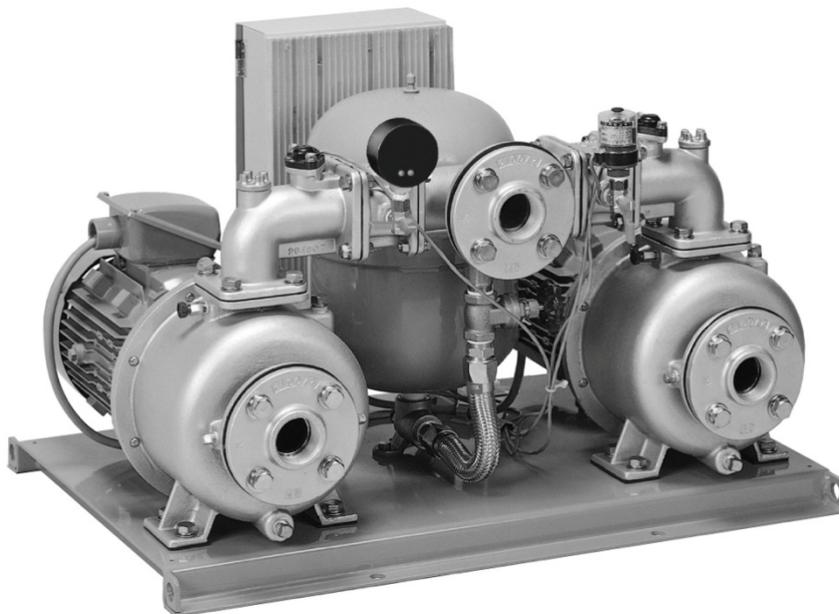


Stainless / Constant Pressure Water Supply  
**NEW**  
**PUMPER KB**  
**TECHNICAL HANDBOOK**  
**BY PRESSURE SENSOR BOOSTER PUMP**

(Published in 2016)

- Stainless precision casting
- Compact design
- Energy-saving operation
- Easy maintenance
- Silent design with low operation sound
- Standard installation of total enclosed fan cool



KB2 Type  
Alternate / Alternate & Parallel Operation

## 1. Features

### ① **Stainless precision casting**

Stainless precision casting is adopted for the pump casing and flange etc., and there is no concern about deformation. As for material of water contact section, mainly stainless and resin/bronze parts are adopted, so there is no worry about rust.

### ② **Compact design**

Compact horizontal multi-stage pump is adopted, and the design is compact and space-saving with the low height of the unit.

### ③ **Energy-saving operation (P.A.T)**

As for the operation at the time of conveying a small amount of water, the starting frequency is 60 times/hour or less, and the optimum operation time (10-30 seconds/10-90 seconds) was adjusted, so a water supply with a high energy-saving effect was achieved.

As for the Alternative&Parallel operation type, it is possible to implement the operation with less gap between parallel/parallel off flows because of the operation time of the parallel pump and adjustment function of the parallel off flow.

### ④ **Safety design**

Standard installation of the fully-closed motor that is secure against dust, humidity etc.

The real time and secure sensor control by the microcomputer based on the pointless and trustable pressure and flow sensors data of the pump's operation electric current value and water tank.

The system design is secure even in the case of trouble because the retry function (\*) and automatic alternative operation function are fitted.

(\*) Retry function: In the case that failure of the water supply is detected after the pump starts operating, do not worry immediately and implement the automatic alternative operation, and if failure of the water supply is detected again after the pump restarts, implement the failure display and signal output. If the water supply recovers after restarting, return to normal operation.

### ⑤ **Abundant functions**

The digital electric current display, failure mode No. display, electronic alarm buzzer and level sensor are fitted. The operation status of the pump is an individual display and easy to understand, and maintenance in the case of trouble is easy because of the intelligent alarm function.

### ⑥ **Silent design with low operation sound**

The original stainless multistage pump that has a low sound pump is adopted for the main pump. The impeller is a cast 3D impeller with efficiency is high, and the silent operation.

### ⑦ **Constant pressure water supply**

The starting frequency while supplying water is low and the water supply pressure is stable because of the original operation method with the pressure sensor and individual flow sensors for each pump.

### ⑧ **Adoption of pointless circuit (alternative/alternative&parallel: 3.7kW or lower)**

A pointless sensor is adopted for the signals of pressure, flow, and tank level that are necessary for operational control, so a trustable control is implemented.

### ⑨ **Adoption of a shock-less valve to prevent water hummer**

The stainless shock-less valve with bypass to prevent water shock is adopted for the check valve, to prevent water hammer.

### ⑩ **It is possible to install a heater to prevent freezing**

(\*) A length for piping section in the unit is necessary.

## 2. Standard specification

Control method	Constant pressure water supply by pressure sensor and flow sensor
Operation method	Alternate / Alternate & Parallel
Installation location	Outdoor
Liquid lifting	Clean water, 0-40°C (Not frozen)
Pump (Material)	Stainless multistage turbine pump (Impeller: Resin, SCS13 or CAC406 (Bronze)) (Main Material : Water section SUS304, Casing: SCS13)
Motor	Total Enclosed fan cool outdoor Synchronous rotation speed 50Hz: 3,000min <sup>1</sup>
Total Suction head condition	Positive suction: 0-5m, 0-3, (40-5.5kW, 50-7.5kW) Negative suction: Suction lifting height 6m.Suction actual lifting height 4m or less
Power source	1PH220V or 3PH380V
Companion flange shape	JIS10K type
Paint colour (Munsell No.)	Pump, Piping: Silver Control panel: Grey (5Y7/1) Accumulator: Grey (10Y5.5/0.5) Others: Grey (2.5PB5.1/0.8)

- Special specification
- Change the position of the control panel (Please consult with us)
- Special control panel specification (3-phase 200V 0.75kW or higher)
- BK type with vibration-proof stage
  - Special accessory
  - Vibration-proof stage
  - Pump cover
  - Anti-freezing heater
  - Circuit for positive suction electromagnetic valve (electric valve) (in the control box)
  - Connecting curved tube (to change the discharge direction)
  - Electrode holder
  - Electrode
  - Foundation bolt

### Standard specification for the control panel

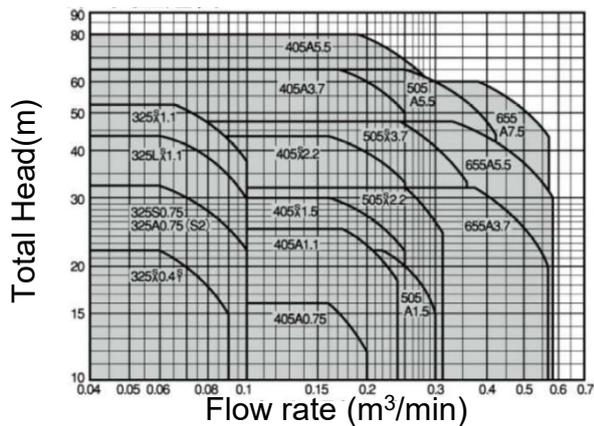
Shape		ECFW-A-S	ECFW-P-S
Operation method		Alternate	Alternate & Parallel
Rated voltage		1PH220V or 3PH380V	
Box material (Plate thickness)		Box type: Steel plate (1.2t)	
Installation location		Outdoor	
Voltage/Electric current type		Digital display	
Motor protection		Electronic thermal	
Liquid level relay		3.7kW or lower, 5P+3P (for inflow electromagnetic valve)	
		5.5/7.5kw 5P	
Function	Alarm buzzer	○	
	Automatic alternative operation at the time of failure	○	
	Water supply failure (Detection of water supply failure)	○	
	Starting frequency automatic adjustment	○	
	Alternative / Alternative & Parallel operation automatic adjustment	-	○
	Water supply failure retry	○	
Indication lamp	Power source	○ (Red)	
	Operation mode (manual/stop/automatic)	○ (Red)×3	
	Selection pump (No.1/No.2/No.1&2)	○ (Red)×3	
	Operation (Individual)	○ (Red)×2	
	Failure (Individual)	○ (Orange)×2	
	Water supply (Individual)	○ (Red)×2	
	Water full	○ (Orange)	
	Water empty	○ (Orange) (*1)	
External signal (*2)	Operation	○ (Individual)	○ (Individual)
	Failure	○ (Individual)	○ (Individual)
	Water full	○	○
	Water empty	○	○
	Water decreasing	○	○
	Inflow electromagnetic valve	3.7kW or lower ○	
	5.5/7.5kW -		

(\*1) When the water is decreasing: Blinks for 1 second, or when the electromagnetic valve is operating: Blinks 2 times and OFF for 1 second (\*2). No voltage signal.

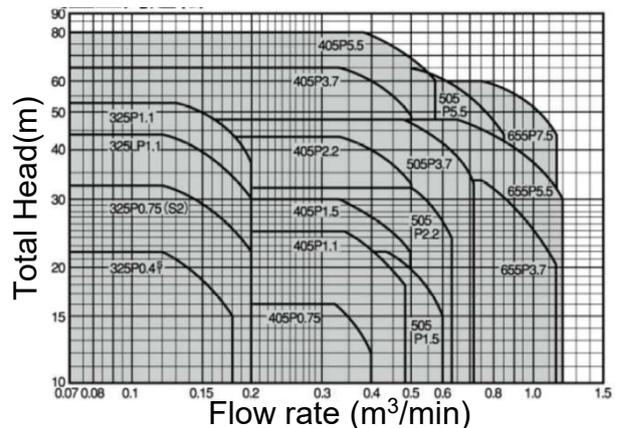
3. Application chart/Specification table  
50Hz Application chart/Specification table

