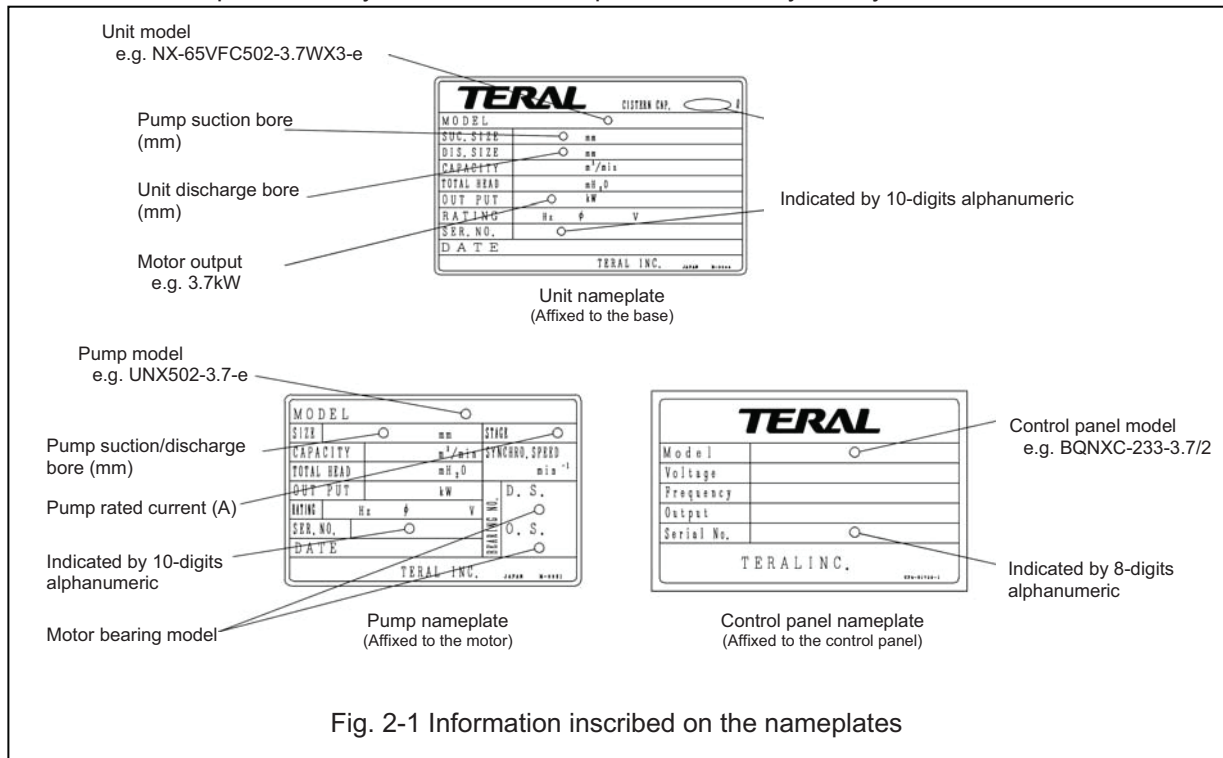
**Note**

After unpacking, ask the vendor to dispose of packaging materials that are no longer necessary.

### 2.1 Points to be checked

When you receive the water supply unit, check the following points immediately after unpacking.

- (1) Check the nameplate to verify that the delivered product is exactly what you ordered.



- (2) Check that no part of the unit has been damaged during transportation.
- (3) Check all fastening parts including bolts and nuts are securely tightened.
- (4) Check all the accessories that you ordered have been completely delivered.

### 2.2 Model type description

NX - 65 VFC 40 3 - 7.5A WX3 - K - e  
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

- ① NX Pump
- ② Unit discharge nominal diameter
- ③ Estimated terminal pressure constant control of water supply unit
- ④ Pump nominal diameter
- ⑤ No. of pump stage
- ⑥ Output (If there are duplicate model types, add "A" or "B" at the end.)

- ⑦ Operation mode  
WX3: 2-pump Parallel, 3-pump Rotation  
TX3: 3-pump Parallel, 3-pump Rotation  
TX4: 3-pump Parallel, 4-pump Rotation  
FX4: 4-pump Parallel, 4-pump Rotation  
FX5: 4-pump Parallel, 5-pump Rotation  
GX5: 5-pump Parallel, 5-pump Rotation
- ⑧ Identification code  
None: -  
K: High head
- ⑨ Equipped with a Top Runner efficiency (IE3 equivalent) motor



### 3. Configuration and overview of the water supply unit

This chapter describes standard specifications of the water supply unit. If you have purchased a customized product, some information in this chapter may not be applicable to your unit. Refer to the separately supplied delivery specifications and other documents to check the product specifications in such a case.

#### 3.1 Specifications of the water supply unit



 <b>Caution</b>	 Do not use this unit under any conditions other than those provided in the specifications. Otherwise, electric shock, fire, water leakage, or property damage may occur.
<b>Note</b>	If the inflow pump head is 5m or more, contact us for consultation.

Table 3-1 Standard specifications of water supply unit

Operation mode		WX3 : 2-pump Parallel, 3-pump Rotation TX3 : 3-pump Parallel, 3-pump Rotation TX4 : 3-pump Parallel, 4-pump Rotation FX4 : 4-pump Parallel, 4-pump Rotation FX5 : 4-pump Parallel, 5-pump Rotation GX5 : 5-pump Parallel, 5-pump Rotation
Control method		Estimated terminal pressure constant control / Discharge pressure constant control by frequency control
Applicable liquid	Liquid property	Fresh water
	Temperature	0 to 40°C
Installation location		Indoors (0 to 40°C, Max. RH85%, no condensation), Altitude: Max. 1,000m
Suction conditions		Inflow (Inflow pump head: Max. 5 m)*
Pump (Material)		NX model stainless steel horizontal multistage centrifugal pump (Impeller: SUS304, Casing: SCS13, Main shaft: SUS304)
Motor	Type	Totally-enclosed fan-cooled type for indoor use
	Protection class	IP44
	Number of poles	2 poles
Flange		Suction: Dedicated companion flange, Discharge: JIS Flange
Power supply		1.1 to 7.5 kW: 3-phase 200/200-220 V (50/60 Hz)
Paint color		Common base: Munsell N-5 Pressure tank: Munsell 10Y5.5/0.5
Pressure tank		Model DPT20 (20L diaphragm tank)
Pressure detection device		Pressure transmitter: Transmission system: 5 VDC, 3-wire system Output voltage: 0.5 to 3.5 V DC
Control panel	Model	BQNXC type
	Motor Protection	Inverter (with electronic thermal protection)
	Normal indications	Indicator lamp: Power supply, Pump operation (per pump), Pump operation inhibition (per pump), Failure (all) Other indications: Discharge pressure, Voltage, Current (per pump), Operating frequency (per pump), Cumulative operation time (per pump), Cumulative number of starts (per pump), Number of start times of the unit on the previous day, Alarm log (last 5 alarms)
	Alarm indications	Receiver tank full, Receiver tank low, Dry-run prevention, Electrode failure, Start frequency failure, Pressure transmitter 1 failure, Control panel high temperature, EEPROM error, Overload (per pump), Discharge pressure abnormal drop (per pump), Electric leak (per pump), High temperature (per pump), Flow switch failure (per pump), Overcurrent (per pump), Overvoltage (per pump), Stall prevention (per pump), Inverter overload (per pump), Open-phase output (per pump), Inverter overheat (f per pump), Communication failure (per pump), Inverter trouble 1 (per pump), Inverter trouble 2 (per pump)
	External outputs	Power supply for alarm (at power voltage), Inflow solenoid valve output (at power voltage), Operation/alarm signal (No-voltage a-contact)
	External inputs	External stop signal (interlock): supports a/b-contacts

\* The negative suction models support up to 4 m in the actual pump head and up to 6 m in the total pump head (at 20°C water temperature).

\* If a flush valve or the like is used, a sudden pressure drop may occur, thus leading to the problems such as insufficient water supply, noise, premature damage of the pressure tank, or others. Contact us for such cases.

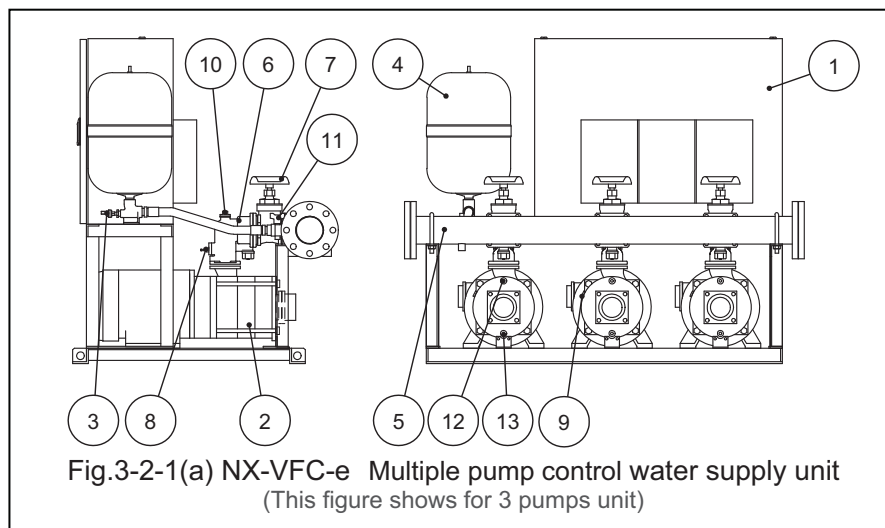


## 3.2 Names and functions of each part

### 3.2.1 Names and functions of the components of the water supply unit

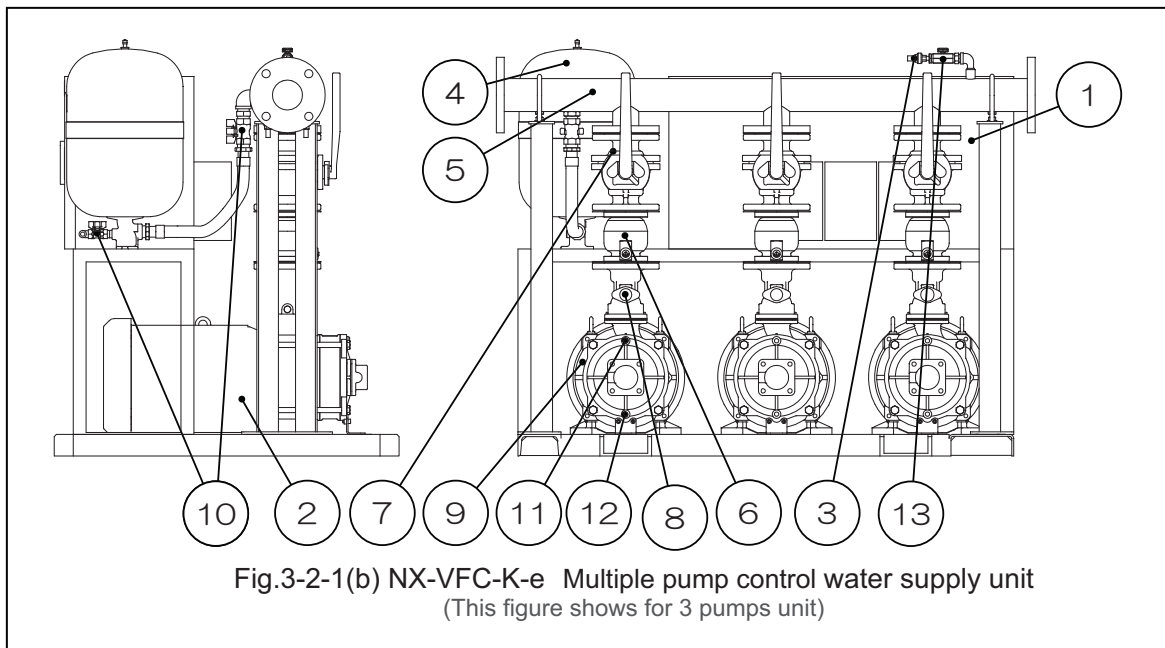
[NX-VFC-e multiple pump control]

- ① Control panel  
The control panel controls the pump and supplies the power to the motor.  
It enables to start/stop the pump, detects the operating status of the pump and automatically switches the No. of the pump to run.  
Also it enables pump variable speed control by a pressure transmitter signal and thereby estimated terminal pressure constant control is conducted.
- ② Pump  
Its motor rotates an impeller to generate pressure for delivering water.
- ③ Pressure transmitter  
The pressure transmitter converts pressure into an electric signal so as to use it for control.
- ④ Pressure tank  
The pressure tank maintains the pressure in the piping and reduces the number of start/stop and pressure fluctuations of the pump.
- ⑤ Junction pipe  
The junction pipe joins the discharge pipes of the two pumps into one pipe.
- ⑥ Discharge elbow  
The discharge elbow has a built-in silent check valve and is equipped with the flow switch ⑧. Inside the elbow, a bypass is provided and this bypass can be opened during maintenance to allow water to flow backwards.
- ⑦ Gate valve  
The gate valve is used for maintenance and is provided with each pump.
- ⑧ Flow switch  
The flow switch outputs a signal to stop the pump when the water flow rate is not higher than the setup (stop) flow rate.
- ⑨ High temperature sensor  
If the water temperature is not lower than the setup temperature due to zero-discharge operation, the high temperature sensor outputs a signal to stop the pump.
- ⑩ Priming plug  
This plug is used to prime the pump.
- ⑪ TJ valve  
This is a three-way valve used to discharge water from the pressure tank when you carry out the maintenance of the pressure tank and the pressure transmitter.
- ⑫ Air vent plug of pump  
This plug is used to release air from the pump.
- ⑬ Pump drain  
This drain is used to discharge water from the pump.



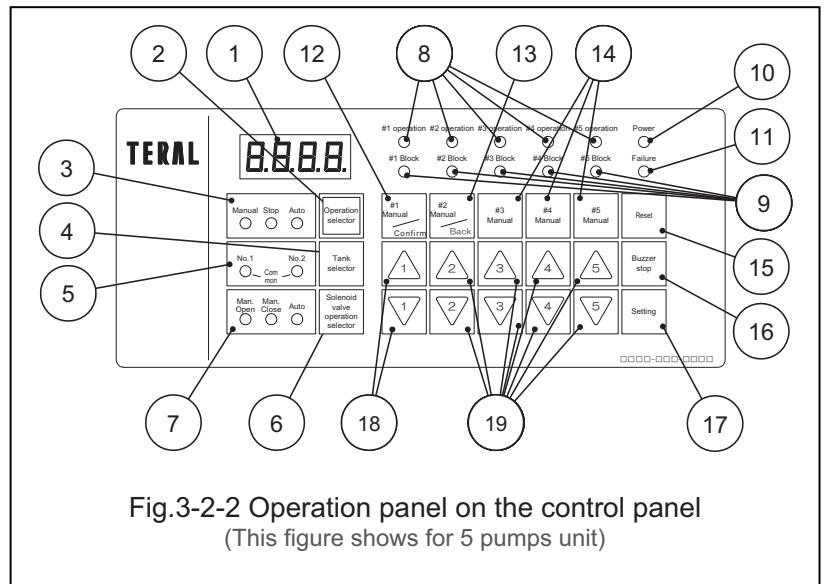
[NX-VFC-K-e multiple pump control]

- ① Control panel  
The control panel controls the pump and supplies the power to the motor.  
It enables to start/stop the pump, detects the operating status of the pump and automatically switches the No. of the pump to run.  
Also it enables pump variable speed control by a pressure transmitter signal and thereby estimated terminal pressure constant control is conducted.
- ② Pump  
Its motor rotates an impeller to generate pressure for delivering water.
- ③ Pressure transmitter  
The pressure transmitter converts pressure into an electric signal so as to use it for control.
- ④ Pressure tank  
The pressure tank maintains the pressure in the piping and reduces the number of start/stop and pressure fluctuations of the pump.
- ⑤ Junction pipe  
The junction pipe joins the discharge pipes of the two pumps into one pipe.
- ⑥ Bypass check valve  
The bypass check valve prevents backflow from the discharge piping to the pump. A bypass is provided and this bypass can be opened during maintenance to allow water to flow backwards.
- ⑦ Ball valve  
The ball valve is used for maintenance and is provided with each pump.
- ⑧ Flow switch  
The flow switch outputs a signal to stop the pump when the water flow rate is not higher than the setup (stop) flow rate.
- ⑨ High temperature sensor  
If the water temperature is not lower than the setup temperature due to zero-discharge operation, the high temperature sensor outputs a signal to stop the pump.
- ⑩ Ball valve for pressure tank drainage  
This valve is used to discharge water from the pressure tank when you carry out the maintenance of the pressure tank.
- ⑪ Air vent plug of pump  
This plug is used to release air from the pump.
- ⑫ Pump drain  
This drain is used to discharge water from the pump.
- ⑬ Gauge valve  
The gauge valve is used for maintenance of the pressure transmitter.



### 3.2.2 Names and functions of control panel elements

- ① Display  
It displays a variety of information about the water supply unit. (→ see 7.4)
- ② Operation selector switch  
The switch is to change the operation mode of the water supply unit. (→ see 7.1)
- ③ Current mode indicator lamp  
The lamp is to display the operation mode currently selected.
- ④ Tank selector switch  
Press this switch to select the receiver tank(s) to be used. (→ see 7.2)
- ⑤ Current tank indicator lamp  
The indicator lamp will be on for the receiver tank currently selected.
- ⑥ Solenoid valve operation selector switch  
Press this switch to change the solenoid valve operation mode. (→ see 7.3)
- ⑦ Current solenoid valve operation indicator lamp  
The indicator lamp will be on for the solenoid valve operation currently selected.
- ⑧ Operation indicator lamp  
The indicator lamp will be on while the pump is running. The lamp blinks during checking for low flowrate in automatic mode.
- ⑨ Operation inhibition indicator lamp (per pump)  
The indicator lamp will be on when the operation parameter is set to “Operation inhibition” mode. (→ see 7.5)
- ⑩ Power indicator lamp  
The indicator lamp will be on while the power is turned ON. It blinks in inspection mode (→ see 8.2).
- ⑪ Failure indicator lamp  
The indicator lamp blinks when an alarm occurs.
- ⑫ No. 1 Manual/Confirm switch  
Press the switch to run the pump No.1 in the manual mode. The switch is also used as the “Confirm” switch in the setting and other modes.
- ⑬ No.2 Manual/Back switch  
Press the switch to run the pump No.2 in the manual mode. The switch is also used as the “Back” switch in the setting and other modes.
- ⑭ Manual switch (No. 3 to 5)  
The switch is to manually operate the pumps No. 3 to 5.
- ⑮ Reset switch  
The switch is used to reset an alarm.  
Generated alarms can be reset by pressing the switch once the cause of the alarm is eliminated.
- ⑯ Buzzer stop switch  
The switch is used to manually stop the buzzer when an alarm occurs. The switch is also used in combination with the cursor switch 1 to switch the basic information items on the display.
- ⑰ Setting switch  
The switch is used to switch to or to exit from the setting mode (→ see 7.5).
- ⑱ Cursor switch 1  
The operating frequency can be changed by pressing the switch in the manual mode of Pump no.1. The switch is used to switch the indication items, make the settings, and switch the indication items of the pump No.1.
- ⑲ Cursor switch (No. 2 to 5)  
The operating frequency can be changed by pressing this switch in the manual mode of the pumps No.2 to 5. The switch is used to switch the indication items of the pump No.2 to 5.

