

# DUAL PUMP

KP-21/22 Series

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## OPERATION MANUAL

**ATTENTION:**

Before using the pump, read this manual thoroughly for the correct operation procedure. After reading, be sure to store the manual in a safe place for future reference. The Warranty Certificate is attached to the back page of this manual.



## **CONTENTS**

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• INTRODUCTION.....	p.1
1. SAFETY PRECAUTIONS.....	p.2
2. LIST OF STANDARD ATTACHMENTS.....	p.3
3. NAMES AND FUNCTIONS.....	p.4
4. INSTALLATION.....	p.7
5. BASIC OPERATIONS.....	p.9
6. SPECIAL OPERATIONS.....	p.11
7. PRECAUTIONS IN HANDLING.....	p.14
8. MAINTENANCE.....	p.16
9. TROUBLESHOOTING.....	p.22
10. REPLACEMENT PARTS.....	p.24
11. SPECIFICATIONS.....	p.25
12. PRODUCT WARRANTY.....	p.26

## **INTRODUCTION**

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Thank you for purchasing our Dual Pump KP-21/22 series

This operation manual describes how to use Dual Pump KP series properly in order to prevent injuries and damages arising from operations and maintenance.

To ensure safety, read this manual thoroughly to understand the contents before installation, tubing and operation.

Every one of the following cautions must be understood by operators and implemented thoroughly.

Store this operation manual at a location that is readily accessible by operators.

The following items describe the matters to be observed for safety.

The safety precautions are ranked according to the classifications of **DANGER**, **WARNING** and **CAUTION**. The details are described in “Safety Precautions” in the following page, and the contents should be understood before using the pump.

Note that the following items are excluded from the scope of our liability.

- 1) Accidents caused by usage not described in this operation manual.
- 2) Accidents caused by using replacement parts other than the original parts (See the list of attachments).
- 3) Accidents caused by usage not specified in the contracted specifications.

Do not modify any part of the pump without manufacturer’s written statement of consent.

Be sure to follow the descriptions in this manual when performing maintenance and inspections.

Install your Dual Pump at a location other than those described in 7-2: Locations for Installation and Storage. Avoid installation to any other locations considered dangerous. Install the pump to a safe location to avoid possibilities of fire, injury and any unexpected disaster.

The Warranty Certificate is attached at the end of this manual. Handle it with care so as not to lose it. If this operation manual is lost, contact us with information including the model number, serial number and the date of purchase (include the detail about customization if any), and a new operation manual will be issued. However, some of the warranty contents may become void, so be sure to store this manual in a safe place.

## 1 SAFETY PRECAUTIONS

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Prior to use (installation, operation, maintenance and inspection), read this operation manual carefully to understand proper use of Dual Pump KP-21/22 series.

Understand all the detail on the operation, safety and precautions concerning the pump before operation.

Carefully store the operation manual at a location readily accessible by the operators.

< Definitions of the safety precaution marks >

Pay attention to the mark : that you find throughout this manual.

- : mark: This mark is shown when attention is needed before pump operation.  
The word put beside this mark, **DANGER**, **WARNING**, or **CAUTION**, gives the reason why precaution is required. These are important safety matters that must be observed.

The degree of hazard and damage that may be caused is explained by the classification as follows:

: **DANGER** : This mark indicates “an imminently hazardous situation which, if not avoided, is likely to result in death or serious personal injury.”

: **WARNING** : This mark indicates “a potentially hazardous situation which, if not avoided, could result in death or serious personal injury.”

: **CAUTION** : This mark indicates “a potentially hazardous situation which, if not avoided, could result in minor or moderate personal injury, or property damage only.”

## 2 LIST OF STANDARD ATTACHMENTS

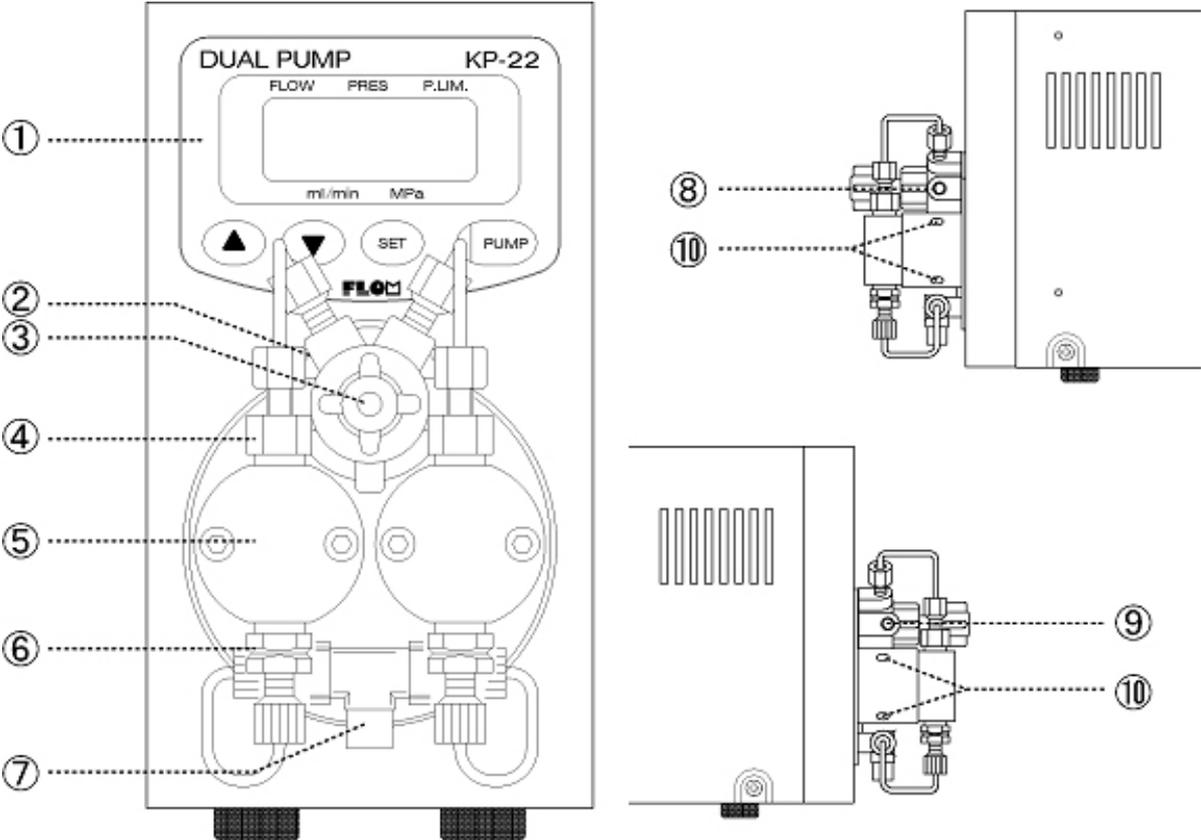
Check upon opening the package that the following attachments are enclosed.