Application chart

Single/Alternate operation



Alternate & Parallel operation



Specification table Stopping flow: 10L/min

Unit bore	Suction bore	Operation mode	Model	Motor	Standard specification				Starting pressure (*3) Selection range	Accumulator pressure	Noise
					Discharge	TDH	Starting pressure	Stopping pressure			
mm	mm			kW	M³/min	m	MPa(kgf/cm²)	MPa(kgf/cm²)	MPa(kgf/cm²)	MPa(kgf/cm²)	dB(A)
40	32	Alternate	KB2-325AE0.4T (*1)	0.4	0.06	22	0.22 (2.2)	0.28 (2.9)	0.15 (1.5)	0.12 (1.2)	42
			KB2-325AE0.75S2 (*2)	0.75	0.06	32	0.31 (3.2)	0.39 (4.0)	0.22 (2.2)	0.17 (1.7)	52
			KB2-325AE0.75	0.75	0.06	32	0.31 (3.2)	0.39 (4.0)	0.22 (2.2)	0.17 (1.7)	50
			KB2-325LAE1.1	1.1	0.06	44	0.43 (4.4)	0.52 (5.3)	0.29 (3.0)	0.25 (2.5)	49
			KB2-325AE1.1	1.1	0.065	53	0.52 (5.3)	0.65 (6.6)	0.36 (3.7)	0.29 (3.0)	51
40	40		KB2-405AE0.75 (*1)	0.75	0.16	16	0.16 (1.6)	0.24 (2.4)	0.12 (1.2)	0.088 (0.9)	46
			KB2-405AE1.1	1.1	0.17	25	0.25 (2.5)	0.31 (3.2)	0.18 (1.8)	0.14 (1.4)	50
			KB2-405AE1.5	1.5	0.16	30	0.29 (3.0)	0.35 (3.6)	0.22 (2.2)	0.17 (1.7)	53
			KB2-405AE2.2	2.2	0.16	44	0.43 (4.4)	0.51 (5.2)	0.32 (3.3)	0.25 (2.5)	50
			KB2-405AE3.7	3.7	0.165	65	0.64 (6.5)	0.73 (7.4)	0.49 (5.0)	0.34 (3.5)	54
40	50	KB2-405AE5.5	5.5	0.19	80	0.78 (8.0)	0.92 (9.4)	0.59 (6.0)	0.44 (4.5)	57	
		KB2-505AE1.5 (*1)	1.5	0.22	22	0.22 (2.2)	0.29 (3.0)	0.15 (1.5)	0.12 (1.2)	50	
		KB2-505AE2.2	2.2	0.25	32	0.31 (3.2)	0.44 (4.5)	0.24 (2.4)	0.20 (2.0)	51	
		KB2-505AE3.7	3.7	0.24	48	0.47 (4.8)	0.50 (6.0)	0.32 (3.3)	0.27 (2.8)	55	
		KB2-505AE5.5	5.5	0.25	55	0.64 (6.5)	0.74 (7.6)	0.43 (4.4)	0.34 (3.5)	58	
50	65	KB2-655AE3.7	3.7	0.37	32	0.31 (3.2)	0.41 (4.2)	0.23 (2.3)	0.17 (1.7)	56	
		KB2-655AE5.5	5.5	0.325	48	0.47 (4.8)	0.56 (5.7)	0.29 (3.0)	0.25 (2.5)	60	
		KB2-655AE7.5	7.5	0.375	60	0.50 (6.0)	0.68 (6.9)	0.43 (4.4)	0.31 (3.2)	62	
40	32	Alternate & parallel	KB2-325PE0.4T (*1)	0.4 × 2	0.12	22	0.22 (2.2)	0.28 (2.9)	0.15 (1.5)	0.12 (1.2)	45
			KB2-325PE0.75S2 (*2)	0.75 × 2	0.12	32	0.31 (3.2)	0.39 (4.0)	0.22 (2.2)	0.17 (1.7)	54
			KB2-325PE0.75	0.75 × 2	0.12	32	0.31 (3.2)	0.39 (4.0)	0.22 (2.2)	0.17 (1.7)	52
			KB2-325LPE1.1	1.1 × 2	0.12	44	0.43 (4.4)	0.52 (5.3)	0.29 (3.0)	0.25 (2.5)	51
			KB2-325PE1.1	1.1 × 2	0.13	53	0.52 (5.3)	0.65 (6.6)	0.36 (3.7)	0.29 (3.0)	53
50	40		KB2-405PE0.75 (*1)	0.75 × 2	0.32	16	0.16 (1.6)	0.24 (2.4)	0.12 (1.2)	0.088 (0.9)	49
			KB2-405PE1.1	1.1 × 2	0.34	25	0.25 (2.5)	0.31 (3.2)	0.18 (1.8)	0.14 (1.4)	52
			KB2-405PE1.5	1.5 × 2	0.32	30	0.29 (3.0)	0.35 (3.6)	0.22 (2.2)	0.17 (1.7)	55
			KB2-405PE2.2	2.2 × 2	0.32	44	0.43 (4.4)	0.51 (5.2)	0.32 (3.3)	0.25 (2.5)	52
			KB2-405PE3.7	3.7 × 2	0.33	65	0.64 (6.5)	0.73 (7.4)	0.49 (5.0)	0.34 (3.5)	56
65	50		KB2-405PE5.5	5.5 × 2	0.38	80	0.78 (8.0)	0.92 (9.4)	0.59 (6.0)	0.44 (4.5)	60
			KB2-505PE1.5 (*1)	1.5 × 2	0.44	22	0.22 (2.2)	0.29 (3.0)	0.15 (1.5)	0.12 (1.2)	53
			KB2-505PE2.2	2.2 × 2	0.5	32	0.31 (3.2)	0.44 (4.5)	0.24 (2.4)	0.20 (2.0)	54
			KB2-505PE3.7	3.7 × 2	0.48	48	0.47 (4.8)	0.50 (6.0)	0.32 (3.3)	0.27 (2.8)	57
			KB2-505PE5.5	5.5 × 2	0.5	55	0.64 (6.5)	0.74 (7.6)	0.43 (4.4)	0.34 (3.5)	61
80	65	KB2-655PE3.7	3.7 × 2	0.74	32	0.31 (3.2)	0.41 (4.2)	0.23 (2.3)	0.17 (1.7)	58	
		KB2-655PE5.5	5.5 × 2	0.65	48	0.47 (4.8)	0.56 (5.7)	0.29 (3.0)	0.25 (2.5)	62	
		KB2-655PE7.5	7.5 × 2	0.75	60	0.50 (6.0)	0.68 (6.9)	0.43 (4.4)	0.31 (3.2)	64	

Note) \*1: Specialized for inflow \*2: 1PH220V \*3: Minimum starting pressure adjustable from the standard starting pressure. The noise is the maximum value within the specification. The stopping pressure is a reference.

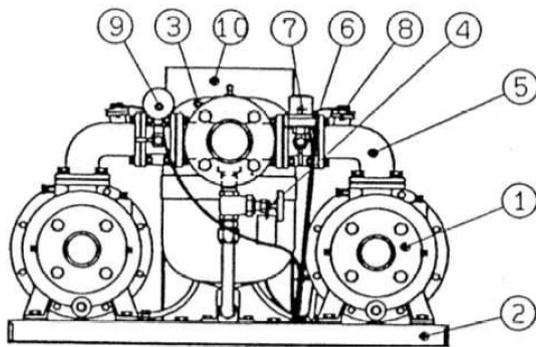
4. Part placement drawing and operation explanation

4-1. Part placement drawing

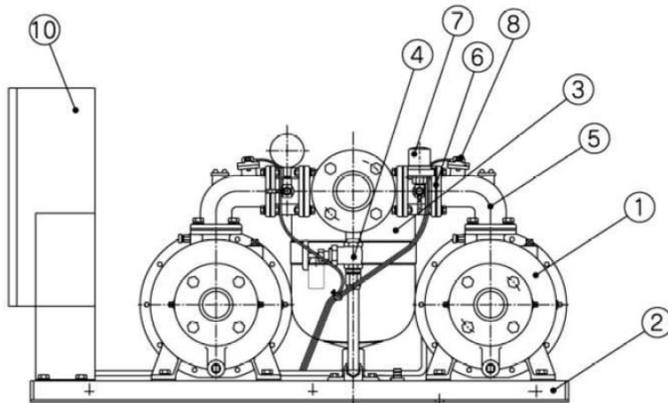
No.	Name	Remark
1	Pump	Stainless Casting iron (SCS13)
2	Baseplate	Steel plate (SPHC)
3	Accumulator	PTD3-1
4	Gate valve	
5	Connecting Bend	Stainless Casting iron (SCS13)
6	Check valve	VCR3 with by-pass
7	Pressure sensor	
8	Flow sensor	
9	Pressure gauge	
10	Control panel	Outdoor type

<Alternate / Alternate & Parallel operation>

In the case of 3.7kW or lower



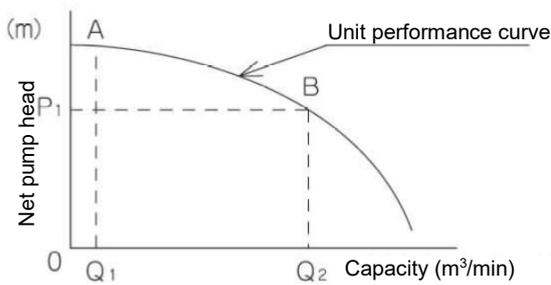
In the case of 5.5 or 7.5kW



<Drawing 4-1>

## 4-2. Operation Theory

### 4.1 Alternate operation

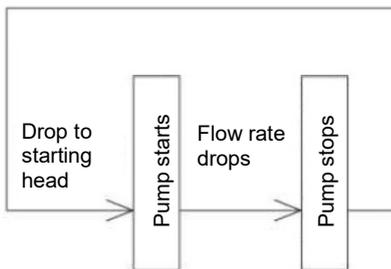


$Q_1$  = Stop flow rate ( $0.01\text{m}^3/\text{min}$ )  
 $Q_2$  = Max. flow rate  
 $P_1$  = Starting pressure

- (1) When water is used while the pump is stopped and the pressure drop to  $P_1$ , the pressure sensor detects the pressure, and pump starts.
- (2) The water supply continues operation between A and B 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.

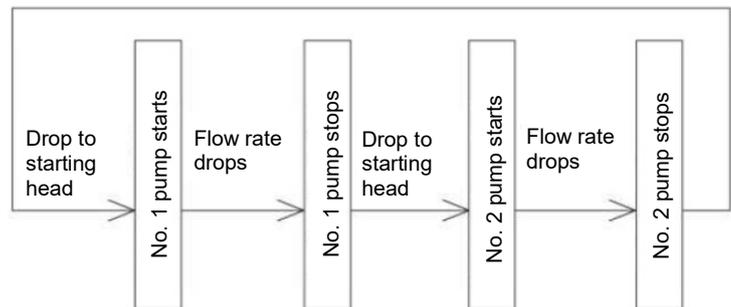
<Single operation>

- (4) Repeat step (1) to (3).

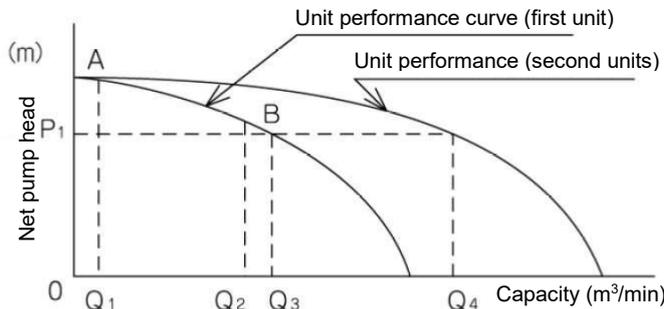


<Alternative operation>

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

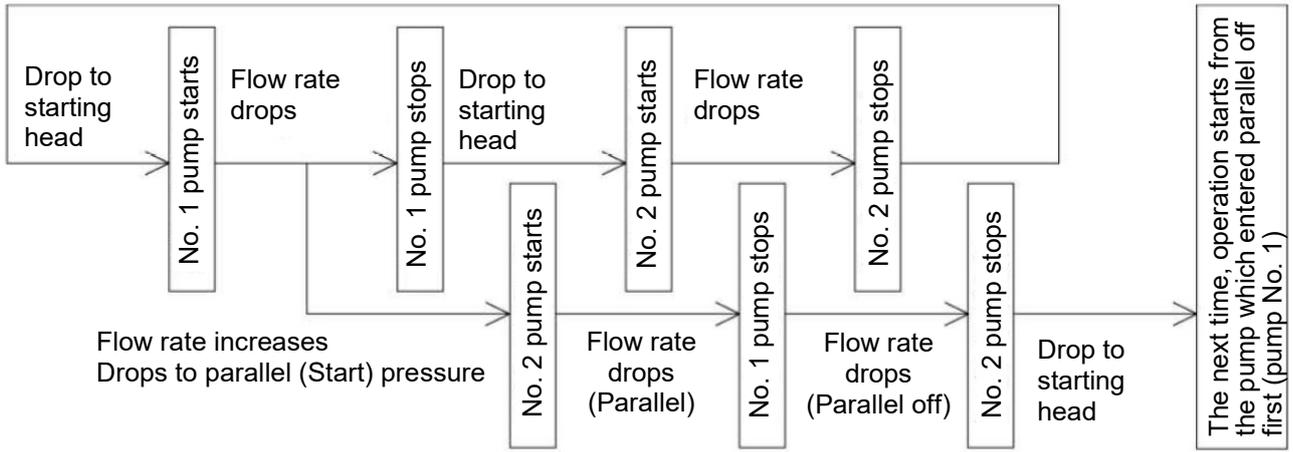


### 4.2 Alternate-Parallel operation



$Q_1$  = Stopped flow rate ( $0.01\text{m}^3/\text{min}$ )  
 $Q_2$  = Parallel off flow rate  
 $Q_3$  = Parallel flow rate  
 $Q_4$  = Max. flow rate  
 $P_1$  = Starting pressure, Parallel pressure

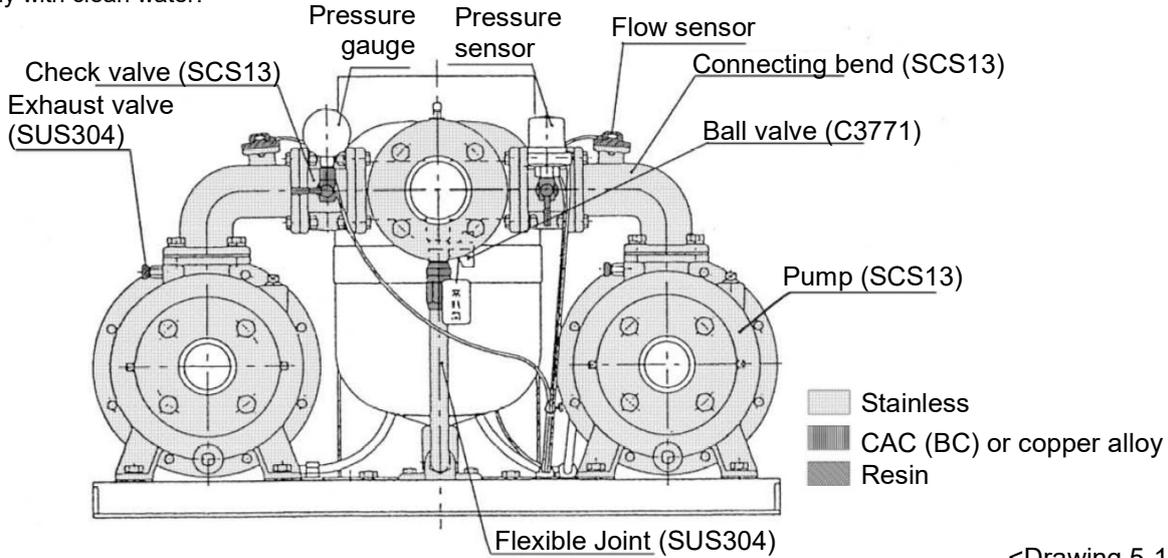
- (1) When water is used while the pump is stopped and the pressure drop to  $P_1$ , the pressure sensor detects the pressure, and pump starts.
- (2) The water supply continues operation between AB on the unit performance curve while the used water rate is between  $Q_1$  and  $Q_3$ .
- (3) When the used water rate drop 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 operation will start.
- (6) If the used water rate drops to  $Q_2$  or less during parallel operation, the pump the started last will stop, and alternate operation will start.