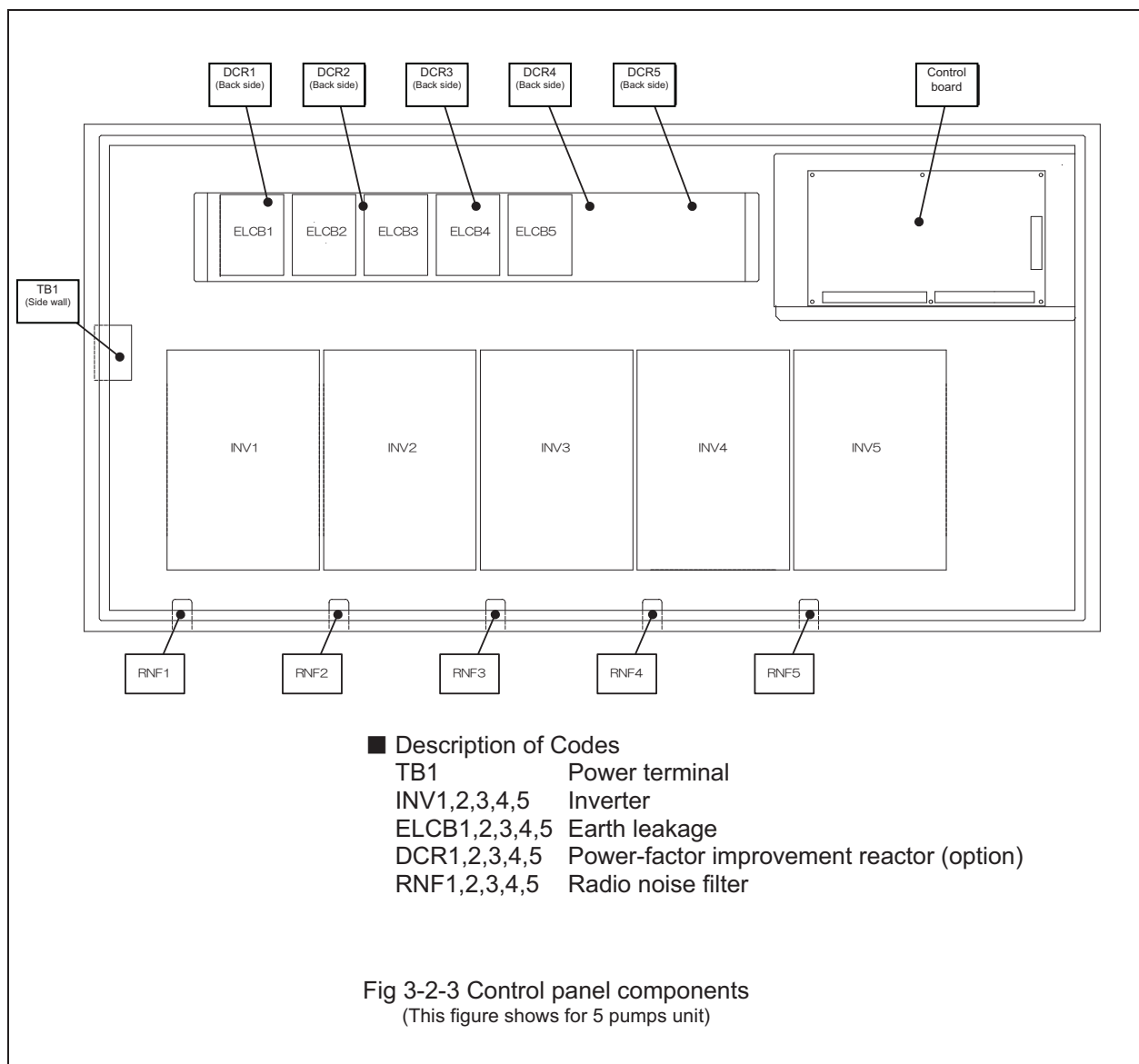


### 3.2.3 Configuration of the control panel



While the power is on, high voltage is applied inside the control panel, which is very dangerous. Any person other than the one authorized to do so must not open cover of the control panel. If not followed, it may cause an electric shock.

#### (1) Components



### 3.2.4 Control board

The following are the details of the control board.

**Warning**

Do not remove the protective cover on the control board or the cover of the I/O terminal block when the power is turned on. Otherwise, it may lead to an electric shock.

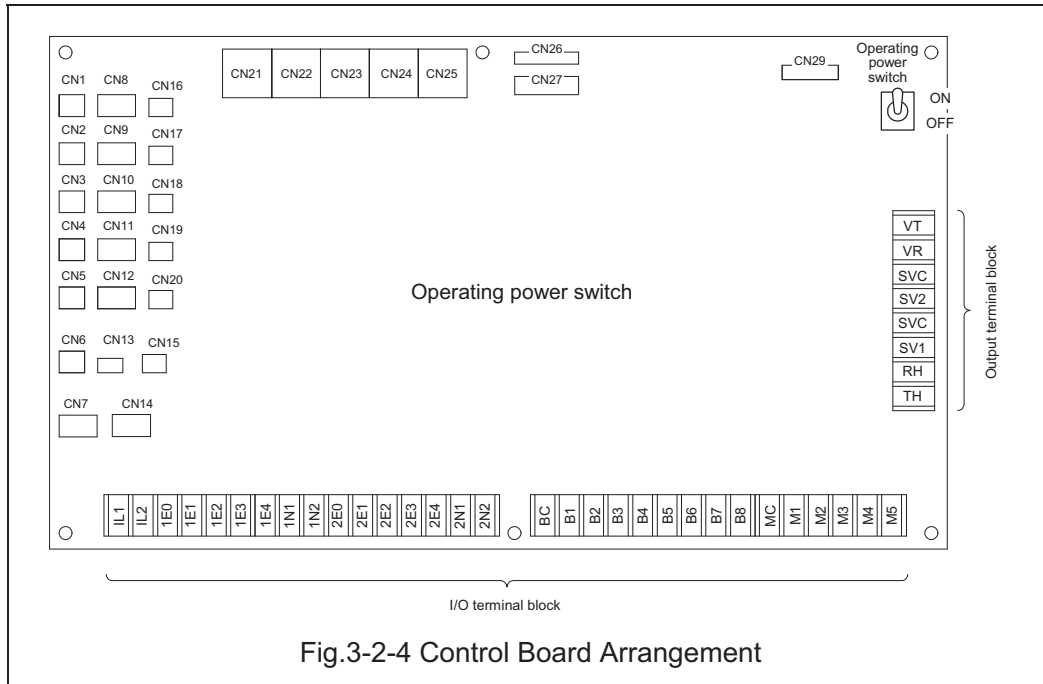


Fig.3-2-4 Control Board Arrangement

Table 3-2-4 (a) Connector assignments

No.	Connection point	No.	Connection point	No.	Connection point
CN1	Equipment inside the control panel	CN11	Flow switch for pump No. 4	CN21	Equipment inside the control panel
CN2	Equipment inside the control panel	CN12	Flow switch for pump No. 5	CN22	Equipment inside the control panel
CN3	Equipment inside the control panel	CN13	(Unused)	CN23	Equipment inside the control panel
CN4	Equipment inside the control panel	CN14	(Unused)	CN24	Equipment inside the control panel
CN5	Equipment inside the control panel	CN15	Control panel high-temperature sensor*1	CN25	Equipment inside the control panel
CN6	(Unused)	CN16	High temperature sensor No. 1	CN26	Equipment inside the control panel
CN7	Pressure transmitter	CN17	High temperature sensor No. 2	CN27	(Unused)
CN8	Flow switch for pump No. 1	CN18	High temperature sensor No. 3	CN29	Equipment inside the control panel
CN9	Flow switch for pump No. 2	CN19	High temperature sensor No. 4		
CN10	Flow switch for pump No. 3	CN20	High temperature sensor No. 5		

\*1 This sensor is connected depending on the specifications.

Table 3-2-4 (b) Codes and application of input/output terminal block

Code	Application	Code	Application
IL1 and IL2	Interlocking signal	B1 to B8	Alarm signal output
1E0 to 1E4	Receiver tank water level detector electrode No. 1	BC	Alarm signal output common
2E0 to 2E4	Receiver tank water level detector electrode No. 2	VR, VT	Power supply for alarm (200V)
1N1, 1N2	Receiver tank solenoid valve control electrode No.1	RH, TH*1	Freeze-proof heater(200V)
2N1, 2N2	Receiver tank solenoid valve control electrode No.2	SVC, SV1	Receiver tank solenoid valve No. 1 (200V)
M1 to M5	Pumps No. 1 to pump No. 5 operation signal	SVC, SV2	Receiver tank solenoid valve No. 2 (200V)
MC	Operation signal common		

\*1 The freeze-proof heater is connected only for the freeze-proof models (special specification).

### 3.3 Specifications of control panel

Table 3-3 Specifications of control panel

Item			Specifications 1	Specifications 2
Control panel model			BQNXC	
Operation mode			Automatic rotational operation (WX3/TX3/TX4/FX4/FX5/GX5)	
Material and external color of casing			Steel plate (Munsell 5Y7/1 semigloss/baking finish)	
Output range	Three-phase 200/200-220 V (50/60 Hz)		1.1 to 7.5 kW	
Circuit configuration	Ground fault interrupter		Individual pump systems	
	Power-factor correcting reactor (DCR)		Individual pump systems	
	Motor protection		Inverter (electronic thermal protection)	
	Double receiver tank circuit		Can be switched on the operation panel	
	Inflow solenoid valve circuit		Can be operated on the operation panel	
Functions	Electrode 5P circuit		—	
	Dry-run prevention		—	
	Automatic switching upon failure		—	
	Pump continuous operation prevention function		—	
	Pump operation time equalization function		—	
	External stop signal (interlock) available		a/b-contact available	
	Buzzer stop timer setting		1 to 60 min, ∞, no buzzer	
	Full/low water alarm automatic recovery setting		—	
	Inflow solenoid valve automatic alternation setting		—	
	Inspection mode		—	
	Alarm buzzer		—	
	Buzzer stop switch		—	
	Energy-saving operation setting		—	
	Power		—	
	Operation (per pump)		—	
Indications on control panel	Indicator lamp	Inhibition (per pump)	—	S
		Failure (collective)	—	S
		Discharge pressure	Unit: m·H <sub>2</sub> O	S
		Power voltage	Unit: V	S
		Operation current (per pump)	Unit: 0.1 A	S
	Various indications	Operation frequency (per pump)	Unit: 0.1 Hz (only automatic)	S
		Cumulative operation time (per pump)	Unit: Hour	S
		Cumulative number of starts (per pump)	Unit: times	S
		Number of start times of the unit	Number of starts on the previous day	S
		Alarm log	5 latest alarms	S
	Alarm indications	Interlocking in operation	—	S
		Receiver tank full	No: E001	S
		Receiver tank low	No: E002	S
		Dry-run prevention	No: E003	S
		Electrode failure	No: E004	S
		Start frequency failure	No: E006	S
		Pressure transmitter 1 failure	No: E051	S
		Control panel high temperature	No: E070	O
		EEPROM error	No: E080	S
		Overload (per pump)	No: E#01	S
		Discharge pressure abnormal drop (per pump)	No: E#02	S
		Electric leak (per pump)	No: E#03	S
		High temperature (per pump)	No: E#04	S
		Flow switch failure (per pump)	No: E#05	S
		Overcurrent (per pump)	No: E#11	S
		Overvoltage (per pump)	No: E#12	S
		Stall prevention (per pump)	No: E#14	S
		Inverter overload (per pump)	No: E#15	S
		Open-phase output (per pump)	No: E#16	S
		Inverter overheat (per pump)	No: E#17	S
		Inverter communication failure (per pump)	No: E#18	S
		Inverter trouble 1 (per pump)	No: E#19	S
		Inverter trouble 2 (per pump)	No: E#20	S
External output	Power for alarm		Power voltage	S
	Inflow solenoid valve output		Power voltage	S (Open/closed selectable when the power is supplied)
	Operation signal		No-voltage a-contact	S (per pump)
	Fault signal		No-voltage a-contact	S (5 points: patterns 0 to 4)

“S” indicates standard features, and “O” indicates optional features.

- \*1 Power voltage and operation current values are estimated values. There is an error of approximately 10% with respect to the full scale.
- \*2 “E006” and “E#04” can be disabled using settings. Refer to “7.5 Parameter setting.”
- \*3 The character “#” is replaced by the corresponding pump number.
- \*4 The open-phase output error is detected by only the units with the rated output of 5.5 kW or more.
- \*5 For the fault signal external output pattern, refer to “7.5 Parameter setting.”

### 3.4 Specification tables

#### 3.4.1 Standard models (positive suction type)

Table 3-4-1 Specification list (positive suction type)

Operation method	Nominal dia. mm		Type	Output kW	Phase/Voltage V	Standard specification				Spec. range		Charged pressure in pressure tank MPa(kgf/cm <sup>2</sup> )
	Pump suction	Unit discharge				Max. w.ater supply amount m <sup>3</sup> /min	Total pump head m	Min. pump head m	Stop pressure (rough value) MPa(kgf/cm <sup>2</sup> )	Water supply amount m <sup>3</sup> /min	Discharge pump head range m	
2-pump Parallel, 3-pump Rotation	40	65	NX-65VFC401-1.1WX3-e	1.1 x2	3-phase 200 (50Hz)	0.4	18	15	0.20 (2.0)	0.04-0.48	15-25	0.13 (1.3)
			NX-65VFC402-1.5WX3-e	1.5 x2		0.4	28	24	0.28 (2.9)	0.04-0.54	21-35	0.18 (1.8)
			NX-65VFC402-2.2WX3-e	2.2 x2		0.4	40	34	0.39 (4.0)	0.04-0.54	30-51	0.25 (2.6)
			NX-65VFC402-3.7WX3-e	3.7 x2		0.4	56	48	0.55 (5.6)	0.04-0.60	37-64	0.31 (3.2)
			NX-65VFC403-3.7WX3-e	3.7 x2		0.4	64	54	0.63 (6.4)	0.04-0.60	45-79	0.39 (4.0)
			NX-65VFC403-5.5WX3-e	5.5 x2		0.4	77	65	0.76 (7.7)	0.04-0.60	50-90	0.44 (4.5)
			NX-65VFC403-7.5AWX3-K-e	7.5 x2		0.4	99	79	0.82 (8.4)	0.04-0.66	79-100	0.54 (5.5) ※1
	50		NX-65VFC403-7.5BWX3-K-e	7.5 x2	3-phase 200/220 (60Hz)	0.4	105	100	1.03 (10.5)	0.04-0.66	100-110	0.54 (5.5) ※1
			NX-65VFC502-2.2WX3-e	2.2 x2		0.6	25	21	0.25 (2.6)	0.04-0.74	18-30	0.16 (1.6)
			NX-65VFC502-3.7WX3-e	3.7 x2		0.6	47	40	0.46 (4.7)	0.04-0.87	30-52	0.25 (2.6)
			NX-65VFC503-5.5WX3-e	5.5 x2		0.6	64	54	0.63 (6.4)	0.04-0.87	41-71	0.35 (3.6)
	65	80	NX-65VFC503-7.5WX3-e	7.5 x2		0.6	74	63	0.73 (7.4)	0.04-0.90	50-90	0.44 (4.5)
			NX-80VFC652-3.7WX3-e	3.7 x2		1.0	22	19	0.24 (2.4)	0.04-1.11	18-30	0.15 (1.5)
			NX-80VFC652-5.5WX3-e	5.5 x2		1.0	35	30	0.34 (3.5)	0.04-1.22	25-42	0.22 (2.2)
			NX-80VFC653-7.5WX3-e	7.5 x2		1.0	51	43	0.50 (5.1)	0.04-1.15	41-71	0.35 (3.6)
3-pump Parallel, 3 (4) -pump Rotation	40	80	NX-80VFC401-1.1TX3(4)-e	1.1 x3	3-phase 200 (50Hz)	0.6	18	15	0.20 (2.0)	0.06-0.72	15-25	0.13 (1.3)
			NX-80VFC402-1.5TX3(4)-e	1.5 x3		0.6	28	24	0.28 (2.9)	0.06-0.81	21-35	0.18 (1.8)
			NX-80VFC402-2.2TX3(4)-e	2.2 x3		0.6	40	34	0.39 (4.0)	0.06-0.82	30-51	0.25 (2.6)
			NX-80VFC402-3.7TX3(4)-e	3.7 x3		0.6	56	48	0.55 (5.6)	0.06-0.90	37-64	0.31 (3.2)
			NX-80VFC403-3.7TX3(4)-e	3.7 x3		0.6	64	54	0.63 (6.4)	0.06-0.90	45-79	0.39 (4.0)
			NX-80VFC403-5.5TX3(4)-e	5.5 x3		0.6	77	65	0.76 (7.7)	0.06-0.90	50-90	0.44 (4.5)
			NX-80VFC403-7.5ATX3(4)-K-e	7.5 x3		0.6	99	79	0.82 (8.4)	0.06-0.99	79-100	0.54 (5.5) ※1
	50	100	NX-80VFC403-7.5BTX3(4)-K-e	7.5 x3	3-phase 200/220 (60Hz)	0.6	105	100	1.03 (10.5)	0.06-0.69	100-110	0.54 (5.5) ※1
			NX-100VFC502-2.2TX3(4)-e	2.2 x3		0.9	25	21	0.25 (2.6)	0.06-1.10	18-30	0.16 (1.6)
			NX-100VFC502-3.7TX3(4)-e	3.7 x3		0.9	47	40	0.46 (4.7)	0.06-1.30	30-52	0.25 (2.6)
			NX-100VFC503-5.5TX3(4)-e	5.5 x3		0.9	64	54	0.63 (6.4)	0.06-1.30	41-71	0.35 (3.6)
	65	125	NX-100VFC503-7.5TX3(4)-e	7.5 x3		0.9	74	63	0.73 (7.4)	0.06-1.35	50-90	0.44 (4.5)
			NX-125VFC652-3.7TX3(4)-e	3.7 x3		1.5	22	19	0.24 (2.4)	0.06-1.66	18-30	0.15 (1.5)
			NX-125VFC652-5.5TX3(4)-e	5.5 x3		1.5	35	30	0.34 (3.5)	0.06-1.83	25-42	0.22 (2.2)
			NX-125VFC653-7.5TX3(4)-e	7.5 x3		1.5	51	43	0.50 (5.1)	0.06-1.72	41-71	0.35 (3.6)
4-pump Parallel, 4 (5) -pump Rotation	40	80	NX-80VFC401-1.1FX4(5)-e	1.1 x4	3-phase 200 (50Hz)	0.8	18	15	0.20 (2.0)	0.08-0.97	15-25	0.13 (1.3)
			NX-80VFC402-1.5FX4(5)-e	1.5 x4		0.8	28	24	0.28 (2.9)	0.08-1.08	21-35	0.18 (1.8)
			NX-80VFC402-2.2FX4(5)-e	2.2 x4		0.8	40	34	0.39 (4.0)	0.08-1.10	30-51	0.25 (2.6)
			NX-80VFC402-3.7FX4(5)-e	3.7 x4		0.8	56	48	0.55 (5.6)	0.08-1.20	37-64	0.31 (3.2)
			NX-80VFC403-3.7FX4(5)-e	3.7 x4		0.8	64	54	0.63 (6.4)	0.08-1.20	45-79	0.39 (4.0)
			NX-80VFC403-5.5FX4(5)-e	5.5 x4		0.8	77	65	0.76 (7.7)	0.08-1.20	50-90	0.44 (4.5)
			NX-80VFC403-7.5AFX4(5)-K-e	7.5 x4		0.8	99	79	0.82 (8.4)	0.08-1.32	79-100	0.54 (5.5) ※1
	50	100	NX-80VFC403-7.5BFX4(5)-K-e	7.5 x4	3-phase 200/220 (60Hz)	0.8	105	100	1.03 (10.5)	0.08-0.92	100-110	0.54 (5.5) ※1
			NX-100VFC502-2.2FX4(5)-e	2.2 x4		1.2	25	21	0.25 (2.6)	0.08-1.47	18-30	0.16 (1.6)
			NX-100VFC502-3.7FX4(5)-e	3.7 x4		1.2	47	40	0.46 (4.7)	0.08-1.74	30-52	0.25 (2.6)
			NX-100VFC503-5.5FX4(5)-e	5.5 x4		1.2	64	54	0.63 (6.4)	0.08-1.74	41-71	0.35 (3.6)
	65	125	NX-100VFC503-7.5FX4(5)-e	7.5 x4		1.2	74	63	0.73 (7.4)	0.08-1.80	50-90	0.44 (4.5)
			NX-125VFC652-3.7FX4(5)-e	3.7 x4		2.0	22	19	0.24 (2.4)	0.08-2.22	18-30	0.15 (1.5)
			NX-125VFC652-5.5FX4(5)-e	5.5 x4		2.0	35	30	0.34 (3.5)	0.08-2.43	25-42	0.22 (2.2)
			NX-125VFC653-7.5FX4(5)-e	7.5 x4		2.0	51	43	0.50 (5.1)	0.08-2.30	41-71	0.35 (3.6)
5-pump Parallel, 5-pump Rotation	40	100	NX-100VFC401-1.1GX5-e	1.1 x5	3-phase 200 (50Hz)	1.0	18	15	0.20 (2.0)	0.10-1.21	15-25	0.13 (1.3)
			NX-100VFC402-1.5GX5-e	1.5 x5		1.0	28	24	0.28 (2.9)	0.10-1.35	21-35	0.18 (1.8)
			NX-100VFC402-2.2GX5-e	2.2 x5		1.0	40	34	0.39 (4.0)	0.10-1.36	30-51	0.25 (2.6)
			NX-100VFC402-3.7GX5-e	3.7 x5		1.0	56	48	0.55 (5.6)	0.10-1.50	37-64	0.31 (3.2)
			NX-100VFC403-3.7GX5-e	3.7 x5		1.0	64	54	0.63 (6.4)	0.10-1.50	45-79	0.39 (4.0)
			NX-100VFC403-5.5GX5-e	5.5 x5		1.0	77	65	0.76 (7.7)	0.10-1.50	50-90	0.44 (4.5)
			NX-100VFC403-7.5AGX5-K-e	7.5 x5		1.0	99	79	0.82 (8.4)	0.10-1.65	79-100	0.54 (5.5) ※1
	50	125	NX-100VFC403-7.5BGX5-K-e	7.5 x5	3-phase 200/220 (60Hz)	1.0	105	100	1.03 (10.5)	0.10-1.15	100-110	0.54 (5.5) ※1
			NX-125VFC502-2.2GX5-e	2.2 x5		1.5	25	21	0.25 (2.6)	0.10-1.84	18-30	0.16 (1.6)
			NX-125VFC502-3.7GX5-e	3.7 x5		1.5	47	40	0.46 (4.7)	0.10-2.18	30-52	0.25 (2.6)
			NX-125VFC503-5.5GX5-e	5.5 x5		1.5	64	54	0.63 (6.4)	0.10-2.17	41-71	0.35 (3.6)
	65	150	NX-125VFC503-7.5GX5-e	7.5 x5		1.5	74	63	0.73 (7.4)	0.10-2.25	50-90	0.44 (4.5)
			NX-150VFC652-3.7GX5-e	3.7 x5		2.5	22	19	0.24 (2.4)	0.10-2.78	18-30	0.15 (1.5)
			NX-150VFC652-5.5GX5-e	5.5 x5		2.5	35	30	0.34 (3.5)	0.10-3.04	25-42	0.22 (2.2)
			NX-150VFC653-7.5GX5-e	7.5 x5		2.5	51	43	0.50 (5.1)	0.10-2.88	41-71	0.35 (3.6)

\* The initial gas pressure at the time of shipment is 0.44MPa (4.5kgf/cm<sup>2</sup>).Please adjust it before starting to use at the site.



