

## Solenoid-driven Diaphragm Metering Pump

# SP/SA/ST Series

## INSTALLATION, OPERATION AND MAINTENANCE MANUAL

**Before beginning operation, read this manual carefully!  
Ignoring the instructions in this IOM MANUAL and mishandling  
the unit may result in death or injury, or cause physical damage.**

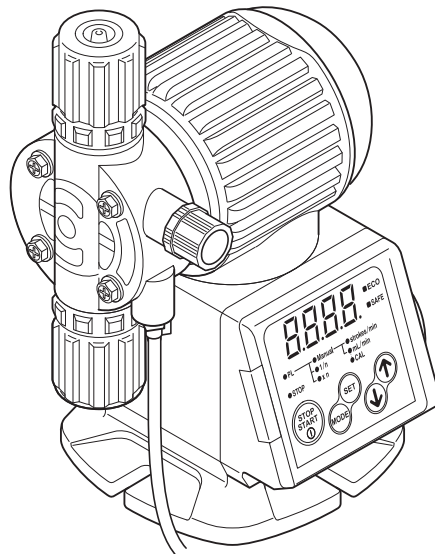


Illustration of SM-03R

- Thank you for purchasing this Wanner Engineering product. Please read this IOM MANUAL carefully in order to ensure safety precaution awareness and to maximize equipment performance.
- Keep this IOM MANUAL in a designated place available for frequent reference.
- If the product purchased conforms to alternative specifications not described in this IOM MANUAL, handle the product according to details of separate meetings, drawings and approved documents.

- Wanner Engineering accepts no liability whatsoever for any damage caused by malfunction of this product and/or damage caused by use of this product.

## How to operate the pump safely

In order to ensure that the pump will be operated correctly and safely, this IOM MANUAL contains specific guidelines for the user of important safety precautions and considerations which, depending on their seriousness, are categorized as defined below. The operator must follow these precautions and considerations to prevent personal injury and maximize equipment performance.

### **WARNING**

- This signal word indicates a condition or action which may result in death or serious injury if the instructions stated in this manual are ignored and the operations are performed incorrectly.

### **CAUTION**

- This signal word indicates a condition or action which may result in injury and/or damage to personal property if the instructions stated in this manual are ignored and the operations are performed incorrectly.

### **IMPORTANT**

- This signal word indicates a condition or action which must be established or carried out in order to maintain the performance and service life of the equipment.

### **NOTE**

- This signal word indicates supplementary information useful to the operator.

## Conditions of Use

### **WARNING**

- The solenoid-driven diaphragm metering pump cannot be used in explosion-proof areas or in explosive or combustible atmospheres.

### **CAUTION**

The solenoid-driven diaphragm metering pump:

- Must be used for the purpose of transferring or injecting liquids only. Using it for any other purpose may result in accidents and/or malfunctions.
- Cannot be used to transfer or inject any liquids containing slurry.
- Cannot use the valve on the discharge side of the pipe to adjust flow rate.
- Will result in pulsating flow. If pulsation threatens to be a problem, install a pulsation dampener or some other device for reducing the effects of pulsation.
- Must be operated within the following operating parameters. Not doing so may cause malfunctions.

Ambient temperature	0 to 40 °C*1 (32 to 104 °F*1)
Ambient humidity	35 to 85% RH
Temperature of liquid	0 to 40 °C (32 to 104 °F) (no freezing)
Viscosity of liquid	Less than 50 mPa·s/cps*2
Altitude of installation location	Less than 1,000 m (3,281 ft.)
Environmental protection	IEC standard : IP65 or equivalent (Water and dust - proof)

\*1 Transport and store the pump at temperatures within the -10 to +50°C (14 to 122°F) range. Do not subject the pump to strong impacts.

\*2 The maximum viscosity for the high-viscosity model is 3,000 mPa·s/cps.

\* Install the tank at a position higher than the pump to ensure flooded suction.

\* The volume and viscosity of the liquids that can be pumped differ according to the conditions under which the pipes are connected and the properties of the chemicals to be pumped.

## Installation: Piping & Connections

### **WARNING**

- The solenoid-driven diaphragm metering pump does not have explosion-proof specifications. Do not install this pump in explosion-proof areas or in explosive or combustible atmospheres.
- Install the pump in a location that cannot be accessed by anyone other than authorized control personnel.