\*NOTE : Contact your distributor if any of the attachment is missing or damaged.  
 Troubles caused by connecting non-genuine parts are excluded from the scope of the warranty and liability.

Product name	Description	Qty	Note
Power cable	7 A 1 2 5 V	1	
3P connector	1 5 A 1 2 5 V	1	
Fuse	1 A	2	
Wrench	8 × 1 0	1	
Hex wrench	2 . 5 mm	1	
PEEK tube	KP-2x-01 : 1/16 × 0.25 × 1m KP-2x-13 : 1/16 × 0.50 × 1m KP-2x-33 : 1/16 × 0.75 × 1m	1	
Easy Fitt 10mm	# 9 0 0 1	2	
Stop Fitt	# 9 0 0 4	1	
Suction needle		1	
Teflon tube	3 × 2 × 1 m	1	2 for Semi-prep pump
Suction filter	P.P 製 # 8 8 0 0	1	2 for semi-prep pump
<b>For KP-21-01, KP-22-01, KP-21-13 and KP-22-13</b>			
Tee joint	# 9 1 0 8	1	Attached to pump
ETFE tube		1	Attached to pump
Tee holder		1	Attached to pump
Flat Seal Fitt	# 9 7 1 1	1	
Flat Seal Ferrule	# 9 7 0 1	1	
<b>KP-21-33, KP-22-33</b>			
Double-lock fitting	# 9 3 0 5	2	
Double-lock ferrule	# 9 4 0 5	2	

### 3 NAMES AND FUNCTIONS

#### 3 - 1 < Name and Function of Front Panel Parts >



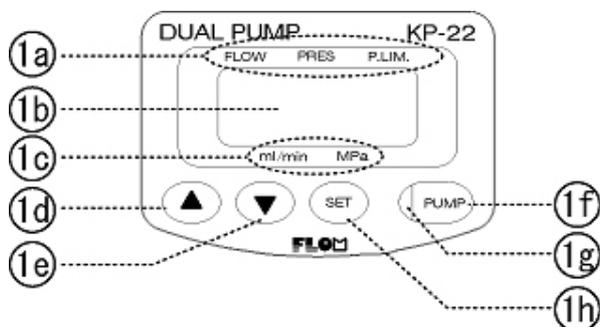
### **3 NAMES AND FUNCTIONS**

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	Name	Function
<b>Functions for KP-24</b>		
1	LCD Display Panel	Displays preset flow rate, current pressure, upper pressure limit.
2	Drain Valve (Pressure Sensor Holder)	Left connecting port is connected to liquid flow system, and right connecting port to draining system. Pressure sensor is mounted inside.
3	Drain Valve Opening/Closing Plug	Turning the plug clockwise will open the outlet port of Drain Valve and close the drain port. Turning counter-clockwise will open the drain port and close the outlet port.
4	Check Valve (Outlet)	
5	Pump Head	
6	Check Valve (Inlet)	
7	Inlet Port	Connects to inlet tube.
8	Outlet Port	Connects to column.
9.	Drain Port	See “3 Drain Valve Opening/Closing Plug” above.
10	Cleaning Port	To be connected to 2 x $\phi 3$ Teflon tube or silicon tube for backwashing plunger.

### 3 NAMES AND FUNCTIONS

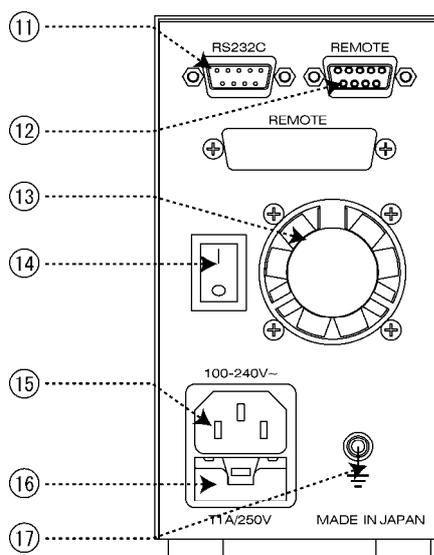
#### 3 - 3 < Name and Function of LCD Display >