5. Detail of features

5-1. Stainless precision casting

A stainless precision casting is adopted for the pump casing and flange, so the strength against stress and deformation is stronger than stainless sheet parts. And since the stainless steel products, there is no worry about rusty water, it can supply with clean water.



<Drawing 5-1>

References

(1) Features of the "lost wax method", the casting method of stainless precision casting adopted for Pumper KB

- 1 It is possible to form an integrated molding into a complicated shape
- 2 It is possible to achieve a casting with good mechanical characteristics
- 3 The dimensional precision and surface roughness are good
- 4 Because the fluidity is good, a thin wall design is possible.
- 5 Compared to stainless sheet parts,
  - Higher strength and strong resistance against piping stress.
  - Excellent shape flexibility
  - No corrosion cracks due to stress

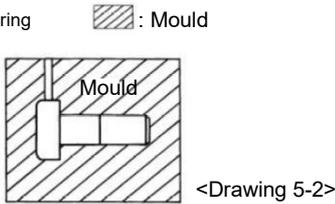
◎: Excellent ○: Good △: Inferior

Item	Lost wax	Sand mould casting
Mold cost	△	◎
Mold durability	◎	△
Dimensional precision	○	△
Surface roughness	○	△
Shape difficulty	◎	△
Price	△	○

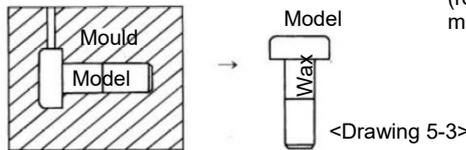
Parts adopted for Pumper KB  
 • Casing • Piping, Check valve  
 • Casing cover • Flange

(2) Process: Explanation with a bolt with a simple structure (It has not been manufactured in fact)

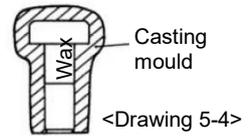
① Manufacturing of mould



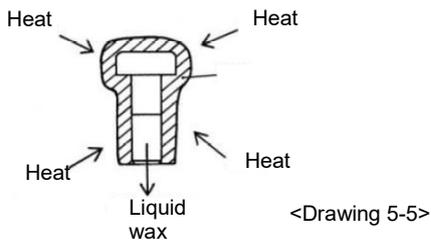
② Structure of model  
 Create a model by injecting wax into the mould. Take the model out of the mould



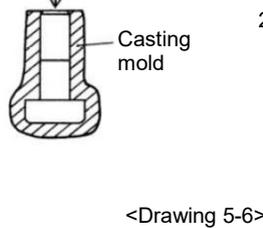
③ Coating  
 Cover a model bolt with a refractory material (repeat a few times) and make a casting mould.



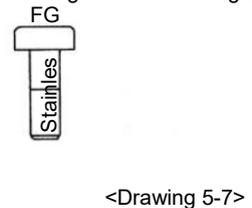
④ Dewaxing  
 Once the coating work is completed, heat the wax inside casting mold and liquitate. (This is why this method is called the "lost wax method.")



⑤ Casting  
 Pour in the stainless material



⑥ Finishing work  
 1. After casting, break the casting mold and remove the "casting".  
 2. Finish by implementing surface finishing etc.



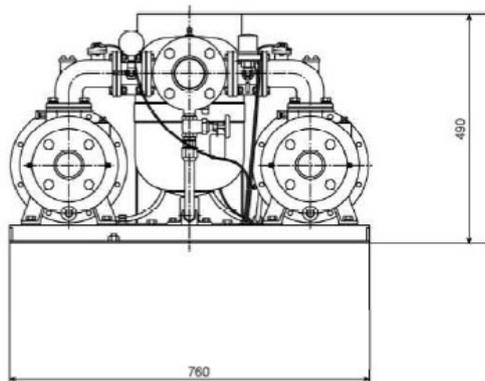
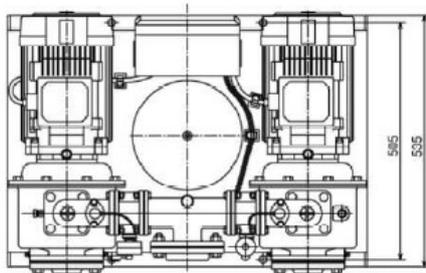
## 5.2 Compact design

A small multistage turbine pump has been adopted for the main pump, and the unit became compact.

<Alternate / Alternate & Parallel, 3.7kW or lower>

Base dimensions: 760mm × 535mm

Unit height: 490mm

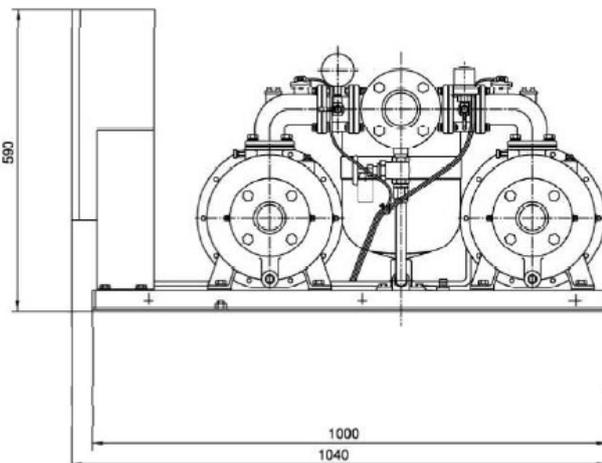
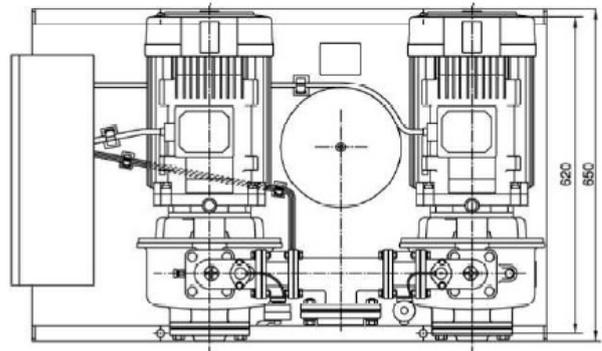


<Drawing 5-9:  
In the case of Alternate /Alternate & Parallel, 3.7kW or lower>

< Alternate / Alternate & Parallel, 5.5/7.5kW>

Base dimensions: 1000mm × 650mm

Unit height: 590mm



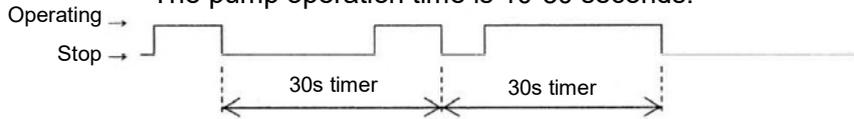
<Drawing 5-9:  
In the case of Alternate / Alternate & Parallel, 5.5/7.5kW >

5-3. Energy saving operation

(1) Achieve water supply with high energy saving effect by suppressing the starting frequency being 60 times/hour or less, and changing the forcible operation time to 10-30 seconds normally (adjusting to 10-90 seconds if that the starting frequency is high).

<① Starting frequency: Within 30 times/1 hour>

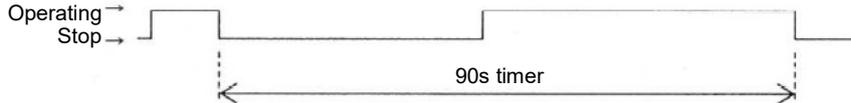
The pump operation time is 10-30 seconds.



<Drawing 5-11>

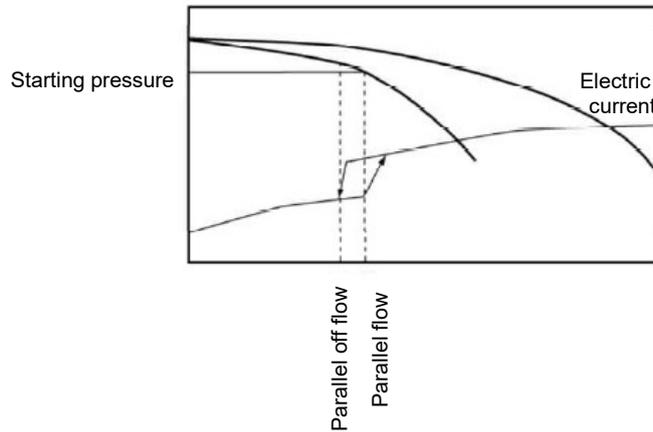
<② Starting frequency: 30 times or more/1 hour>

The pump operation time is 10-90 seconds, and the starting frequency is suppressed to 60 times or less/1 hour together with ①.



<Drawing 5-12>

(2) In the alternate & parallel operation type, energy saving is achieved by adjusting the parallel off flow to the optimum flow by the electric current control, and operation with less gap between the parallel flow and parallel off flow. (The parallel off flow is calculated by detecting the electric current of each pump during a shutdown period and the electric current of each pump at the time of parallel starting)

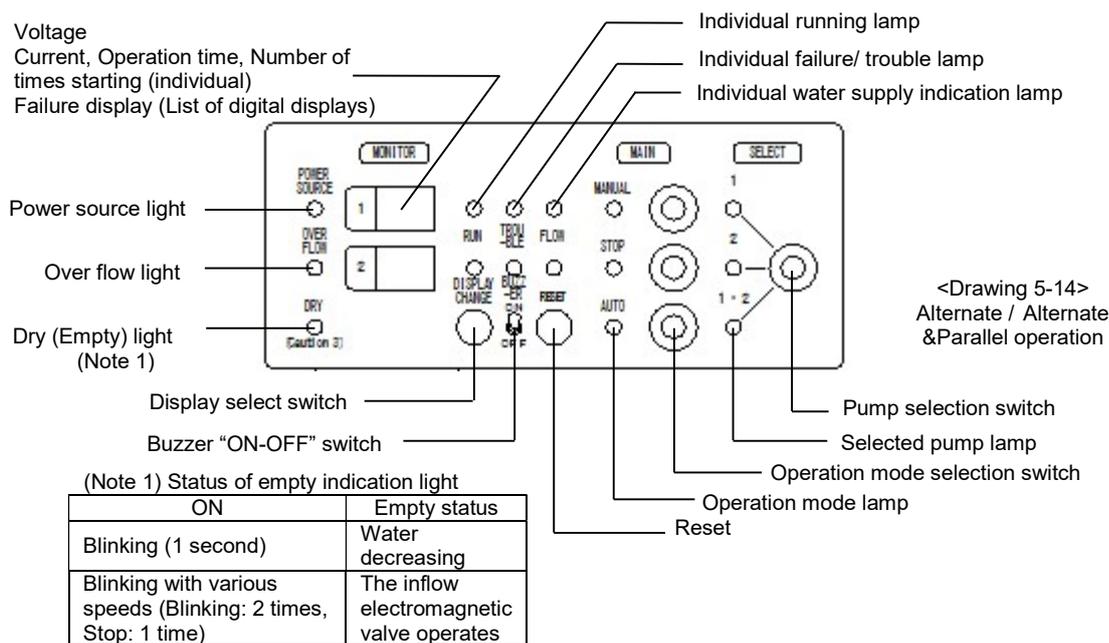


<Drawing 5-13>

### 5-4. Control panel with abundant functions (Alternate / Alternate & Parallel operation)

#### 1) Functions of the control panel

The operation status of pump is displayed on the panel on the control panel.