### 3.4.2 Special models (negative suction type)











Table 3-4-2 Specification list (negative suction type)

Operation method	Nominal dia. mm		Type	Output kW	Phase/Voltage V	Standard specification				Spec. range		Charged pressure in pressure tank MPa(kgf/cm <sup>2</sup> )
	Pump suction	Unit discharge				Max. water supply amount m <sup>3</sup> /min	Total pump head m	Min. pump head m	Stop pressure (rough value) MPa(kgf/cm <sup>2</sup> )	Water supply amount m <sup>3</sup> /min	Discharge pump head range m	
2-pump Parallel, 3-pump Rotation	40	65	NX-65VFC401-1.1WX3-e	1.1 x2	3-phase 200 (50Hz)	0.4	18	15	0.20 (2.0)	0.04-0.55	12-25	0.10 (1.0)
			NX-65VFC402-1.5WX3-e	1.5 x2		0.4	27	23	0.27 (2.8)	0.04-0.55	19-37	0.16 (1.6)
			NX-65VFC402-2.2WX3-e	2.2 x2		0.4	39	33	0.38 (3.9)	0.04-0.55	28-54	0.25 (2.5)
			NX-65VFC402-3.7WX3-e	3.7 x2		0.4	55	47	0.54 (5.5)	0.04-0.60	34-63	0.29 (3.0)
			NX-65VFC403-3.7WX3-e	3.7 x2		0.4	63	54	0.62 (6.3)	0.04-0.60	42-79	0.36 (3.7)
			NX-65VFC403-5.5WX3-e	5.5 x2		0.4	76	65	0.75 (7.6)	0.04-0.60	47-88	0.41 (4.2)
	50	65	NX-65VFC403-7.5AWX3-K-e	7.5 x2	3-phase 200/220 (60Hz)	0.4	96	75	0.78 (8.0)	0.04-0.66	75-99	0.54 (5.5) ※1
			NX-65VFC403-7.5BWX3-K-e	7.5 x2		0.4	101	100	1.03 (10.5)	0.04-0.42	99-110	0.54 (5.5) ※1
			NX-65VFC502-2.2WX3-e	2.2 x2		0.6	24	20	0.25 (2.5)	0.04-0.78	15-30	0.13 (1.3)
			NX-65VFC502-3.7WX3-e	3.7 x2		0.6	46	39	0.45 (4.6)	0.04-0.88	28-54	0.25 (2.5)
			NX-65VFC503-5.5WX3-e	5.5 x2		0.6	63	54	0.62 (6.3)	0.04-0.88	39-73	0.34 (3.5)
			NX-65VFC503-7.5WX3-e	7.5 x2		0.6	73	62	0.72 (7.3)	0.04-0.93	47-88	0.41 (4.2)
	65	80	NX-80VFC652-3.7WX3-e	3.7 x2		1.0	21	18	0.23 (2.3)	0.04-1.15	16-31	0.14 (1.4)
			NX-80VFC652-5.5WX3-e	5.5 x2		1.0	34	29	0.33 (3.4)	0.04-1.19	25-48	0.22 (2.2)
			NX-80VFC653-7.5WX3-e	7.5 x2		1.0	50	43	0.49 (5.0)	0.04-1.13	41-77	0.35 (3.6)
3-pump Parallel, 3 (4) -pump Rotation	40	80	NX-80VFC401-1.1TX3(4)-e	1.1 x3	3-phase 200 (50Hz)	0.6	18	15	0.20 (2.0)	0.06-0.83	12-25	0.10 (1.0)
			NX-80VFC402-1.5TX3(4)-e	1.5 x3		0.6	27	23	0.27 (2.8)	0.06-0.83	19-37	0.16 (1.6)
			NX-80VFC402-2.2TX3(4)-e	2.2 x3		0.6	39	33	0.38 (3.9)	0.06-0.83	28-54	0.25 (2.5)
			NX-80VFC402-3.7TX3(4)-e	3.7 x3		0.6	55	47	0.54 (5.5)	0.06-0.90	34-63	0.29 (3.0)
			NX-80VFC403-3.7TX3(4)-e	3.7 x3		0.6	63	54	0.62 (6.3)	0.06-0.90	42-79	0.36 (3.7)
			NX-80VFC403-5.5TX3(4)-e	5.5 x3		0.6	76	65	0.75 (7.6)	0.06-0.90	47-88	0.41 (4.2)
	50	100	NX-80VFC403-7.5ATX3(4)-K-e	7.5 x3	3-phase 200/220 (60Hz)	0.6	96	79	0.82 (8.4)	0.06-0.99	75-99	0.54 (5.5) ※1
			NX-80VFC403-7.5BTX3(4)-K-e	7.5 x3		0.6	101	100	1.03 (10.5)	0.06-0.63	99-110	0.54 (5.5) ※1
			NX-100VFC502-2.2TX3(4)-e	2.2 x3		0.9	24	20	0.25 (2.5)	0.06-1.17	15-30	0.13 (1.3)
			NX-100VFC502-3.7TX3(4)-e	3.7 x3		0.9	46	39	0.45 (4.6)	0.06-1.32	28-54	0.25 (2.5)
			NX-100VFC503-5.5TX3(4)-e	5.5 x3		0.9	63	54	0.62 (6.3)	0.06-1.31	39-73	0.34 (3.5)
			NX-100VFC503-7.5TX3(4)-e	7.5 x3		0.9	73	62	0.72 (7.3)	0.06-1.39	47-88	0.41 (4.2)
	65	125	NX-125VFC652-3.7TX3(4)-e	3.7 x3		1.5	21	18	0.23 (2.3)	0.06-1.73	16-31	0.14 (1.4)
			NX-125VFC652-5.5TX3(4)-e	5.5 x3		1.5	34	29	0.33 (3.4)	0.06-1.79	25-48	0.22 (2.2)
			NX-125VFC653-7.5TX3(4)-e	7.5 x3		1.5	50	43	0.49 (5.0)	0.06-1.70	41-77	0.35 (3.6)
4-pump Parallel, 4 (5) -pump Rotation	40	80	NX-80VFC401-1.1FX4(5)-e	1.1 x4	3-phase 200 (50Hz)	0.8	18	15	0.20 (2.0)	0.08-1.10	12-25	0.10 (1.0)
			NX-80VFC402-1.5FX4(5)-e	1.5 x4		0.8	27	23	0.27 (2.8)	0.08-1.11	19-37	0.16 (1.6)
			NX-80VFC402-2.2FX4(5)-e	2.2 x4		0.8	39	33	0.38 (3.9)	0.08-1.11	28-54	0.25 (2.5)
			NX-80VFC402-3.7FX4(5)-e	3.7 x4		0.8	55	47	0.54 (5.5)	0.08-1.20	34-63	0.29 (3.0)
			NX-80VFC403-3.7FX4(5)-e	3.7 x4		0.8	63	54	0.62 (6.3)	0.08-1.20	42-79	0.36 (3.7)
			NX-80VFC403-5.5FX4(5)-e	5.5 x4		0.8	76	65	0.75 (7.6)	0.08-1.20	47-88	0.41 (4.2)
	50	100	NX-80VFC403-7.5AFX4(5)-K-e	7.5 x4	3-phase 200/220 (60Hz)	0.8	96	79	0.82 (8.4)	0.08-1.32	75-99	0.54 (5.5) ※1
			NX-80VFC403-7.5BFX4(5)-K-e	7.5 x4		0.8	101	100	1.03 (10.5)	0.08-0.84	99-110	0.54 (5.5) ※1
			NX-100VFC502-2.2FX4(5)-e	2.2 x4		1.2	24	20	0.25 (2.5)	0.08-1.55	15-30	0.13 (1.3)
			NX-100VFC502-3.7FX4(5)-e	3.7 x4		1.2	46	39	0.45 (4.6)	0.08-1.76	28-54	0.25 (2.5)
			NX-100VFC503-5.5FX4(5)-e	5.5 x4		1.2	63	54	0.62 (6.3)	0.08-1.74	39-73	0.34 (3.5)
			NX-100VFC503-7.5FX4(5)-e	7.5 x4		1.2	73	62	0.72 (7.3)	0.08-1.85	47-88	0.41 (4.2)
	65	125	NX-125VFC652-3.7FX4(5)-e	3.7 x4		2.0	21	18	0.23 (2.3)	0.08-2.31	16-31	0.14 (1.4)
			NX-125VFC652-5.5FX4(5)-e	5.5 x4		2.0	34	29	0.33 (3.4)	0.08-2.38	25-48	0.22 (2.2)
			NX-125VFC653-7.5FX4(5)-e	7.5 x4		2.0	50	43	0.49 (5.0)	0.08-2.27	41-77	0.35 (3.6)
5-pump Parallel, 5-pump Rotation	40	100	NX-100VFC401-1.1GX5-e	1.1 x5	3-phase 200 (50Hz)	1.0	18	15	0.20 (2.0)	0.10-1.38	12-25	0.10 (1.0)
			NX-100VFC402-1.5GX5-e	1.5 x5		1.0	27	23	0.27 (2.8)	0.10-1.38	19-37	0.16 (1.6)
			NX-100VFC402-2.2GX5-e	2.2 x5		1.0	39	33	0.38 (3.9)	0.10-1.39	28-54	0.25 (2.5)
			NX-100VFC402-3.7GX5-e	3.7 x5		1.0	55	47	0.54 (5.5)	0.10-1.50	34-63	0.29 (3.0)
			NX-100VFC403-3.7GX5-e	3.7 x5		1.0	63	54	0.62 (6.3)	0.10-1.50	42-79	0.36 (3.7)
			NX-100VFC403-5.5GX5-e	5.5 x5		1.0	76	65	0.75 (7.6)	0.10-1.50	47-88	0.41 (4.2)
	50	125	NX-100VFC403-7.5AGX5-K-e	7.5 x5	3-phase 200/220 (60Hz)	1.0	96	79	0.82 (8.4)	0.10-1.65	75-99	0.54 (5.5) ※1
			NX-100VFC403-7.5BGX5-K-e	7.5 x5		1.0	101	100	1.03 (10.5)	0.10-1.05	99-110	0.54 (5.5) ※1
			NX-125VFC502-2.2GX5-e	2.2 x5		1.5	24	20	0.25 (2.5)	0.10-1.95	15-30	0.13 (1.3)
			NX-125VFC502-3.7GX5-e	3.7 x5		1.5	46	39	0.45 (4.6)	0.10-2.20	28-54	0.25 (2.5)
			NX-125VFC503-5.5GX5-e	5.5 x5		1.5	63	54	0.62 (6.3)	0.10-2.18	39-73	0.34 (3.5)
			NX-125VFC503-7.5GX5-e	7.5 x5		1.5	73	62	0.72 (7.3)	0.10-2.32	47-88	0.41 (4.2)
	65	150	NX-150VFC652-3.7GX5-e	3.7 x5		2.5	21	18	0.23 (2.3)	0.10-2.88	16-31	0.14 (1.4)
			NX-150VFC652-5.5GX5-e	5.5 x5		2.5	34	29	0.33 (3.4)	0.10-2.98	25-48	0.22 (2.2)
			NX-150VFC653-7.5GX5-e	7.5 x5		2.5	50	43	0.49 (5.0)	0.10-2.83	41-77	0.35 (3.6)

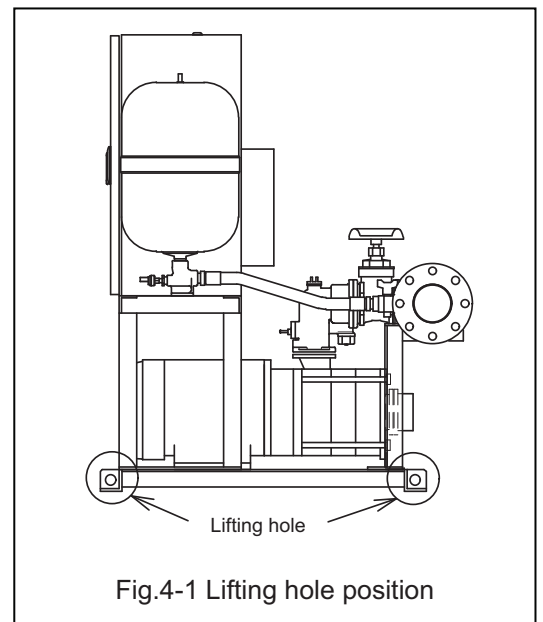
\* The initial gas pressure at the time of shipment is 0.44MPa (4.5kgf/cm<sup>2</sup>). Please adjust it before starting to use at the site.

## 4. Installation









### 4.1 Precautions for installation

 <b>Warning</b> 	<p>When moving or installing the unit, never lift it in an unstable condition or with any load applied to the pressure tank, pipes, or control panel. Otherwise, the unit may fall, resulting in injury and/or damage. Before lifting the unit, refer to the catalog, the external dimensions drawing, or other documents to check the weight of the unit, and use an appropriate lifting device of which rated load is over the unit. Otherwise, the unit may fall, resulting in injury and/or damage.</p>
 <b>Warning</b> 	<p>Electric motor or control panel insulation degradation may result in electric leakage, electric shock, or fire. Keep the ambient temperature at 0 to 40°C with sufficient ventilation to prevent damage to the equipment and deterioration of its life. Avoid dust, corrosive or explosive gases, salinity, humidity, condensation. For indoor installations avoid direct sunlight or wind and rain.</p>
 <b>Caution</b> 	<p>For the installation environment, follow the precautions described below. Otherwise, it may lead to failures and/or other problems as well as a shorter life of the units.</p>
 <b>Caution</b> 	<p>This water supply unit is designed for indoor use. If the water supply unit is used outdoors, select "with outdoor cover" as a special specification and install the outdoor cover before use. Otherwise, it may cause malfunction.</p>
 <b>Caution</b> 	<p>To suck up water from a lower position, use a water supply unit designed for lifting operation. Otherwise, discharge pressure may drop, thus leading to disruption of water supply.</p>

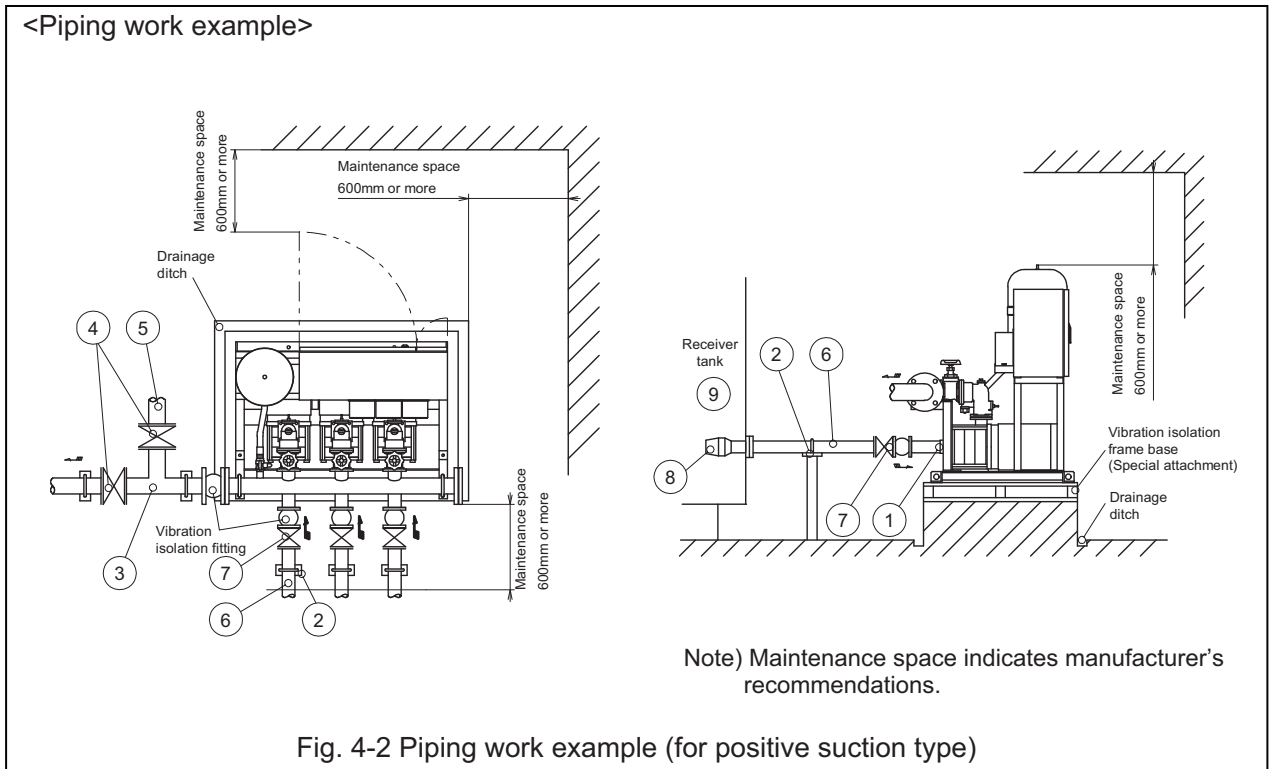
- (1) Install the unit at a place that meets the following conditions:
  - a place that meets the requirements in Section "3.1 Specifications of the water supply unit";
  - a place that is not exposed to the wind or rain;
  - a dry, well-ventilated environment, which as free of dust or moisture as possible;
  - a location where unauthorized persons cannot easily enter or operate the product;
  - a location as close to the water source as possible so that the suction pipe can be short.; and
  - a location where maintenance can be conducted easily and abnormality can be readily coped with.
- (2) Fix the water supply unit firmly on a level concrete foundation with anchor bolts.
- (3) Be sure to provide a drain ditch around the water supply unit, and waterproof the floor.
- (4) If the system could be exposed to the freezing temperature in winter, be sure to take measures to prevent freezing in the pump room or prevent the pump, valves, piping, pressure transmitter, pressure tank, and other devices from freezing. We can offer the special models designed to prevent freezing. Please consult with us.
- (5) Use sound insulating materials for the door and walls of the pump room. Particularly when generated noise may pose a problem, take necessary measures against the noise.
- (6) When lifting the water supply unit, use the lifting holes in the common base as shown in the figure below. Also apply pads so as not to damage the unit body. Do not remove the cap of the control panel for attaching hanging bolts to lift the unit.
- (7) If the unit is operated for a long period of time at low flow rate, a constant relief kit may be required. Please consult with us.