### **CAUTION**

- If the solenoid-driven diaphragm metering pump has been dropped or damaged, consult your vendor or a Wanner Engineering representative. Using a dropped or damaged pump may result in accidents and/or malfunctions.

- Do not install the pump where there is a risk of flooding or where there are high levels of moisture or dust. Doing so may cause electric shocks and/or malfunctions.
- This pump has a water-proof construction (equivalent to IP65 under IEC standards). However, it is made of plastic; therefore, avoid installation in a position that will shorten its service life (such as exposure to direct sunlight, wind or rain).
- Do not connect the pipes above a passageway. Do not install the pipes where the chemical may splash onto people if the hose/tube should break.
- When using a pump with a relief-valve function, always attach a hose for relief purposes and run the end of the pipe back to a tank or another appropriate container.
- When using a pump without a relief-valve function, it is absolutely necessary to install a relief valve on the pipe just beyond the pump on the discharge side. If the user has forgotten to open the valve or foreign matter is clogged inside the pump's discharge-side pipe, this may cause the pressure to rise above the pump's specification range, liquid to escape, the pipes to become damaged and/or the pump to malfunction, all of which are dangerous conditions.
- When using the pump in cold regions, the chemical may freeze inside the pump head or pipes, possibly damaging the pump and its surroundings; therefore, installing a heating unit or heat-insulating unit is highly recommended.
- The water used for the pre-shipment testing may be left in the liquid-end parts of the pump. If the pump is to be used for chemicals that may harden or give off gas if it reacts with water, it is important to dry off the liquid-end parts prior to use.
- When the hoses/tubes become very hot, their ability to withstand pressure will deteriorate. When using hoses/tubes other than those supplied with the pump, they **MUST** be resistant to chemicals and capable of withstanding the temperatures and pressures under which the pump will be used.
- The durability of a hose/tube differs significantly depending on chemical exposure, temperature and pressure, and on the presence of ultraviolet rays. Inspect the hoses/tubes and replace them if deteriorated.
- The control panel cover is made of plastic; do not subject it to excessive force or it may be damaged.

## Electrical Wiring



### WARNING

- This pump cannot be used in explosion-proof areas or in explosive or combustible atmospheres.
- Ensure that the power will not be turned on during the course of work. Hang a sign on the power switch indicating that work is in progress.
- Do not operate the pump with wet hands. Doing so may result in electric shocks.
- Securely ground by plugging into a properly grounded receptacle. Install a ground fault circuit interrupter to avoid electric shocks.
- Do not attempt to disassemble the pump body or the circuit parts.



### CAUTION

- The wiring must be done by a qualified electrician.
- Check the supply voltage. If within appropriate range, connect the wires.

## Operation & Maintenance



### WARNING

- Ensure that only trained operators and control personnel will operate the pump.
- Ensure that the power will not be turned on during the course of work. Hang a sign on the power switch indicating that work is in progress.
- Do not operate the pump with wet hands. Doing so may result in electric shocks.
- Should a problem occur such as the appearance of smoke or a burning smell, shut down the pump's operation immediately and contact your vendor or a Wanner Engineering representative. Otherwise, a fire, electric shocks and/or malfunctions may result.
- Do not attempt to disassemble the pump body or the circuit parts.
- During the air release, it is possible for the chemical to escape from the piping. Run the end of the air-release hose back to the tank or another appropriate container, and secure it so that it will not become disconnected.
- A closed valve or other blockage on the discharge side of the pump is dangerous. It may lead to an excessive rise in pressure that will exceed the pump's specification range, causing liquid to escape, the pipe to be damaged and the pump itself to malfunction. Prior to operating the pump, check the valves and pipes, etc.



### CAUTION

- When working on the liquid-end parts of the pump, wear personal protective gear suited to the chemical involved (such as rubber gloves, a mask, protective goggles and work overalls that are resistant to chemical reaction).
- Before attempting to maintain or repair the pump, release the pressure in the discharge pipe, discharge the liquid in the pump head, and clean the liquid-end parts.

- The vibration of the pump may cause the hoses/tubes to become loose and/or disconnected. Before starting operation, secure the hoses/tubes.
- While the pump is operating, the pump's surfaces may become hot, reaching a temperature of 60°C (140°F) or more.
- Idling the pump for prolonged periods of time can lead to malfunctions.
- When diluting sodium hypochlorite, use pure water or water processed with a water softener. Otherwise the pump may malfunction or discharge hazardous chemicals.