	Name	Function
1a	Display Indicator	A bar underlines either FLOW, PRES, or P.LIM. to indicate what is shown on display.
1b	LCD Display	Displays flow rate, flow pressure, preset pressure upper limit.
1c	Units Indicator	A bar indicates the unit standard shown on display.
1d	UP Key	The number on display increases its value.
1e	DOWN Key	The number on display decreases its value.
1f	Pump START	Activates/Deactivates Pump
1g	Pump LED	Blue LED is lit when pump is activated. Red LED is lit in case of error.
1h	SET Key	Changes LCD display items. (Flow Rate Pressure Pressure Upper Limit)

#### 3 - 4 < Name and Function of Rear Panel Parts >

	Name	Function
11	RS232C terminal	
12	Remote terminal	D-SUB 9 pin
13	Cooling fan	
14	Power switch	
15	AC Inlet	
16	Fuse Holder	2A x2
17	Ground Terminal	For connecting grounding wire.



## 4 INSTALLATION

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### 4 - 1 < Attachments >

Upon opening the package, check to see that all the attachments are enclosed. (See “2. List of Standard Attachments”)

\*NOTE : Contact your distributor if you find a missing or damaged attachment.  
Troubles caused by connecting a non-genuine part are excluded from the scope of our warranty and liability.

### 4 - 2 < WIRING >

#### **! WARNING**

Hold the plug of the power cable and insert it to a receptacle.  
Do not touch with wet hands. It may cause an electric shock.

#### **! CAUTION**

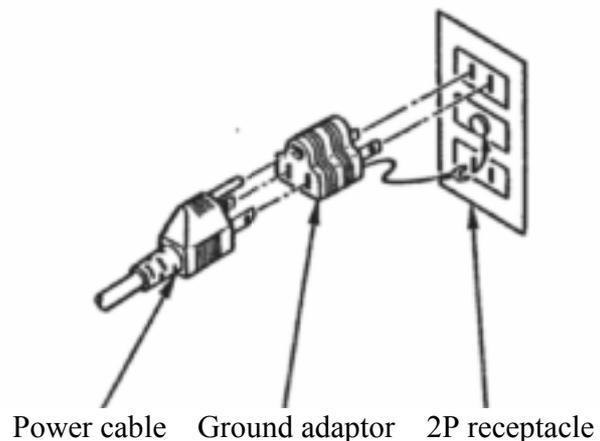
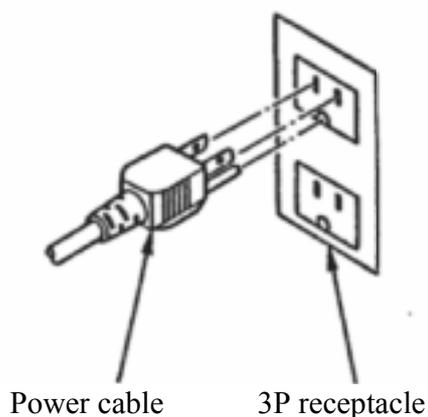
If a large piece of equipment that may deliver a voltage shock to this equipment is installed in the same power supply system, secure a separate power source.

Connect the attached power cable to the AC inlet at the back of the pump and insert the cable to an indoor receptacle.

The power source rating is AC100V-240V and the power source frequencies of both 50/60Hz are acceptable.

The power cable enclosed as attachment to the product is of 3-lead grounding type.

For 2P type receptacles, use a conversion adaptor for 2P provided and ensure to ground as shown in the figure below.



## 4 INSTALLATION

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### 4 - 3 < Inlet Tubing >

Connect the attached Teflon tube to the inlet check valve.  
Make sure to connect solvent filter at the other end of the tube  
Utilization of degasser is strongly recommended.

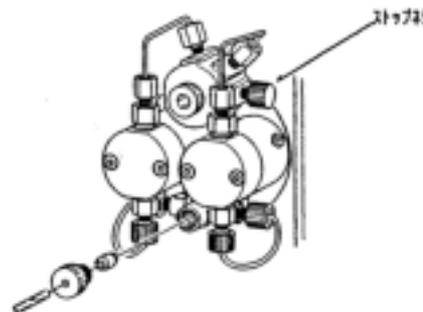


Fig.4-3: Suction Tube Tubing

### 4 - 4 < Removing Air >

Connect the attached suction needle to the drain port. Turn the plug counter-clockwise to open the drain valve. Remove air in the pump head by drawing the solvent in with the syringe connected to the suction needle. Set the flow rate at approximately 1ml/min and activate the pump to adequately draw in the solvent.

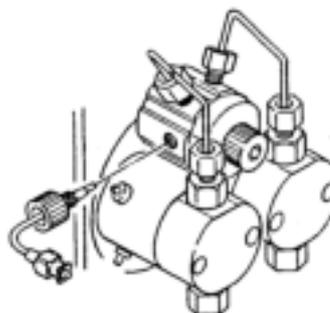


Fig. 4-4: Removing Air

### 4 - 5 < Outlet Tubing >

With the pump OFF, connect the tube from Outlet Port to the next system component. Make sure to close the drain valve.

## 5 BASIC OPERATIONS

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When you are not sure about the position of a key, refer to “3. Names and Functions” before proceeding. Numbers in the parenthesis in the following correspond to the number given to each part in “3. Names and Functions.”

### 5-1 < Changing the Display >

Pressing SET Key (1h) will change the panel display: Flow Rate Display  
Pressure Display      Pressure Upper Limit Display along with underline in turn of the three values (1a) on the upper side of the panel.

### 5-2 <Flow Rate Setting>

Confirm that FLOW is underlined.

Set a flow rate with UP/DOWN Keys(1d)(1e).