## 4.2 Precautions for piping work

 <b>Caution</b>		Do not screw a pipe into the pump with the companion flange attached to the pump. Otherwise, it may damage the pump.
 <b>Caution</b>		Do not merge the suction pipes. Do not install the piping with a shape of upward bend (i.e. providing the piping with a rising slope and then a descending slope). Otherwise, it may hinder the normal operation.
 <b>Caution</b>		Do not use any piping materials that are prone to rust. Otherwise, it may damage the unit.
 <b>Caution</b>		After work, thoroughly clean (flush) the inside of the receiver tank and piping.













- (1) Attach a companion flange ① to the water supply unit after connecting the pipe.
- (2) Install an adequate pipe support ② so that the weight of the piping system will not be applied to the main unit.
- (3) For test operation and adjustments, be sure to attach sluice valves ④ and a test pipe ⑤ to the discharge pipe ③.
- (4) Ensure to install a suction pipe ⑥ to each pump.
- (5) The suction pipes ⑥ must be as short and straight as possible with minimal bends.
- (6) To minimize the piping loss, the bore of the suction pipes ⑥ must be equal to or one size larger than that of the pump. Pay special attention because the flow rate of the subsequently activated pump exceeds the value divided the maximum water usage by the maximum number of paralleled units.
- (7) For maintenance, be sure to attach sluice valves ⑦ to the suction pipes ⑥.  
(For negative suction type, do not attach sluice valves ⑦ to the suction pipes.)
- (8) Ensure to attach strainers ⑧ to the ends of the suction pipes ⑥ in order to block the entrance of foreign matter.
- (9) After piping work, be sure to clean the inside of a receiver tank ⑨ to prevent the entry of foreign matter into the pumps.



### 4.3 Precautions for wiring work

	 	Use the wiring equipment and devices compliant to use conditions, and carry out wiring work safely and securely according to the technical standards for electrical facilities, as well as the indoor wiring regulations. Only qualified personnel such as licensed electrical engineers are allowed to carry out electric wiring work. Incomplete wiring work by unqualified persons is prohibited by law.
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#### 4.3.1 Wiring work for power supply

	 	Be sure to install a ground fault interrupter dedicated to this unit at the primary power supply. Otherwise, it may lead to an electric shock and/or fire.
	 	Ensure to securely install a ground wire to the control panel. Ensure to perform grounding work.
		Connecting a ground wire to gas or water pipes is not only prohibited by law but also extremely dangerous.
		Do not install different or other cables or control wires in one pipe or conduit.
		Do not attach a phase advance capacitor to the secondary wiring of the control panel. Otherwise, it may lead to failures in the inverter or the phase advance capacitor.

- (1) On the primary power supply side of the water supply unit, be sure to install a ground fault interrupter dedicated to this unit.  
Check the capacity of the ground fault interrupter fitted inside the control panel, and then select a ground fault interrupter on the power supply side in consideration of protection coordination.
- (2) Be sure to attach a ground wire to prevent an electric shock.  
Connect the ground wire to the ground terminal inside the control panel.
- (3) Connect the primary power line to the power terminal block inside the control panel.  
Pass each wire through a metal tube or a metal conduit for shielding, and ground the covering of the tube.
- (4) Control the fluctuation of the voltage within  $\pm 10\%$  of the rated voltage, and the frequency within  $\pm 5\%$  of the rated frequency.  
Keep in mind that if you use the unit at a voltage or frequency out of the range, the unit may break down.  
Also note that if the power voltage is lower than the rated voltage, an overload may occur even if the flow rate is within the specified range.
- (5) Before running the pump, check the following points again:
  - An appropriate ground fault interrupter is installed.
  - Wiring is correct.
  - The unit is securely grounded.
  - None of the three wires (two wires for single-phase power) of the motor has come loose or is disconnected.  
Note that poor or incorrect connection of motor terminals may burn out the motor.

### 4.3.2 Instrumentation

Carry out wiring work for instrumentation according to the following procedure.

#### Note

Insert the instrumentation wires into the inlet ports for instrumentation wires, secure the wires by passing the binding band through the clamps on the right side face inside the control panel and under the control board, and then connect them to the board. If the clamps are not used for binding the wires, it may cause some trouble in the maintenance of the unit.

#### Caution



Attach grommets (22 mm in diameter) to the wire inlet ports to protect the wires, or use conduit tubes.

#### (1) Wiring work for water level control

Referring to the following table, connect wires to receiver tank electrodes.

- Ball tap type ..... Table 4-3-2(a)
- Inflow solenoid valve type ..... Table 4-3-2(b)

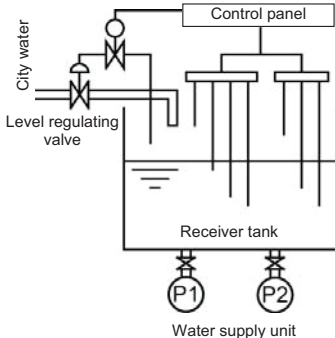
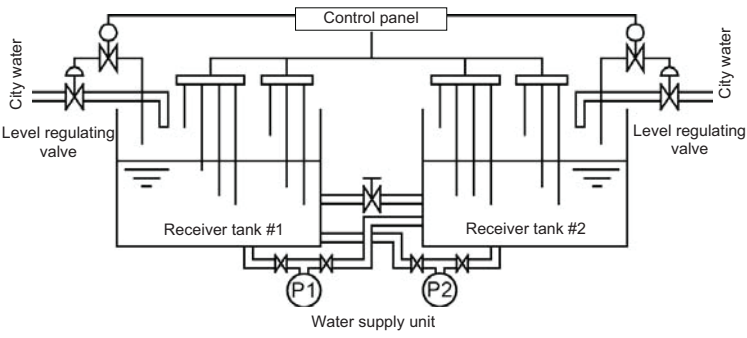
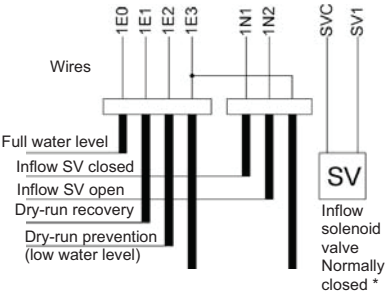
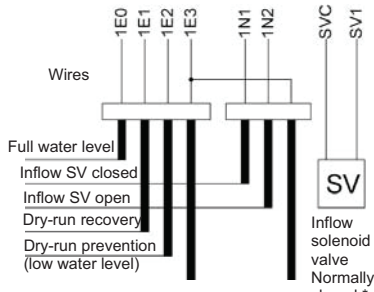
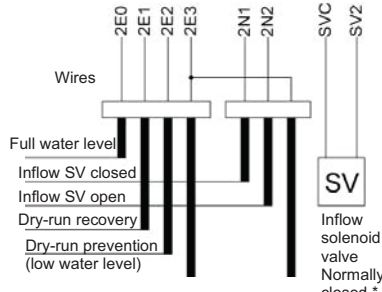
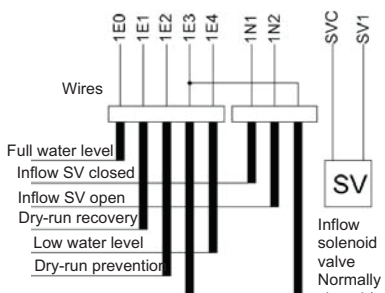
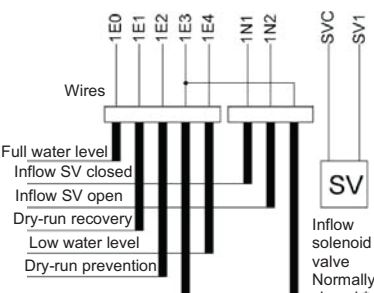
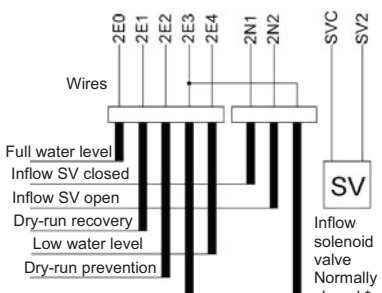
#### Note

- The Tank Selection setting is set to “No tank” before shipment. Before starting the operation of the pumps with receiver tank electrodes connected, select water tank(s) you use on the operation panel. (→ see 7.2.)
- When using an inflow solenoid valve, check the type of the solenoid valve (normally open or normally closed), and set the type (parameter P103). (→ see 7.5.)
- Set the Solenoid Valve Operation setting to “Auto” on the operation panel before use. (→ see 7.3.)

Table 4-3-2 (a) Wiring patterns (ball tap type)

		Single receiver tank	Double receiver tank	
4P type electrode	Settings	Tank Selection setting: No.1 Solenoid Valve Operation setting: Man. Close Parameter P101: 4	Tank Selection setting: Common Solenoid Valve Operation setting: Man. Close Parameter P101: 4	
	Wiring pattern	<div>Terminal block for receiver tank No.1</div> <div>Electrodes for receiver tank</div>	<div>Terminal block for receiver tank No.1</div> <div>Electrodes for receiver tank No.1</div>	<div>Terminal block for receiver tank No.2</div> <div>Electrodes for receiver tank No.2</div>
5P type electrode	Settings	Tank Selection setting: No.1 Solenoid Valve Operation setting: Man. Close Parameter P101: 5	Tank Selection setting: Common Solenoid Valve Operation setting: Man. Close Parameter P101: 5	
	Wiring pattern	<div>Terminal block for receiver tank No.1</div> <div>Electrodes for receiver tank</div>	<div>Terminal block for receiver tank No.1</div> <div>Electrodes for receiver tank No.1</div>	<div>Terminal block for receiver tank No.2</div> <div>Electrodes for receiver tank No.2</div>

Table 4-3-2 (b) Wiring patterns (inflow solenoid valve type)

	Single receiver tank		Double receiver tank	
				
4P type electrode	Settings	Tank Selection setting: No.1 Solenoid Valve Operation setting: Auto Parameter P101: 4	Tank Selection setting: Common Solenoid Valve Operation setting: Auto Parameter P101: 4	
	Wiring pattern	Terminal block for receiver tank No.1  Electrodes for receiver tank	Terminal block for receiver tank No.1  Electrodes for receiver tank No.1	Terminal block for receiver tank No.2  Electrodes for receiver tank No.2
5P type electrode	Settings	Tank Selection setting: No.1 Solenoid Valve Operation setting: Auto Parameter P101: 5	Tank Selection setting: Common Solenoid Valve Operation setting: Auto Parameter P101: 5	
	Wiring pattern	Terminal block for receiver tank No.1  Electrodes for receiver tank	Terminal block for receiver tank No.1  Electrodes for receiver tank No.1	Terminal block for receiver tank No.2  Electrodes for receiver tank No.2

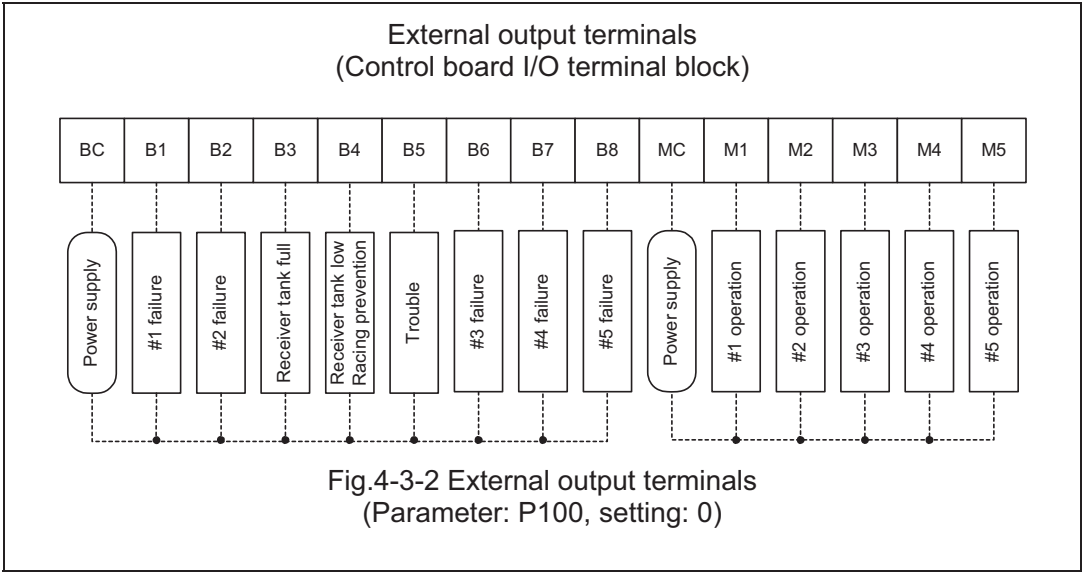
\* A normally-open type inflow solenoid valve can also be used by setting the parameter P103 to the type.



Provide a ground electrode dedicated to the electrodes for the inflow solenoid valve.



- (2) External output signals
- Connect wires to the external output terminals as shown in the following diagram.



**Note**



The parameter P100 allows you to select an external relay output pattern from 5 options.

For details and the setting method, refer to “7.5 Parameter setting.”

## 5. Preparation for operation

### 5.1 Points to be checked before test operation

#### 5.1.1 Electrical system

 <b>Warning</b>		Before carrying out work such as wiring change, be sure to shut down the power of the panel board and confirm that the pilot lamp is turned off. Otherwise, it may lead to an electric shock.
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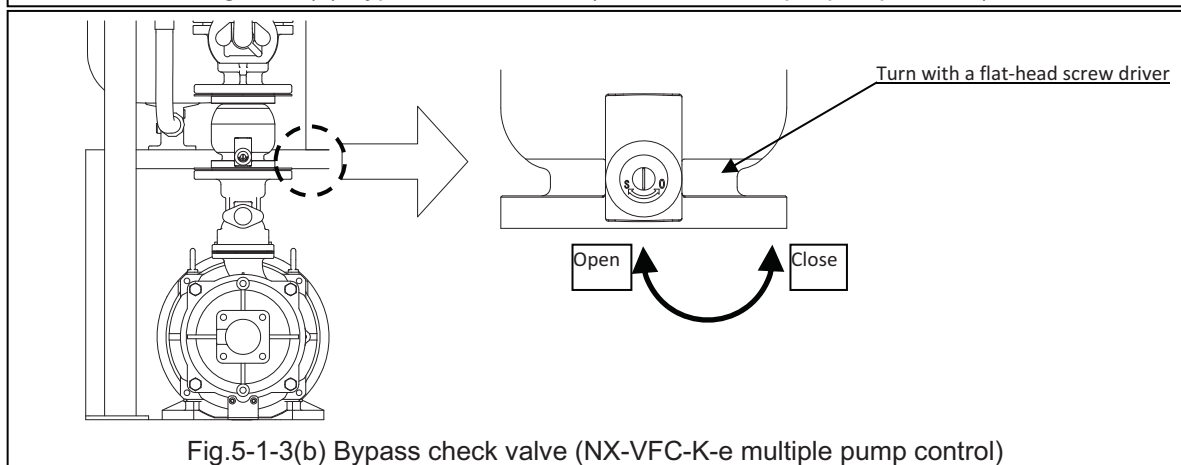
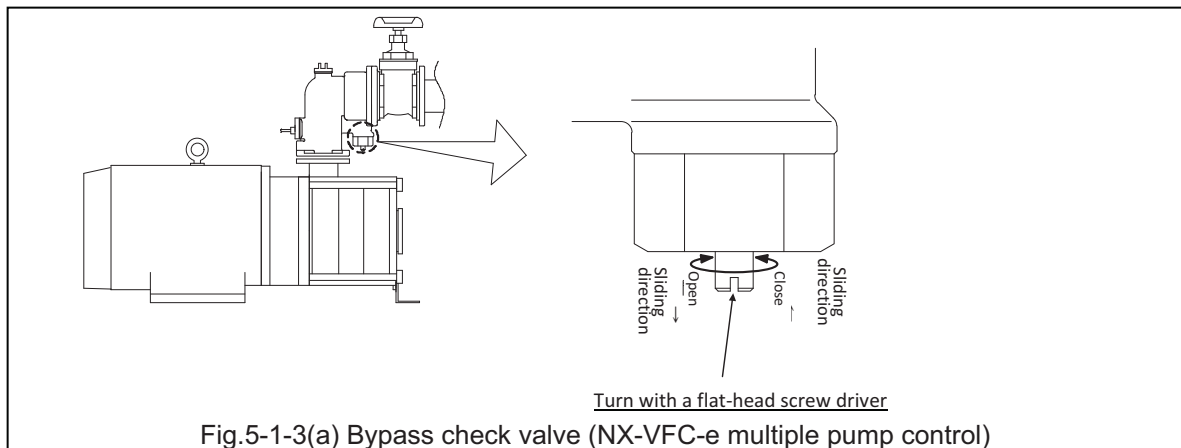
- (1) Check if the unit is correctly wired.
- (2) Check if the terminals are securely connected.
- (3) Check if the unit is securely grounded.

#### 5.1.2 Adjustment of charged pressure in pressure tank

NX-VFC-K-e multiple pump control (pump bore size 40A, output 7.5kW) is set at a lower charged gas pressure to prevent the diaphragm from being affected by long-term storage prior to water flow. Before starting operation, be sure to adjust the charged gas pressure in the pressure tank. Failure to do so may result in an increase in the frequency of pump startup and may affect the pressure tank service life. Refer to "8.1 Precautions for maintenance and inspection" for how to adjust the charged gas pressure.

#### 5.1.3 Pump system

- (1) Check that the water level of the receiver tank is between the dry-run recovery level and the full water level.
- (2) Ensure to fully open each sluice valve on the suction side, and to fully close each sluice valve on the discharge side.
- (3) Make sure that water is flowing to the pressure transmitter.  
The water supply unit will not operate properly unless water is flowing to the pressure transmitter.
- (4) Make sure that the bypass of the check valve is closed.





When operating the pump, close the bypass of the check valve.  
If the bypass is opened, the check valve will not function.

- (5) Manually turn the pump to make sure that it can be rotated smoothly. To manually turn, insert a flat blade screwdriver into the groove of the shaft end through the hole in the external fan cover of the motor and then turn it. If it is rotated smoothly and evenly, it will be OK.



Before manually turning the pump, be sure to turn off the main power supply of the water supply unit.







- (6) Loosen the air vent valve to discharge the air from the pump. At the same time, manually turn the pump to discharge the air from the impeller completely.

When the water starts running over and the air feeding stops, priming of water is completed.



Never operate the pump without priming water.  
It may cause seizure to the sliding part inside of the pump.

## 5.2 Turning on the power

 <b>Danger</b>	 	<p>After turning on the power, do not touch any parts other than those mentioned below that are required for operation. Otherwise, it may lead to an electric shock.</p>
 <b>Warning</b>	 	<p>Do not operate the control panel with a wet hand. Otherwise, it may lead to an electric shock and/or a short circuit.</p>

- (1) Open the cover of the control panel.
- (2) Turn on the main power of the panel board.
- (3) Turn on the ground fault interrupter inside the control panel.
- (4) Turn on the operation power switch on the control board.
- (5) Check that the pilot lamp on the control board is turned on.
- (6) At that time, the initial set values and other information are shown on the display of the panel, in the following order:

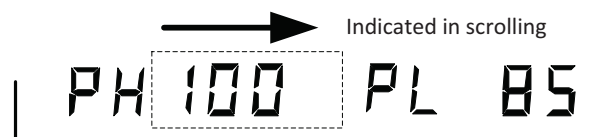
① Program version

When the power is supplied to the board, the system shows the version of the installed control program twice.

Note that the program version is subject to change without notice.

② Pressure setting value

The pressure setting value is indicated on the display in scrolling.



<Above example>

Total head :100 [m·H<sub>2</sub>O]

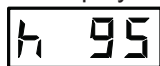
Min. pump head :85 [m·H<sub>2</sub>O]

③ Initial check monitor

When the power is turned on, the system checks its status. If no abnormal condition is detected, the flashing **Good** message appears on the display of the panel for about 2 seconds. If any abnormal condition is detected, the system generates the corresponding alarm.

④ In normal operation

The pressure in the discharge piping is indicated on the display.



<Above example>

Pressure in the discharge piping: 29[m·H<sub>2</sub>O]

- (7) Close the cover of the control panel.

