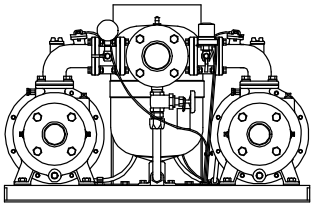
Kawamoto

No.	87209517

Uniting water with an abundant lifestyle ••••• Kawamoto Pump

Stainless Steel
Constant Pressure
Water Supply
TYPE KB2

Pumper KB
Instruction Manual



Thank you for purchasing the Constant Pressure Water Supply Unit Pumper KB.
The methods for safely using this product are explained in this manual.
Please read this manual thoroughly and understand the contents before using the Pumper.
Please keep this instruction manual in a handy place for quick reference.

<Contents>

⚠ Special Notes

1. Always earth the equipment with Class D (Class 3) earthing, and install a dedicated residual current circuit breaker on the power supply side.
   Failure to observe this could result in earth leakages, faults, electric shocks or fires.
2. Use an insulation resistance tester that is 250V or less when measuring the insulation resistance.
   Failure to observe this could result in control panel damage.
3. Confirm that the floor is waterproofed and well drained.
   Failure to observe this could result in major damage if there is water leakage.
4. Do not dry run (run without water in the pump) or closed run (run with no flow of water to or from the pump).
   Failure to observe this could cause the pump temperature to rise, and lead to burns or faults.
5. The motor and control panel are hot during and immediately after operation, so do not touch these.
   Failure to observe this could lead to burns.

Precautions for using this product safely and for preventing personal injuries or physical damage are given in this manual.
The precautions are classified as "**Warning**" and "**Caution**" to alert of the degree of injury or damage that could occur if handling is mistaken.
In either case, these are important matters related to safety, and must be observed.

⚠ **Warning** : Details which if ignored could lead to fatalities or serious injuries.
⚠ **Caution** : Details which if ignored could lead to personal injuries or physical damage.

The conventional units and values based on these given in { } are provided for reference.

[1] Introduction

Check the following items after the pump has been delivered.

1. Has the ordered model been delivered?
   Check the type, bore, total head, frequency, No. of phases and rated output, etc., on the nameplate.
2. Have any parts been damaged or any bolts or nuts become loose during transportation?
3. Are all accessories enclosed?

   <If there are any problems, please contact your dealer.>

[2] Specifications

⚠ Caution

● Always use this pump within the specified product specifications.
Failure to observe this could lead to electric shocks, fires or water leakage.

2.1 Specifications

Pumped fluids (Fluid quality/Fluid temperature)	Clean water (PH6.5 to 8 / 0 to 40°C)	
Installation place (Ambient temperature/humidity)	Indoors (0 to 40°C / 85%RH or less)	
Usage power source	Voltage	200～220V (Tolerable range: 90 to 110%, unbalance rate 3% or less)
		380～440V (Tolerable range: 90 to 110%, unbalance rate 3% or less)
	Frequency: 50/60Hz (Tolerable range : ±1Hz)	
Suction conditions	For positive suction : 0 to 5m 0 to 3m (40 - 5.5kW, 50 - 7.5kW) For negative suction: Suction actual head 4m or less, and suction total head 6m or less Note, models with standard specifications 22m or less are excluded.	
Pump	KR4-C type stainless steel multi-stage pump	
Operation method	Independent, alternate, alternate/parallel operation	
Main circuit switch	Magnetic contact (MC), SSC (alternate, alternate/parallel operation: up to 3.7kW only)	
Motor protection unit	Independent operation : Thermal relay	
	Alternate, alternate/parallel operation : Electronic thermal	

2.2 Control panel special specifications (Excluding single-phase and 0.4kW output models)

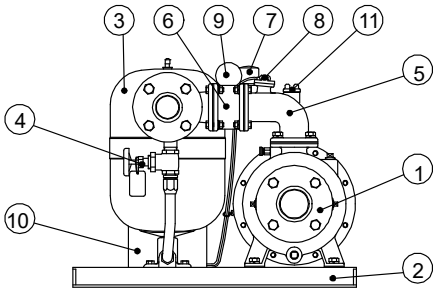
Operation method		Special specification No.	Fault, Full, Empty Lamp and output	With residual current circuit breaker	With power capacitor	2-tank reservoir compatible
Independent operation		01	○			
		02	○	○		
		03	○		○	
		04	○	○	○	
Alternate operation, alternate/parallel operation	Output 3.7kW or less	01	Standard	○		
		02	Standard		○	
		03	Standard	○	○	
		04	Standard			○
		07	Standard	○	○	○
	Output 5.5kW or more	01	Standard	○		Standard
		02	Standard		○	Standard
		03	Standard	○	○	Standard

[3] Product Configuration

3.1 Configuration Drawing

The following figure shows the typical KB2 type. The actual state may differ slightly according to the model.

<Independent operation>

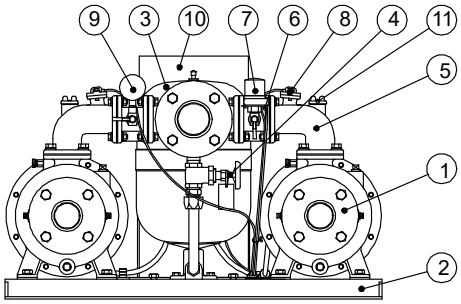


<Fig. 1>

No.	Name
1	Pump
2	Base Plate
3	Accumulator
4	Sluice valve
5	Connecting elbow
6	Check valve

No.	Name
7	Pressure sensor
8	Flow sensor
9	Pressure gauge
10	Control panel
11	Plug

<Alternate, Alternate/parallel operation>



<Fig. 2>

No.	Name
1	Pump
2	Base Plate
3	Accumulator
4	Sluice valve
5	Connecting elbow
6	Check valve

No.	Name
7	Pressure sensor
8	Flow sensor
9	Pressure gauge
10	Control panel
11	Plug

3.2 Standard accessories

Part No.	Part name	Qty.
87209512	Instruction Manual, KB	1
85844012	Nameplate KB	1

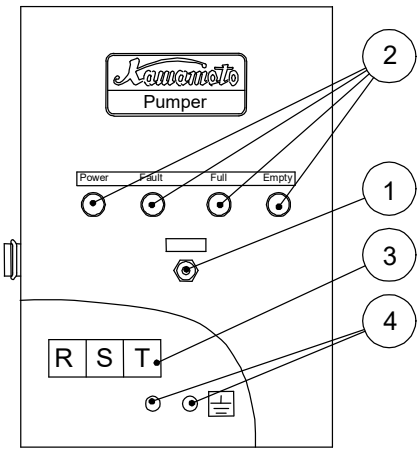
3.3 Optional Accessories

Part No.	Part name	Remarks
08510310	Control panel ECV-3	For inflow solenoid valve control (5.5kW or more)
08510410	Control panel ECV-4	For inflow motorized valve control (5.5kW or more)
08900110	Control panel LVS-1	Water level control part
59101110	Electrode holder EHC-3N	Water level control part (for 3 electrodes)
59101210	Electrode holder EHC-4N	Water level control part (for 4 electrodes)
59101310	Electrode holder EHC-5N	Water level control part (for 5 electrodes)
59120010	Electrode bar 1000	Water level control part
59150010	Electrode separator 3P	Water level control part
59150210	Electrode separator 5P	Water level control part
37002110	Nut M6S	Water level control part (for electrode bar connection)
69050050	Heater 100V - 110W	For freezing prevention
69050250	Heater 200V - 110W	For freezing prevention
56700110	Thermostat	For heater "ON" "OFF" control
264900__	Coupling bent pipe 32~65	For changing piping direction
414126 $^{20}_{30}$	Pump cover 26 $^{B}_{S}$	For alternate, alternate/parallel (3.7kW or less) 26B: Steel plate, 26S: Stainless steel
414145 $^{10}_{20}$	Pump cover 45 $_{S}$	For alternate, alternate/parallel (5.5kW or more) 45: Steel plate, 45S: Stainless steel
414136 $^{10}_{20}$	Pump cover 36 $^{B}_{S}$	For soundproof type, alternate, alternate/parallel (3.7kW or less) 26B: Steel plate, 26S: Stainless steel
02520055	Damper frame QGP-56	For independent
02451030	Damper frame PUL-972	For independent
02500112	Damper frame RK-960	For independent
02520046	Damper frame QGP-37	For alternate, alternate/parallel (3.7kW or less)
02451030	Damper frame PUL-972	For alternate, alternate/parallel (3.7kW or less)
02500010	Damper frame RK-770	For alternate, alternate/parallel (3.7kW or less)
02520054	Damper frame QGP-55	For alternate, alternate/parallel (5.5kW or more)
02460240	Damper frame PW-1102J281	For alternate, alternate/parallel (5.5kW or more)
36490020	Anchor bolt set 4-M12 $\times$ 160	

3.4 Control panel (Detailed drawing)

<Independent operation>

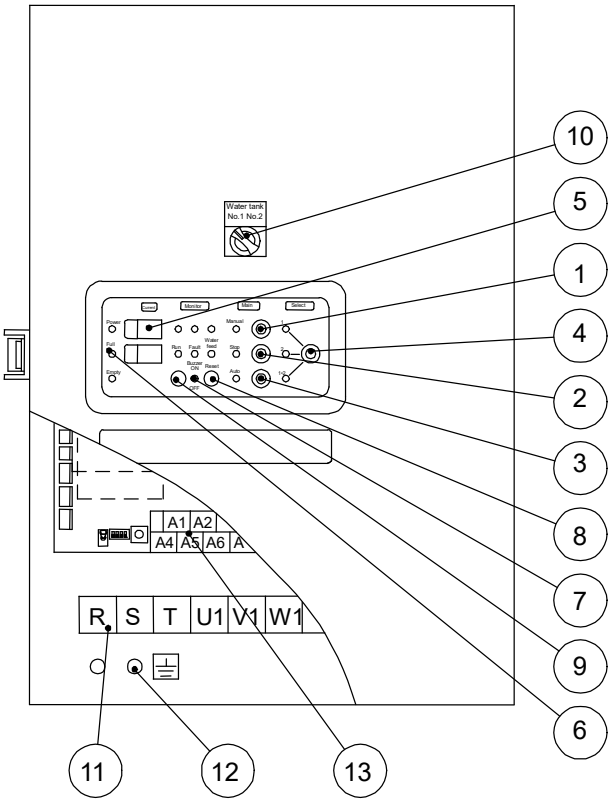
• ECF5



No.	Name	Remarks
1	Main switch	Manual, Stop, Automatic
2	Pilot lamp	Only Power on standard panel
3	Terminal block	
4	Earthing terminal	