#### Intelligent alarm (List of individual digital displays)

Status	Digital display		Content of the display
Power ON	0	0	
Operating	0	0	Stop status
	0-9	0-9	Current value: In the case of 9.9A or lower
	1-5	0-9	In the case of 10A, Max. 50A
	3 0	8 V	Current value: i.e. In the case of 380V
Failure mode (Blinking display)	Current value		Parallel OFF current value (only alternative&parallel operation). The point at the right end turns ON (*)
	0	0	Abnormality of power (Open-phase of S-phase, Abnormality of frequency)
	0	1	Phase-sequence reversal of power
	1	0	Overload
	1	1	Restriction
	2	0	MC open
	2	1	MC short
3	0	Failure of the water supply	
4	0	Abnormality of the flow sensor	
Cumulative time	H1 or H2		Unit: Hour, Maximum 6 digits
Number of times starting and total	C1 or C2		Unit: Number of times, Maximum 8 digits
Failure history	E1 or E2		For 4 times

(\*) Parallel OFF with illumination for 3 seconds or longer (The parallel operation continues if shorter than 3 seconds)

#### Other functions (In the case of Alternate / Alternate & Parallel operation)

- With warning buzzer (at the time of failure)
- Indication lamp for water level in the water tank (Overflow , Dry (Empty))
- Monitor lamp indication of operation/failure/water supply
- No voltage terminal output (running /failure/overflow/dry(empty))

## 2) Comparison table between ECFW-S and other companies

●Excellent ◦Good △Equal ×Inferior

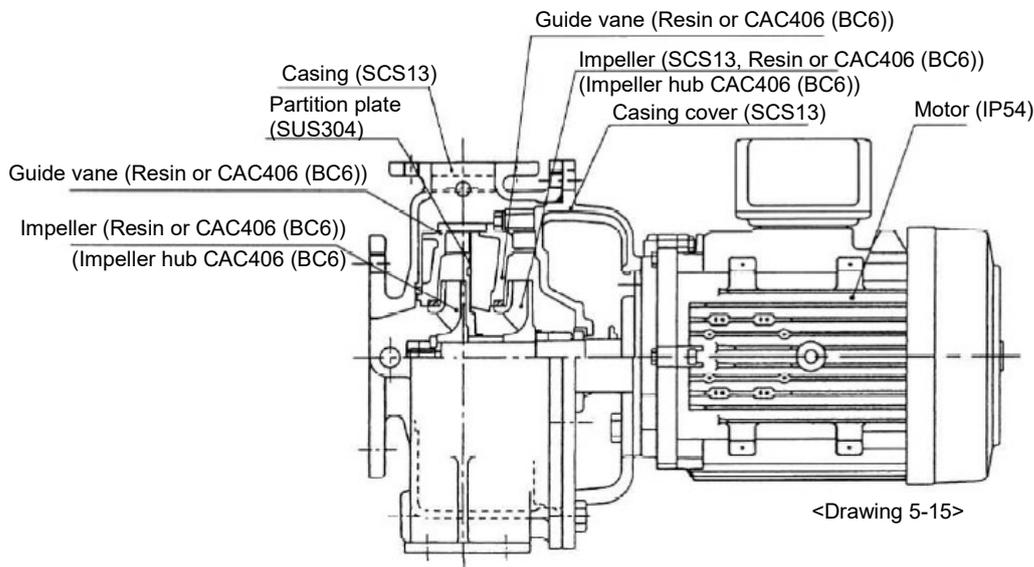
Item	ECFW-A/P-S	Company A	Company B
<b>Pump control</b>			
Main circuit switch	○	Electromagnetic contact	○
Rotary operation	○	Possible	○
Alternate in case of failure	○	Possible	○
Start	○	Pressure sensor	●
Stop	●	Individual pump flow sensor	△ ○
Advance interlock	●	30/90 seconds from the last stop	○
Parallel start	○	Pressure sensor Interval of 3 seconds	○
Parallel off	●	Electric current digital sampling Optimum parallel off control	○
Parallel interlock	●	30/60seconds from the last parallel off	○
<b>Liquid level control</b>			
Overflow	○	Indication LED ON (1 second delay)	○
Empty	●	Indication LED ON (1 second delay) Automatic operation available by turning E <sup>2</sup> (automatic recovery water level) ON with the power ON during empty reset	○
<b>Interface</b>			
Main switch	●	Push switch * (With answer back)	○
Select switch	●	Push switch * (With answer back)	△
Failure reset switch	○	Push switch	△
Manual operation of parallel model	○	Parallel operation (For pressure reducing valve balance check)	△
<b>Indication function</b>			
Power LED	○	Has	○
Running LED	○	Pump individual LED	○
Failure LED	○	Pump individual LED	△
Phase-sequence reversal LED	○	None=Unnecessary	○
Abnormality LED	○	None=Unnecessary	△
Pressure monitor	△	None (Pressure gauge)	○
Water supply monitor	●	Pump individual = For water supply check	△
Electric current meter	●	Pump individual, digital 2 digits, Failure mode No. indication	△
Alarm buzzer	○	Small electronic type	△
<b>Protective function</b>			
Power S-phase open-phase	●	Failure mode 00, Inoperable	△
Power phase-sequence reversal	●	Failure mode 01, inoperable	○
Overload	●	Failure mode 10 Cooling time: 60 seconds CT detection	○
Restriction	●	Failure mode 11 Cooling time: 60 seconds	○
SSC, MC open	●	Failure mode 20	○
SSC, MC short	○	Failure mode 21	△
Water supply interruption	●	Failure mode 30 Retry 2 times Parallel type: Water supply suspension of only 3 seconds	×
Sensor abnormality	●	Failure mode 40 At the time of failure of the flow sensor	△

\* The buzzer rings if it is set.

## 5-5. Silent design

### 5-5-1) Pump section

1. The noise is reduced by adopting a high efficiency cast 3D impeller.
2. By adopting a multistage pump, the power per impeller reduces, the variation of water flow is less, and the flowing water and collision noises are reduced.
3. Because of the double-casing, any noise from the impeller section and guide vane is contained directly. Therefore, the flowing water noise of main body of pump is barely audible.



Comparison of features of the 3D impeller

[Models to be compared: 406-3.7]

◎:Excellent ○: Good X:Inferior

Item		KR5-C	Company A	Company B	
Material & Structure	Number of stages	3	3	4	
	Material	Impeller	Resin	SUS304 (Press)	Resin
		Impeller hub	CAC406 (BC6)	SUS304 (Press)	Resin
	Wing Shape	3D	2D	2D	
	Manufacturing method	Casting by injection (P.A.T)	Press + Welding	Injection + Ultrasonic welding	
Driving method	Width across flat	Width across flat	Width of flat		
Evaluation	Strength	Resistance against centrifugal stress *1	○	◎	○
		Around boss *2	◎	◎	X
		Strength	○ (Integrated with resin)	◎	X (Attached to resin)
	Balance	◎	○	○	
	H-Q performance	◎	○	○	
	Noise feature	◎	○	○	
	Surface roughness	◎	◎	◎	
	Saturation axis power curve *3	◎	○	○	
Support for suction specification (For the main pump)	◎	◎	X		

\*1: The centrifugal stress on the impeller is proportional to the impeller's specific gravity.

Specific gravity: Resin [KR4/5-C] (1.2) < Resin [Company B] (1.66) < Stainless (7.2)  
 Young rate: Resin [KR4/5-C] ( $5.5 \times 10^4 \text{kgf/cm}^2$ ) < Resin [Company B] ( $1.3 \times 10^5$ )

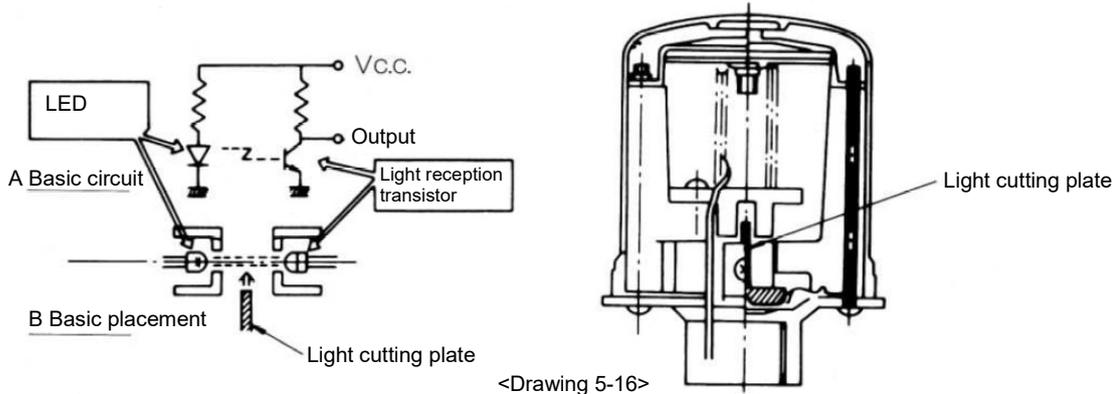
\*2: Fatigue strength, Creep strength, Toughness

\*3: The optimum item for control of the automatic water supply

5-6 Adoption of pointless sensor  
 (1) Light sensor (Pressure sensor)

① Overview

The detecting section consists of the LED and light reception transistor as in Drawing 5-16, which detects light because the light cutting plate is raised/ lowered according to the pressure, and it changes to an electrical signal, and turns ON/OFF.



<Comparison with a conventional pressure switch>

Item	Conventional type	Pressure sensor (Light sensor) type
Structure (Output)	Coil spring + Snap action (Contact)	Coil spring + Electronic circuit (Transistor)
Adjustment of the setting pressure	Discriminates by sound	LED indication
Differential pressure	0.02MPa (0.2kgf/cm <sup>2</sup> ) or higher	Within 0.005MPa (0.05kgf/cm <sup>2</sup> )

② Features

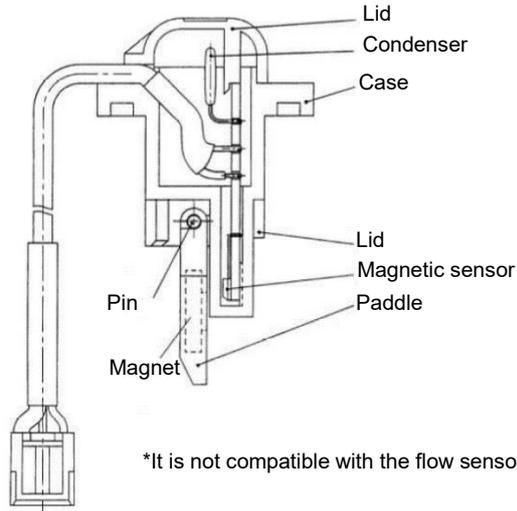
- The adjustable pressure range is wider because the differential pressure is small
- The circuit in the control is simplified, achieving space and cost reduction
- There is no mechanical wear and the life is long because the pressure detecting section is a non-vibrating structure.
- The pressure setting value does not vary even if using for a long time.