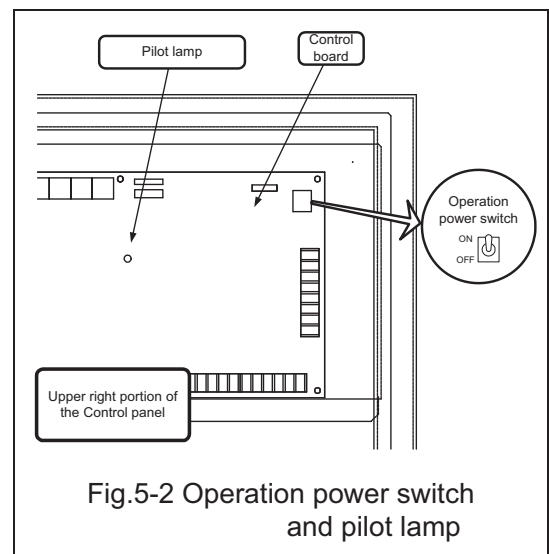





Fig.5-2 Operation power switch and pilot lamp

## 6. Test operation

### 6.1 Check items related to manual operation

#### Note

Check the following items related to manual operation for all the pumps.

- (1) Select "Manual" with the  switch.
- (2) Press "MANUAL" switch  of the pump to be operated (pump No. should be indicated instead of "n".), and then press the cursor switch . While gradually increasing the operation frequency, make sure that if the following does not have problems.
  - ① Installation and piping condition (if water leakage or abnormal vibration, etc. is not caused.)
  - ② Pump rotating direction  
Check the external fan of the motor. It must be rotated in a clockwise direction as viewed from the motor side.
  - ③ Priming condition (if you hear water flowing or not)

#### Switches to operate

For pump #1 operation . . .



For pump #2 operation . . .



For pump #3 operation . . .



For pump #4 operation . . .



For pump #5 operation . . .



- (3) While confirming that the pump is running properly, gradually open the sluice valve of the test pipe until air is completely removed from the pump.



#### Warning



Do not run the pump continuously for over one minute while the sluice valve on the discharge line is shut (zero-discharge operation). Otherwise, the temperature and pressure will increase inside the pump, which may damage the pump and/or cause steam to blow off.

- (4) After air has been completely removed, shut the sluice valve of the test pipe.
- (5) Press the "Manual" switch of the running pump to stop the pump.

## 6.2 Check items related to automatic operation

Select “Automatic” with the  switch to perform automatic operation.

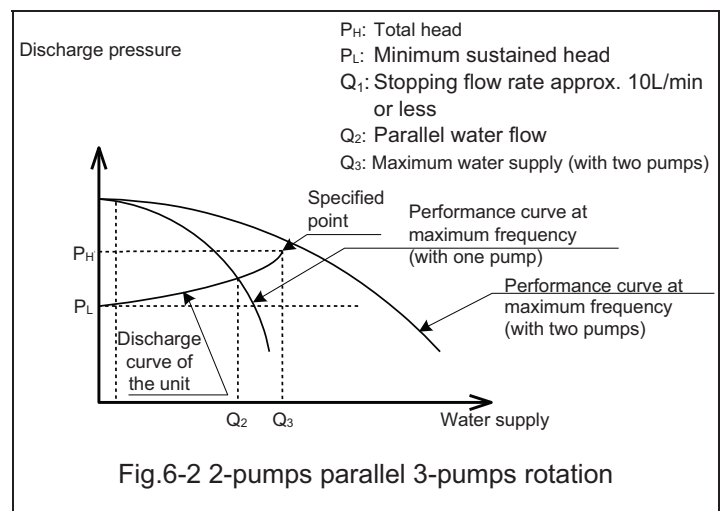
First, carefully read the following sections to understand how automatic operation works, and then confirm that the unit runs properly in automatic modes using the test pipe. During the operation, also check each pump for any abnormal pressure, noise, or vibration.

Note that you can change the Total Head setting and the Minimum Pump Head setting from their factory defaults, depending on the conditions on site. Follow the instructions in “7.5 Parameter setting” in such a case.

<Explanation about operation (2-pump Parallel, 3-pump Rotation type)>

The “2-pump Parallel, 3-pump Rotation” operation uses 3 pumps. In this operation, the 3 pumps are operated in rotation when the water consumption is below the max. water supply amount of one pump, and 2 pumps will be operated together in parallel when the water consumption exceeds the max. water supply amount of one pump.

- (1) When the hydrant is opened and the water is consumed, the pressure inside the discharge pipe will decrease. When the pressure inside the discharge pipe decreases to near the preset min. pump head ( $P_L$ ), it is detected by the pressure transmitter, which makes the pump to start.
- (2) While the water consumption is below the max. water supply amount ( $Q_3$ ), the discharge pressure is changed from  $P_L$  to  $P_H$  by controlling the rotating speed with the inverter according to the increase/decreased in water consumption, which makes the estimated terminal pressure constant-controlled.
- (3) When the water consumption increases to near the water supply amount of the 2nd parallel pump ( $Q_2$ ), the 2nd pump starts operating.
- (4) If the water supply amount changes even while 2 pumps are operated in parallel, the operation continues at pressure corresponding to the unit discharge curve.
- (5) When the water consumption decreases and the pressure decreases to below the water supply amount of the 2nd unit in parallel operation ( $Q_2$ ), the 2nd pump stops and the 1st pump only continues the operation.
- (6) When the water consumption decreased to below the stop flow rate ( $Q_1$ ), it is detected by the flow switch, which makes the pump to stop. While the pump is stopped, the operation indicator lamp will blink. (See 7.5.3.)
- (7) When the hydrant is opened and the water is used again, the pump which has been stopped starts operating as above.



### Note

Operations based on the above operation should be performed for other operation method.

# 7. Basic operations and indications/settings

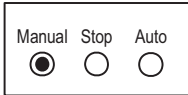
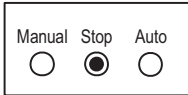
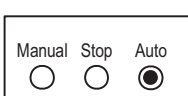
This section describes detailed information about operation, display and setting for the unit.

## 7.1 Pump Operation

### 7.1.1 Selecting operation mode








Select an operation mode with the  switch on the operation panel.

Table 7-1 Operation mode selection

	<b>“Manual mode”</b> This mode is to operate the pump manually. For the instruction of the manual operation, refer to “6.1.2 Manual Operation”.
	<b>“Stop mode”</b> In this mode, the pump will not operate under any circumstances.
	<b>“Automatic mode”</b> In this mode, the pressure transmitter, flow switch, etc. detect pressure inside the discharge pipe or flow rate of water consumed to automatically operate/stop the pump. Select this mode normally.

The system enables the setting of “Manual mode” or “Automatic mode” one second after the indicator lamp comes on.

### 7.1.2 Manual operation

In the “manual mode,” you can start and stop each pump with the     or  switches on the operation panel. You can also change the operation frequency of the corresponding pump with the   switches on the operation panel.

- ① When the switch is pressed while the pump is stopped, the pump will be operated.
- ② When the switch is pressed while the pump is operated, the pump will be stopped.


### 7.1.3 Automatic operation

As soon as the “automatic mode” is enabled, the system starts the automatic operation.  
For the procedures, refer to “6.2 Check items related to automatic operation.”

<b>Note</b>	When a pump is running in either mode (manual or auto), the system turns on the corresponding operation indicator lamp in steady or blinking lamp and outputs the operation signal.
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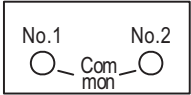
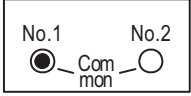
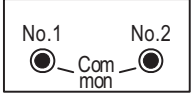
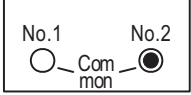


## 7.2 Selecting a receiver tank

Select a receiver tank to be used with the  switch on the operation panel.

For selecting a water tank and the circuits to be used, refer to Table 7-2(b).

Table 7-2 (a) Water Tank Selection

	<p><b>“No tank”</b> Select this mode when the control for the receiver tank is not used. When this mode is selected, the electrode signal will be ignored, and preventing dry operation will not be performed. Solenoid valve operation cannot be selected since all the indicator lamps are turned off.</p>
	<p><b>“Tank No.1”</b> This mode is to select the water tank No.1. When only one receiver tank is used, select this mode. Also select this mode to clean the water tank No. 2 in the “Common” mode.</p>
	<p><b>“Common”</b> Select this mode to operate 2 receiver tanks. To select this mode, provide a communicating tube between the tanks to make the water levels of both the tanks equal.</p>
	<p><b>“Tank No.2”</b> This mode is to select the water tank No.2. Select this mode when cleaning the water tank No. 1 in “Common” mode.</p>


“No tank” is selected before shipment.

The system enables the setting one second after the indicator lamp comes on.

Table 7-2(b) Water tank selection and circuit used

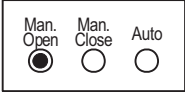
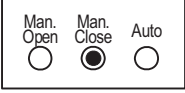
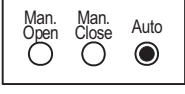
Selected water tank	Water level electrode circuit		Solenoid valve circuit
	For alarm and dry-run prevention	For solenoid valve	
No. 1	1E0, 1E1, 1E2, 1E3, 1E4	1N1, 1N2	SVC-SV1
Common	1E0, 1E1, 1E2, 1E3, 1E4	1N1, 1N2	SVC-SV1 SVC-SV2
No. 2	2E0, 2E1, 2E2, 2E3, 2E4	2N1, 2N2	SVC-SV2
No tank	N/A	N/A	N/A

7.3 Selecting the operation of the inflow solenoid valve

You can select the operation of the inflow solenoid valve with the  switch on the operation panel.

Note that setting the Tank Selection to “No tank” disables these settings.

Table 7-3 Solenoid Valve Operation setting

	<b>“Manual open”</b> The inflow solenoid valve is normally open.
	<b>“Manual Close”</b> The inflow solenoid valve is normally closed.
	<b>“Automatic”</b> The inflow solenoid valve is automatically controlled according to the water level of the tank.

Except for selecting “Man. Close,” the system enables the setting in one second after the indicator lamp comes on.

Note

For the electrode circuit and the solenoid valve circuit to be used, see Table 4-3-2.

Setting the Tank Selection to “No tank” turns off all the indicator lamps for the Solenoid Valve Operation setting and disables the operation of the solenoid valve.

Then, if you change the Tank Selection to any options other than “No tank,” the system automatically selects the Solenoid Valve Operation to “Man. Close.” Whether the solenoid valve is normally open or normally closed while energized depends on the solenoid valve type (Parameter P103) setting.

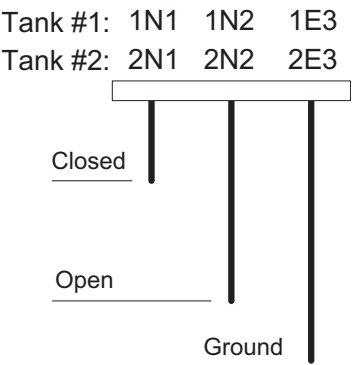




Fig. 7-3 Electrodes for automatic control of the solenoid valve


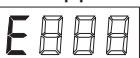
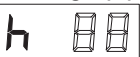
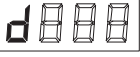
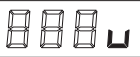
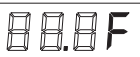
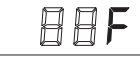
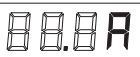
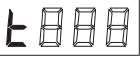
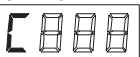
 Caution

 Provide a ground electrode dedicated to the electrodes for the inflow solenoid valve.

## 7.4 Indications on the display

The items described in Table 7-4 can be displayed, through display switching procedures. For the procedures, refer to each section shown in the “Reference page” column.

Table 7-4 Display item list

Display item	Description	Priority	Category	Reference page
Interlocking in operation 	It shows that the system is currently suspended by an interlock signal received from an external source. The message appears only when the interlock function is activated.	①	Basic information	7-5
Alarm appearing 	When the alarm is given, the alarm code is displayed. The message appears only when an alarm occurs. If multiple alarms are given at the same time, the displayed codes are switched every two seconds.	②	Basic information	7-5
Pressure inside the discharge pipe 	Pressure inside the discharge pipe is displayed. Indication unit : Hydraulic head meter [m·H2O]	④	Basic information	7-5
Number of start times of the unit 	Number of start times of the unit on the previous day is displayed. The counter starts when the power is turned on. When the counter exceeds 999, it is scrolled for display.	-	Basic information	7-5
Power voltage 	The power voltage detected in the inverter section is displayed. Indication unit: [V]	-	Basic information	7-5
Alarm log	Up to past 5 alarm histories are displayed.	-	Basic information	7-5 7-6
Operation frequency 	Operation frequency during automatic operation for each pump is displayed. Indication unit: Hertz [Hz] <one decimal place>	-	Pump information	7-6
Preset frequency 	Preset frequency for manual operation of each pump is displayed. Indication unit: Hertz [Hz] <increment of 1 Hz>	-	Pump information	7-7
Operation current 	Operation current for each pump is displayed. Unit of indication: Ampere [A] <one decimal place>	-	Pump information	7-6 7-7
Cumulative pump operating time 	The cumulative operating time of each pump is displayed. Unit of indication: Hours When the time exceeds 999 hours, it is scrolled for display.	-	Pump information	7-6
Cumulative number of pump start 	The cumulative number of start of each pump is displayed. When the counter exceeds 999, it is scrolled for display.	-	Pump information	7-6

To display in scrolling, add a period to the millionth or thousandth digit.

### 7.4.1 How to switch basic information display

Normally, the display shows the pressure in the discharge piping.

In special cases such as the activation of an interlock, the occurrence of an alarm, or during the freeze-proofing cycle, however, the display shows the corresponding message based on the sequence specified in Table 7-4.

To switch the indications on the display, press the keys at the “Indication Switching Operation” shown below.

The display automatically returns to normal indication when no operation is carried out for 30 seconds.

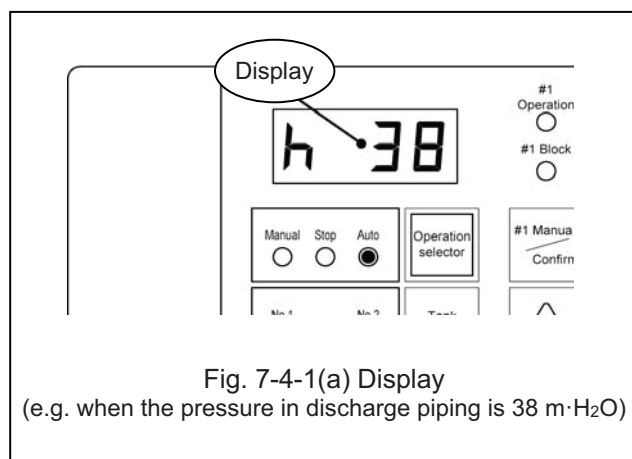


Fig. 7-4-1(a) Display  
(e.g. when the pressure in discharge piping is 38 m·H<sub>2</sub>O)

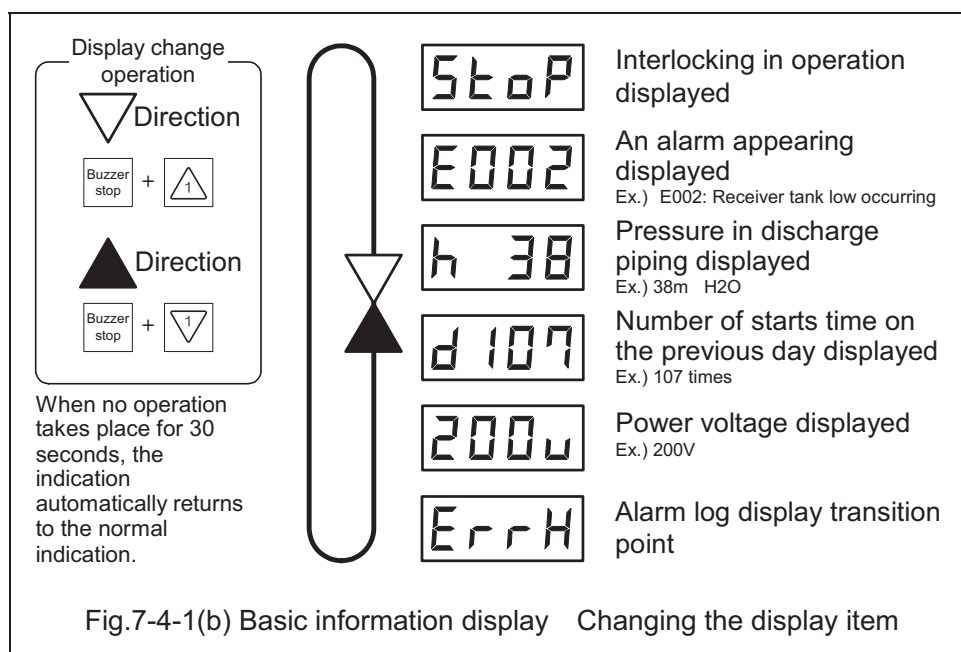




Fig.7-4-1(b) Basic information display Changing the display item



#### Note


The displays for “Interlocking in operation,” “Alarm appearing,” or “Freeze-proofing in progress” are indicated only when the necessary conditions are met.

The “Number of starts time on the previous day” remains “0” for 24 hours after the power is turned on.

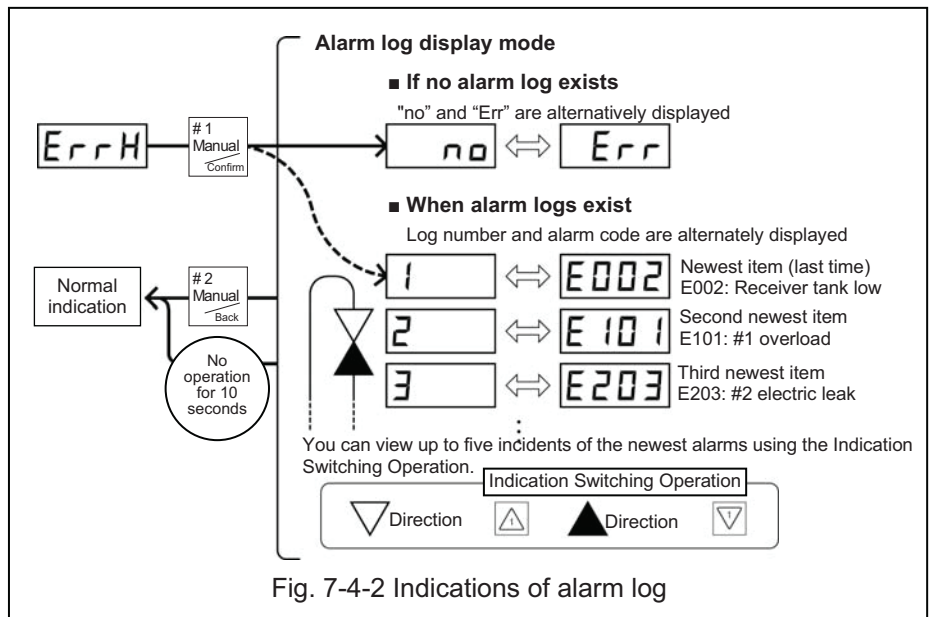
## 7.4.2 How to display alarm logs

Press the  switch at the alarm log display transition point  to enter the alarm log display mode.

In the alarm log display mode, you can view up to 5 alarms by pressing the  or  switch.

The display returns to normal indication by pressing the .

switch or when no operation is carried out for 10 seconds.





### Note

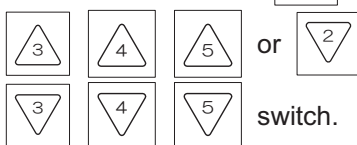
- Alarms are recorded in the log as soon as they are generated.
- Smaller numbers are assigned to newer items: the latest item is 1 and the oldest item is 5.
- When five incidents are recorded in the log, the system discards the oldest alarm (item No.5) in the event of a new alarm.
- The alarm log is retained even when the power is turned off.

## 7.4.3 How to display pump information

(A) If the operation mode is set to "Auto" or "Stop":

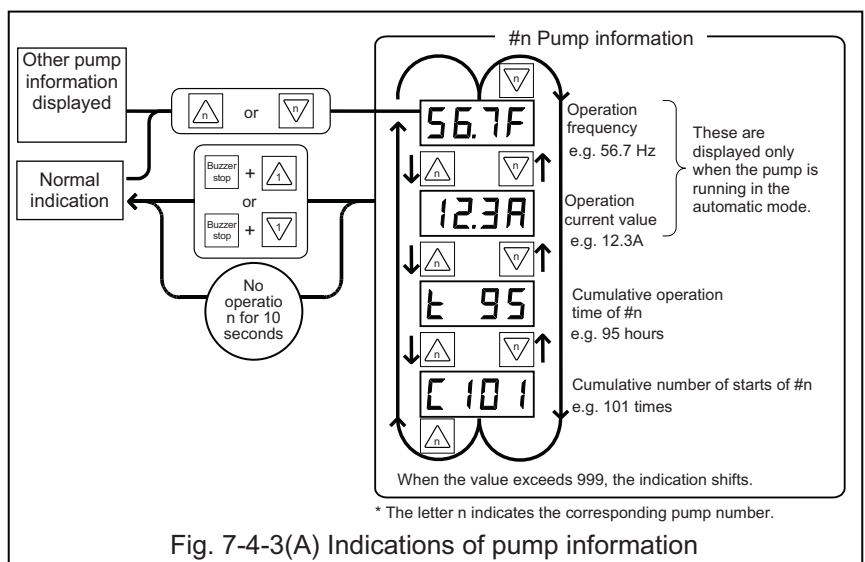
When the basic information is displayed, press the  or  switch and Pump no.1 information is displayed.