<Alternate, Alternate/parallel operation>

• ECF8



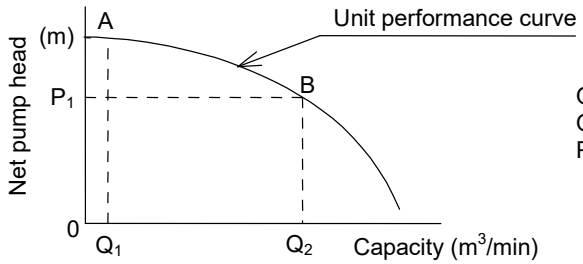
No.	Name	Remarks
1	Main switch	Manual operation
2	Main switch	Stop
3	Main switch	Automatic operation
4	Select switch	For Pump No. 1/No. 2 switching
5	Display panel	Current, voltage, trouble, etc.
6	Pilot lamp	
7	Buzzer switch	For ON/OFF
8	Reset switch	Fault reset
9	Display switching switch	
10	Select switch	For reservoir switching (Note 1)
11	Terminal block	Power supply
12	Earthing terminal	
13	Terminal block	Various output, water level control

<Fig. 3>

(Note 1) Not enclosed with the standard panel (3.7kW or less).
(Enclosed only with special specifications No. 04 and 07).
Note that this is enclosed as a standard with the 5.5kW and larger models, and the reservoir is switched in the control panel.

[4] Operation Theory

4.1 Independent, alternate operation

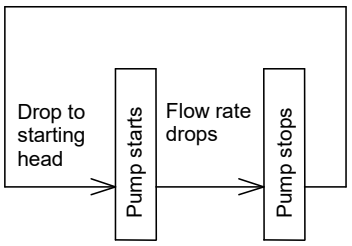


Q_1 = Stopped flow rate (0.01m^3/min)
Q_2 = Max. flow rate
P_1 = Starting pressure

(1) When water is used while the pump is stopped and the pressure drops to P_1, the pressure sensor detects the pressure, and the pump starts.
(2) The water supply continues operation between AB on the unit performance curve while the used water rate is between Q_1 and Q_2.
(3) When the used water rate drops to Q_1 or less, the flow rate sensor detects the flow, and the pump stops.

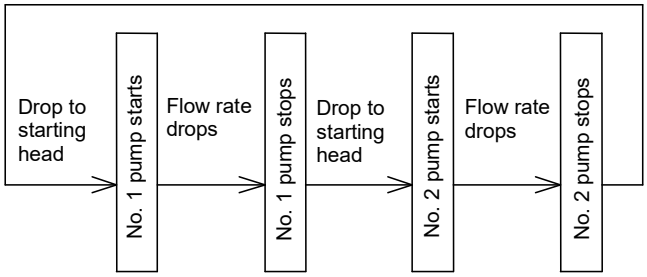
<Independent operation>

(4) Repeats steps (1) to (3).

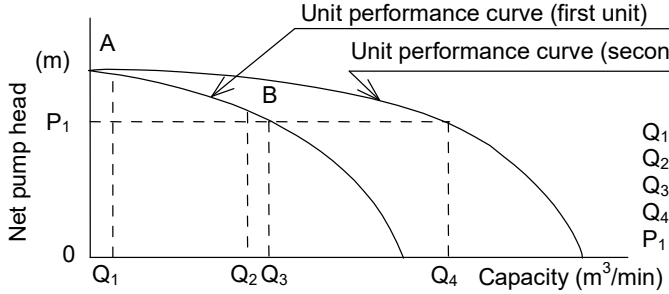


<Alternate operation>

(4) The No. 1 and No. 2 pumps alternately repeat steps (1) to (3).

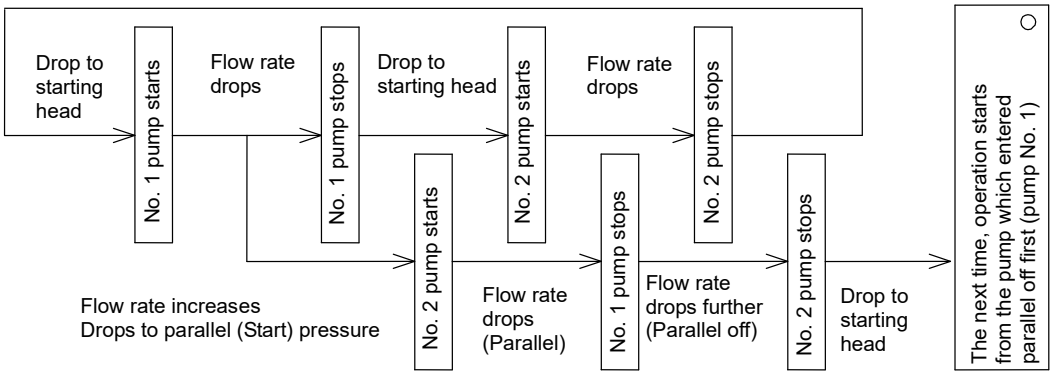


4.2 Alternate/parallel operation



Q_1 = Stopped flow rate (0.01^3/min)
Q_2 = Parallel off flow rate
Q_3 = Parallel flow rate
Q_4 = Max. flow rate
P_1 = Starting pressure, parallel pressure

(1) When water is used while the pump is stopped and the pressure drops to P_1, the pressure sensor detects the pressure, and the pump starts.
(2) The water supply continues operation between AB on the unit performance curve while the used water rate is between Q_1 and Q_3.
(3) When the used water rate drops to Q_1 or less, the flow rate sensor detects the flow, and the pump stops.
(4) If the used water rate is less than Q_3, alternate operation will be repeated.
(5) If the used water rate rises to Q_3 or more during the operation of the first unit, the pressure will drop below P_1 again. The second pump will start, and parallel operation will start.
(6) If the used water rate drops to Q_2 or less during parallel operation, the pump that started last will stop, and alternate operation will start.



[5] New Function (alternate, alternate/parallel operation)

1. When running with a low water supply, the starting frequency is suppressed to 60 times/hours or less. In addition, the forced operation time is normally 10 to 30 seconds, and if the starting frequency is high, the time is automatically adjusted between 10 and 90 seconds. This allows water supply with a high energy saving effect.
2. The parallel off flow rate is optimally and automatically adjusted with current control. Highly efficient alternate/parallel operation with little difference in parallel flow rate and parallel off flow rate is realized.
3. A no-contact SSC (Solid State Contactor) is used in the 3.7kW and smaller models only. This eliminates the magnetic sound when the pump starts, and ensures quiet operation. The MC (Magnetic Contactor) in the control panel is always ON, and turns OFF to protect the motor when an overcurrent flow, etc.

[6] Installation

6.1 Precautions for Installation

⚠ Warning

- Before suspending the pump for unloading, transport or installation, always confirm the device weight and suspension method in the catalog, installation drawings or instruction manual. Do not suspend a device having a rated weight larger than the suspension fitting. Improper suspension could lead to injuries if the pump drops.

(1) When transporting or moving the product, attach shackles, etc., to the four suspension holes on the base as shown in <Fig. 4>, and lift the unit with four ropes. Attaching the ropes to the accumulator, etc., could lead to damage.

(2) Always install the product so that it is level, and securely fix it with anchor bolts **(Note 1)**.
If the foundation is not level and is bumpy, the base could twist and result in damage.

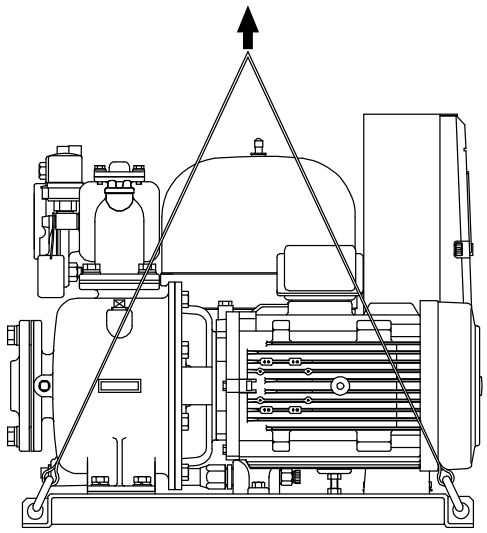
6.2 Selecting the Installation Place

⚠ Caution

- Do not install this pump on a floor has not been waterproofed and treated for drainage. Water leaks could lead to major disasters.
- Do not install in places with high humidity such as bathrooms.
  Failure to observe this could result in residual current or electric shock.
- Do not install in any location where poisonous gases and gases including corrosive components such as acid, alkali, organic solvents, paints, etc., are generated by machines, chemical factories, etc. Do not install in dusty locations.
  Failure to observe this could result in residual current or fire.

(1) Select a place where disassembly and assembly can be done without problem. Make sure that the place is well ventilated and cool, and is not subject to rain water or direct sunlight.
(2) If subject to rain water or direct sunlight, attach a pump cover (special accessory).
(3) Select a place where the ambient temperature of the pump will not exceed 40°C.