(2) Flow sensor

① Features

- A magnetic sensor is fitted, and the life is long because of the no contact flow sensor
- The loss resistance is less  
The loss resistance lifting height is  $H=0.1\text{m}$  until  $Q=0.3\text{m}^3/\text{min}$
- Paddle system (patent pending)
- Small and light weight
- The case and paddle are made of resin, the pin is made of SUS304 with high corrosion resistance

② Structure

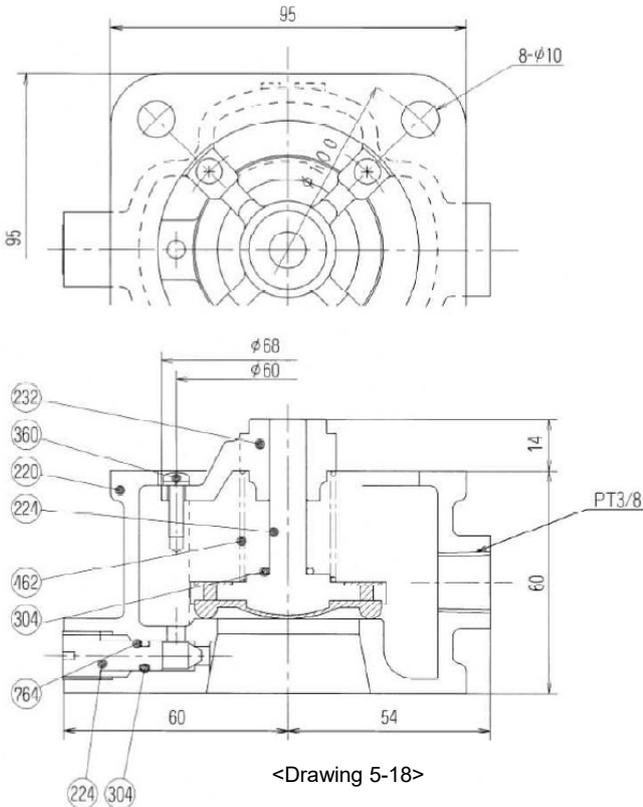


\*It is not compatible with the flow sensor of KF2.

5-7 Fitted with shock-less valve

<Drawing 5-17>

Water hummer due to late valve closing is prevented by the spring type check valve that eliminates water shock.



<Drawing 5-18>

No.	Name	Material
220	Valve casing	SCS13
232	Valve guide	CAC406(BC6)
224	Valve	CAC406(BC6)
462	Spring	SUS304
304	O-ring	Rubber (NBR)
360	Small screw with integral washer	SUS304
224	Valve	CAC406(BC6)
304	O-ring	Rubber (NBR)
764	Grease	

Specification item	Content
(1) Nominal diameter	40A
(2) Nominal pressure	7K
(3) Maximum allowable pressure	0.98MPa{10kgf/ae}
(4) Working temperature	0-85°C
(5) Liquid name	Clean water

## 6. Handling precautions

### ▲ Points to be noted especially

1. Connect the grounding securely, and install a dedicated breaker. An electric shock may be caused at the time of failure or electrical leakage.
2. Execute the electrical work safely and securely by complying with the electrical equipment technical standard and interior wiring regulation. Electrical leakage or fire may result if wiring or connections are defective.
3. Check that suitable waterproofing and draining process are applied to the floor. Severe damage risk if a water leak occurs.
4. Do not implement insulation resistance measures for the control panel. The control board may be damaged.

### 6-1 Installation

#### 1) Installation precautions

### ▲ Warning

In the case of hanging at the time of unloading, carrying in or installation, implement after checking the weight of the device and how to hang according to the brochure, installation diagram, or operation manual. Do not hang a device whose weight is more than the rated load for a hanging tool. If hanging is incomplete, it causes of injury due to falling.

- ① At the time of transfer/carrying in, please hang at four points using hanging shackles in the hanging holes (four points) on the base as in <Drawing 6-1>. If hanging on the accumulator etc., may result in damage.
- ② Install horizontally, and fix securely with suitable foundation bolts.  
If the foundation is not horizontal or uneven, the base might twist resulting in a failure.

(Note 1) Please buy the foundation bolts separately. (Recommended bolt size: 4-M12×160)

#### 2) Selection of the installation location

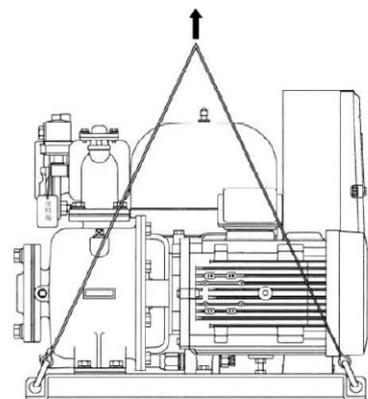
### ▲ Caution

Do not install in a location lacking effective drainage and waterproofing. Severe damage risk if a water leak occurs.

Do not install in a high humidity location, such as a bathroom. Any electrical leakage may cause an electric shock.

Do not install in a location subject to hazardous materials, such as acid, alkali, solvent, paint or gas, or where corrosion may be generated, or a dusty place (i.e. chemical factory). Electrical leakage or a fire may occur.

- ① Please install in a cool location protected from rain or direct sunshine and convenient for disassembly/assembly.
- ② If installing in a location subject to rain or direct sunshine it is essential to fit the pump cover (special accessory).
- ③ Install in a location where the ambient temperature around the pump does not exceed 40°C.



<Drawing 6-1>

6-2 Piping: For positive suction refer to <Drawing 6-2>, for Negative suction refer to <Drawing 6-3>.

**⚠ Caution**

Please do not let the pump suck foreign substance or sand, as this may damage the impeller lock or the mechanical seals.

1) Suction piping

<Common>

- ① Install suction piping for each pump, do not split half way.
- ② Make the piping as short as possible, with minimal bends.
- ③ For any risk of foreign substances or sand, install a suitable filter.

<In the case of inflow>

- ① Install the gate valve for maintenance near the suction port.

<In case of suction>

- ① Make the tip of the suction pipe deeper than the pipe's diameter (D) by two times or more, and separate it from the bottom by 30cm or more.
- ② Slope the suction piping to prevent air pockets.
- ③ Do not install a valve in the suction piping.
- ④ Loosen the bypass check valve counter clockwise by two rotations and apply a positive pressure to each suction pipe. Also, make sure there is no leakage from the foot valve.

2) Discharge piping

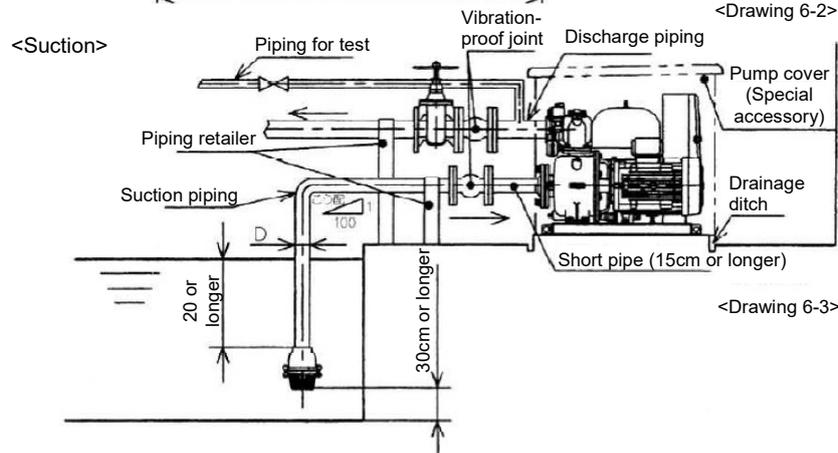
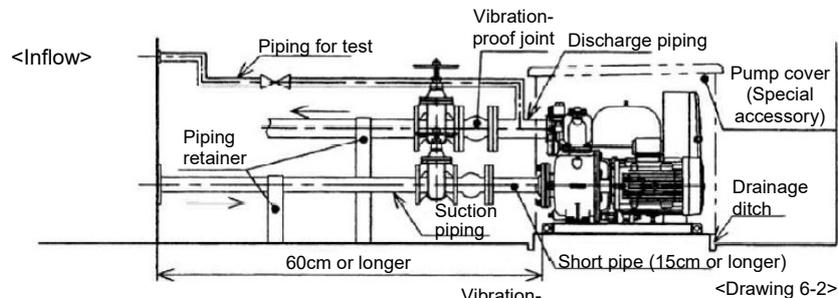
- ① Install the sluice valve for maintenance near the suction port.
- ② Installation of piping for maintenance testing is recommended.

3) Common

- ① Install a vibration-proof joint and piping support to avoid any direct load on the piping or the pump.
- ② To prevent freezing, cover the piping with heat insulating material. It is recommended to install a heater (special accessory). If installing a heater on site, contact the supplier or the service provider designated by our Company.

4) Precaution concerning installation of the pump cover

- ① If installing a vibration-proof joint directly to the pump, it might contact the pump cover. In that case, install a short pipe (15cm or longer) between the pump and the vibration-proof joint.

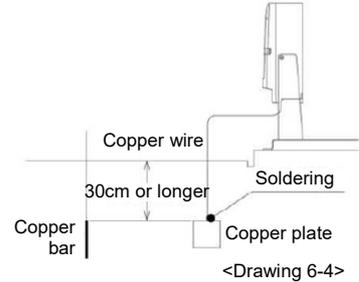


### 6-3. Electrical work

#### Warning

Install a dedicated breaker at the power side to avoid the risk of electrical leakage, electric shock or a fire. Execute electrical work safely and securely by following the electrical equipment technical standard and interior wiring regulation. Electrical leakage or a fire may result if wiring or connections are defective. Implement the grounding work before turning on the electricity supply. Do not connect the grounding to a gas pipe, water pipe, lightning rod, or telephone grounding. An electric shock may result if the grounding is defective.

- 1) If the control panel does not have a breaker, install a breaker at the power source. (For existence/nonexistence of a breaker, refer to the list in the "Control panel special specification" (P2).
- 2) Connect the power line to R.S (single phase)/R.S.T (3-phase) of the control panel.
- 3) There is a grounding terminal in the control panel to implement the installation work.  
 Attach copper plate (30cm×30cm or bigger) or copper bar (Thickness: 1cm or thicker, Length: 40cm or longer), and bury it in wet ground by 30cm or deeper. When handling the grounding cable, turn OFF the main power.



### 6-4. Connection method

For the water supply unit, the connections of the main parts (motor, pressure sensor, flow sensor) have been implemented already, so implement only the connections below, as necessary.

#### 1) Liquid surface control

#### Caution

Do not operate if empty (operation without water in the tank). The water in the pump becomes hot that may cause damage. To prevent empty operation, install the tank's liquid level control unit.

To install the liquid level control unit, the parts in <Drawing 6-5> are required. In the case of the standard control panel for the single operation model, the LVS-1 control panel (special accessory) is required, as a separate purchase.

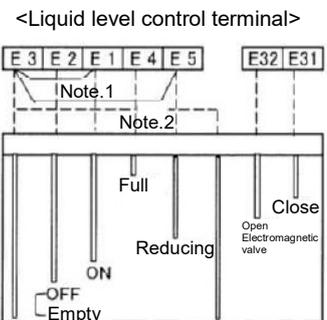
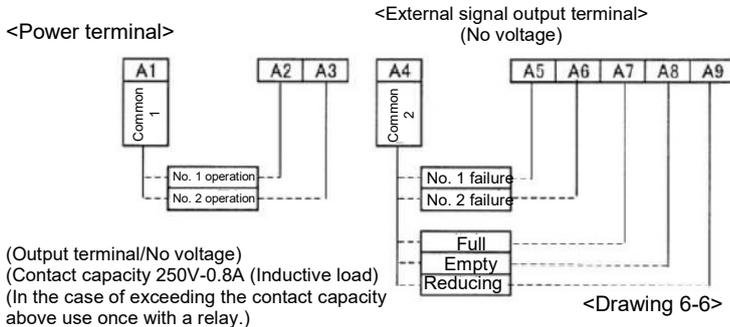
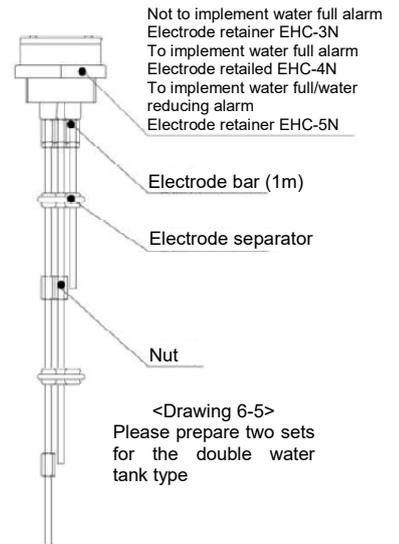
- ① Fit the electrode depending on the tank's water level in <Drawing 6-5>.  
 For operation of the level sensor, the water level gap may change due to the effect of water quality, so be aware.
- ② A short-circuit line has been installed between E1 and E3 at the time of factory shipment, remove it.
- ③ Connect by referring to the connection diagram in <Drawing 6-6>.
- ④ In the case of using EHC-3 or EHC-4 (resistance built-in electrode retainer), remove the internal resistance.