Similarly, press either



Information for No.2 to 5 pumps is displayed.


The display returns to normal indication when no operation is carried out for 10 seconds or through indication Switching Operation for basic information.




### Note

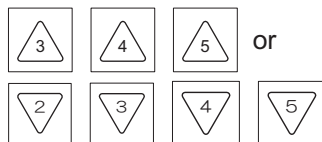
- "Cumulative operation time" and "Cumulative number of starts" are retained even when the power is turned off.
- Note that because the data is written into the memory device only once every 2 hours, unsaved new information (within up to 2 hours) is lost when the power is turned off.

(B) If the operation mode is set to “Manual”:

When basic information is displayed, press the  or

 switch and the Pump no.1 information is displayed.

Similarly, press either  or



switch. Information for No.2 to 5 pumps is displayed.

The display returns to normal indication when no operation is carried out for 5 seconds or through the Indication Switching Operation for basic information.

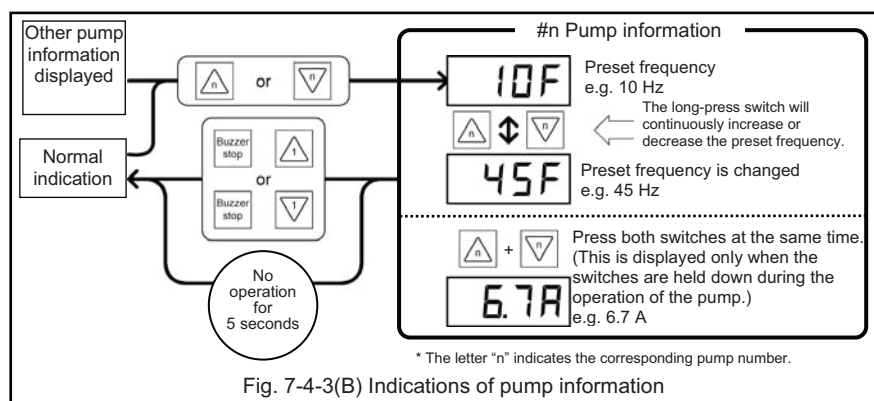


Fig. 7-4-3(B) Indications of pump information

## 7.5 Parameter settings

Functions of the water supply unit can be configured and adjusted using parameters. Parameter settings are retained when the power is turned off.

### 7.5.1 Parameter list

Table 7-5-1 Parameter list

Class	Display code	Parameter	Initial value	Adjustable range
Basic	PH	Total pump head	10	1 to 115 [m·H <sub>2</sub> O]
	PL	Min. sustained head	7	1 to PH [m·H <sub>2</sub> O]
	1Go	Permission for No. 1 run	on	on : Permission for No. 1 run off : Inhibition for No. 1 run
	2Go	Permission for No. 2 run	on	on : Permission for No. 2 run off : Inhibition for No. 2 run
	3Go	Permission for No. 3 run	on	on : Permission for No. 3 run off : Inhibition for No. 3 run
	4Go	Permission for No. 4 run	on	on : Permission for No. 4 run off : Inhibition for No. 4 run
	5Go	Permission for No. 5 run	on	on : Permission for No. 5 run off : Inhibition for No. 5 run
	CHEC	Inspection mode	off	on : In inspection mode off : In normal mode
Extended	ECO	Energy-saving operation setting	on	on : enables energy-saving operation off : disables energy-saving operation
	P100	External relay output pattern	0	0 to 4 : → refer to 7.5.4 (1).
	P101	Number of water level electrodes	4	4 : 4 poles 5 : 5 poles
	P102	5P electrode pattern	0	0 : Standard 1 : Special
	P103	Solenoid valve type	0	0 : Opened when power is turned on 1 : Closed when power is turned on
	P104	Solenoid valve control system	0	0 : All together 1 : Alternately
	P105	Interlock signal	0	0 : Contact "a" 1 : Contact "b"
	P200	Buzzer stop time	60	0 : No buzzer 1 to 60 : Time until the buzzer stops [min.] 99 : No buzzer stop
	P201	High-temperature alarm detection	1	0 : Not detected 1 : Detected
	P202	Abnormal start frequency alarm detection	1	0 : Not detected 1 : Detected
	P203	Water level alarm resetting method	0	0 : Manual 1 : Automatic


#### Note


The initial settings shown above are standard factory defaults. If you specify a different value or option upon placing an order, the specified value and option are preset in the parameter.

## 7.5.2 Parameter setting procedure

Parameters are set in “Setting mode.”



### ① Entering the setting mode



When the normal indication is displayed, hold down the  switch for at least 3 seconds to enter the “setting mode.”


When the system enters the setting mode, the basic parameter selection screen appears, and the indicator lamp alternately shows  and the set value.

The parameter selection screen alternately shows a parameter name and its set value.

### ② Selecting a parameter to be set

Press the  or  switch to cycle through the parameters until the target parameter appears.



To select an extended parameter, press the  switch while  is displayed, which enters the extended parameter selection screen.

To return to the basic parameter selection screen from the extended parameter selection screen, press the  switch.

### ③ Changing a set value


Press the  switch on the parameter selection screen to enter the set value change screen.

Only the preset value is shown in the set value change screen.


Press the  or  switch to change the set value.

#### Note

Extended parameters can be changed only when the operation mode is set to “Stop.”

In the “Manual” or “Auto” operation mode, pressing the  switch on the extended parameter selection screen the alarm will sound a warning buzzer and does not enter the set value change screen.


### ④ To save the change of the set value

When you have changed the set value, press the  switch to confirm the change of the set value.

When the change is entered, the system makes a beep sound and the display flashes three times. Then it automatically goes back to the parameter selection screen.



⑤ Canceling the change of the set value

To cancel the change of the set value and return to the parameter selection screen, press the  switch.


#2  
Manual  
Back

⑥ Exiting the setting mode

Press the  switch to exit the setting mode and return to the normal mode.

Also when no operation is carried out for 60 seconds in the setting mode, the system automatically exits the setting mode and returns to the normal mode.

**Note**

If you press the  switch to exit the setting mode without confirming the change, the setting change will be discarded.

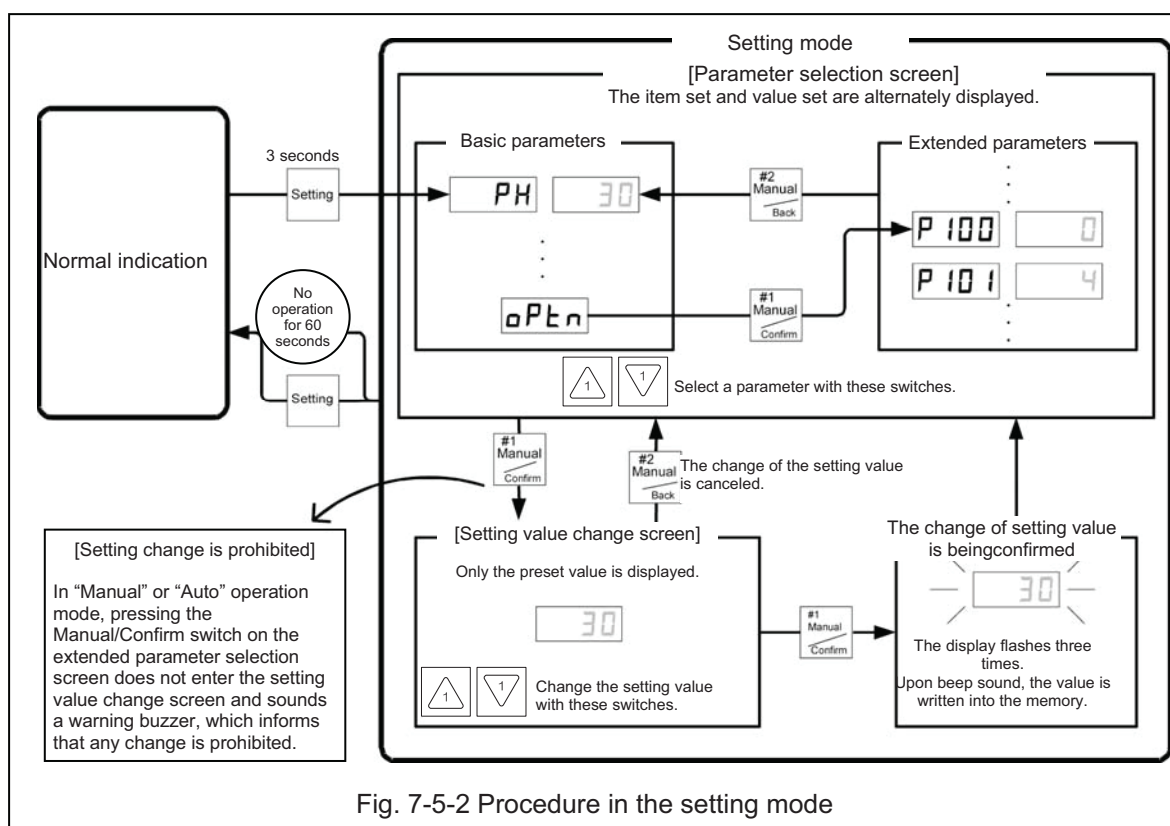


Fig. 7-5-2 Procedure in the setting mode

### 7.5.3 Basic parameters

The following are basic parameters for using the water supply unit.

#### (1) Total pump head

**PH** : Total Pump Head

Function	Selects the total head for automatic operation. Referring to “3.4 Specification tables,” set the total head that complies with the specifications.
Adjustable range	1 to 115 [m·H <sub>2</sub> O]
Remarks	Unless otherwise specified, the standard value of the unit is set before shipment (see the “Total head” column for standard models in “3.4 Specification tables”).

#### (2) Minimum sustained head

**PL** : Minimum sustained head

Function	Selects the minimum sustained head for automatic operation. Referring to “3.4 Specification tables,” set the minimum sustained head that complies with the specifications.
Adjustable range	1 to PH [m·H <sub>2</sub> O]
Remarks	Unless otherwise specified, the standard value of the unit is set before shipment (see the “Minimum sustained head” column for standard models in “3.4 Specification tables”).



**Caution**



Properly make the settings depending on the conditions of use. Incorrect settings may hinder the normal operation of the water supply unit.

#### (3) Operation permission setting

**100** : Setting for permission for No. 1 run

**200** : Setting for permission for No. 2 run

**300** : Setting for permission for No. 3 run

**400** : Setting for permission for No. 4 run

**500** : Setting for permission for No. 5 run

Function	Permits or prohibits the operation of each pump. If you set this to “Operation blocked” for a pump, you cannot run the pump in the manual or automatic mode.
Adjustable range	<b>0n</b> : Operation permitted <b>0FF</b> : Operation blocked
Initial setting	<b>0n</b> : Operation permitted
Remarks	Setting this to “Operation blocked” turns on the corresponding No.n block indicator lamp on the operation panel. * The letter “n” indicates the corresponding pump number (1 to 5).

(4) Inspection mode setting

**CHEC** : Inspection mode setting

Function	Enters/Exits the inspection mode. * The contents of the inspection mode setting are not retained when the power is shut off.
Setting range	<b>ON</b> : In inspection mode <b>OFF</b> : In normal mode
Initial setting	<b>OFF</b> : In normal mode
Remarks	For the inspection mode, refer to “8.2 Inspection mode.”

(5) Energy-saving operation setting

**ECO** : Energy-saving operation setting

Function	Enables/Disables the energy-saving operation. The energy-saving operation enables variable control of pump-stop period depending on the operation conditions of the unit in automatic mode.
Adjustable range	<b>ON</b> : Enables the energy-saving operation <b>OFF</b> : Disables the energy-saving operation
Initial setting	<b>ON</b> : Enables the energy-saving operation
Remarks	If the energy-saving operation is disabled, the pump-stop check period is set to 60 seconds.

#### 7.5.4 Extended parameters

The following are extended parameters for setting or adjusting various functions of the water supply unit.

<b>Note</b>	Extended parameters can be changed only when the operation mode is set to “Stop.” Therefore, make the settings before starting the operation of the water supply unit.
-------------	--

(1) External relay output pattern setting

**P 100** : External relay output pattern setting

Function	Selects a pattern of the signals to be output from the relays M1, M2, and B1 to B5. For the patterns, see Table 7-5-4.
Adjustable range	0 to 4
Initial setting	0 (This can be preset to a value that is specified when an order is placed.)
Remarks	The common terminal for M1 and M2 is MC, and the common terminal for B1 to B5 is BC.

Table 7-5-4 External relay output pattern

Terminal	P100 set value				
	0	1	2	3	4
M1	No. 1 run	No. 1 run	No. 1 run	No. 1 run	Run <sup>*7</sup>
M2	No. 2 run	No. 2 run	No. 2 run	No. 2 run	On inspection <sup>*8</sup>
M3	No. 3 run	No. 3 run	No. 3 run	No. 3 run	-
M4	No. 4 run	No. 4 run	No. 4 run	No. 4 run	-
M5	No. 5 run	No. 5 run	No. 5 run	No. 5 run	-
B1	Pump No. 1 failure <sup>*1</sup>	Serious failure <sup>*3</sup>	Overload	INV trip <sup>*9</sup>	Pump No. 1 failure <sup>*1</sup>
B2	Pump No. 2 failure <sup>*1</sup>	Slight failure <sup>*4</sup>	Discharge pressure abnormal drop	Discharge pressure abnormal drop	Pump No. 2 failure <sup>*1</sup>
B3	Full water	-	Electric leakage	Electric leakage	Full water
B4	Receiver tank low Dry-run prevention	-	Abnormal water level <sup>*5</sup>	Abnormal water level <sup>*5</sup>	Receiver tank low Dry-run prevention
B5	Trouble <sup>*2</sup>	Any failure <sup>*6</sup>	Any failure <sup>*6</sup>	Any failure <sup>*6</sup>	Trouble <sup>*2</sup>
B6	Pump No. 3 failure <sup>*1</sup>	-	-	-	Pump No. 3 failure <sup>*1</sup>
B7	Pump No. 4 failure <sup>*1</sup>	-	-	-	Pump No. 4 failure <sup>*1</sup>
B8	Pump No. 5 failure <sup>*1</sup>	-	-	-	Pump No. 5 failure <sup>*1</sup>

\*1 The "No.(n) failure" signal is output if one of the following alarms occurs at the No.(n) pump. (n: 1 to 5)  
Discharge pressure abnormal drop, Electric leak, INV trip, High temperature, Flow switch failure

\*2 The "Trouble" signal is output if one of the following alarms occurs.  
Electrode failure, Start frequency failure, Pressure transmitter 1 failure, Control panel high temperature, EEPROM error

\*3 The "Serious failure" signal is output if no pumps can run in automatic mode in the event of an error.  
Note that the signal is not output if the "Operation Permission" settings for all the pumps are set to "Operation blocked."

\*4 The "Slight failure" signal is output if any of the pumps can still run in automatic mode in the event of an error.

\*5 The "Abnormal water level" signal is output if any of the "Receiver tank full," "Receiver tank low," "Dry-run prevention," or "Electrode failure" alarms occur.

\*6 The "Any failure" signal is output if any type of an alarm occurs.

\*7 The "Run" signal is output if any of the pumps are running.

\*8 The "On inspection" signal is output in inspection mode.

\*9 The "INV trip" is output if one of the following alarms occurs.  
Overload, Overcurrent, Overvoltage, Stall prevention, Inverter overload, Open-phase output, Inverter overheat, Communication failure, Inverter trouble 1, Inverter trouble 2

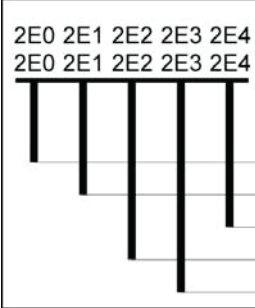
(2) Pole number setting of water level electrodes

**P 101** : Pole number setting of water level electrodes

Function	Selects the number of electrode bars for measuring the water level
Adjustable range	4: 4 electrode bars (4P) 5: 5 electrode bars (5P)
Initial setting	4: 4 electrode bars (4P) (If you specify the other value upon placing an order, the specified value is preset in the parameter.)
Remarks	Setting this to "4 electrode bars" causes the system to ignore the input of the electrode bars 1E4 and 2E4.

(3) 5P-electrodes pattern setting

**P 102** : 5P-electrodes pattern setting

Function	Selects the pattern for assigning a monitoring task to each electrode when the "Number of Water Level Electrode Bars" setting is set to "5 electrode bars."		
		5P-electrode bar patterns	
		Setting: 0	Setting: 1
		Full water level	Full water level
		Dry-run recovery	Low water level
		Low water level	Dry-run recovery
Adjustable range	0: Standard 1: Special	Dry-run prevention	Dry-run prevention
		Ground	Ground
Initial setting	0: Standard (If you specify the other value upon placing an order, the specified value is preset in the parameter.)		
Remarks	This setting is ignored when 4 electrode bars are selected in P101.		

(4) Solenoid valve type setting

**P 103** : Solenoid valve type setting

Function	Selects the type of the solenoid valve connected to the control panel.
Adjustable range	0: Normally open type 1: Normally closed type
Initial setting	0: Normally open type (If you specify the other value upon placing an order, the specified value is preset in the parameter.)
Remarks	-

(5) Solenoid valve control method setting

**P 104** : Solenoid valve control method

Function	When the Tank Selection is set to "Common" and the Solenoid Valve Operation is set to "Auto," selects whether the solenoid valve for Tank No.1 and the solenoid valve for Tank No.2 are controlled simultaneously or alternately.
Adjustable range	0: Simultaneous control 1: Alternate control
Initial setting	0: Simultaneous control (If you specify the other value upon placing an order, the specified value is preset in the parameter.)
Remarks	When the Solenoid Valve Operation is set to "Man. Close" or "Man. Open," both solenoid valves are simultaneously controlled regardless of this setting.

(6) Interlock signal setting

**P 105** : Interlock signal setting

Function	Selects the signal type used for the interlock function that forcibly stops the water supply unit. Usable signals are no-voltage a-contact or no-voltage b-contact. When no interlock is connected, select "Setting 0: no-voltage a-contact."
Adjustable range	0: No-voltage a-contact      activates the interlock mechanism when the contact is closed. 1: No-voltage b-contact      activates the interlock mechanism when the contact is open.
Initial setting	0: No-voltage a-contact (If you specify the other value upon placing an order, the specified value is preset in the parameter.)
Remarks	When the system is in a state of suspension after an interlock signal has been input, the message <b>STOP</b> appears on the display. If <b>STOP</b> appears without any signal input, this setting may be improperly configured. In that case, check whether or not the type of signal used is consistent with the setting.

(7) Buzzer stop time setting

**P 200** : Buzzer stop time setting

Function	Selects the time period after which the buzzer automatically stops in the event of an alarm. If this is set to "0," the buzzer does not sound in the event of an alarm.
Adjustable range	0: Disables the buzzer 1 to 60: Period after which the buzzer automatically stops [minutes] 99: Turns OFF the automatic buzzer stop function
Initial setting	60 [minutes] (If you specify a different value upon placing an order, the specified value is preset in the parameter.)
Remarks	In addition to this automatic stop function, it is possible to manually stop the buzzer by pressing the <b>Buzzer stop</b> switch.

(8) High temperature alarm detection setting

**P201** : High temperature alarm detection

Function	Selects whether or not to detect a high temperature alarm.
Adjustable range	0: No detection 1: Detection
Initial setting	1: Detection (If you specify the other value upon placing an order, the specified value is preset in the parameter.)
Remarks	Use the water supply unit by selecting "Detection" for this setting, except when alarm signals need to be kept undetected until a damaged high temperature sensor is replaced.