(Note 1) The anchor bolts must be purchased separately. (Recommended anchor bolt size: 4-M12×160)



<Fig. 4>

[7] Piping (For positive suction refer to <Fig. 5>, for negative suction refer to <Fig. 6>.

⚠ Caution

● Make sure that foreign matter and sand, etc., are not sucked in.
The impeller may lock, the mechanical seal may be damaged.

7.1 Suction Piping

<Common>

(1) Attach the suction piping individually, and do not merge the pipes midway.
(2) Make the length of piping to the minimum and avoid the use of bends as much as possible.
(3) Install a strainer or sand filter if foreign matter or sand might enter the pipe.

<For positive suction>

(1) Install a sluice valve near the suction port for maintenance.

<For negative suction>

(1) Make sure that the end of the suction piping is two times or larger than the piping diameter (D), and separate it 30cm or more from the base.
(2) Incline the suction piping so that air traps are not formed.
(3) Do not install a valve on the suction piping.
(4) Loosen the bypass valve of the check valve twice in the counterclockwise direction so that positive pressure is applied on each suction pipe. Check that there are no leaks from the foot valve.

7.2 Discharge Piping

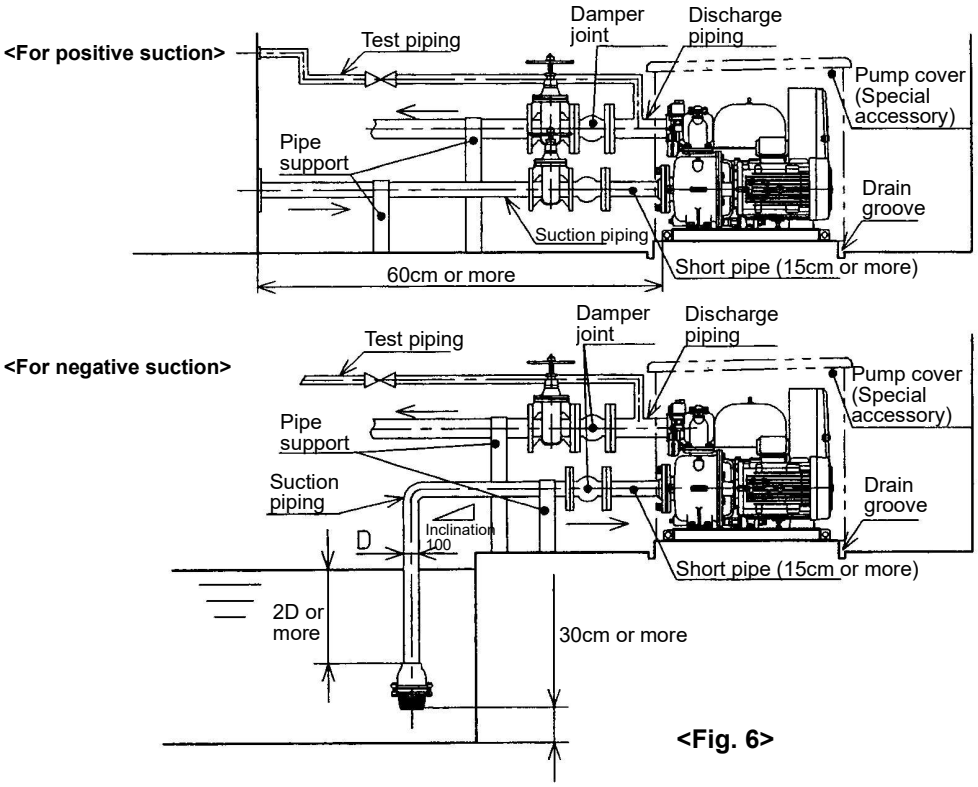
(1) Install a sluice valve near the discharge outlet for maintenance
(2) Installation of a test piping for maintenance is recommended.

7.3 Common

(1) Install damper joint and piping supports so that the weight of the piping is not applied directly onto the pump
(2) Wrap thermal insulating material around the piping as anti-freezing measures. Installation of a heater (special accessory) onto the pump is recommended. When installing the heater at the site, contact your dealer or Kawamoto-designated Service Shop for details.

7.4 Precautions for attaching pump cover

(1) If the damper joint is directly attached to the pump, it could interfere with the pump cover. Install a short pipe (15cm or more) between the pump and damper joint in this case.



<Fig. 6>

[8] Electrical Work

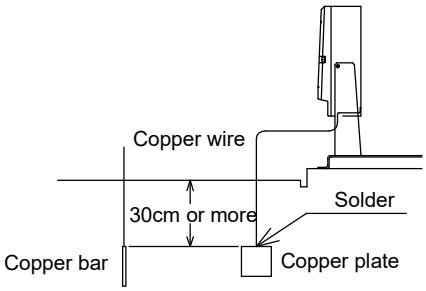
⚠ Warning

- Always earth the equipment with Class D (Class 3) earthing, and install a dedicated residual current circuit breaker on the power supply side.
  Failure to observe this could result in earth leakages, faults, electric shocks or fires.
- The power source facility and wiring work must be done by a qualified electrician according to the Electrical Installation Technical Standards, Wiring Regulations.
  Improper wiring or connections could result in earth leakages or fires.
- Always earth the pump before turning the power on. Do not connect the earthing wire to gas pipes, water pipes, lightning rods or telephone earthing wires.
  Failure to earth the equipment correctly could result in electric shocks.

8.1 If a residual current circuit breaker is not provided on the control panel, install one on the power supply. (Refer to section [2] 2.2 Control panel special specifications, and check whether a residual current circuit breaker is installed.)

8.2 Connect the power wire to RS (single-phase) and RST (3-phase) terminals on the control panel.

8.3 An earthing terminal is provided in the control panel, so always earth the product. A copper plate that is 30cm square or more or a copper bar that is 1cm thick and 40cm or more long is solder to the end, and then buried 30cm or more under ground in a moist area as shown in Fig. 7. Always turn the power source off before handling the earthing wire.



<Fig. 7>

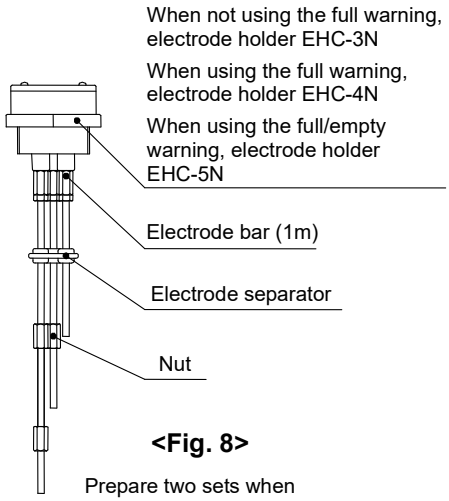
[9] Connection

The main components (motor, pressure sensor, flow sensor) of this water supply unit have already been connected, so perform the following connection as required

9.1 Water level control

The parts shown in <Fig. 8> are required to control the water level. When using the standard control panel for the independent operation model, the special accessory control panel LVS-1 is required. Refer to section [3] 3.3 Special accessories, and purchase these parts.

(1) Assemble the electrode according to the level of water in the reservoir. <Fig. 8>
The level sensor will operate at a water level differences of several cm depending on the water quality.
(2) A short-circuit wire has been connected between E1 and E3 before shipment from the factory. Always remove this short-circuit wire.
(3) Refer to the connection diagram in <Fig. 9, 11> and make correct connections.
(4) When using the electrode holder EHC-3 or EHC-4 with built-in resistor, disconnect the internal resistor.



<Fig. 8>

Prepare two sets when using two-tank reservoirs

9.2 External Signals

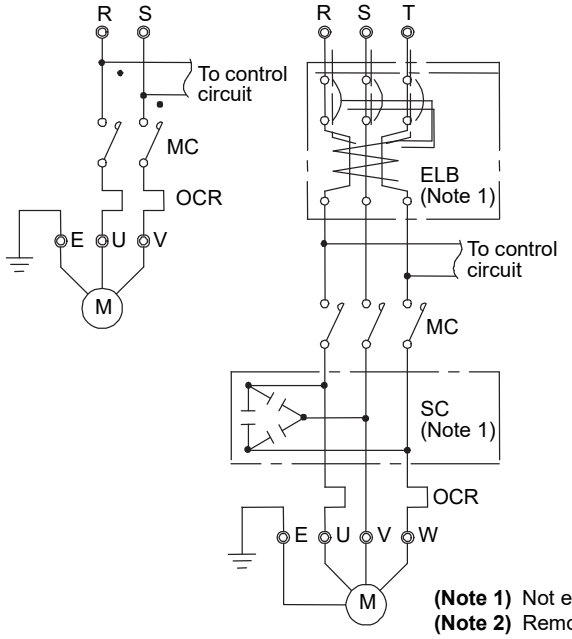
These are no-voltage terminals for the external signals connected for the monitor panel, etc. Refer to the terminal block layout in Fig. 9, 10 and make correct connections

9.3 Independent operation (ECF5) control panel elementary wiring diagram

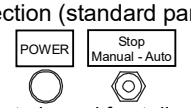
• Main circuit section

Power source: Single model
200～220VAC
50/60Hz

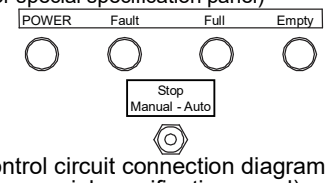
Power source:
3-phase model
380～440VAC
50/60Hz



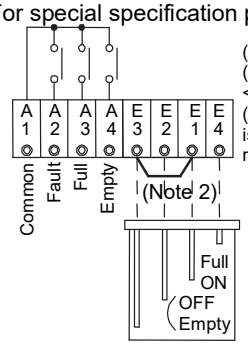
• Control panel front display/operation section (standard panel)



• Control panel front display/operation section (For special specification panel)



• Control circuit connection diagram (For special specification panel)



(Output terminal, no-voltage)
(Contact capacity 250V-0.8A
<Conductive load>
(If the above contact capacity is exceeded, pass through a relay.)