Continuous key-pressing will allow the values on the display to change rapidly.

After setting flow rate, press PUMP Key (1f) to start pump operation.

Flow rate may be changed while the pump is on.

### 5-3 <Pressure Monitoring>

Confirm that PRES(1a) is underlined.

LCD panel displays current pressure in Mega Pascal (MPa).

### 5-4 <Pressure Upper Limit Setting>

Confirm that P. LIM LED (1a) is underlined.

Set a pressure upper limit with UP/DOWN Keys (1d)(1e).

Pressure upper limit value is changeable while the pump is in operation. When the pressure exceeds the preset value of pressure upper limit, pump operation will stop with a buzzer sound with error message “Er 1” indicated on the display panel. Then, press any key to restore operation, and set the pressure upper limit again.

### 5-5 <Dosing: Measured Flow Mode>

Outline: This is a mode in which the solvent volume is preset. The flow automatically stops when the preset volume is reached.

\* NOTE: To operate in measured flow mode, change the flow mode in accordance with “6-5: Flow Mode Selection.”

Keep pressing the SET Key (1h) will add display parameter where both FLOW (1a) and PRES (1a) are underlined after display of pressure upper limit. Then, set the value of measured flow by means of UP/DOWN Keys (1d)(1e). Any value may be set for flow rate preset value.

Pressing the PUMP Key (1f) will commence the flow, and when the preset value is dispensed from outlet or draw in from inlet, the pump will automatically stop. The maximum set value is 1000mL.

## **5 BASIC OPERATIONS**

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### 5-6 <Set Pressure Flow>

Outline: This is a mode in which the flow pressure is preset. The pressure automatically stabilizes when the preset pressure is reached.

\* NOTE: To operate in set pressure flow mode, change the flow mode in accordance with “6-5: Flow Mode Selection.”

P.LIM is the indicator for this mode. Use UP/DOWN Keys (1d)(1e) to set the pressure and pressing the PUMP Key (1f) will commence the flow. When the preset pressure is reached, the flow is automatically adjusted to maintain the pressure. Pressing the PUMP Key (1f) again will stop the pump.

Caution:

- 1) The flow rate cannot be adjusted during this operation. The pump will automatically adjust the flow rate to maintain the set flow pressure.
- 2) The pump will buzz when the maximum flow rate fails to bring the set flow pressure.

## 6 SPECIAL OPERATIONS

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Special operations provide various pump settings including the following:

- Pulse reduction
- Flow rate calibration
- Pressure loss correction
- Flow mode selection
- Auto pressure zero reset

### 6-1 <User Parameters>

All the five functions above are to be set in user parameter mode. Turn power ON while pressing down SET Key (1h) to switch to user parameter input mode.

In the user parameter input mode, PUMP LED will be lit and display **1: 1** in blinking. The figure at the left represents the function item, while the right figure shows preset value. Press SET Key (1h) to change the function and press UP/DOWN Keys (1d)(1e) to change the value. Enter any value to the function desired, and press PUMP Key (1f) to fix the value. You can end the user parameter mode by pressing SET Key repeatedly until End appears on display and then press PUMP Key (1f).

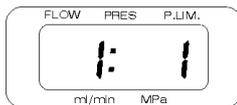
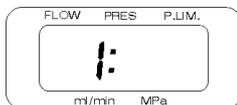


Fig. 6-1 User Parameter

### 6-2 <Pulse Reduction Input>

Enter user parameter input mode to make the selection. (See “6-1 User Parameters”)



The function item “1” in the left is the parameter to set pulse reduction.

At this time, enter any value using UP/DOWN Keys (1d)(1e) on the right side referring to the following. Press PUMP Key (1f) to confirm the value.

List of Pulse Reduction Value  
Active (Pulse reduction on)  
Inactive (Pulse reduction off)

## 6 SPECIAL OPERATIONS

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### 6-3 <Flow Rate Calibration Input>

Enter user parameter input mode to set the parameter. (See 6-1: User Parameters)



The function item “2” in the left is the parameter to set flow rate calibration.

At this time, input correction value in increments of 0.1% on the right side using UP/DOWN Keys (1d)(1e). Press PUMP Key (1f) to fix the preset value.

(Example) To input a correction value of +1.2%



As shown on the left, input 12 and fix the value.

(Example) To input a correction value of -0.5%



Input the value in the same manner as the above. You will not see a display of “-” (negative sign) at this time, but can confirm it by pressing either of the UP/DOWN Keys (1d)(1e) continuously. Make sure to check it before final setting.

### 6-4 <Pressure Loss Correction Value Input>

Enter user parameter input mode to set a parameter. (See “6-1: User Parameters”)



The function item “3” in the left is the parameter to set pressure loss correction value.

Input a correction value in increments of 0.1%/1MPa using UP/DOWN Keys (1d)(1e). Press PUMP Key (1f) to fix the value.

(Example) Correction input in the case of 12.5% loss caused at 10MPa



As the loss rate per 1MPa is 1.25%, the correction value is made to 1.3% by rounding the second decimal place. Input the figure without decimal point “13”.

## 6 SPECIAL OPERATIONS

### 6-5 <Flow Mode Selection>

Enter user parameter input mode to make the selection. (See “6-1 User Parameters”)



The function item “5” in the left is the parameter to set flow input mode.

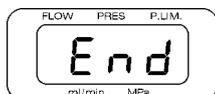
At this time, enter any value using UP/DOWN Keys (1d)(1e) on the right side referring to the following. Press PUMP Key (1f) to confirm the value.