(9) Starting frequency failure alarm detection setting

**P202** : Starting frequency failure alarm detection

Function	Selects whether or not to detect a start-frequency failure alarm.
Adjustable range	0: No detection 1: Detection
Initial setting	1: Detection (If you specify the other value upon placing an order, the specified value is preset in the parameter.)
Remarks	-

(10) Water level alarm reset setting

**P203** : Water level alarm reset setting







Function	Selects the method to reset the water level alarms (Receiver tank full, Receiver tank low, and Dry-run prevention): Manual reset by using the reset switch or Automatic reset by the recovery of water level.
Adjustable range	0: Manual reset 1: Automatic reset
Initial setting	0: Manual reset (If you specify the other value upon placing an order, the specified value is preset in the parameter.)
Remarks	If Automatic reset is selected, the water level alarm is automatically canceled when the water level is recovered. In such a case, the generated alarms can be checked in the alarm log.



## 8. Maintenance and inspection

### 8.1 Precautions for maintenance and inspection

Carry out maintenance and inspection of the water supply unit according to the “8.3 Maintenance check list.”

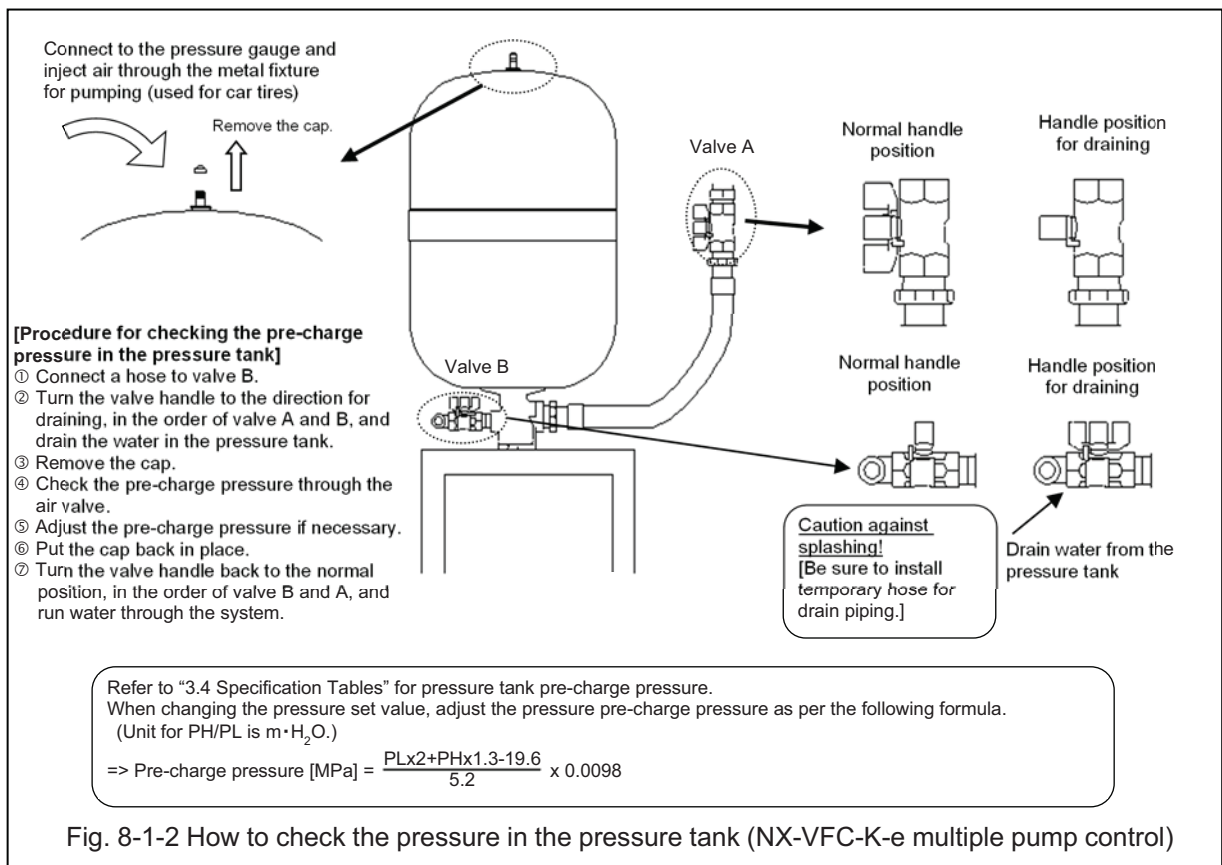
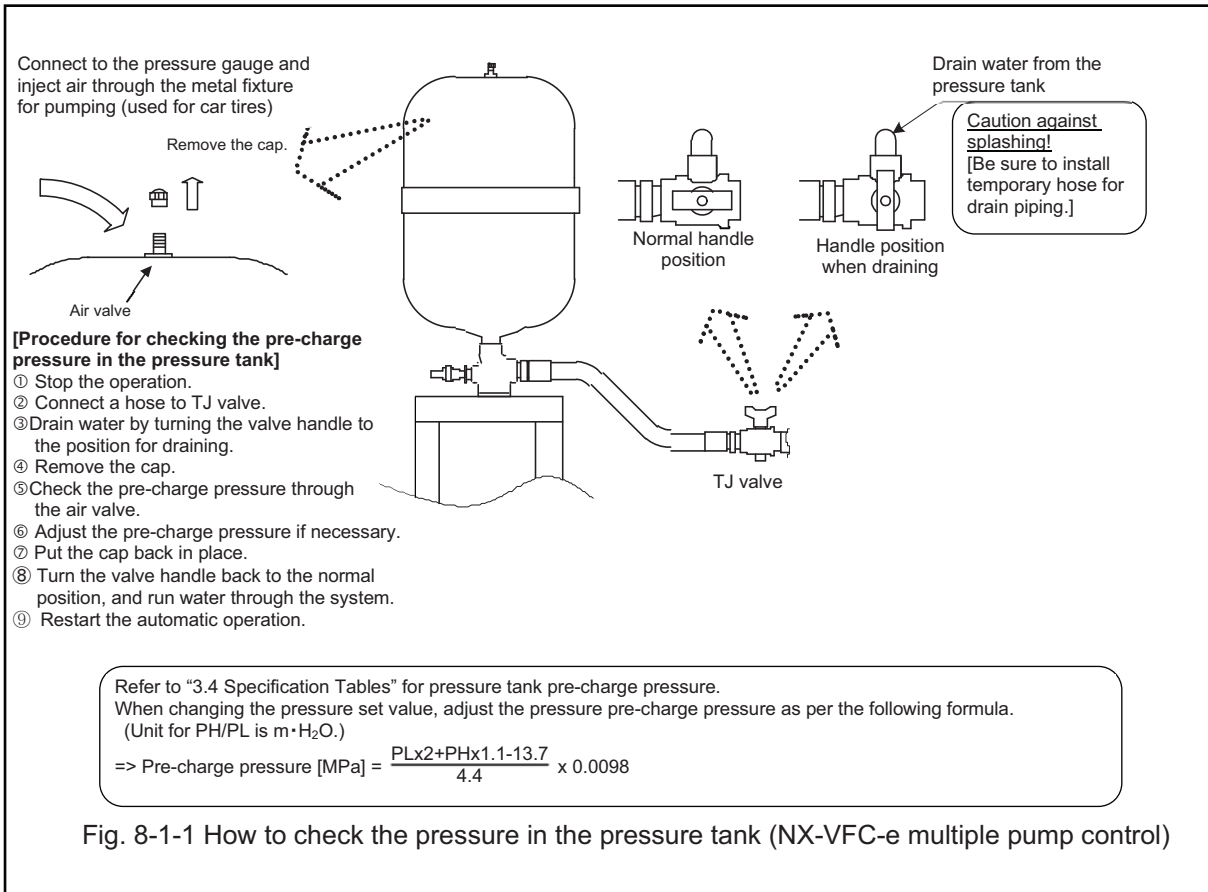
 <b>Warning</b>	 If any problem is found during inspection, immediately stop operation, and remove the cause or contact TERAL INC. Otherwise, it may lead to an accident.
 <b>Warning</b>	 Regularly inspect your equipment and perform maintenance on each component.
 <b>Caution</b>	 Ensure to carry out a daily/periodic inspection according to the checklist. Otherwise, it may be impossible to prevent potential failures and accidents and it also shortens the product life.

■ **When carrying out a daily inspection, carefully observe the following points:**

- ① A large deviation in the pump's discharge pressure, current, vibration, noise, or other conditions from the normal status is a possible fault. Therefore, immediately perform detailed inspection and maintenance. For this purpose, it is recommended to keep an operation log.
- ② Check that the unit is running properly in automatic mode.
- ③ Check the piping for any water leakage or damage.
- ④ Check the mechanical seal for any water leakage.

In the initial stage of pump operation, a small amount of initial leakage may occur until the sliding surfaces on the mechanical seal completely settle (or fit) into place. In case of initial leakage, the leakage will stop after 10 to 20 hours of operation. This initial leakage is not caused by the mechanical seal failure. You can use the pump with ease.

High-frequency sounds (mechanical squeaks) may occur occasionally, but this is not a pump failure. Even if you use the pump as it is, there is no problem in the function of the pump.
- ⑤ Check that the contacts, terminals, and other connections of the control panel are securely tightened and that there are no entries of water droplets inside.
- ⑥ Completely remove water from the pressure tank, and then check that the pre-charge pressure inside the tank complies with the specifications. Periodically check the pre-charge pressure (at least every 6 months) because the life of the pressure tank depends largely on the pressure.



■ **When the pump is not operated for a long time, observe the following points:**

- ① To prevent freezing inside the pump in winter, be sure to keep the pump warm enough or completely drain the pump.
- ② If you have a backup pump, run it from time to time to make it available for operation at any time.

## 8.2 Inspection mode

You can put the system into the inspection mode to notify other personnel that inspection is in progress.

### (1) Entering and exiting the inspection mode (→ see 7.5.)

- ① To enter the inspection mode

Set the basic parameter **[CHEC]** to “on.”

- ② To exit the inspection mode

Set the basic parameter **[CHEC]** to “off.”

\* The system automatically exits from the inspection mode in 24 hours, just in case the user forgets cancellation.

### (2) Operations in inspection mode

- ① Display

The power indicator lamp flashes while in inspection mode.

Any other indications are the same as in normal mode.

- ② External output

Signals are output externally via M2 and MC (no-voltage a-contact) in inspection mode only when the External Relay Output Pattern setting (parameter: P100) is set to “4.”

No signals are output externally when the External Relay Output Pattern setting is set to a value between “0” and “3.”

- ③ Other operations

Other operations are carried out in the same way as in normal mode.

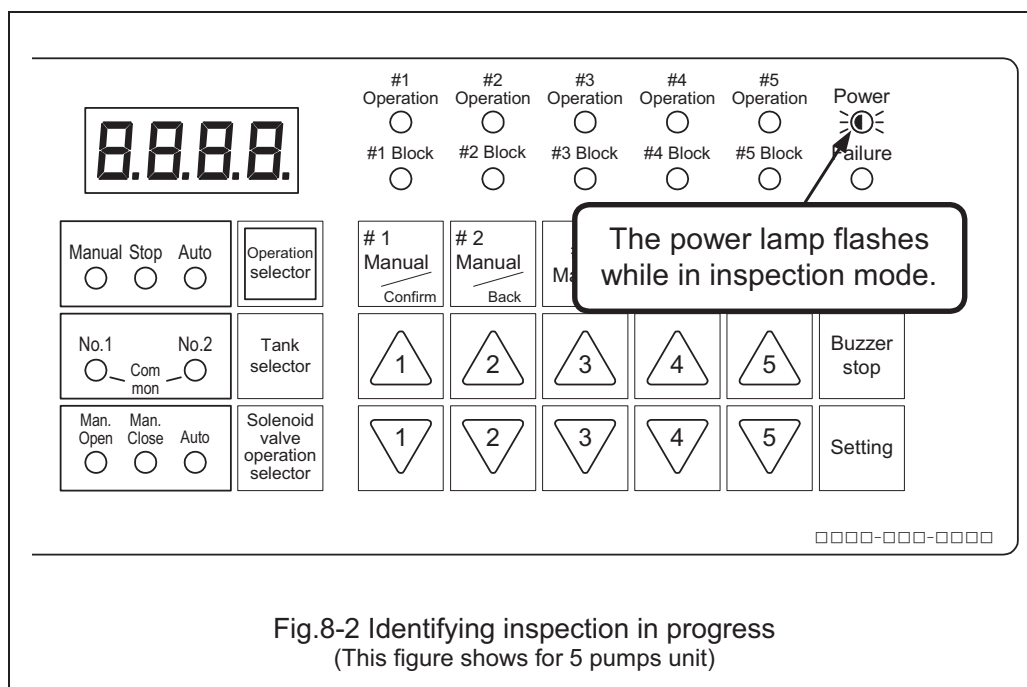


Fig.8-2 Identifying inspection in progress  
(This figure shows for 5 pumps unit)

### 8.3 Maintenance check list











 <b>Warning</b>	 Before carrying out inspection that requires disassembly and service, be sure to turn off the main power supply. Otherwise, it may lead to an electric shock, and/or causes the pump to start up suddenly in automatic mode etc., thus exposing the personnel to great danger.
 <b>Warning</b>	 If motors or control panels are used for more than a certain period of time, it may cause ignition or other accidents due to aging deterioration.
 <b>Caution</b>	 Only the service personnel with special knowledge of repairs are allowed to disassemble the unit. For work such as replacement of parts, repairs, or inspection that requires disassembly of the unit, contact TERAL INC. Incorrect work may cause a failure or accident.
 <b>Caution</b>	 Do not perform an insulation resistance test on the control panel. Before performing an insulation resistance test on the motors, remove the wires from the control panel. Otherwise, it may lead to a failure in the control panel.
 <b>Caution</b>	 Replace any packing and O-rings during inspection involving disassembly. Otherwise, it may lead to water leakage.

Table 8-3(a) Maintenance check list

	Inspection point	Inspection item	Method	Criterion	Frequency			Consumables		
					Daily	Half-yearly	Yearly	Part name	Qty.	Replacement cycle
Ambient environment	Temperature	Check against the specified range.	Measure	Between 0 and 40°C	○					
	Humidity		Measure	85%RH or less No condensation	○					
	Dust and other contaminants		Visual check	No dust or other contaminants	○					
Power	Power terminal block	Voltage	Measure	The specified voltage is applied.	○					
		Voltage fluctuation	Measure	Within the allowable fluctuation range	○					
Control panel	Panel display, indicator lamps	Check if they are lit on	Visual check	No abnormal condition	○					
	Set values	Set values	Visual check	As per the requirements	○					
	Operations	Operations in automatic mode	Visual check	No abnormal condition	○					
	Operating conditions	Startup pressure	Visual check	As per the set value	○					
		Stop pressure	Visual check	As per the specifications	○					
		Number of start time of the unit	Visual check	400 times or less	○					
		Cumulative operation time of each pump	Visual check	Check the adequacy.	○					
		Cumulative number of start of each pump	Visual check	Check the adequacy.	○					
		Alarm log	Visual check	No alarms are active. Check the past alarms.	○					
	Ground fault interrupter	Operation point	Visual check	Not tripped	○					
	Power supply terminal block, Control circuit terminal block, Power line	Loose screws	Tighten	Securely tightened			○			
		Trace of heating	Visual check	No discoloration			○			
		Adhesion of dust, damage	Visual check	No dust or damage			○			
	Cover and its installation status	Open/close the cover.	By hand	Smoothly opens/closes			○			
		Loose connections	Tighten	Securely tightened			○			
	Structure and appearance	Insulator	Visual check	No cracks or deformation			○			
	Inverter	Looseness of screws	Tighten	Securely tightened			○	Inverter	n	Every 5 years
	Printed board	Operation	Visual check	No abnormal condition			○	Printed board	1	Every 5 years
	Cooling fan	Noise, vibration	Listen	No abnormal condition	○			Cooling fan	n	Every 3 years
		Operation	Visual check	Normal rotation	○					

Table 8-3(b) Maintenance check list

	Inspection point	Inspection item	Method	Criterion	Frequency				Replacement cycle of consumables (as a guide)		
					Daily	Half-yearly	Yearly		Consumable	Qty.	Replacement cycle
Pumps and motors	Operating conditions	Head	Visual check	As per the specifications	○						
		Electric current value	Measure	As per the specifications	○						
		Noise, vibration	Listen Touch	No abnormal condition	○						
		Rotation direction	Visual check	Each motor rotates in the correct direction.	○						
	Mechanical seal	Water leakage	Visual check	No water leakage	○				Mechanical seal	n	Every year or after 8000 hrs. of continuous operation
	Impeller	Clogging with foreign matter, wear, damage	Disassemble and inspect	No abnormal condition			○				
	Liner ring	Head, wear, damage	Disassemble and inspect	No significant drop in head. No abnormal condition			○		Liner ring	m x n <sup>*1</sup>	Every 3 years
	Guide vane	Clogging with foreign matter, wear, damage	Disassemble and inspect	No abnormal condition			○				
	Main shaft and its surrounding area	Smooth rotation	Rotate manually	Smoothly rotates			○				
	Bearing <sup>*2</sup>	Heat, noise, vibration	Touch	No abnormal condition			○		Bearing	2n	Every 3 years or after 15000 hrs. of continuous operation
	Winding resistance	Resistance between wires (U-V, V-W, W-U)	Measure	Those resistance values are the same.			○				
Accessories and others	Pressure tank	Pre-charge pressure	Measure	As per the setting pressure		○			Pressure tank	1	Every 3 years
		Painting conditions	Visual check	No abnormal condition			○				
	Pressure transmitter	Operation	Visual check	Pressure is indicated correctly.	○				Pressure transmitter	1	Every 5 years
	Pressure gauge	Check the reading	Visual check	No abnormal condition	○				Pressure gauge	1	Every 3 years
	Compound pressure gauge	Check the reading	Visual check	No abnormal condition	○				Compound pressure gauge	1	Every 3 years
	Flow switch	Operation	Visual check	Pump stops at a low flow rate.	○						
		Clogging with foreign matter, damage	Disassemble and inspect	No abnormal condition		○			Flow switch	n	Every 3 years
	High-temperature sensor	Operation	Visual check	High-temperature alarm is issued at a high temperature (50°C or more).		○			High-temperature sensor	n	Every 3 years
	Check valve	Clogging with foreign matter, wear, water leakage	Disassemble and inspect	No abnormal condition		○			Check valve	n	Every 3 years
	Each section of piping	Water leakage	Visual check	No water leakage	○						
	Packing and O-rings	Flaws, deformation, adherence of foreign matter	Visual check	No abnormal condition		○			Packing and O-rings	1 set	Whenever disassembled

\*1: The letter "m" indicates the number of pump stages, and the letter "n" indicates the number of pumps.

Eg: UNX403-3.7-e = ①Bore(40A), ②Number of stage (3 stages), ③Rated output(3.7kW)

① ② ③

\*2: Long-life urea grease is used as lubricating grease in bearings.

When you replace parts, apply one of the following types of greases to each bearing.

- ① Bearings made by NTN: MP-1 grease
- ② Bearings made by NSK: ENS grease
- ③ Bearings made by KOYO: KTC grease

### Note

Information in the "Replacement cycle of consumables (as a guide)" column shows standard values that are applicable when the unit has been properly used and periodically inspected. The service life may be shortened depending on the operation conditions.

### Note

Waste parts and other disposal items removed during repairs or replacement must be disposed of by a specialized contractor.

## 9. How to handle troubles



**Caution**



In the event of an alarm or abnormal condition that cannot be resolved, immediately stop the operation and contact TERAL INC. Otherwise, it may lead to an accident.

Before the contact, check the status of abnormal condition and the alarm code No., as well as information shown on the nameplate, and then let us know the information.

### 9.1 Alarm handling

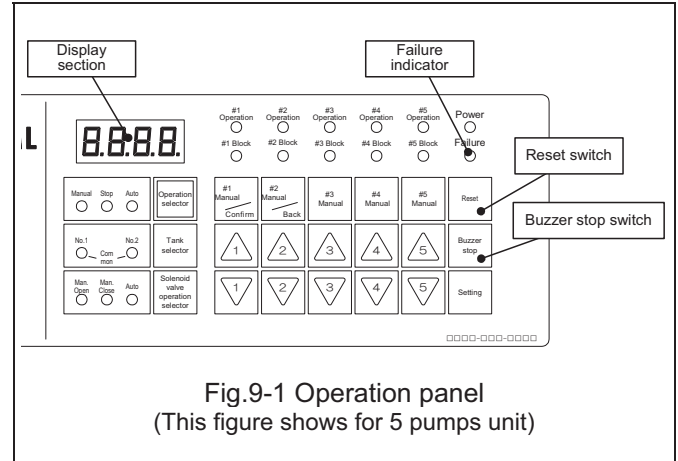
#### 9.1.1 Checking the alarm description

If an alarm occurs, the buzzer sounds, the Failure indicator lamp on the operation panel blinks, and the alarm code appears on the display.