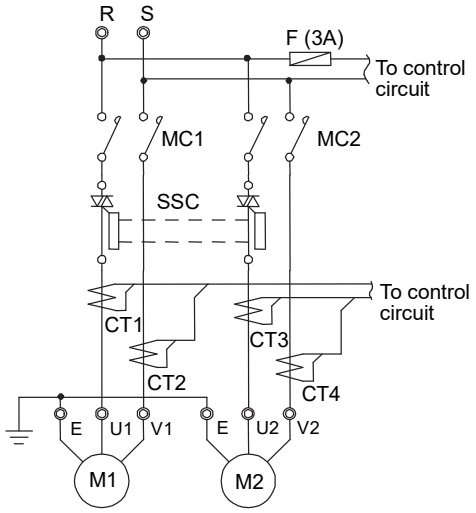
<Fig. 9>

(Note 1) Not enclosed with standard panel. (For special specifications panel)
(Note 2) Remove the short-circuit wire across E3 and E1 when using the electrode bar.

9.4 Alternate, alternate/parallel operation (ECF8) control panel elementary wiring diagram

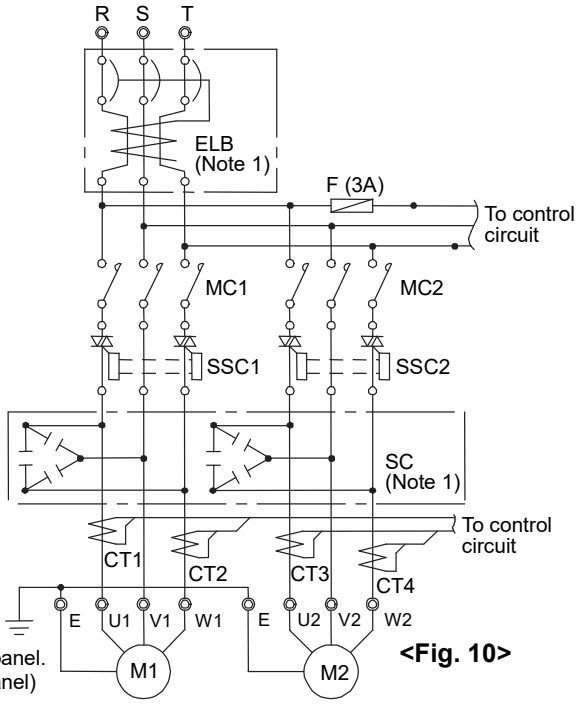
• Main circuit section

Power source: Single model
200～220VAC
50/60Hz



SSC: Solid State Contactor
(only models up to 3.7kW)

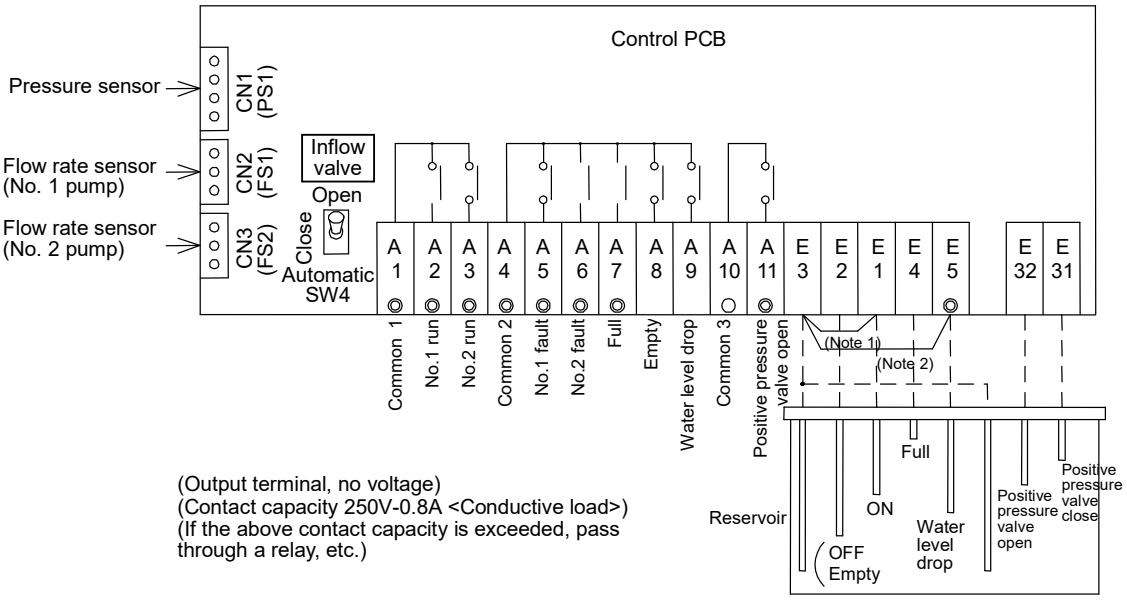
Power source: 3-phase model
380～440VAC
50/60Hz



(Note 1) Not enclosed with standard panel.
(For special specifications panel)

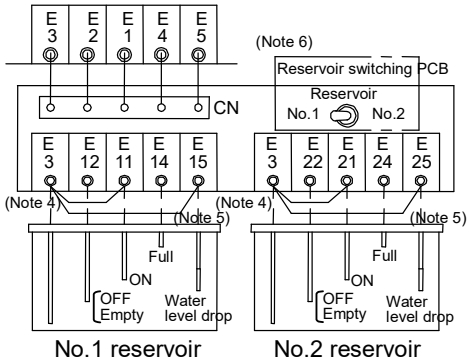
<Fig. 10>

• Control circuit connection diagram (standard panel for models up to 3.7kW)



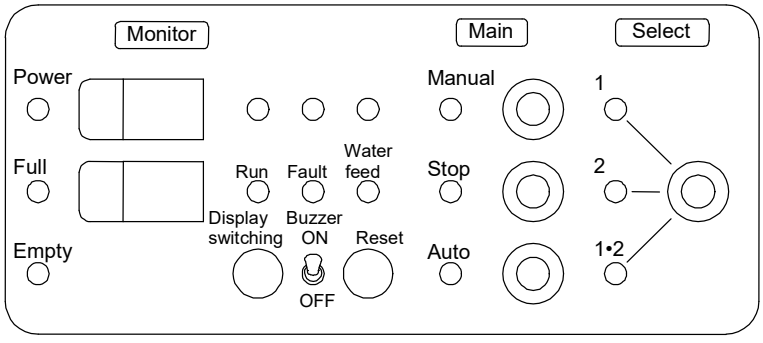
(Note 1) Remove the short-circuit wire across E3 and E1 when using the electrode bar.
(Note 2) Remove the short-circuit wire across E3 and E5 when using the reservoir water level drop detection.
(Note 3) When a drop in the water level is detected, the EMPTY lamp flickers. (Flickers for 1 second)
The lamp flickers at a variable speed when the positive pressure valve is operating.
(Flicker twice, stop 1 second)

• Water level control terminal connection diagram (Control panel for 5.5kW and larger capacity, Special specification panel for 2-tank reservoir models up to 3.7kW)



(Note 4) Remove the short-circuit wire across E3 and E11, E3 and E21 when using the electrode bar.
(Note 5) Remove the short-circuit wire across E3 and E15, E3 and 25 when using the reservoir water level drop detection.
(Note 6) For 5.5kW and larger capacity control panel (When using the special specification panel for 2-tank reservoir model up to 3.7kW, the reservoir switching switch is on the control panel's front surface.

• Control panel front display/operation section

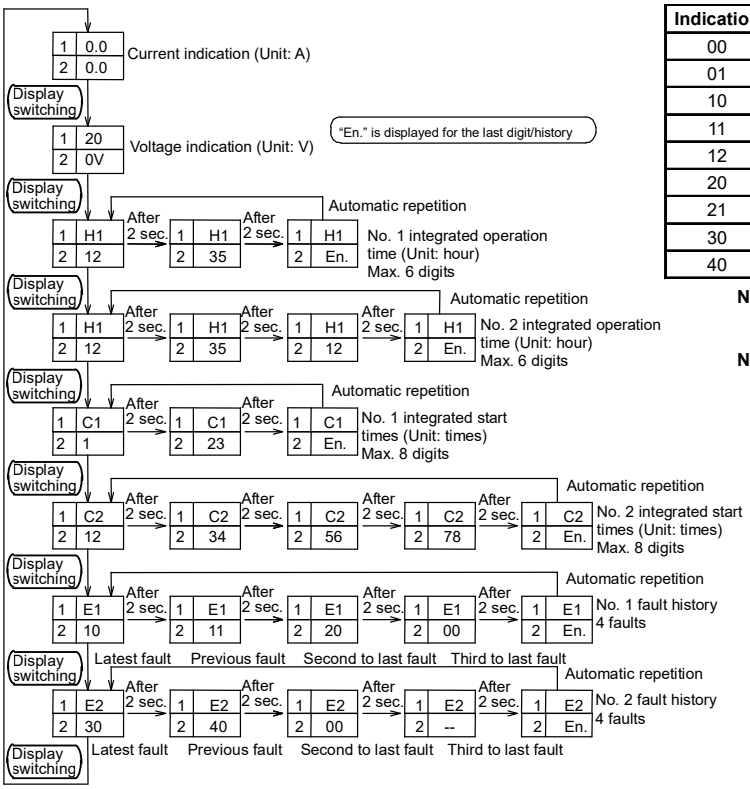


<Fig. 11>

9.5 Control panel display panel operation methods (Excluding independent operation models)

The various indications shown in <Fig. 12> can be displayed on the control PCB's display panel.

<Normal display mode>



Indication	Fault details
00	Power error (S-phase failure, frequency error)
01	Power phase reversal
10	Overload
11	Lock
12	Output phase failure
20	SSC, MC open
21	SSC, MC short-circuit
30	Water supply disabled
40	Flow sensor error

Note 1) A buzzer sounds when a fault occurs. Note that the buzzer will not sound for fault modes "00" and "01".