#### List of Flow Modes

Normal flow mode  
Set pressure flow mode  
Measured flow mode

### 6-6 <Auto Pressure Zero Reset>

Enter user parameter input mode to set the parameter. (See 6-1: User Parameters)



The function item “End” is the parameter to reset pressure value.

Open the drain valve by turning the plug counter-clockwise (3). By pressing PUMP Key (1f), the pressure value is reset to zero automatically.

### 6-7 <Other Parameters>

Item NO.	Description	Value	Note
7	Motor speed	-10 ~ +10	Default = 0
8	Lower pressure limit sensitivity	1 ~ 999 sec	Default = 0
9	Stop bit (RS232C)	1 = 1 bit 2 = 2 bit	Default = 2 bit
11	Lower pressure limit set value	0 ~ 349 (x0.1MPa)	Default = 0
12	Error signal output (RS232C)	0 = Error signal out 1 = No error signal	Default = 1

## 7 PRECAUTIONS IN HANDLING

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### 7-1 <Precautions for Use>

#### ! WARNING

: The following items are WARNINGS that must be adhered to.

Do not apply organic solvents or aqueous solutions to the panel cover. If applied by mistake, turn off the power, pull out the plug from the receptacle, and quickly wipe the liquid off the cover. Avoid starting up the equipment until it is completely clean and dry. Fire, electric leakage, electric shock or equipment failure may be caused if wet or any dried substance remains. Consult with your distributor if the equipment has been wetted.

Do not insert foreign objects or metal pieces through ventilation slits of the cover into the pump mechanics. Electric leakage, electric shock, equipment failure or physical injury may result.

If the pump inside mechanics requires repair, avoid repairing or disassembling. Fire, electric shock or physical injury may result. Consult with your distributor for repair.

To replace seals in the pump head or the head guide, turn OFF power on the rear panel and pull out the power plug from the AC inlet. Avoid pulling and inserting the plug with wet hands. Do not disassemble the pump head for reasons other than seal replacement. Electric shock or physical injury may result. The seal replacement should be performed by following the procedure described in "8: Maintenance."

#### ! CAUTION

: The following items are CAUTIONS that must be adhered to.

This equipment cannot be used with power supply except AC100V-240V(50Hz/60Hz). Any other power supply may cause fire, electric shock or equipment failure.

When an abnormality is detected, immediately stop the operation, and contact us with description of the abnormality observed. Continuous usage of the equipment may result in fire, electric shock or physical injury.

Avoid improper handling of power cable such as forced flexing, processing, pinching, knotting, binding, or laying under heavy object. Fire, heating or electric shock may be caused.

Avoid covering ventilating port on the cover and exhausting port on the rear panel. Fire, heating and equipment failure may be caused.

It is not necessary to firmly tighten PEEK checkvalves connected to the discharge side of the pump head and to the drain valve. The tightened angle of the checkvalves (the point where no more tightening is necessary) is the point reached by tightening 60° to 90° more by a wrench, from the point where the checkvalves are hand tightened. Be careful to avoid excessive tightening. It may result in equipment failure.

When a buffer is used, back-flush the plunger with distilled water from the cleaning ports and replace the cleaning solution at least once a week. The back-flushing will prevent salt crystallization, which causes leakage by damaging plunger and plunger seal. See "8: Maintenance" for details. (The optional cleaning kit is available.)

## **7 PRECAUTIONS IN HANDLING**

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### 7-2 <Locations for Installation and Storage>

**DANGER** : The following contents are DANGER that must definitely be adhered to .

This pump is not made to explosion-proof specifications. Do not use the pump in an explosive atmosphere. Death, physical injury or fire may be caused.

Despite the light weight and the compact design of the pump, it must not be placed anywhere higher than operator's height, where it can fall off. Death or physical injury and pump failure may be caused.

The pump must be placed securely and evenly. Any structure where the pump is placed must be robust enough in strength to support the weight of the pump. Never put the pump on a slippery surface.

The tubes from the pump must be placed carefully, so nothing will catch the loose end of them and result in damage to the pump or physical injury.

**CAUTION** : The following describes places that are not suitable for installing the pump. Avoid the following to prevent electric leakage and equipment failure from happening.

Outdoor use and storage.

Use and storage within the vicinity of corrosive gas.

Use in the vicinity of high-frequency generators. Strong electromagnetic wave may affect CPU and cause its erroneous actuation.

Use at a location without physical stability.

Installation at a location under direct sunlight or in the vicinity of a heater

Use or storage at a location with high humidity

Use or storage at an extreme temperature. Use and storage at room temperature is a precondition - ambient temperature at 4-45°C. No dew condensation is allowed.

If the pump is not likely to be used for a long period of time, displace substance in the interior space of the head and the cleaning port with distilled water or alcohol. Especially after use of a buffer solution, remember to back-flush the plungers with distilled water.

\*NOTE: Place solvent bottles at the same level as the pump or higher.

## 8 MAINTENANCE

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### 8-1 <Cleaning of Plunger>

**CAUTION**

: Make sure to strictly observe the following to prevent failure of the driving unit.

Use of a buffer solution for elution may generate crystallized salt that may scratch plunger and/or significantly wear off the seal. Inject distilled water with a syringe after connecting silicon tube to the upper portion of the cleaning port on the head (See “3. Names and Functions”) and clean the plunger to prevent salt precipitation.

The cleaning mechanism is not automatic. Replace with new distilled water once in three days to once a week.

An optional silicon tube kit for cleaning is available. But any tube you may have can also be used for connection. Use OD3.0mm x ID2.0mm tube.