### Other Precautions



- Do not attempt to remodel the pump.
- Install a protective barrier or other preventative action to cope with an incidental chemical spill. Ensure that the chemical will not leak onto the pump.
- Recommended practice of pump disposal is through an industrial waste disposal company whose operations have been authorized in accordance with applicable laws and regulations.

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* The instructions differ according to the model. Find the appropriate model in the table on page 22 and follow the instructions there.	
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# Product inspection

After unpacking the pump, check the following:

- Is the pump the one that was ordered?
- Do the details on the pump's nameplate match what was ordered?
- Are all the accessories supplied?
  - \* Check the supplied accessories against the "Accessories list" below.
- Has the pump sustained any damage from vibration or impact during transit?
- Have any of the screws come loose or displaced?

Every care is taken by Wanner Engineering in the shipment of its pumps. Please contact your vendor or a Wanner Engineering representative regarding concerns, additional information or assistance.

## Solenoid-driven Metering Pump

Model :	
Serial No. :	
Max.Capacity :	L/H ( GPM)
Max.Pressure :	bar ( psi)
Stroke Speed :	1~300 strokes/min
Power Supply :	1Ø,50/60 Hz AC100~240V
Max. Current :	A
Ave.Power Cons :	W



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## Accessories list

### ■ PE/PF type

Relief-valve function	with relief valve			without relief valve			
Model	03R	06R	10R	030	060	100	200
Tube (3m)	PE tube (6×8)						
Relief/air-release hose (1m)	Soft PVC hose (4×6, installed)			Soft PVC hose (4×6)			-
Hose band (spare) for relief hose	1 piece			-			
Anti-siphon check valve	1 set (R1/2)						
Foot valve	1 set						
Ceramic weight	1 set						
Cable	2 m						
Pump mounting nuts/bolts	2 sets (M5×30)						
IOM MANUAL	1 copy						

### ■ KE/KF type

Relief-valve function	with relief valve			without relief valve		
Model	03R	06R	10R	030	060	100
Tube (3m)	PE tube (6×8)					
Relief/air-release hose (1m)	Soft PVC hose (4×6, installed)			Soft PVC hose (4×6)		
Hose band (spare) for relief hose	1 piece			-		
Anti-siphon check valve	1 set (R1/2)					
Foot valve	1 set					
Ceramic weight	1 set					
Cable	2 m					
Pump mounting nuts/bolts	2 sets (M5×30)					
IOM MANUAL	1 copy					

### ■ KP type

Relief-valve function	with relief valve			without relief valve		
Model	03R	06R	10R	030	060	100
Tube (3m)	FEP tube (6x8)					
Relief/air-release hose (1m)	Soft PVC hose (4x6, installed)			Soft PVC hose (4x6)		
Hose band (spare) for relief hose	1 piece			-		
Anti-siphon check valve	1 set (R1/2 or R3/8)					
Foot valve	1 set					
Ceramic weight	1 set					
Cable	2 m					
Pump mounting nuts/bolts	2 sets (M5x30)					
IOM MANUAL	1 copy					

# Accessories list

## ■ ST type

Model	030	060	100
Tube (3m)	PTFE tube (6×8)		
Anti-siphon check valve	1 set (R1/2 or R3/8)		
Foot valve	1 set		
Air-release hose pump	1 set		
Cable	2 m		
Pump mounting nuts/bolts	2 sets (M5×30)		
IOM MANUAL	1 copy		

## ■ HV type (High-viscosity type)

Model	060	100
Hose (3m)	PVC braided hose (12×18)	
Air-release hose pump	1 set	
Cable	2 m	
Pump mounting nuts/bolts	2 sets (M5×30)	
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## ■ BH type (Boiler type)

Relief-valve function	with relief valve	without relief valve
Model	03R	030
Discharge side tube (2m)	PA tube (4×6)	
Suction side tube (1m)	PVC braided hose (4×9)	
Relief/air-release hose (1m)	Soft PVC hose (4×6, installed)	Soft PVC hose (4×6)
Hose band (spare) for relief hose	1 piece	
Anti-siphon check valve	1 set (R1/2)	
Foot valve	1 set	
Cable	2 m	
Pump mounting nuts/bolts	2 sets (M5×30)	
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## ■ CH type (High-pressure type)