#### 2) External signal

The non-voltage output terminal for external signal connection to the monitoring panel etc. Connect by referring the terminal connection diagram in <Drawing 6-6>.

#### 3) Electronic connection diagram

<Drawing 6-6> is the example for the standard Alternative/Alternative& Parallel operation (3.7kW or lower). Refer to the connection diagram on the back side of the door for the single operation model 5.5kW or higher, or the special specification panel.



(Output terminal/No voltage)  
 (Contact capacity 250V-0.8A (Inductive load))  
 (In the case of exceeding the contact capacity above use once with a relay.)

- (Note 1) In the case of using the electrode bar, please remove the short-circuit wire between E3 and E1.  
 (Note 2) In the case of using the water tank water reduction detection, remove the short-circuit wire between E3 and E5.  
 (Note 3) In the case of detecting water reduction, this status is indicated by blinking of the water empty lamp. (Blinks for one second). When the inflow valve is operating, flicker blinking is implemented. (Blinks of twice, stops for one second).

## 6-5. Operation

### ⚠ Warning

In the case of connecting or disconnecting wiring, shut OFF the power source, and confirm no electricity in order to avoid an electric shock.  
After turning the power ON, do not leave the door of the control panel open or touch the charging section. Do not operate the operation switch etc. with a wet hand, in order to avoid an electric shock or fire risk.

### ⚠ Caution

Do not use with any voltage other than the rated voltage, in order to avoid an electric shock or fire risk  
Do not run if empty (operation without water in the tank), or fully-closed operation (status without inflow/outflow of water in the pump) manually. The pump gets hot, and burn or failure may result.  
Do not put a finger or stick in the opening section of the motor while operating. Electric shock or injury may result.  
Do not touch the motor or control panel while operating or immediately after operating because it may be hot. A burn may result.  
Shut OFF the power source if not using for a long time. Electric shock, electric leakage, or fire may be caused by insulation degradation.  
Do not cover the pump or control panel with blanket or cloth or place an object on it. Electric leakage, fire, or injury may result.  
Check that there is water inside the pump. The heater may be disconnected, or a fire may result.

- 1) Before starting operation
- (1) Check connections
  - ① Check that wiring is implemented correctly and the terminal screws are tightened securely.
  - ② Check the power source.
- (2) Check the piping
  - ① Check that the bolts and nuts are tightened securely.
- (3) Priming the pump

### ⚠ Caution

Implement priming correctly for each pump. If priming is not enough, empty operation may occur causing a failure.  
Turn the main power OFF when priming to avoid the risk of an injury.

- ① Check the water level in the water tank.
- ② Remove the rubber bush of the motor fan cover.

<In the case of inflow>

- ③ Open the sluice valve at the suction port of the pump, and then open the ventilation valve <Drawing 6-7>.
- ④ Rotate the edge axis of the motor with a flat-head screwdriver to release any air in the impeller.
- ⑤ The priming is completed once water starts flowing vigorously from the ventilation valve.

<In the case of suction>

- ① Open the ventilation valve, remove the plug, and implement priming.
- ② Rotate the edge axis of the motor with a flat-head screwdriver to release any air in the impeller.
- ③ The priming is complete once air bubbles stop going out from the ventilation valve.

<Common>

- ① Close the ventilation valve, install the plug (in case of the suction), and rubber bush on the motor fan cover.

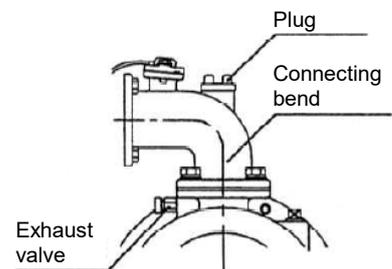
(4) Check the rotation direction

<Single operation>

- ① Confirm that the switch on control panel is at "Stop", and then turn the power ON.
- ② Repeat switching from "Manual" to "Stop" once or twice, and check the rotation direction.  
The normal rotation direction is clockwise if looking from the motor side.
- ③ In the case of opposite rotation, turn off the main power, replace two phases out of the three phases at the power side (only 3-phase).

<Alternative/Alternative & Parallel operation>

- ① Turn the power ON after confirming that the wiring is correct.  
If the power source is normal, the electrical current is displayed as "0.0" (lighting) on the display panel.  
If the power source is abnormal, "00" or "01" is displayed (blinking) on the display panel, so correct the cause as follows;  
"00": Open-phase of S-phase, abnormal frequency (only 3-phase)  
"01": Phase-sequence reversal of power source (only 3-phase)



- ② Confirm that the selector switch on the control panel is at "1", turn to "Manual" and "Stop" and turn main switch ON and OFF once or twice and check the rotation direction of Pump 1.  
The normal direction of rotation is the right rotation as viewed from the motor side.
- ③ Check the rotation direction of Pump 2 by setting the selector switch to "2". (It is not possible to switch the selector switch if the main switch is not at "Stop" status)
- ④ In the case of reverse rotation, turn OFF the main power, and reverse two motor cables out of the three motor cables (3-phase).

## 2) Check the manual operation

### (1) Check the valves open/close.

Sluice valves of the unit discharge port and piping for test	→ Close
Sluice valves of the unit suction port and accumulator	] → Open
Ball valves of the pressure sensor and pressure gauge	

#### <Single operation>

- (2) Set the switch to "Manual" and operate the pump.
- (3) When the pump pressure increases, open the test piping sluice valve gradually and check that water comes out from the piping vigorously. (If lifting does not start within a few minutes, set the switch to "Stop", and implement priming again).

#### <Alternative/Alternative & Parallel operation>

- (2) Set the switch to "1" and main switch to "Manual".
- (3) When the pump pressure increases, open the test piping sluice valve gradually and check that water comes out from the piping vigorously. This time, one of the "Water supply" monitor lamps turns ON. (If lifting does not start within a few minutes, set the main switch to "Stop", and implement priming again).
- (4) After lifting is complete, close the sluice valve and set the main switch to "Stop".
- (5) Check Pump 2 the same way.

## 3) Check of automatic operation

#### <Single operation>

- (1) Set the switch to "Auto"

#### <Alternative/Alternative & Parallel operation>

- (1) Set the select switch to "1/2", and the main switch to "Auto". (It is not possible to turn the main switch from "Manual" to "Auto" directly. Switch after setting to "Stop")

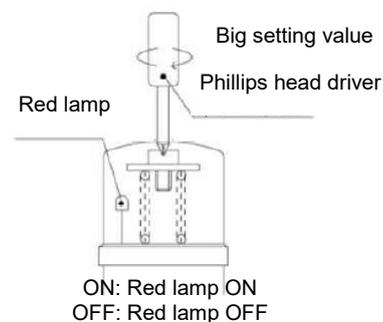
#### <Common>

- (2) Open/close the testing sluice valve slowly and check that the pressure does not change drastically.
- (3) Close the sluice valve and check that the pump stops. (If the starting frequency suppression timer is operating in closed status, the pump does not stop immediately, this is normal).
- (4) Repeat starting and stopping and check that the pump operates as per 4-2).
- (5) For Alternative & Parallel operation, check that the pump starts after opening the sluice valve and the pressure decreases, and the pump starts parallel operation (two-unit operation) when opening the sluice valve more.
- (6) If the test piping is not installed, check by opening/closing the sluice valve at the unit's discharge port.

## 4) Adjustment of the pressure sensor: refer to <Drawing 6-9>.

The pressure sensor is set at the standard starting pressure (P.20, 21) at the time of factory shipment, but it is possible to adjust depending on the site conditions. Adjust by following the procedure below.

- ① Operate the pump manually, supply water for a while, and then close the sluice valve.
- ② Set the main switch to "Stop" to stop the operation.
- ③ Open the sluice valve gradually, and close the sluice valve to adjust the pressure.
- ④ Adjust the pressure sensor according to the procedure below.
  - If the red lamp is ON: Turn the screw at the top of pressure sensor counterclockwise with a Philips head driver until the red lamp goes OFF, and then turn clockwise until the red lamp comes ON.
  - If the red lamp is OFF: Turn clockwise the screw at the top of pressure gauge turn clockwise until the red lamp turns ON.



<Drawing 6-9>

#### <In the case of using for suction>

Change the starting pressure by adjusting the pressure based on the formula below.

Pressure after adjustment (Starting pressure)  $\leq$  Standard starting pressure - Suction total lifting height (m)/10

## 10.4 Adjustable range

### 1) 50Hz

Operation type	Unit bore mm	Suction bore mm	Model	Motor	Standard specification			Pressure sensor	
					Flow rate	TDH	Starting pressure	Adjustment range	
					kW	M <sup>3</sup> /min	m	MPa{kgf/cm <sup>2</sup> }	MPa{kgf/cm <sup>2</sup> }
Alternate	40	32	KB2-325AE0.4T	0.4	0.06	22	0.22 {2.2}	0.22 {2.2}	~ 0.15 {1.5}
			KB2-325AE0.75S2 (*2)	0.75	0.06	32	0.31 {3.2}	0.31 {3.2}	~ 0.22 {2.2}
			KB2-325AE0.75	0.75	0.06	32	0.31 {3.2}	0.31 {3.2}	~ 0.22 {2.2}
			KB2-325LAE1.1	1.1	0.06	44	0.43 {4.4}	0.43 {4.4}	~ 0.29 {3.0}
			KB2-325AE1.1	1.1	0.065	53	0.52 {5.3}	0.52 {5.3}	~ 0.36 {3.7}
			KB2-405AE0.75 (*1)	0.75	0.16	16	0.16 {1.6}	0.16 {1.6}	~ 0.12 {1.2}
		40	KB2-405AE1.1	1.1	0.17	25	0.25 {2.5}	0.25 {2.5}	~ 0.18 {1.8}
			KB2-405AE1.5	1.5	0.16	30	0.29 {3.0}	0.29 {3.0}	~ 0.22 {2.2}
			KB2-405AE2.2	2.2	0.16	44	0.43 {4.4}	0.43 {4.4}	~ 0.32 {3.3}
			KB2-405AE3.7	3.7	0.165	65	0.64 {6.5}	0.64 {6.5}	~ 0.49 {5.0}
			KB2-405AE5.5	5.5	0.19	80	0.78 {8.0}	0.78 {8.0}	~ 0.59 {6.0}
			KB2-505AE1.5 (*1)	1.5	0.22	22	0.22 {2.2}	0.22 {2.2}	~ 0.15 {1.5}
	50	50	KB2-505AE2.2	2.2	0.25	32	0.31 {3.2}	0.31 {3.2}	~ 0.24 {2.4}
			KB2-505AE3.7	3.7	0.24	48	0.47 {4.8}	0.47 {4.8}	~ 0.32 {3.3}
			KB2-505AE5.6	5.5	0.25	55	0.64 {6.5}	0.64 {6.5}	~ 0.43 {4.4}
50	65	KB2-655AE3.7	3.7	0.37	32	0.31 {3.2}	0.31 {3.2}	~ 0.23 {2.3}	
		KB2-655AE5.5	5.5	0.325	48	0.47 {4.8}	0.47 {4.8}	~ 0.29 {3.0}	
		KB2-655AE7.5	7.5	0.375	60	0.50 {6.0}	0.50 {6.0}	~ 0.43 {4.4}	
Alternate & parallel	40	32	KB2-325PE0.4T	0.4×2	0.12	22	0.22 {2.2}	0.22 {2.2}	~ 0.15 {1.5}
			KB2-325PE0.75S2 (*2)	0.75×2	0.12	32	0.31 {3.2}	0.31 {3.2}	~ 0.22 {2.2}
			KB2-325PE0.75	0.75×2	0.12	32	0.31 {3.2}	0.31 {3.2}	~ 0.22 {2.2}
			KB2-325LPE1.1	1.1×2	0.12	44	0.43 {4.4}	0.43 {4.4}	~ 0.29 {3.0}
			KB2-325PE1.1	1.1×2	0.13	53	0.52 {5.3}	0.52 {5.3}	~ 0.36 {3.7}
	50	40	KB2-405PE0.75 (*1)	0.75×2	0.32	16	0.16 {1.6}	0.16 {1.6}	~ 0.12 {1.2}
			KB2-405PE1.1	1.1×2	0.34	25	0.25 {2.5}	0.25 {2.5}	~ 0.18 {1.8}
			KB2-405PE1.5	1.5×2	0.32	30	0.29 {3.0}	0.29 {3.0}	~ 0.22 {2.2}
			KB2-405PE2.2	2.2×2	0.32	44	0.43 {4.4}	0.43 {4.4}	~ 0.32 {3.3}
			KB2-405PE3.7	3.7×2	0.33	65	0.64 {6.5}	0.64 {6.5}	~ 0.49 {5.0}
			KB2-405PE5.5	5.5×2	0.38	80	0.78 {8.0}	0.78 {8.0}	~ 0.59 {6.0}
	65	50	KB2-505PE1.5 (*1)	1.5×2	0.44	22	0.22 {2.2}	0.22 {2.2}	~ 0.15 {1.5}
			KB2-505PE2.2	2.2×2	0.5	32	0.31 {3.2}	0.31 {3.2}	~ 0.24 {2.4}
			KB2-505PE3.7	3.7×2	0.48	48	0.47 {4.8}	0.47 {4.8}	~ 0.32 {3.3}
	80	65	KB2-505PE5.5	5.5×2	0.5	55	0.64 {6.5}	0.64 {6.5}	~ 0.43 {4.4}
KB2-655PE3.7			3.7×2	0.74	32	0.31 {3.2}	0.31 {3.2}	~ 0.23 {2.3}	
KB2-655PE5.5			5.5×2	0.65	48	0.47 {4.8}	0.47 {4.8}	~ 0.29 {3.0}	
			KB2-655PE7.5	7.5×2	0.75	60	0.50 {6.0}	0.50 {6.0}	~ 0.43 {4.4}