The illustration below shows the method of tubing on the cleaning side. Distilled water injecting port is connected to the top. Set the opposite side to a beaker etc. for waste water.

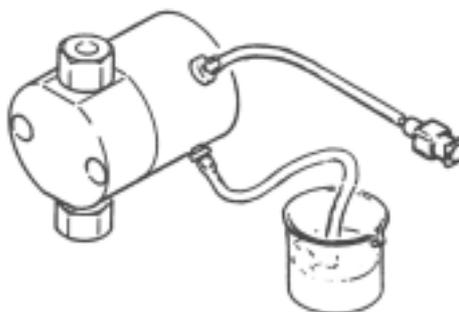


Fig. 8-1 Plunger Cleaning

### 8-2 <Replacement of Plunger Seal>

Plunger seals are expendable parts. Replace them periodically.

Normally, only the plunger seal inserted inside the pump head is to be replaced.

When the cleaning port is used, replace the plunger seal of the pump head guide as well.

Follow the procedure below.

Remove the tubing of the check valves for suction and discharge.

Remove the pump head fixing screw using the hex L wrench, 2.5mm.

Pull out pump head.

Take out the worn-out seal from the pump head.

After applying a stopper to the discharge-side checkvalve of the head, attach a suction needle to the suction-side checkvalve, and fill water in with a syringe until it overflows the head.

## **8 MAINTENANCE**

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Take an optional seal-insertion tool and fully insert its round rod end that is longer than the other end (i.e. end that is not tiered) .

The seal will come up due to inner pressure. Repeat insertion with additional water and the seal stuck to the tool may be removed. If the O-ring remains inside, make sure to remove it. See the illustration below (Method of Seal Removal).

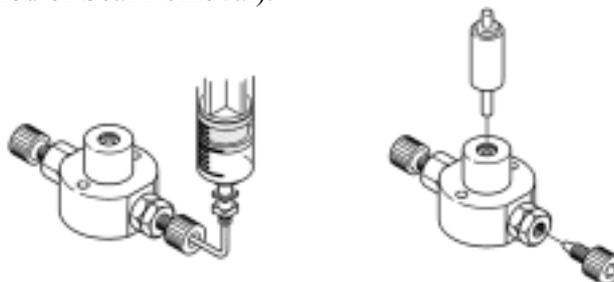


Fig. 8-2 Method of Seal Removal

Insert a seal into the head. Take the optional seal-insertion tool and set a new seal to its tiered end seeing to it that an O-ring is placed on the outer side. Make sure that the seal is attached to the O-ring, since it will be damaged if inserted separately. Insert the tool together with the O-ring and seal into the head slowly in a circular motion. Note that hasty insertion will damage the O-ring and cause liquid leakage. Press the seal-insertion tool until it is leveled with the pump head, then pull out the tool and set the pump head to the body to complete seal insertion. See the illustration below (Method of Seal Insertion).

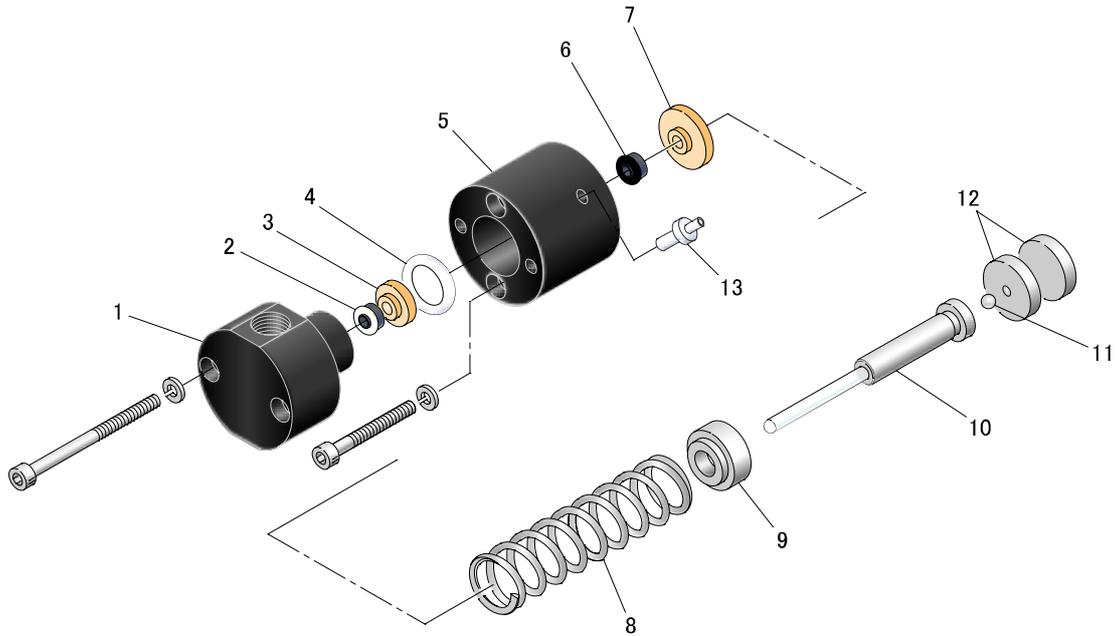


Fig. 8-3 Method of Seal Insertion

Attach the head to the body and tighten the fixing screw to set the tubing, which completes seal replacement. The following illustration shows the parts composing the driving unit.