Model	030
Discharge side tube (2m)	PA tube (4×6)
Suction side hose (1m)	PVC braided hose (4×9)
Air-release hose (1m)	Soft PVC hose (4×6)
Anti-siphon check valve	1 set (R1/2)
Foot valve	1 set
Cable	2 m
Pump mounting nuts/bolts	2 sets (M5×30)
IOM MANUAL	1 copy

# Accessories list

## ■ CD type (With automatic out gassing function)

Relief-valve function	with relief valve			without relief valve		
Model	03R	06R	10R	030	060	100
Tube (3m)	PE tube (6×8)					
Relief/air-release hose (1m)	Soft PVC hose (4×6, installed)			Soft PVC hose (4×6)		
Hose band (spare) for relief hose	1 piece			-		
Degassing joint *1	1 set					
Degassing joint hose (already attached)	1.5m (1/4"×3/8")					
Anti-siphon check valve with duckbill cap	1 set (R1/2)					
Cable	2 m					
Pump mounting nuts/bolts	2 sets (M5×30)					
IOM MANUAL	1 copy					

\*1 The joint and union nut have already been installed on the pump head.

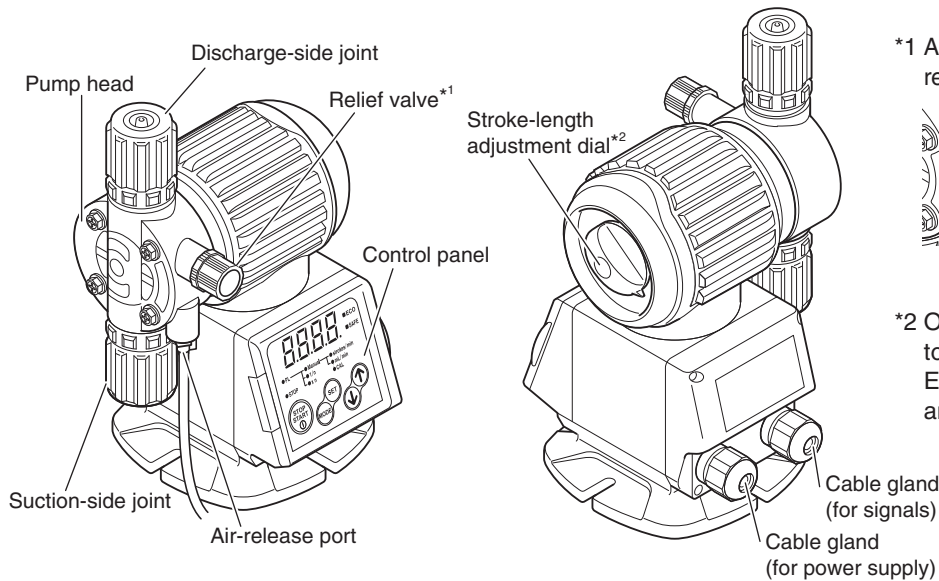
## ■ CN type (With manual out gassing function)

Relief-valve function	with relief valve			without relief valve		
Model	03R	06R	10R	030	060	100
Tube (3m)	PE tube (6×8)					
Relief/air-release hose (1m)	Soft PVC hose (4×6, installed)			Soft PVC hose (4×6)		
Hose band (spare) for relief hose	1 piece			-		
Anti-siphon check valve with duckbill cap	1 set (R1/2)					
Foot valve	1 set					
Cable	2 m					
Pump mounting nuts/bolts	2 sets (M5×30)					
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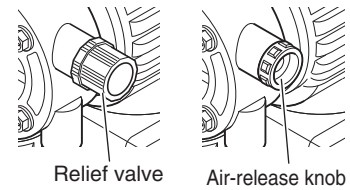
# Product description

This is a solenoid-driven diaphragm metering pump with chemically resistant liquid-end parts and a compact body. It operates on any supply voltage from AC 100V to AC 240V ( $\pm 10\%$ ). Pump adjustment ensures constant discharge capacity over the supply voltage range.

## Parts identification



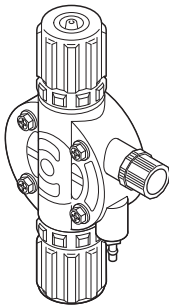
\*1 Air-release knob on models without relief-valve function.