Note 2) To reset the fault, remove the cause, and then press the Reset switch.

<Fig. 12>

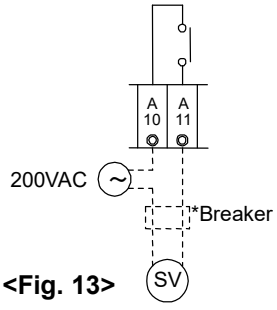
9.6 Connecting the inflow solenoid valve

(1) Connect the reservoir as shown in <Fig. 11>.

(2) The contact capacity of the inflow solenoid valve circuit relays (A10, 11) is 250V-0.8A.
If this contact capacity is exceeded, pass through a relay.

(4) Refer to <fig. 13> for the connection methods when using a 200VAC inflow solenoid valve (open when energized).

(6) The select switch SW4 on the control PCB is used for selecting the open/close state of the inflow solenoid valve.
Normally, set this to "Auto". The valve will open and close automatically according to the water level.
* Installing a breaker for maintenance is recommended.



<Fig. 13>

[10] Operation

⚠ Warning

- Always turn the power OFF and confirm that there is no charge before connecting or disconnecting the wiring.
  Failure to do so could lead to electric shocks.
- Do not leave the control panel door open or touch the charged sections after turning the power ON. Do not operate the operations switches with wet hands.
  Failure to observe this could lead to electric shocks, residual current or fires.

⚠ Caution

- Do not use this pump outside the rated voltage. Failure to observe this could result in fires or electric shocks.
- Do not dry run (run without water in the pump) or closed run (run with no flow of water to or from the pump).
  Failure to observe this could cause the motor temperature to rise, and lead to burns or faults.
- Do not place fingers or rods into motor openings during operation.
  Failure to observe this could lead to electric shocks or injuries.
- The motor and control panel are hot during and immediately after operation, so do not touch these.
  Failure to observe this could lead to burns.
- When not using the pump for a long time, turn OFF the power.
  Failure to observe this could result in electric shock, residual current or fire from insulation deterioration.
- Do not cover the pump or control panel with blankets or cloth, and do not place objects on top.
  Failure to observe this could lead to electric shocks, residual current or fires.
- Confirm that there is water in the pump.
  Operation without water in the pump could cause the heater to disconnect and to fires.

10.1 Preparation

(1) Confirmation of connection
  1) Is the wiring correct? Are any of the terminal screws loose?
  2) Is the power source correct?

(2) Confirmation of piping
  1) Are any of the bolts or nuts loose?

(3) Priming of pump

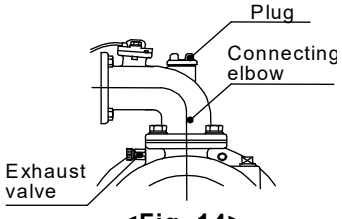
⚠ Caution

- Correctly prime each pump with the following procedure.
  Insufficient priming will cause the pump to dry run, and could lead to trouble.
- Always turn the main power OFF before priming. Failure to observe this could lead to injuries.

  1) Check the water level in the reservoir.
  2) Remove the rubber bushing on the motor fan cover.

<For positive suction>

  3) After opening the sluice valve at the pump suction inlet, open the exhaust valve<fig. 14>.
  4) Turn the motor shaft end with a flat-tip screwdriver, etc., to purge the air in the impeller.
  5) Priming is completed when water is continuously discharged from the exhaust valve



<Fig. 14>

<For negative suction>

3) Open the exhaust valve, remove the plug and prime the pump.
4) Turn the motor shaft end with a flat-tip screwdriver, etc., to purge the air in the impeller.
5) Priming is finished when bubbles no longer come out of the exhaust valve.

<Common>

6) Close the exhaust valve, attach plug (for positive suction), and attach the rubber bushing onto the motor fan cover.

(4) Confirmation of rotation direction

<Independent operation>

1) Confirm that the switch on the control panel is set to "STOP", and then turn the power ON.
2) Switch the switch between "Manual" and "Stop" once or twice, and check the rotation direction. The correct rotation direction is right looking from the motor side.
3) If rotating in reverse, turn the main power OFF, and interchange two of the three phases on the power side. (Only 3-phase)

<Alternate, Alternate/parallel operation>

1) Confirm that the wiring is correct, and then turn the power ON.
   If the power is normal, "0.0" and the current will appear on the display panel.
   If the power is abnormal, "00" or "01" will flicker on the panel, so remove the cause.
   "00": S phase failure, frequency error (Only 3-phase)
   "01": Power phase reversal (Only 3-phase)
2) Confirm that the select switch on the control panel is set to "1". Turn the main switch between "Manual" and " Stop " once or twice, and confirm the No. 1 pump's rotation direction. The correct rotation direction is right looking from the motor.
3) Set the select switch to "2", and check the No. 2 rotation direction in the same manner. (The select switch can be changed only when the main switch is set to "Stop".)
4) If rotating in reverse, turn the main power OFF and interchange two of the three motor cables. (3-phase)

10.2 Check of Manual Operation

(1) Check that the valves are open or closed

Unit discharge outlet and test piping sluice valve	→ Closed
Unit intake port and accumulator sluice valve Pressure sensor and pressure gauge's ball valve	→ Open

<Independent operation>

(2) Set the switch to "Manual", and start the pump.
(3) When the pump pressure rises, gradually open the sluice valve for the test piping, and confirm that water gushes out of the piping. (If the water is not pumped within several minutes, set the switch to "Stop", and prime the pump again.)

<Alternate, Alternate/parallel operation>

(2) Set the select switch to “1”, and main switch to “Manual”.
(3) When the pump pressure rises, gradually open the sluice valve for the test piping, and confirm that water gushes out of the piping. The 1 side of the “Water Supply” monitor lamp will turn ON at this time. (If the water is not pumped within several minutes, set the switch to "Stop", and prime the pump again.)
(4) When the water has been completely pumped, close the sluice valve, and set the main switch to "Stop".
(5) Check the No. 2 pump in the same manner.

10.3 Check of Automatic Operation

<Independent operation>

(1) Set the switch to "Automatic".

<Alternate, Alternate/parallel operation>

(1) Set the select switch to "1.2", and main switch to "Automatic". (The main switch cannot be set to "Automatic" directly from the "Manual" setting. Set it to "Stop" once.)

<Common>

(2) Gradually open and close the sluice valve for the test piping, and confirm that the pressure does not fluctuate greatly.
(3) Close the sluice valve, and confirm that the pump stops. (Note that if the starting frequency suppression timer is functioning, the pump will not stop immediately even when the sluice valve is completely closed. This is not a fault.)
(4) Repeatedly start and stop, and confirm that alternate operation takes place as explained in 4. Theory of operation.
(5) When using the alternate/parallel operation type, open the sluice valve, and confirm that the pump operates when the pressure drops. Open the sluice valve further, and confirm that the pump starts parallel operation (2-pump operation).
(6) If test piping is not installed, confirm by opening and closing the sluice valve on the unit discharge port piping.