## 8 MAINTENANCE

### Driving Unit



Index No.	P/N	Product Name	Description
1	2200	3.2 $\phi$ Pump head	PEEK
2	2204	3.2 $\phi$ Plunger seal	Chemraz, PTFE
3	2214	3.2 $\phi$ Backup ring	PEEK
4	2222	O-ring	PTFE
5	2210	3.2 $\phi$ Head guide	PPS
6	2205	3.2 $\phi$ Plunger seal	PP, Byton
7	2216	3.2 $\phi$ Plunger guide	PEEK
8	2223	Spring	Stainless steel, 3.2 $\phi$
9	2218	3.2 $\phi$ Plunger adapter	Stainless steel
10	2220	3.2 $\phi$ Plunger	Sapphire, stainless steel
11	2225	Stainless steel ball	stainless steel
12	2224	Spacer	Stainless steel
13	2304	Cleaning port joint	PTEFE

## **8 MAINTENANCE**

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### 8-3 <Method to Clean Check Valve>

Most of flow troubles are caused by malfunctioning check valves, caused by gas bubbles, foreign matters accumulated between the ball and the valve seat, or when the ball dries up and sticks to the valve seat. See “4-4: Procedure to Remove Air” when poor operation is caused by gas bubbles. If the flow is not restored after removing bubbles, filth or foreign matter is suspected between the ball and the valve seat. Clean them following the procedure below.

Remove the tubing from the check valves.

Remove the checkvalves from the pump head.

Place the check valves in a beaker. Fill the beaker with alcohol or distilled water (Use distilled water when buffer solution served as mobile phase), to clean the check valves by supersonic cleaning for approximately 10 to 20 minutes.

After cleaning, attach the checkvalves to the pump head. Be careful not to mix up the suction checkvalve and the discharge checkvalve. Make sure to put them back where they are supposed to be. Then finger-tighten the checkvalves firmly to the pump head before tightening another 60-90 degree by using a wrench.

\* NOTE: Excessive tightening with spanner WILL cause damage. NEVER over-tighten.

Install the tube for both the suction and the discharge checkvalves.

Finger-tighten the tubing on the discharge side firmly as you did with the checkvalves and tighten another 60-90 degree.

\* NOTE: Excessive tightening with spanner WILL cause damage. NEVER over-tighten.

After the tubing is complete, remove air by drawing solvent in. See “4-4 Procedures to Remove Air.”

In most cases, this procedure cleans the checkvalves sufficiently to end checkvalve malfunctions. However, if the problem persists, disassemble the checkvalves for thorough cleaning.

To disassemble a checkvalve, first take out the checkvalve in question and insert the attached Stop Fitt into the joint turning it with your fingers. This will gradually move the interior out from the valve cartridge.

### <Check Points for Assembling>

The mirror side of the valve seat is to face the ball. (Light reflection will make identification easy.)

Use forceps for setting the ball and the valve seat in the valve seat housing.

Make sure to place seal A that is thinner than seal B to the center of the valve cartridge.

## **8 MAINTENANCE**

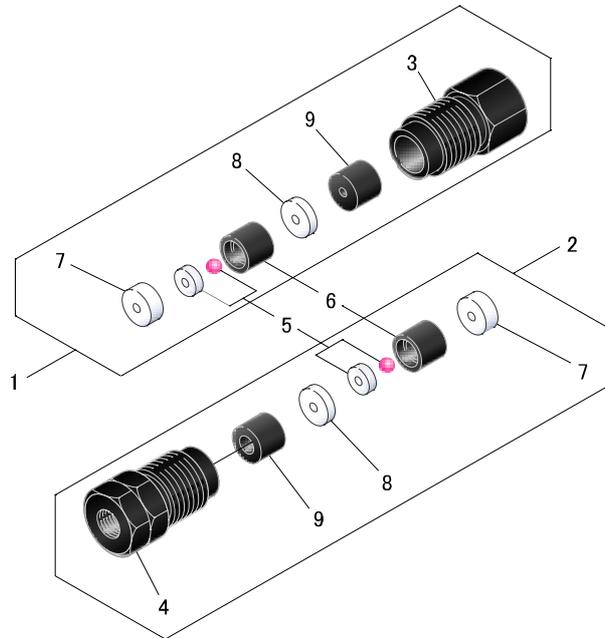
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Insert the valve housing that was set in      into the cartridge as shown in the illustration. Note that the orientation of the valve seats on the suction side and the discharge side are different from each other.

Press Seal B evenly. (Seal B is an expendable item. Use of a new seal is recommended.)

## 8 MAINTENANCE

### Checkvalves



Index No.	P/N	Product Name	Description
1	2105	1/16 Checkvalve Assy (out)	PEEK(10-32UNF)
2	2106	1/16 Checkvalve Assy (in)	PEEK(10-32UNF)
3	2115	1/16 Checkvalve Cartridge (out)	PEEK(10-32UNF)
4	2116	1/16 Checkvalve Cartridge (in)	PEEK(10-32UNF)
5	2008	Ball and Seat	Rubby, Sapphire
6	2009	Ball Case	PEEK
7	2007	Seal B	PCTFE(2.0mm)
8	2006	Seal A	PCTFE(1.5mm)
9	2005	Tapered Spacer	PEEK

## 9 TROUBLESHOOTING

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### <Error Displays and Countermeasures>