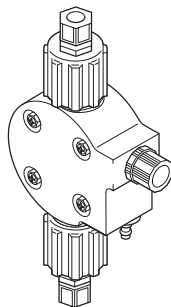
\*2 Operate with the stroke length set to 100% when the SAFE mode, ECO mode or ALARM functions are to be enabled.

### General chemical injection type

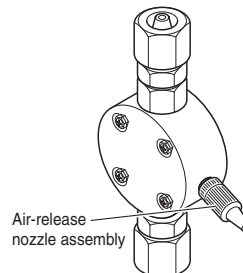
PE/PF



KE/KF/KP

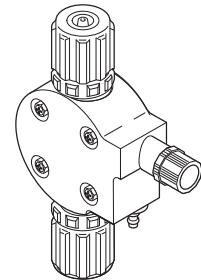


ST



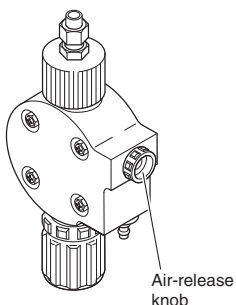
### Injection of out-gassing fluids

CN



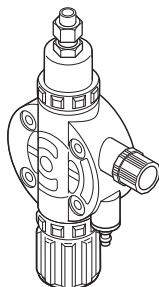
### High-pressure type

CH \* Without relief valve



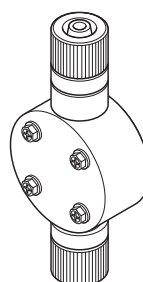
### Boiler type

BH

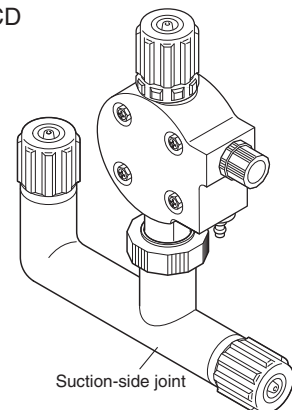


### High-viscosity type

HV \* Without relief valve



CD



\* The shapes of these parts may differ slightly than those shown in the figure depending on the model. Refer to "Exploded views of liquid-end parts and external dimensions".

# Product installation



## WARNING

- The solenoid-driven diaphragm metering pump does not have explosion-proof specifications. Do not install this pump in explosion-proof areas or in explosive or combustible atmospheres.
- Install the pump in a location that cannot be accessed by anyone other than authorized control personnel.



## CAUTION

- Do not install the pump where there is a risk of flooding or where there are high levels of moisture or dust. Doing so may cause electric shocks and/or malfunctions.
- This pump has a water-proof construction (equivalent to IP65 under IEC standards); however, it is made of plastic. Avoid installation in a position that will shorten its service life, such as exposure to direct sunlight, wind or rain.

## Installation location

- Avoid installing the pump in a location exposed to direct sunlight or wind and rain. Although it features a water-proof construction (equivalent to IP65 under the IEC standards), direct sunlight may cause the temperature of the metal parts to rise; ultraviolet rays may cause the plastic parts to deteriorate; and sand, dust, and rainwater may damage or corrode the pump body. When installing the pump outdoors, it is recommended that an awning or cover be installed to protect the pump from the elements and extend its service life.
- Install the pump in a location with good ventilation and where the chemical will not freeze.
- Provide adequate space around the pump to facilitate maintenance and inspections.
- Place the pump in a level location and secure it so that it will not vibrate. Installing the pump at an angle may result in operational difficulties or inability of the pump to discharge.

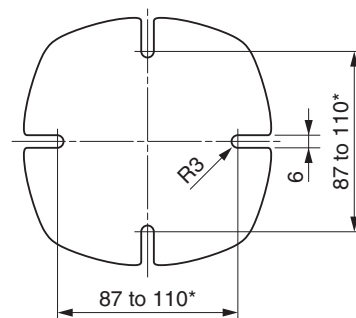


## Mounting bolt positions

Use the pump mounting bolts (x2) provided to secure the pump.

- \* Secure the pump in two places opposite each other among the four possible places.