10.4 Pressure sensor adjustment range

1) 50Hz

Operation method	Discharge bore	Suction bore	Type	Motor	Standard specifications			Pressure sensor
					Discharge flow rate	Total head	Starting pressure	Adjustment range
	mm	mm		kW	m^3/min	m	MPa {kgf/cm^2}	MPa {kgf/cm^2}
Independent	40	32	KB2-325S0.4S	0.4	0.06	22	0.22 {2.2}	0.22 {2.2} to 0.15 {1.5}
			KB2-325S0.4T	0.4	0.06	22	0.22 {2.2}	0.22 {2.2} to 0.15 {1.5}
			KB2-325S(E)0.75	0.75	0.06	32	0.31 {3.2}	0.31 {3.2} to 0.22 {2.2}
			KB2-325LS(E)1.1	1.1	0.06	44	0.43 {4.4}	0.43 {4.4} to 0.29 {3.0}
			KB2-325S(E)1.1	1.1	0.062	53	0.52 {5.3}	0.52 {5.3} to 0.36 {3.7}
		40	KB2-405S(E)1.5	1.5	0.16	30	0.29 {3.0}	0.29 {3.0} to 0.22 {2.2}
			KB2-405S(E)2.2	2.2	0.16	44	0.43 {4.4}	0.43 {4.4} to 0.32 {3.3}
		50	KB2-505S(E)2.2	2.2	0.25	32	0.31 {3.2}	0.31 {3.2} to 0.24 {2.4}
			KB2-505S(E)3.7	3.7	0.24	48	0.47 {4.8}	0.47 {4.8} to 0.32 {3.3}
Alternate	40	32	KB2-325A0.4S	0.4	0.06	22	0.22 {2.2}	0.22 {2.2} to 0.15 {1.5}
			KB2-325A0.4T	0.4	0.06	22	0.22 {2.2}	0.22 {2.2} to 0.15 {1.5}
			KB2-325A0.75S2	0.75	0.06	32	0.31 {3.2}	0.31 {3.2} to 0.22 {2.2}
			KB2-325A(E)0.75	0.75	0.06	32	0.31 {3.2}	0.31 {3.2} to 0.22 {2.2}
			KB2-325LA(E)1.1	1.1	0.06	44	0.43 {4.4}	0.43 {4.4} to 0.29 {3.0}
			KB2-325A(E)1.1	1.1	0.065	53	0.52 {5.3}	0.52 {5.3} to 0.36 {3.7}
		40	KB2-405A(E)0.75	0.75	0.16	16	0.16 {1.6}	0.16 {1.6} to 0.12 {1.2}
			KB2-405A(E)1.1	1.1	0.17	25	0.25 {2.5}	0.25 {2.5} to 0.18 {1.8}
			KB2-405A(E)1.5	1.5	0.16	30	0.29 {3.0}	0.29 {3.0} to 0.22 {2.2}
			KB2-405A(E)2.2	2.2	0.16	44	0.43 {4.4}	0.43 {4.4} to 0.32 {3.3}
			KB2-405A(E)3.7	3.7	0.165	65	0.64 {6.5}	0.64 {6.5} to 0.49 {5.0}
			KB2-405A(E)5.5	5.5	0.19	80	0.78 {8.0}	0.78 {8.0} to 0.59 {6.0}
		50	KB2-505A(E)1.5	1.5	0.22	22	0.22 {2.2}	0.22 {2.2} to 0.15 {1.5}
			KB2-505A(E)2.2	2.2	0.25	32	0.31 {3.2}	0.31 {3.2} to 0.24 {2.4}
			KB2-505A(E)3.7	3.7	0.24	48	0.47 {4.8}	0.47 {4.8} to 0.32 {3.3}
			KB2-505A(E)5.5	5.5	0.25	65	0.64 {6.5}	0.64 {6.5} to 0.43 {4.4}
	50	65	KB2-655A(E)3.7	3.7	0.37	32	0.31 {3.2}	0.31 {3.2} to 0.2 {2.0}
			KB2-655A(E)5.5	5.5	0.325	48	0.47 {4.8}	0.47 {4.8} to 0.29 {3.0}
			KB2-655A(E)7.5	7.5	0.375	60	0.59 {6.0}	0.59 {6.0} to 0.43 {4.4}
Alternate/parallel	40	32	KB2-325P0.4S	0.4 × 2	0.12	22	0.22 {2.2}	0.22 {2.2} to 0.15 {1.5}
			KB2-325P0.4T	0.4 × 2	0.12	22	0.22 {2.2}	0.22 {2.2} to 0.15 {1.5}
			KB2-325P0.75S2	0.75 × 2	0.12	32	0.31 {3.2}	0.31 {3.2} to 0.22 {2.2}
			KB2-325P(E)0.75	0.75 × 2	0.12	32	0.31 {3.2}	0.31 {3.2} to 0.22 {2.2}
			KB2-325LP(E)1.1	1.1 × 2	0.12	44	0.43 {4.4}	0.43 {4.4} to 0.29 {3.0}
			KB2-325P(E)1.1	1.1 × 2	0.13	53	0.52 {5.3}	0.52 {5.3} to 0.36 {3.7}
	50	40	KB2-405P(E)0.75	0.75 × 2	0.32	16	0.16 {1.6}	0.16 {1.6} to 0.12 {1.2}
			KB2-405P(E)1.1	1.1 × 2	0.34	25	0.25 {2.5}	0.25 {2.5} to 0.18 {1.8}
			KB2-405P(E)1.5	1.5 × 2	0.32	30	0.29 {3.0}	0.29 {3.0} to 0.22 {2.2}
			KB2-405P(E)2.2	2.2 × 2	0.32	44	0.43 {4.4}	0.43 {4.4} to 0.32 {3.3}
			KB2-405P(E)3.7	3.7 × 2	0.33	65	0.64 {6.5}	0.64 {6.5} to 0.49 {5.0}
			KB2-405P(E)5.5	5.5 × 2	0.38	80	0.78 {8.0}	0.78 {8.0} to 0.59 {6.0}
	65	50	KB2-505P(E)1.5	1.5 × 2	0.44	22	0.22 {2.2}	0.22 {2.2} to 0.15 {1.5}
			KB2-505P(E)2.2	2.2 × 2	0.50	32	0.31 {3.2}	0.31 {3.2} to 0.24 {2.4}
			KB2-505P(E)3.7	3.7 × 2	0.48	48	0.47 {4.8}	0.47 {4.8} to 0.32 {3.3}
			KB2-505P(E)5.5	5.5 × 2	0.50	65	0.64 {6.5}	0.64 {6.5} to 0.43 {4.4}
	80	65	KB2-655P(E)3.7	3.7 × 2	0.74	32	0.31 {3.2}	0.31 {3.2} to 0.2 {2.0}
			KB2-655P(E)5.5	5.5 × 2	0.65	48	0.47 {4.8}	0.47 {4.8} to 0.29 {3.0}
			KB2-655P(E)7.5	7.5 × 2	0.75	60	0.59 {6.0}	0.59 {6.0} to 0.43 {4.4}

"E" in the model name shows the model equipped with the premium efficiency motor.

2) 60Hz

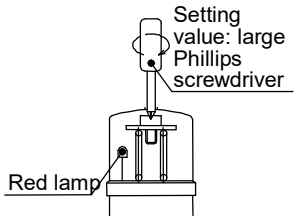
Operation method	Discharge bore	Suction bore	Type	Motor	Standard specifications			Pressure sensor
					Discharge flow rate	Total head	Starting pressure	Adjustment range
	mm	mm		kW	m^3/min	m	MPa {kgf/cm^2}	MPa {kgf/cm^2}
Independent	40	32	KB2-326S0.4S	0.4	0.06	22	0.22 {2.2}	0.22 {2.2} to 0.15 {1.5}
			KB2-326S0.4T	0.4	0.06	22	0.22 {2.2}	0.22 {2.2} to 0.15 {1.5}
			KB2-326S(E)0.75	0.75	0.065	32	0.31 {3.2}	0.31 {3.2} to 0.22 {2.2}
			KB2-326LS(E)1.1	1.1	0.06	44	0.43 {4.4}	0.43 {4.4} to 0.29 {3.0}
			KB2-326S(E)1.1	1.1	0.06	53	0.52 {5.3}	0.52 {5.3} to 0.36 {3.7}
		40	KB2-406S(E)1.5	1.5	0.14	32	0.31 {3.2}	0.31 {3.2} to 0.22 {2.2}
			KB2-406S(E)2.2	2.2	0.14	48	0.47 {4.8}	0.47 {4.8} to 0.29 {3.0}
			KB2-406S(E)3.7	3.7	0.16	65	0.64 {6.5}	0.64 {6.5} to 0.43 {4.1}
		50	KB2-506S(E)2.2	2.2	0.225	32	0.31 {3.2}	0.31 {3.2} to 0.24 {2.4}
			KB2-506S(E)3.7	3.7	0.265	48	0.47 {4.8}	0.47 {4.8} to 0.32 {3.3}
Alternate	40	32	KB2-326A0.4S	0.4	0.06	22	0.22 {2.2}	0.22 {2.2} to 0.15 {1.5}
			KB2-326A0.4T	0.4	0.06	22	0.22 {2.2}	0.22 {2.2} to 0.15 {1.5}
			KB2-326A0.75S2	0.75	0.065	32	0.31 {3.2}	0.31 {3.2} to 0.22 {2.2}
			KB2-326A(E)0.75	0.75	0.065	32	0.31 {3.2}	0.31 {3.2} to 0.22 {2.2}
			KB2-326LA(E)1.1	1.1	0.06	44	0.43 {4.4}	0.43 {4.4} to 0.29 {3.0}
			KB2-326A(E)1.1	1.1	0.06	53	0.52 {5.3}	0.52 {5.3} to 0.36 {3.7}
		40	KB2-406A(E)0.75	0.75	0.16	16	0.16 {1.6}	0.16 {1.6} to 0.12 {1.2}
			KB2-406A(E)1.1	1.1	0.18	25	0.25 {2.5}	0.25 {2.5} to 0.18 {1.8}
			KB2-406A(E)1.5	1.5	0.14	32	0.31 {3.2}	0.31 {3.2} to 0.22 {2.2}
			KB2-406A(E)2.2	2.2	0.14	48	0.47 {4.8}	0.47 {4.8} to 0.29 {3.0}
			KB2-406A(E)3.7	3.7	0.16	65	0.64 {6.5}	0.64 {6.5} to 0.43 {4.4}
			KB2-406A(E)5.5	5.5	0.19	80	0.78 {8.0}	0.78 {8.0} to 0.59 {6.0}
		50	KB2-506A(E)1.5	1.5	0.24	22	0.22 {2.2}	0.22 {2.2} to 0.15 {1.5}
			KB2-506A(E)2.2	2.2	0.225	32	0.31 {3.2}	0.31 {3.2} to 0.24 {2.4}
			KB2-506A(E)3.7	3.7	0.265	48	0.47 {4.8}	0.47 {4.8} to 0.32 {3.3}
			KB2-506A(E)5.5	5.5	0.24	70	0.69 {7.0}	0.69 {7.0} to 0.43 {4.4}
			KB2-506A(E)7.5	7.5	0.28	80	0.78 {8.0}	0.78 {8.0} to 0.59 {6.0}
	50	65	KB2-656A(E)3.7	3.7	0.38	32	0.31 {3.2}	0.31 {3.2} to 0.2 {2.0}
			KB2-656A(E)5.5	5.5	0.35	48	0.47 {4.8}	0.47 {4.8} to 0.29 {3.0}
			KB2-656A(E)7.5	7.5	0.38	60	0.59 {6.0}	0.59 {6.0} to 0.43 {4.4}
Alternate/parallel	40	32	KB2-326P0.4S	0.4 × 2	0.12	22	0.22 {2.2}	0.22 {2.2} to 0.15 {1.5}
			KB2-326P0.4T	0.4 × 2	0.12	22	0.22 {2.2}	0.22 {2.2} to 0.15 {1.5}
			KB2-326P0.75S2	0.75 × 2	0.13	32	0.31 {3.2}	0.31 {3.2} to 0.22 {2.2}
			KB2-326P(E)0.75	0.75 × 2	0.13	32	0.31 {3.2}	0.31 {3.2} to 0.22 {2.2}
			KB2-326LP(E)1.1	1.1 × 2	0.12	44	0.43 {4.4}	0.43 {4.4} to 0.29 {3.0}
			KB2-326P(E)1.1	1.1 × 2	0.12	53	0.52 {5.3}	0.52 {5.3} to 0.36 {3.7}
	50	40	KB2-406P(E)0.75	0.75 × 2	0.32	16	0.16 {1.6}	0.16 {1.6} to 0.12 {1.2}
			KB2-406P(E)1.1	1.1 × 2	0.36	25	0.25 {2.5}	0.25 {2.5} to 0.18 {1.8}
			KB2-406P(E)1.5	1.5 × 2	0.28	32	0.31 {3.2}	0.31 {3.2} to 0.22 {2.2}
			KB2-406P(E)2.2	2.2 × 2	0.28	48	0.47 {4.8}	0.47 {4.8} to 0.29 {3.0}
			KB2-406P(E)3.7	3.7 × 2	0.32	65	0.64 {6.5}	0.64 {6.5} to 0.43 {4.4}
			KB2-406P(E)5.5	5.5 × 2	0.38	80	0.78 {8.0}	0.78 {8.0} to 0.59 {6.0}
	65	50	KB2-506P(E)1.5	1.5 × 2	0.48	22	0.22 {2.2}	0.22 {2.2} to 0.15 {1.5}
			KB2-506P(E)2.2	2.2 × 2	0.45	32	0.31 {3.2}	0.31 {3.2} to 0.24 {2.4}
			KB2-506P(E)3.7	3.7 × 2	0.53	48	0.47 {4.8}	0.47 {4.8} to 0.32 {3.3}
			KB2-506P(E)5.5	5.5 × 2	0.48	70	0.69 {7.0}	0.69 {7.0} to 0.43 {4.4}
			KB2-506P(E)7.5	7.5 × 2	0.56	80	0.78 {8.0}	0.78 {8.0} to 0.59 {6.0}
	80	65	KB2-656P(E)3.7	3.7 × 2	0.76	32	0.31 {3.2}	0.31 {3.2} to 0.2 {2.0}
			KB2-656P(E)5.5	5.5 × 2	0.7	48	0.47 {4.8}	0.47 {4.8} to 0.29 {3.0}
			KB2-656P(E)7.5	7.5 × 2	0.76	60	0.59 {6.0}	0.59 {6.0} to 0.43 {4.4}