\*1 : Positive suction

\*2 : 1PH220V

6) Normal operation



Do not touch the motor. It is hot and may cause a burn.

(1) Check the valves open/close

Sluice valve of the test piping, Ball valve of the pressure gauge	→Close
Suction port of the unit, Sluice valves at the discharge port and accumulator	] → Open
Ball valves of the sluice valve and pressure sensor	

(2) Check the control panel.

	Alternative & Parallel operation
Main switch	“Auto”
Select switch	“1.2”

6-6. Maintenance/Inspection



If the unit does not operate or there is an abnormality (burnt smell etc.), stop the operation immediately, shut off the power, and implement maintenance and inspection. Operating with an abnormality or a faulty repair may result in an electric shock, fire, or water leakage.  
If the gas pressure in the accumulator is low, refill with air. Filling with an explosive gas such as hydrogen gas may cause an explosion.



- 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 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.

1) Daily inspection

Item	Confirmation item	Judgment standards
Pump	Water leaks from mechanical seals	There is no dripping
Motor	Outer temperature	Ambient temperature + 70°C or less
	Ball bearings	No abnormal operating 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.

2) 6-month inspection

Item	Confirmation item	Judgment standards
Motor	Insulation resistance (Note1)	1MΩ or more
Accumulator	Charged gas pressure (Note2)	Nameplate value ± 0.01MPa {0.1kgf/cm <sup>2</sup> }
	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.

### 3) Consumable parts

The parts in <Table 6-2> are consumable parts. Refer to the replacement guideline and replace the parts.

<Table 6-2>

Part name	Replacement guideline	Applicable model	Remark
O-ring K 170	At each disassembly and inspection	KB2 – 32	Casing × casing cover
O-ring K 190	At each disassembly and inspection	KB2 – 40, 50 (to 3.7) excluding KB2-405-3.7	
O-ring K220	At each disassembly and inspection	KB2 – 40, 50 (5.5 to) KB2 – 405 – 3.7	
O-ring K235	At each disassembly and inspection	KB2 – 65	
O-ring P65	At each disassembly and inspection	KB2 – 32, KB2 – 405 – 3.7 KB2 – 40 – 5.5	Casing × guide valve
O-ring P75	At each disassembly and inspection	KB2 – 50 (5.5 to)	
O-ring P80	At each disassembly and inspection	KB2 – 40, 50 (to 3.7)	
O-ring P90	At each disassembly and inspection	KB2 – 65	
Mechanical seal 16EA560-J	2 years	KB2 – 32 – 0.4	
Mechanical seal 20EA560-J	2 years	KB2 – 32 (0.75 to) KB2 – 40, 50, 65 (to 3.7)	
Mechanical seal 25EA560-J	2 years	KB2 – 40, 50, 65 (5.5 to)	
Ball bearings	3 years		Indicated on motor nameplate
Accumulator PTD3-1	5 years		Indicated on accumulator nameplate
Pressure sensor PSR	5 years		Indicated on the pressure sensor nameplate
Flow sensor	5 years		

### 6-7. 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 disassembled, repair or modify the motor and control panel. Failure to observe this will not only lead to trouble, but may also lead to electric shock or fires.  
Contact your dealer or the designated service center.

#### 1) Before disassembling

<Single operation>

- (1) Turn the main power OFF by setting the main switch on the control panel to “Stop”.
- (2) Tighten the sluice valve of the suction port.

<Alternative/Alternative& Parallel operation> (If Pump 1 is broken)

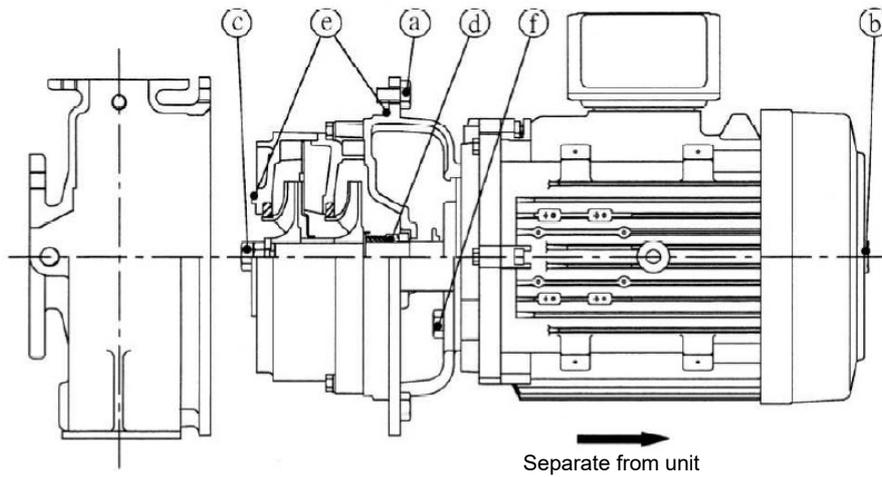
- (1) Turn the main power OFF by setting the main switch on the control panel to “Stop”.
- (2) Tighten the sluice valve of the suction port of Pump 1.
- (3) Remove the motor cable to Pump 1 from the control panel.
- (4) Turn the main power ON.
- (5) Set the selector switch to “2”, the main switch to “AUTO”. The water supply will go to Pump 2 only.

#### 2) Replacement of the mechanical seal: Refer to <Drawing 6-10>.

- (1) Remove the casing and the casing cover from the unit by removing the bolts (a).
- (2) Remove the protective cap (b) of the motor, remove the impeller nut (c) while securing the end of axis with pliers.
- (3) Remove the parts in sequence from the front side, and then remove the mechanical seal (d).
- (4) Install a new mechanical seal. It is easier to insert if wetting the circumference of the cushion rubber with water. When inserting the mechanical seal, be careful not to damage the sliding surface.
- (5) Assemble in the reverse sequence of disassembly.
- (6) Replace the O-ring (e) with a new one.
- (7) Check there is no contact by rotating the main axis after assembly.

#### 3) Replacement of the ball bearing: Refer to <Drawing 6-10>

- (1) Remove as far as the mechanical seal in the same way as for replacing the mechanical seal.
- (2) Remove the bolt (f) that secures the motor and bracket.
- (3) Remove the motor, and order a replacement ball bearing from specialist supplier.
- (4) Assemble in the reverse sequence to disassembly.
- (5) Replace the O-ring (e) with a new one.
- (6) Check there is contact by rotating the main axis after assembly.



<Drawing 6-10>

#### 4) Replacement of the accumulator

- (1) Close the sluice valve of 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 the open the sluice valve.

<Order replacement parts from your dealer>

#### 6-8 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.

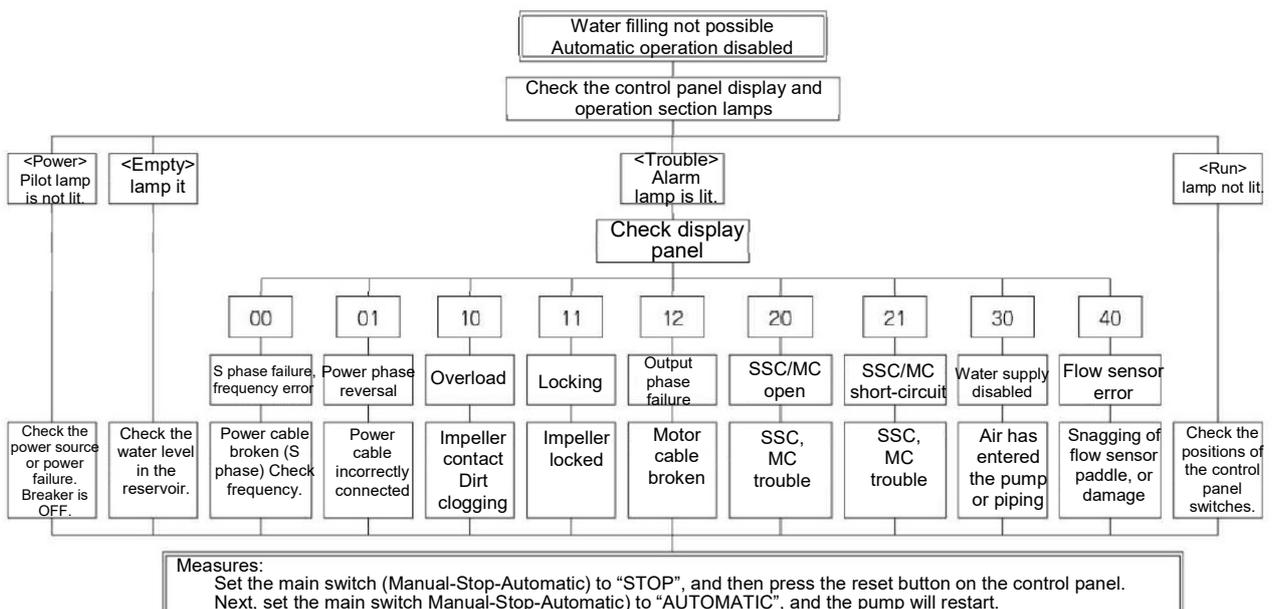
#### 1) List of trouble Display (Excluding independent operation models)

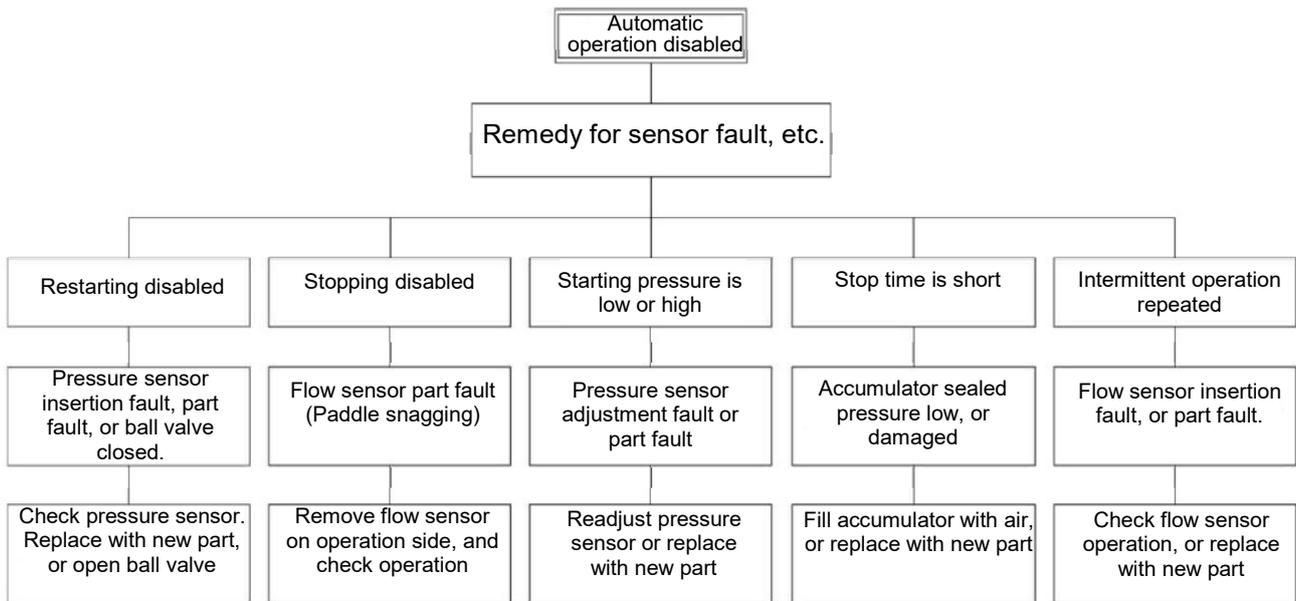
When trouble occurs, the trouble message will be digitally displayed on the control PCB's display panel.