Er 1	Upper pressure limit error
Flow pressure is higher than the preset upper limit value.	
Check outlet tubes and the column for clogging.	
Er 2	Lower pressure limit error
Flow pressure is lower than the preset lower limit value.	
Check outlet tubes and the column for leaking.	
Check solvent level in the reservoir.	
Er 6	Overheat
Motor and/or motor driver is overheated.	
Check if sufficient space is secured at the side ventilation slits and the cooling fan in the rear panel.	
Er 7	Motor Rotation Error
The motor torque is exceeded by excess load.	
Check the checkvalves for air bubble – remove bubbles with syringe. See 4-4 <Removing Air> for detailed instruction.	
Check the checkvalves for accumulated substance – disassemble and wash the checkvalves in ultra sonic bath.	
If Error 7 occurs within 1-2 seconds after starting the pump, the internal sensor may have been damaged. Please ask for a service visit.	
No power	
Check the socket, power line, and breaker.	
Check the fuse inside the pump.	
Check the voltage.	
Abnormal noise	
Check to see if the tubes and other parts are not in contact with the pump casing.	
Keep sufficient distance (at least 2cm) from the pump casing and other instruments.	
Unstable flow volume	
Check the checkvalves for air, leakage, and substance accumulation.	
Check the power voltage to see if the enough voltage is being supplied.	
Abnormal odor	
Turn off the power switch immediately and ask for a service visit.	

## 9 TROUBLESHOOTING

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### <Other Troubles and Countermeasures>

Power supply does not turn on.
Check main power supply (breakers), and receptacles/socket. Check fuses. Check AC voltage. (Acceptable range for use AC100-240V) Supplying voltage over AC 250V will damage power supply switching, requiring a service visit.
Abnormal noise is heard.
Check if the pump head is in contact with the front panel. Allow sufficient length of tubing from the liquid flow system port to the column. Check if the pump is in contact with other equipment. Air inlet port is located on the side. Allow a space of more than 2cm on the side. Check if tubing is in contact with the blower fan at the rear panel.
Abnormal odor is smelled.
Ask for a service visit immediately after turning the power OFF. Advise service personnel the detail of the problem.
Flow rate is not stabilized.
Check the AC voltage. (Acceptable range for use: AC 100-240V) Voltage lower than AC 90V will result in insufficient motor torque inhibiting proper functions. Check if air remains in the pump head. See “4-4 Procedure to Remove Air” and remove air from inside the pump head. If plunger seal is worn out, see “8-2 Replacement of Plunger Seal” to replace it. Poor operation of check valve causes irregular flow. If this is the case, see “8-3 Method to Clean Check Valve” to perform supersonic cleaning and cleaning after disassembly.

## **10 REPLACEMENT PARTS**

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<Replacement Parts / Optional Parts>

P/N	Name	Grade	Qty.
#2315	Cleaning kit	Silicon	1 set
#2492	Pump ON/OFF Remote connector	D-SUB 9-pin connector	1
#2105	1/16 check valve ASSY (discharge)	No. 10-32UNF, PEEK	1
#2106	1/16 check valve ASSY (suction)	No. 10-32UNF, PEEK	1
#2204	Plunger seal	3.2φ inorganic specification	1
#2206	Plunger seal	3.2φ solvent containing salt spec.	1
#2227	Plunger seal	3.2φ organic specification	1
#2205	Cleaning seal	3.2φ	1
#2209	Seal insert tool	Teflon 3.2φ	1
#2220	Plunger	Sapphire 3.2φ	1

## 11 SPECIFICATIONS

<b>Product name</b>	<b>Dual Pump</b>		
Product number	KP-21-01/KP-22-01	KP-21-13/KP-22-13	KP-21-33/KP-22-33
Max. pressure	PEEK: 20MPa SS: 25MPa	PEEK: 20MPa SS: 25MPa	PEEK: 5MPa SS: 5MPa
Flow rates	0.001 ~ 1.0mL/min	0.01 ~ 10.0mL/min	0.1 ~ 50.00 mL/min
Flow volume per stroke	4uL	32uL	154uL
Flow volume accuracy	±0.3%		
Pressure display accuracy	±5%		
Wetted Materials	PEEK version: PEEK, Sapphire, Ruby, PTFE, PCTFE SS version: SS, Sapphire, Ruby, PTFE, PCTFE		
Standard features	Flow volume calibration, dispensing mode		
Extra features KP-22 series only	Flow pressure reset, stable pressure flow mode, programmed pulse reduction, upper pressure limiter (Manual input from front panel and RS232C), lower pressure limit (thru RS232C only)		
Remote input	Input: Pump on/off Output: Error		
Communication port	RS232C		
Dimensions	144mm(H) x 79mm(W) x 285mm(D)		
Weight (kg)	Approximately 3.4 ~ 4.3kg		

\*Maximum discharge pressure (MPa) is a maximum instantaneous pressure and does not mean a constant maximum discharge pressure at the setting of maximum flow rate.

## 12 PRODUCT WARRANTY

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### WARRANTY CERTIFICATE

Thank you for purchasing Dual Pump KP-21/22 series.  
FLOM Corporation provides this equipment with one-year product warranty.  
Should a failure occur to the product within the warranty period and is covered by the warranty, we will repair or replace parts free of charge, provided, however, that the failures due to the following causes and the like will not be covered by our warranty.

- 1) Failure caused by not adhering to the instructions given In “7: Precautions in Handling” of this operation manual.
- 2) Failure caused by improper use.
- 3) Failure caused by repair or remodeling not performed by us.
- 4) Failure caused by earthquake, disaster, or natural calamity.
- 5) Failure caused by a cause attributable to equipment other than this equipment.
- 6) Failure caused by using the equipment in a severe environment involving high temperature, high humidity, extremely low temperature, or corrosive gas, or at a regularly vibrating location.
- 7) Replacement of expendable parts, or parts corresponding to this classification.

- Ensure to fill out the following items. Failure to provide the information will result in exclusion of your equipment from our warranty.

Model Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Date Delivered: \_\_\_\_\_

Distributor: \_\_\_\_\_



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