Some failures do not generate an alarm immediately. Instead, the system takes back and retries the action several times and generates an alarm only if the failure still persists.

Referring to the “Table 9-1 Alarm code table,” identify the alarm status and eliminate the cause. To find out the cause of the problem, refer to “9.2 Troubleshooting.”

If multiple alarms occur at the same time, the displayed codes are switched every two seconds.



**Fig.9-1 Operation panel**  
(This figure shows for 5 pumps unit)

**Table 9-1 Alarm code table**

Alarm code	Description	Alarm code	Description
E001	Receiver tank full	E#01	No.# overload
E002	Receiver tank low	E#02	No.# discharge pressure abnormal drop
E003	Receiver tank dry-run prevention	E#03	No.# electric leak
E004	Electrode failure	E#04	No.# high temperature
E006	Start frequency failure	E#05	No.# flow switch failure
E051	Pressure transmitter 1 failure	E#11	No.# overcurrent
E070	Control panel high temperature	E#12	No.# overvoltage
E080	EEPROM error	E#13	No.# stall prevention
		E#14	No.# inverter overload
		E#15	No.# open-phase output
		E#16	No.# inverter overheat
		E#17	No.# communication failure
		E#18	No.# inverter trouble 1
		E#19	No.# inverter trouble 2

\* “#” should be replaced with one of pumps No. 1 to 5.

#### 9.1.2 Resetting alarms

Eliminate the cause of the problem and then press the reset switch.

If the reset switch is pressed before the cause of the problem is eliminated, the alarm cannot be reset.

If multiple alarms occur, the system resets only the alarms whose cause has been removed.

#### 9.1.3 Stopping the buzzer

You can stop a sounding buzzer by pressing the Buzzer stop switch.

The Buzzer Stop Time setting (P200) allows you to specify whether to stop the buzzer automatically after a specified period or to prevent the buzzer from sounding.

For the setting procedure, refer to “7.5 Parameter setting.”

## 9.2 Troubleshooting

Table 9-2(a) Troubleshooting

Alarm code	Description	Probable cause	Remedy
E001	Receiver tank full	Water flows into the tank continuously because the Solenoid Valve Operation setting is set to "Man. Open."	Set the Solenoid Valve Operation to "Auto."
		Water does not stop running because of a failure in the ball tap.	Check and/or replace the ball tap.
		Water does not stop running because of a failure in the inflow solenoid valve.	Check and/or replace the inflow solenoid valve.
		Water has seeped inside the electrode holder.	Check and/or correct the electrode holder section.
		Although water level has reached the point of closing the solenoid valve, water still comes out because an incorrect setting of the Solenoid Valve Type (P103) causes the solenoid valve to open.	Correctly set the Solenoid Valve Type to the type of the inflow solenoid valve in use.
E002 E003	Receiver tank low Dry-run Prevention	The Tank Selection setting is set to a water tank not in use (to which no electrodes are connected or for which cleaning work is in progress).	Set the Tank Selection to the water tank to be used.
		Water does not flow into the receiver tank because the Solenoid Valve Operation setting is set to "Man. Close."	Set the Solenoid Valve Operation to "Auto."
		Water does not come out because of a failure in the ball tap.	Check and/or replace the ball tap.
		Water does not come out because of a failure in the inflow solenoid valve.	Check and/or replace the inflow solenoid valve.
		Although water level has reached the point of opening the solenoid valve, no water comes out because an incorrect setting of the Solenoid Valve Type (P103) causes the solenoid valve to close.	Correctly set the Solenoid Valve Type to the type of the inflow solenoid valve in use.
		Poor connection or disconnection of the electrode wiring	Check and/or correct the electrode wiring.
		Poor connection of the electrode holder section	Check and/or correct the electrode holder section.
E004	Electrode failure	Wrong electrode wiring	Check and/or correct the electrode wiring.
		Poor connection or disconnection of the electrode wiring	Check and/or correct the electrode wiring.
E006	Start frequency failure	Because of damage to the diaphragm of the pressure tank, its internal pressure cannot be maintained when no pumps are running, thus increasing the start frequency of the pump(s).	It is necessary to check and/or replace the pressure tank. Contact us.
		Water usage continues at low flow rate because of water leakage or the user's failure to close the faucet.	Check and/or replace the piping. Additionally install a pressure tank with a large capacity.
		A low flow rate is constantly detected because of malfunction of the flow switch.	It is necessary to check and/or replace the flow switch. Contact us.
E051	Pressure transmitter failure	The pressure transmitter is broken.	It is necessary to check and/or replace the pressure transmitter. Contact us.
		The piping is frozen.	Protect the piping with a heat insulating material, or contact us to make modifications for the freeze-proof specifications.
E070	Control panel high temperature	The cooling fan of the outdoor cover is broken.	Check the cooling fan. If it is broken, replace it.
		The ambient temperature is too high. The unit is exposed to direct sunlight.	Improve the installation environment.
E080	EEPROM error	The memory device of the control board is broken.	Normal operation may not be possible because parameters and operating information cannot be stored. It is necessary to check and/or replace the control board. Contact us.



Table 9-2(b) Troubleshooting

Alarm code	Description	Probable cause	Remedy
E101	No.1 overload	An overload has occurred because the unit is running at a flow rate outside the specified range.	Adjust the load so that it falls within the specified range.
E201	No.2 overload	An overload has occurred because of damage to the bearings.	It is necessary to replace the bearings. Contact us.
E301	No.3 overload	An overload has occurred because foreign matter is caught in the pump.	It is necessary to disassemble and inspect the pump. Contact us.
E401	No.4 overload	A drop in power voltage or an imbalance between phases has led to an increase in the electric current value.	Check for any insufficient power capacity or any imbalance between phases, and fix the problem.
E501	No.5 overload	A failure in the motor has led to an overcurrent flow.	It is necessary to check and/or replace the motor. Contact us.
E102	No.1 discharge pressure abnormal drop	Because of insufficient priming or the escape of water from the piping system, the pump cannot lift water.	Sufficiently perform priming. If water escapes from the piping system, Check and/or correct the suction piping.
E202	No.2 discharge pressure abnormal drop	An entry of air through the suction piping prevents the pump from delivering its rated performance.	Check and/or replace the suction piping.
E302	No.3 discharge pressure abnormal drop	The pressure cannot be detected because water is not flowing to the pressure transmitter.	Operate the TJ valve and gage valve so that water is flowing to the pressure transmitter.
E402	No.4 discharge pressure abnormal drop	The set value for starting the pump is set to a value beyond the pump capacity.	Check the pump capacity, and set the correct set value for starting the pump.
E502	No.5 discharge pressure abnormal drop	Because of problems such as a failure in each pump/motor or the disconnection of the power line, the pump does not run or the motor rotates in reverse.	Check the rotation direction. Check and/or correct the wiring. If it is necessary to disassemble and inspect the pump, contact us.
E103	No.1 electric leak	There is electric leakage somewhere in the secondary circuit of the ground fault interrupter.	Find the location of electric leakage, and fix the problem.
E203	No.2 electric leak	The ground fault interrupter is broken.	It is necessary to check and/or replace the ground fault interrupter. Contact us.
E303	No.3 electric leak		
E403	No.4 electric leak		
E503	No.5 electric leak		
E104	No.1 high temperature	Because of malfunction of the flow switch, the pump does not stop even when no water is used, thus leading to a high temperature.	It is necessary to check and/or replace the flow switch. Contact us.
E204	No.2 high temperature	Water usage continues at a low flow rate because of water leakage or other conditions. At that time, the heat of stirring accumulates inside the pump, thus leading to a high temperature.	Check and/or replace the piping. Additionally install a pressure tank with a large capacity.
E304	No.3 high temperature	Because of damage to the diaphragm of the pressure tank, its internal pressure cannot be maintained when no pump is running. The pressure drop starts running the pump even when no water is used, thus leading to a high temperature.	It is necessary to check and/or replace the pressure tank. Contact us.
E404	No.4 high temperature		
E504	No.5 high temperature	Flow-in water is hotter than the specification.	Check the conditions of use, and fix the problem.
		The high-temperature sensor is broken.	It is necessary to check and/or replace the high-temperature sensor. Contact us.

Table 9-2(c) Troubleshooting

Alarm code	Description	Probable cause	Remedy
E105	No.1 flow switch failure	The flow switch is broken or its wiring is disconnected.  Or, the flow switch is not working properly because of contamination with foreign matter or other causes.	It is necessary to check and/or replace the flow switch. Contact us.
E205	No.2 flow switch failure		
E305	No.3 flow switch failure		
E405	No.4 flow switch failure		
E505	No.5 flow switch failure		
E111	No.1 overcurrent	An overload has occurred because the unit is running at a flow rate outside the specified range.	Adjust the load so that it falls within the specified range.
E211	No.2 overcurrent		
E311	No.3 overcurrent	An overcurrent has occurred because of damage to the bearings.	It is necessary to replace the bearings. Contact us.
E411	No.4 overcurrent		
E511	No.5 overcurrent	An overcurrent has occurred because foreign matter is caught in the pump.	It is necessary to disassemble and inspect the pump. Contact us.
E114	No.1 stall prevention		
E214	No.2 stall prevention	A drop in power voltage or an imbalance between phases has led to an increase in the electric current value.	Check for any insufficient power capacity or any imbalance between phases, and fix the problem.
E314	No.3 stall prevention		
E414	No.4 stall prevention	A failure in the motor has led to an overcurrent flow.	It is necessary to check and/or replace the motor. Contact us.
E514	No.5 stall prevention		
E115	No.1 inverter overload		
E215	No.2 inverter overload		
E315	No.3 inverter overload		
E415	No.4 inverter overload		
E515	No.5 inverter overload		
E112	No.1 overvoltage	The power voltage is too high.	Check the power voltage.
E212	No.2 overvoltage		
E312	No.3 overvoltage		
E412	No.4 overvoltage		
E512	No.5 overvoltage		

Table 9-2(c) Troubleshooting

Alarm code	Description	Probable cause	Remedy
E116 E216 E316 E416 E516	No.1 open-phase output No.2 open-phase output No.3 open-phase output No.4 open-phase output No.5 open-phase output	The motor has burned out.	It is necessary to check and/or replace the motor. Contact us.
E117 E217 E317 E417 E517	No.1 inverter overheat No.2 inverter overheat No.3 inverter overheat No.4 inverter overheat No.5 inverter overheat	The ambient temperature is too high.  The cooling fan is broken.	Improve the installation environment.  It is necessary to replace the cooling fan. Contact us.
E118 E218 E318 E418 E518	No.1 communication failure No.2 communication failure No.3 communication failure No.4 communication failure No.5 communication failure	A cause other than electric leak has turned "off" the ground fault interrupter.  The communication connector is coming off.	Turn on the ground fault interrupter.  Firmly insert the connector.
E119 E219 E319 E419 E519 E120 E220 E320 E420 E520	No.1 inverter trouble 1 No.2 inverter trouble 1 No.3 inverter trouble 1 No.4 inverter trouble 1 No.5 inverter trouble 1 No.1 inverter trouble 2 No.2 inverter trouble 2 No.3 inverter trouble 2 No.4 inverter trouble 2 No.5 inverter trouble 2	The inverter is broken.	It is necessary to check and/or replace the inverter. Contact us.

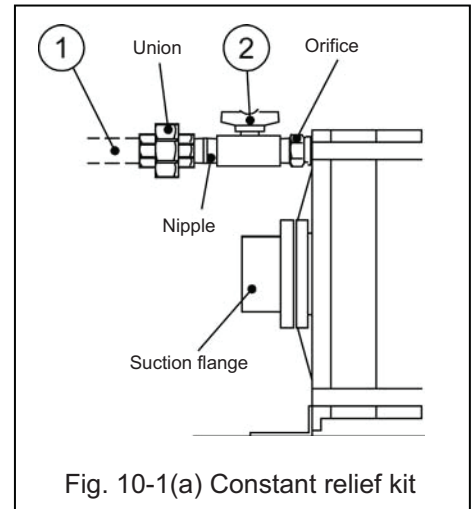
## 10. Special specification

### 10.1 Negative suction type

This section describes specification of the negative suction type water supply unit.

By employing the negative suction type unit, suction of up to -4m (actual pump head) and -6m (total pump head) is enabled.

A constant relief kit (an orifice, a ball valve, a nipple, and a union) is provided. Connect a constant relief pipe to the kit to send water back to the source of water supply.



#### Note

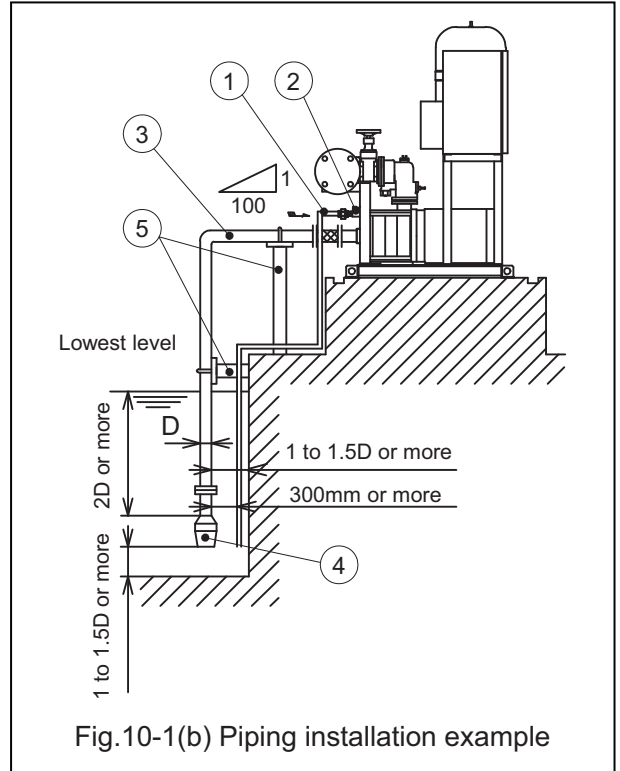
For the installation procedure of the constant relief pipe, there may be an applicable guideline or guidance from local governments or other official institutions. Carefully check for such guidelines and follow the instructions.

#### Note

A standard model can be modified to the negative suction type. For further information, contact TERAL INC.

[Instructions only applicable to negative suction type]

- (1) Ensure to install the constant relief pipe ① for each pump.
- (2) Submerge the end of the constant relief pipe deep enough to prevent exposure to air even if refilling of water creates waves on the surface. In addition, keep a distance from the suction pipe so that air from the constant relief pipe does not enter the suction pipe.
- (3) Fully open the valve ② during operation. (Water flows at a rate of 10-30 L/min.)
- (4) Ensure to install the suction pipe ③ for each pump, and provide a rising slope (at least 1/100 degrees) leading up to each pump to prevent the formation of air pockets inside the pipe. Furthermore, install joints in a way that no air enters from there. Pay special attention because the flow rate of the subsequently activated pump exceeds the value divided the maximum water usage by the maximum number of paralleled units.
- (5) Ensure to attach a foot valve ④ with a strainer to the end of the suction pipe ③ to block entrance of foreign matter or objects. The suction port must be located at a position more than twice as deep as the size of the suction pipe diameter (D) below the lowest water level, and at a distance of at least 1 to 1.5 times the pipe diameter (D) away from the bottom and the side of the water tank.
- (6) Do not attach a sluice valve to the suction pipe ③.
- (7) Install strong piping supports ⑤ to prevent the weight of the piping components from being applied to the unit.



## 10.2 Models with outdoor cover

This section describes the assembly and disassembly of the outdoor cover. Remove the outdoor cover before installation.

Also, remove the front plate of the outdoor cover, before operating the control panel.

- (1) Attach the mounting leg ① to the unit base. (Mounting screw ⑫x 8pcs)
- (2) Attach the top plate support ② to the mounting leg ①.  
(Mounting screw ⑫x 8pcs)
- (3) Attach the back plate ③ and front plate ④ to the mounting leg ①.  
(Decorative screw ⑩x 16pcs)
- (4) Attach the left side plate ⑤ to the mounting leg ①, and the side plate lid ⑦ to the left side plate ⑤. (Decorative screw ⑩x 16pcs)
- (5) Attach the right side plate ⑥ in the same manner as the left side plate ⑤, and attach the discharge port lid ⑧.

(Decorative screw ⑩x12pcs)  
\* The discharge direction can be changed by exchanging the side plate cover ⑦ and the discharge port cover ⑧.

- (6) Fix the back board ③ and the front board ④ to the unit base with the mounting screws. (Mounting screw ⑫x 8pcs)
- (7) Fit a hexagon bolt ⑬ on the top board ⑨, and attach it in alignment with the notch of the top plate support ②.  
Next, fix the top board ⑨ and the top board support ② with the decorative screw ⑪.

(Decorative screw ⑪x4pcs, Hexagon bolt ⑬x4pcs)

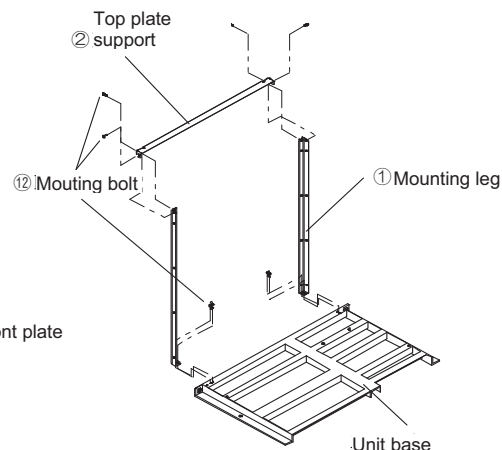
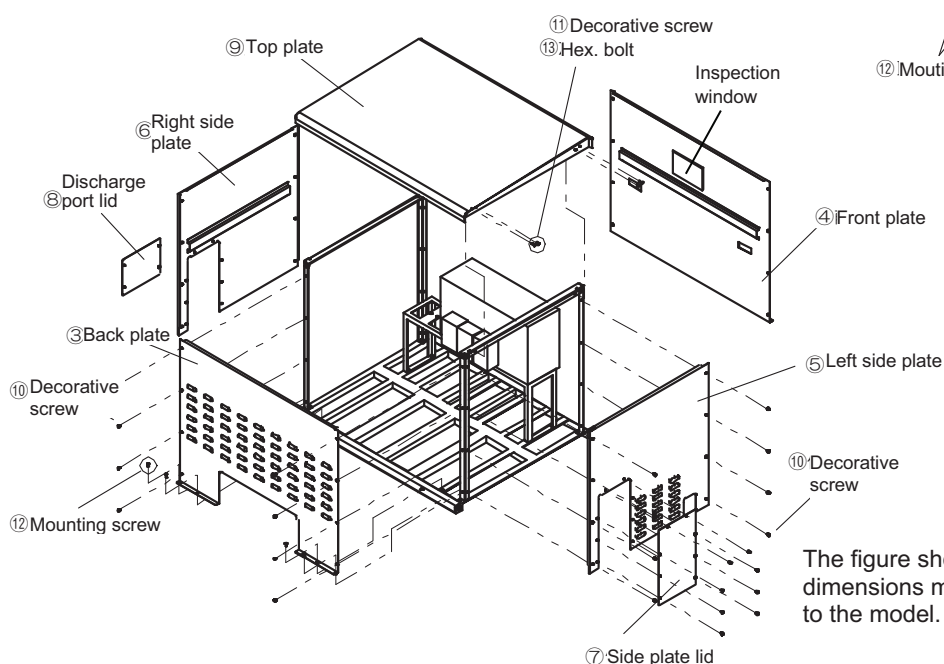
- (8) When disassembling the outdoor cover, perform in the reverse order.

No	Accessory	Qty
①	Mounting leg	4
②	Top plate support	2
③	Back plate	1
④	Front plate	1
⑤	Left side plate	1
⑥	Right side plate	1
⑦	Side plate lid	1
⑧	Discharge port lid	1
⑨	Top plate	1
⑩	Decorative (Urea) screw (No.3 M6X10)	44
⑪	Decorative (Urea) screw (No.3 M6X21)	44
⑫	Mounting bolt (Cross recessed hex. head bolt)	24
⑬	Hexagon bolt	4



Caution

- Do not step on the outside cover.
- Do not place any items on the outside cover.
- Do not remove the inspection window.
- Do not disassemble the outside cover in the wet weather.



The figure shows a representative model. The dimensions may be partially different according to the model.



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