Refer to <Drawing 6-10> 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)





\*1.The flow sensor is designed so that the pump will stop when the sensor is disconnected from the connector.

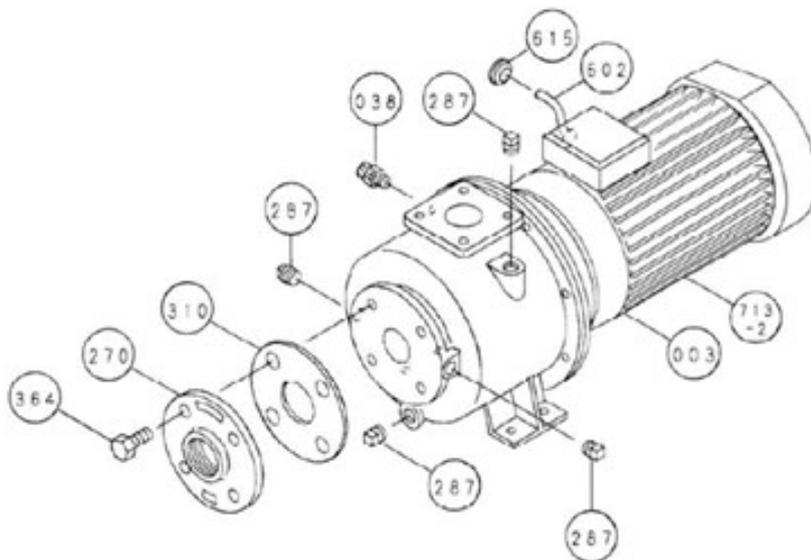
## 2) Troubleshooting Table.

Phenomenon	Cause	Measure
The power source pilot lamp does not light	The residual current circuit break 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 value
	The pump rotation direction is reversed.	Correctly connect
	The pump is not filled with water	Sufficiently prime the pump
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"
	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"
	The select switch is set to "1" or "2"	Set the select switch "1" or "2"
Parallel operation is not possible.	The main switch is set to "Manual"	Set the main switch to "Automatic"
	The select switch is set to "1" or "2"	Set the select switch "1" or "2"
	The pressure sensor pressure setting is too low	Adjust the set pressure
The stop time is short	The accumulator sluice valve is closed	Open the sluice valve
	The accumulator sealed gas pressure has dropped.	Replenish the air
	The accumulator is damaged	Replace the accumulator

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.

## 7. Examples of theseal drawing

• Unit



Pump

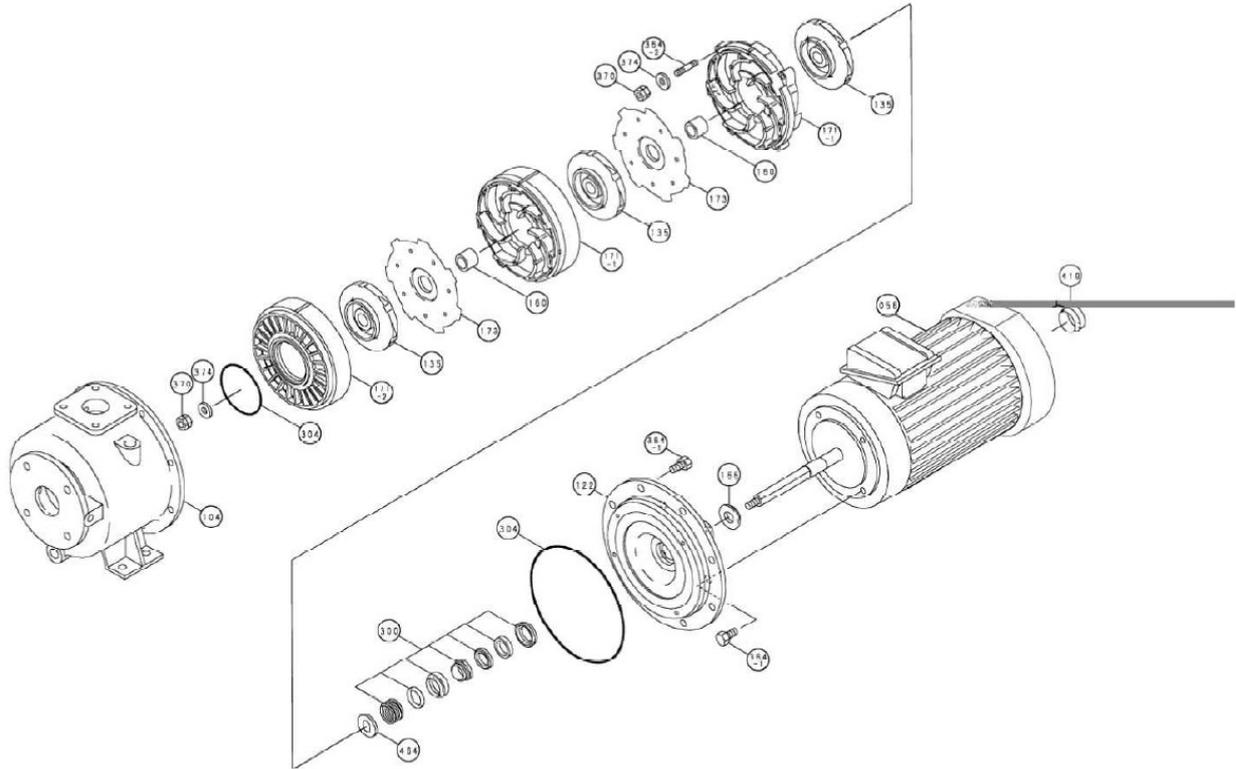
• Booster pump parts list

No.	Name	Material
003	Pump	-
012	Accumulator	-
023	Flexible Joint	SUS304
032	Check valve	SCS13
038	Exhaust valve	(C3604)
039-1	Ball valve	(C3604BD)
039-2	Ball valve	(C3771BE)
077	Control panel	Outdoor
263	Connecting bend	SCS13
269	Connecting pipe	SCS13
270	Flange	SCS13
281	Cheese	SCS13
287	Plug	SCS13
304	O-ring	Rubber
307	Ring packing	Rubber (EPDM)
310	Flange packing	Rubber (EPDM)
312	Square flange packing	Rubber (EPDM)
364	Bolt	SUS304
370	Nut	SUS304

No.	Name	Material
374-1	Plain washer	SUS304
374-2	Spring washer	SUS304
394	Band	Resin
397-1	Clamp	Resin
397-2	Clamp	Resin
404	Base	SPHC
420	Lid	Resin
460-1	Cushion	Rubber
460-2	Cushion	Steel + Rubber
491	Ring	SUS304
602	Code	(VCTF)
613-1	Marker tube	POM
613-2	Marker tube	POM
615	Code bush	Rubber (NR)
694-1	Flow sensor	-
694-2	Pressure sensor	-
700	Pressure gauge	-
713-1	Indication label	A1100P-H24
854	Nameplate	A1100P-H24



• Main pump

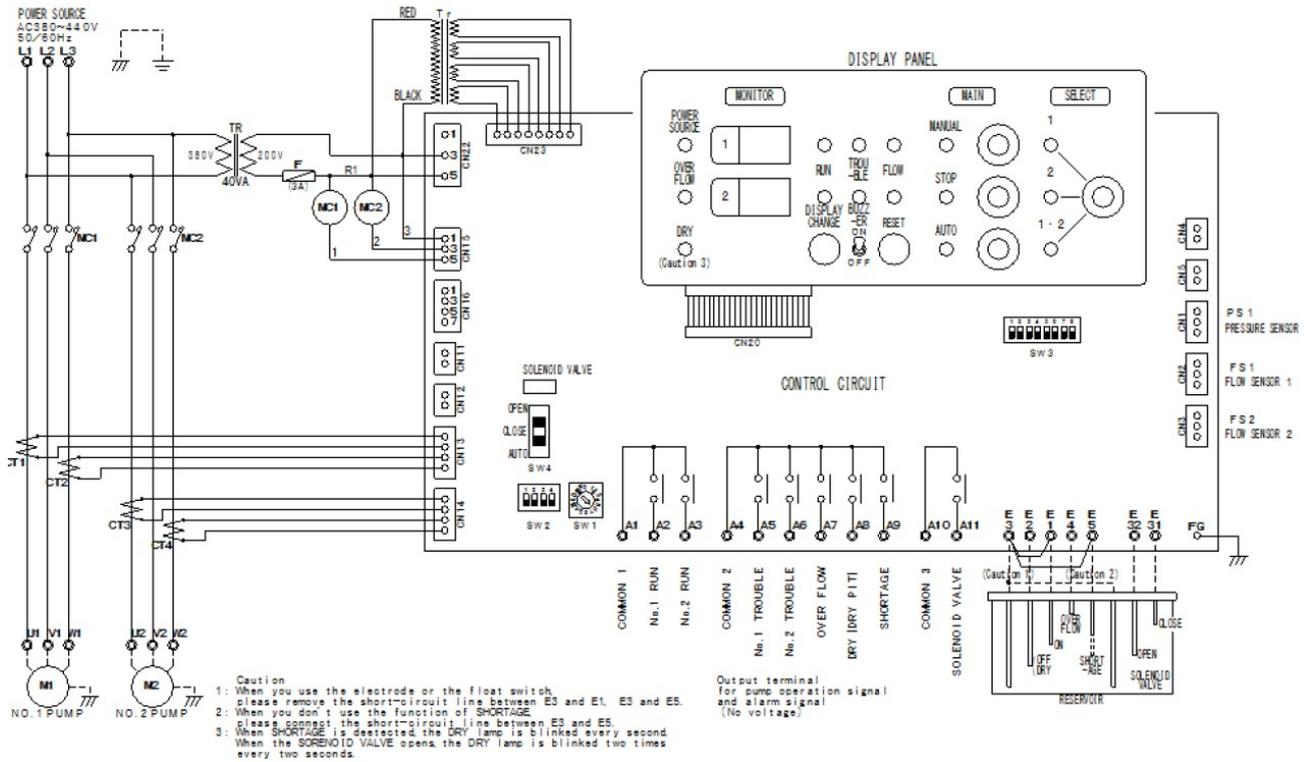


• Main pump parts list

No.	Name	Material	No.	Name	Material
056	Motor	-	173	Partition plate	SUS304
104	Casing	SCS13	300	Mechanical seal	Sic x Carbon
122	Casing cover	SCS13	304	O-ring	Rubber (NBR)
135	Impeller	SCS13, Resin CAC406(BC6)	364-1	Bolt	SUS304
			364-2	Double end stud bolt	SUS304
160	Sleeve	Bronze or SUS304	370	Nut	SUS304
166	Deflector	Rubber (NBR)	374	Plain washer	SUS304
171-1	Guide vane	Resin or Bronze	419	Protection cap	Rubber
171-2	Guide vane	Resin or Bronze	464	Spring receiver	SUS304

## 8. Control panel circuit diagram

Alternate / Alternate - paralell running ( 0.75kW - 7.5kW) 3PH380V



Alternate / Alternate - paralell running ( 0.75kW) 1PH220V