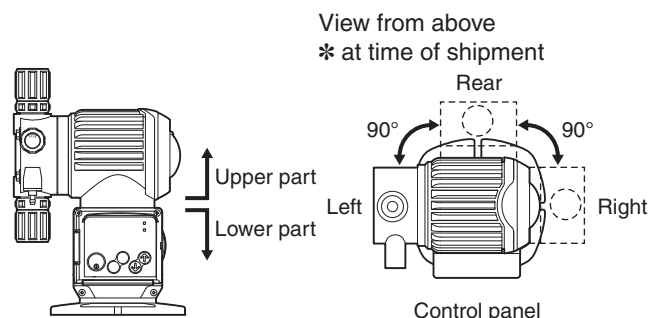
\* The pump can be installed at any pitch ranging from 87 to 110 mm (3.43 to 4.33 in.).



## Assembling the pump

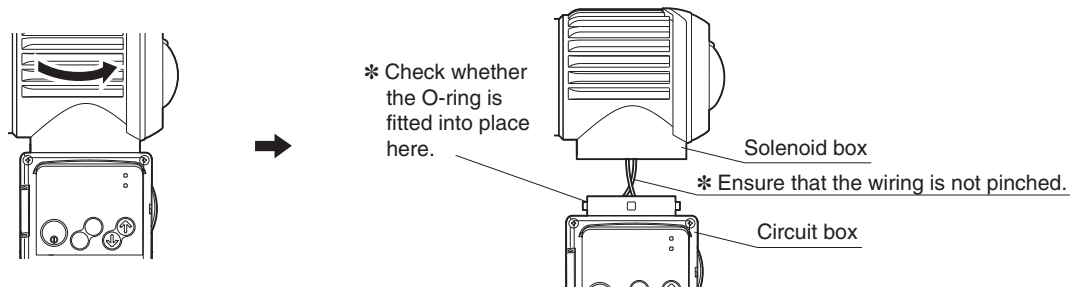
The direction in which the pump head and solenoid box part (upper part) and circuit box part (lower part) are assembled can be changed to one of three directions.

- \* If, due to restrictions on the pipe connections or other factors, the control panel is pointing in a direction in which it is difficult to operate the pump, change the direction by following the steps on the next page.



# Product installation

- (1) Twist the pump head and solenoid-box part (upper part) counterclockwise by about 30 degrees and lift 2 to 3 cm (0.75 to 1 in.).



- (2) Turn the upper part to align the groove in the upper part coupling with the protrusion in the lower part coupling then insert.
- (3) Twist the upper part clockwise and secure.

## IMPORTANT

- The upper part and lower part are connected by wires. When lifting the upper part, lift it until the upper and lower parts are separated by a gap 2 or 3 cm (0.75 or 1 in.). The wires may break if the parts are separated too far.
- When twisting the upper part, do not apply pressure to the pump head and especially not to the joint area and operation panel cover. Otherwise, the parts may be damaged.
- The fixed part of the pump is made of plastic. Refrain from applying excessive force to prevent damage.
- Do not excessively twist the wires or pinch them between parts of the pump.
- The assembly directions are left, rear and right as seen from the control panel (only 90 degrees). The pump cannot be assembled at any midway points.
- During assembly, twist the upper part firmly until the protrusion touches the right end and check that it is secured.

## NOTE

- It is easier to twist the upper part if pressed downward.
- When the pump is shipped, it is assembled so that the pump head is facing the left side as seen from the control panel.

# Piping

## CAUTION

- Connect the pipes to the pump properly.
- Do not connect the pipes above a passageway. Do not install the pipes where the chemical may splash onto people if the hose/tube should break.
- When using a pump with a relief-valve function, always attach a hose for relief purposes and run the end of the pipe back to a tank or another appropriate container.
- It is dangerous to operate a pump with the discharge side pipe closed off due to valve closing or clogging with foreign matter causing abnormal pressure buildup inside the pipe. As a safety measure, take the action in I or II, whichever is applicable.
  - I. When the pump is supplied with a relief-valve function:  
Connect a relief hose to the air-release port, bring the end of the hose back to the chemical tank and secure it.
  - II. When the pump is not implemented with a relief valve function:  
Attach a relief hose and relief valve to the discharge side pipe, and bring the end of the hose back to the chemical tank and secure it.
- When using the pump in cold regions, the chemical may freeze inside the pump head or pipes, possibly damaging the pump and its surroundings; therefore, installing a heating unit or heat-insulating unit is highly recommended.
- When the hoses/tubes become hot, their ability to withstand pressure will deteriorate. When using hoses/tubes other than those supplied with the pump, they **MUST** be resistant to chemical reactions and capable of withstanding the temperatures and pressures under which the pump will be used.
- The durability of a hose/tube differs significantly depending on chemical exposure, temperature and pressure, and on the presence of ultraviolet rays. Inspect the hoses/tubes and replace them if deteriorated.