“E” in the model name shows the model equipped with the premium efficiency motor.

10.5 Adjustment of pressure sensor: Refer to <Fig. 15>

The pressure sensor has been set to the standard starting pressure (P14, P15) before shipment from the factory. However, this can be readjusted to match the site conditions. Use the following steps to adjust the pressure sensor.

(1) Operate the pump in the manual mode, and after water has been supplied for a short time, close the sluice valve.
(2) Set the main switch to "STOP", and stop the pump.
(3) Gradually open the sluice valve, and close it again at the adjusted pressure.
(4) Adjust the pressure sensor as explained below.



<Fig. 15>

• When red lamp is ON : Using a Phillips screwdriver, turn the screw on the head of the pressure sensor in the counterclockwise direction to where the red lamp turns OFF. Then turn the screw clockwise to where the lamp begins to light.
• When red lamp is OFF : Using a Phillips screwdriver, turn the screw on the head of the pressure sensor in the clockwise direction, and set to where the red lamp begins to light.

<For positive suction>

Adjust the pressure sensor according to the following expression, and change the starting pressure.
Pressure after adjustment (starting pressure) ≤ standard starting pressure - total suction head (m) / 10

10.6 Normal Operation

⚠ Caution

● Do not touch the motor. It reaches high temperatures, and cause burns if touched.

(1) Check that the valves are open or closed

Test piping sluice valve, pressure gauge ball valve	→ Closed
Unit suction port, discharge port, accumulator sluice valve Sluice valve and pressure sensor ball valve	→ Open

(2) Check the control panel

	Independent operation	Alternate, alternate/parallel operation
Main switch →	" AUTOMATIC "	"AUTOMATIC"
Select switch →		"1 • 2"

[11] Maintenance and Inspection

⚠ Warning

● If the pump does not operate or if an abnormality is sensed (such as a burning smell), stop operation immediately and turn OFF the power. Inspect or repair the pump.
Continuing operation in an abnormal state, or operation with improper repairs could result in electric shocks, fires, water leaks, etc.
● If the accumulator's charged gas pressure has dropped, always charge gas.
Charging explosive gas, such as hydrogen gas, will cause explosions.

⚠ Caution

- When turning the power source OFF to prepare for a long-time stoppage, always drain the water in the pump.
  If the power is turned OFF with water still in the pump, the heater for preventing function will not operate, and the pump could freeze and rupture.
- Use a 250V or less insulation resistance tester when measuring the insulation resistance.
  Failure to observe this could result in control panel damage.
- Confirm that the inner pressure of the pump unit is zero before starting inspections.
  Water could spray out if there is residual pressure.

11.1 Daily Inspection

Item	Confirmation item	Judgment standards
Pump	Water leaks from mechanical seal	There is no dripping.
Motor	Outer temperature	Ambient temperature +70°C or less
	Ball bearings	No abnormal operation noise or vibration
Unit	Starting pressure	The pressure has not fluctuated greatly from operating pressure value.
	Current	Nameplate current value or less
	Voltage	±10% or less of rated voltage
	Water leakage	No water leakage from any part

Understanding daily changes is vital in finding trouble early. Creation of a daily operation log is recommended for this. Close the pressure gauge ball valve when not making measurements. The pressure gauge will damage easily if the ball valve is left open.

11.2 6-month Inspection

Item	Confirmation item	Judgment standards
Motor	Insulation resistance (Note 1)	1MΩ or more
Accumulator	Charged gas pressure (Note 2)	Nameplate value ±0.01MPa {0.1kgf/cm^2}
	Operation	The operation is not unstable.
Control panel	Dew condensation in panel	There is no dew condensation.
	Relays, etc.	There is no abnormality such as discoloration.

(Note 1) When measuring the motor's insulation resistance, always disconnect the cable or use a 250V or less insulation resistance tester. Measurement is not possible using a 250V or more insulation resistance tester on the control panel.

(Note 2) After closing the accumulator sluice valve, open the drain port at the bottom of the accumulator, drain out the water, and then measure. If the sealed pressure is insufficient, replenish air to the value indicated on the nameplate.

11.3 Consumable Parts

The parts shown in Table 1 are consumable parts. Refer to the replacement guideline and replace the parts.

<Table 1>

Part No.	Part name	Replacement guideline	Applicable model	Remarks
30400312	O-ring K170	At each disassembly and inspection	KB2-32	Casing × casing cover
30400314	O-ring K190	At each disassembly and inspection	KB2-40, 50 (to 3.7)	
			Excluding KB2-405-3.7	
30400317	O-ring K220	At each disassembly and inspection	KB2-40, 50 (5.5 to)	
			KB2-405-3.7	
30400318	O-ring K235	At each disassembly and inspection	KB2-65	
30400557	O-ring P65	At each disassembly and inspection	KB2-32, KB2-405-3.7	Casing × guide valve
			KB2-40-5.5	
30400561	O-ring P75	At each disassembly and inspection	KB2-50 (5.5 to)	
30400562	O-ring P80	At each disassembly and inspection	KB2-40, 50 (to 3.7)	
30400564	O-ring P90	At each disassembly and inspection	KB2-65	
30002910	Mechanical seal 16EA560-J	2 years	KB2-32-0.4	
30003020	Mechanical seal 20EA560-J	2 years	KB2-32 (0.75 to)	
			KB2-40, 50, 65 (to 3.7)	
30000820	Mechanical seal 25EA560-J	2 years	KB2-40, 50, 65 (5.5 to)	
–	Ball bearings	3 years		Indicated on motor nameplate
0122	Accumulator PTD3-1	5 years		Indicated on accumulator nameplate
6940	Pressure sensor PSR	5 years		Indicated on pressure sensor nameplate
69431	Flow sensor	5 years		

[12] Disassembly and Assembly

⚠ Warning

- This product must never be disassembled, repaired or modified by any person other than a qualified repair technician. Improper repairs could lead to electric shocks, fires or water leaks.
- Never disassemble, repair or modify the motor and control panel. Failure to observe this will not only lead to trouble, but may also lead to electric shocks or fires.
  Contact your dealer or the designated service center

12.1 Before Disassembling

<Independent operation>

(1) Set the control panel's main switch to "Stop" and turn the main power OFF.
(2) Tighten the sluice valve at the suction port.

<Alternate, Alternate/parallel operation> (If No. 1 pump has failed)

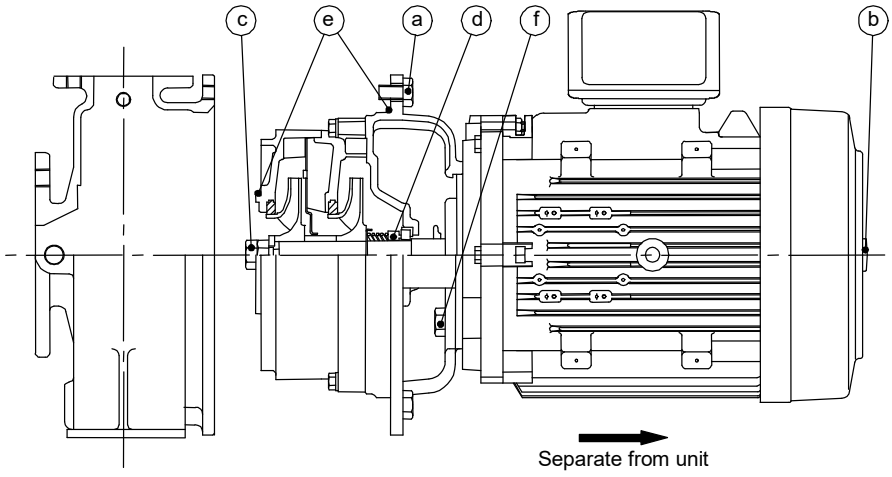
(1) Set the control panel's main switch to "Stop", and turn the main power OFF.
(2) Tighten the sluice valve for the No. 1 pump's sluice valve.
(3) Disconnect the motor cable for the No. 1 pump from the control panel.
(4) Turn the main power source ON
(5) Set the Select switch to "2" and the main switch to "Automatic". The water supply will continue with only the No. 2 pump.

12.2 Replacement of mechanical seal: Refer to Fig. 16.

(1) Remove the bolt (a) fixing the casing and casing cover, and separate from the unit.
(2) Remove the fan cover's rubber bushing (b), and remove the impeller nut (c).
(3) Remove the parts in order from the front, and finally, remove the mechanical seal (d).
(4) Install the new mechanical seal. Wetting the periphery of the shock absorbing rubber with water will make insertion easier
(5) Assemble the parts with the above procedure in reverse.
(6) Replace the O-ring (e) with a new part
(7) After assembling, rotate the motor shaft to confirm that it does not snag.

12.3 Replacement of Ball Bearings**:** Refer to Fig. 16.

(1) Remove the parts to the mechanical seal with the same procedures as for replacing the mechanical seal.
(2) Remove the bolt (f) fixing the motor and bracket.
(3) Remove the motor, and have the ball bearings replaced at a specialist factory.
(4) Assemble the parts with the above procedure in reverse.
(5) Replace the O-ring (e) with a new part
(6) After assembling, rotate the motor shaft to confirm that it does not snag.



<Fig. 16>

12.4 Replacement of Accumulator

(1) Close the sluice valve on the accumulator.
(2) Open the drain port valve at the bottom of the accumulator, and drain the water.
(3) Turn the accumulator by hand, and remove it.
(4) Install the new accumulator, close the drain port's valve, and then open the sluice valve.

<Order replacement parts from your dealer>>

[13] Troubleshooting

⚠ Caution

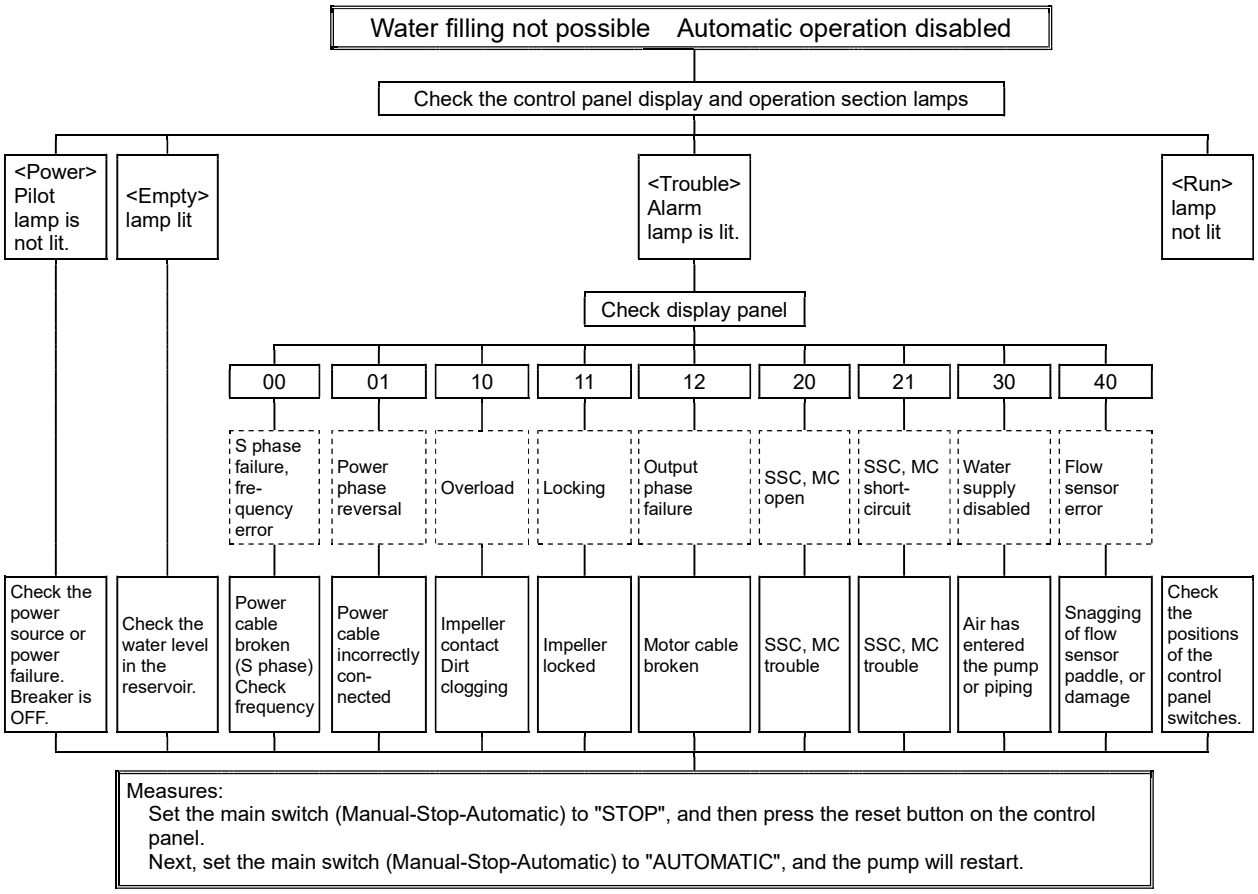
- If the pump does not operate or if an abnormality is sensed (such as a burning smell), stop operation immediately and turn OFF the main power. Then, contact the place of purchase or a designated Kawamoto Pump service center for inspections and repairs.
  Failure to do so could result in electric shock, fire, residual currents, etc.

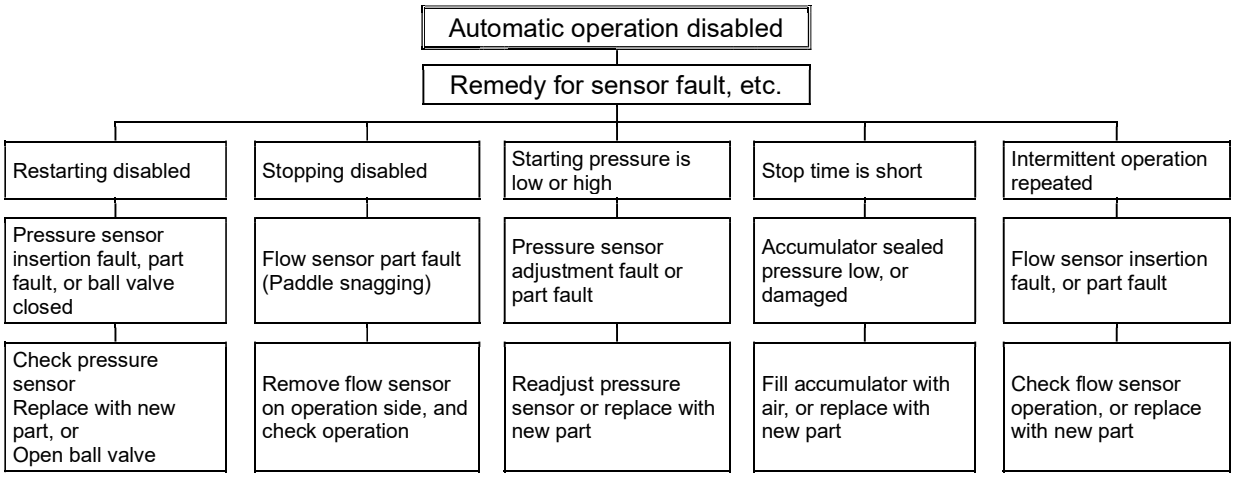
13.1 List of Trouble Displays (Excluding independent operation models)

When trouble occurs, the trouble message will be digitally displayed on the control PCB's display panel. Refer to <Fig. 12> for details on the trouble history and display.

(Note 1) Press the Reset button after removing the trouble cause.

Trouble diagnosis flow sheet (Main trouble details are indicated)





* The flow sensor is designed so that the pump will stop when the sensor is disconnected from the connector.

13.2 Troubleshooting Table

Phenomenon	Cause	Measures	Reference page
The power source pilot lamp does not light.	The residual current circuit breaker is tripped.	Turn the residual current circuit breaker ON.	
	Power cable R or T phase failure.	Connect the power cable R or T phase.	
The motor rotates, but the water is not discharged. The water is discharged but the pressure does not rise.	Reservoir is empty (during manual operation).	Fill the reservoir with water.	
	The sluice valve is closed or half-opened.	Open the sluice valve.	19
	The pump rotation direction is reversed.	Correctly connect.	14, 15, 16
	The pump is not filled with water.	Sufficiently prime the pump.	14
The pump does not separate. The pump operates even when water is not being used.	The main switch is set to "Manual".	Set the main switch to "Automatic".	19
	Water is leaking from the pipes	Inspect and repair	
Alternate operation is not possible.	The main switch is set to "Manual".	Set the main switch to "Automatic".	19
	The select switch is set to "1" or "2".	Set the select switch to "1, 2".	19
Parallel operation is not possible	The main switch is set to "Manual".	Set the main switch to "Automatic".	19
	The select switch is set to "1" or "2".	Set the select switch to "1, 2".	19
	The pressure sensor pressure setting is too low.	Adjust the set pressure.	19
The stop time is short.	The accumulator sluice valve is closed.	Open the sluice valve	19
	The accumulator sealed gas pressure has dropped.	Replenish the air.	19, 20
	The accumulator is damaged.	Replace the accumulator.	22

A mechanical sound may be heard when the pump starts or stops, but this is not an error.

Unexpected trouble could occur. However, it is important to take appropriate measures immediately when an abnormal condition is found. If the cause of the trouble is not clear, contact your dealer or designated service center. Notice the pump type, serial No. and trouble (fault) state making an inquiry.

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