# Piping

## IMPORTANT

- Install a pressure gauge on the discharge-side pipe in order to measure the pressure.
  - Install the pump as close as possible to the tank. If the suction-side pipe is too long, cavitation\* may occur, making it difficult to maintain the pump's metering capability.
  - Install a valve for releasing the pressure inside the discharge side pipe. The 3-way valve on the flushing water line can be used instead.
  - The intake performance may be reduced when the valve seat inside the pump head has dried out. If the pump will not prime, moisten the valve seat with some liquid.
- \* Refer to the "Explanation of terms" on page 60.

## ■Pulsation

- The occurrence of pulsation will cause the pump's hoses/tubes to vibrate. Secure the hoses/tubes to prevent movement.
- In order to reduce pulsation, the installation of a dampener is recommended. Contact a Wanner Engineering representative for more information.

## ■Pipe length

- An excessively long hose/tube: may result in increased pressure loss; may cause the pressure to exceed the pump's pressure allowance; may initiate overfeed; may cause pipe vibration.
- The pump comes with a 3-meter-long hose/tube for both the discharge side and suction side. If the pressure loss exceeds the pump's maximum discharge pressure, larger diameter hose/tube will be required. Provide details on the (1) viscosity of the liquid, (2) length and position of the pipes and (3) specific gravity of the liquid to a Wanner Engineering representative.

## ■During maintenance

- When reusing the same tube after disconnecting for maintenance cut about 10 mm (0.4 in.) from the end of the tube before reconnecting.
- Release the pressure in the discharge hose/tube before conducting maintenance.

## ■When curving a hose/tube

- Provide a sufficient margin so that the hose/tube will curve rather than bend.
- Curve hose/tube avoiding possible damage from bending, rubbing against other parts, pinching, severing, foot traffic.
- Minimize the number of tight curves in the pipes, joints and other parts that may restrict the flow.

# Connections

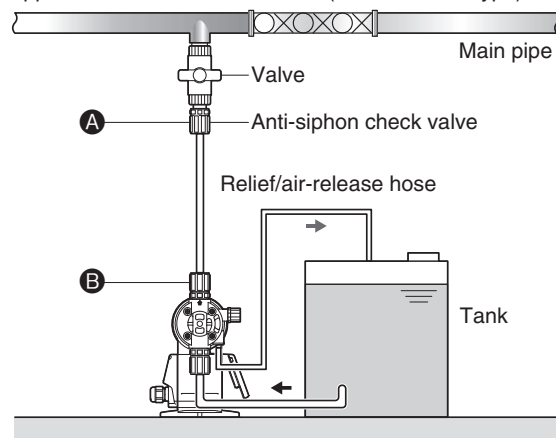
Pumping procedure described by pump type

Type	Model	Liquid-end type	Pump position		Connections of parts			
			Below-tank mounting	Above-tank mounting	Injection point	Piping	Foot valve	Degassing joint
Injection of general chemicals	03R/06R/10R	PE/PF	I	V	A-1	B-1	C-1	D
		KE/KF	I	V	A-1	B-2	C-2	
		KP	I	V	A-3	B-2	C-2	
	030/060/100/200	PE/PF	II	VI	A-1	B-1	C-1	
		KE/KF	II	VI	A-1	B-2	C-2	
		KP	II	VI	A-3	B-2	C-2	
		ST	II	VI	A-3	B-1	C-1	
Injection of high-viscosity chemicals	060/100	HV	II	-	-	B-1	-	
Injection of boiler chemicals	03R	BH	I	V	A-4	Discharge side: B-3	C-1	
	030		II	VI	A-4	Suction side: B-1	C-1	
Injection of high-pressure	030	CH	II	VI	-	Discharge side: B-3 Suction side: B-1	C-1	
Injection of out-gassing fluids	03R/06R/10R	CD	III	-	A-2	B-1	-	
	030/060/100		IV	-	A-2	B-1	-	
	03R/06R/10R	CN	I	V	A-2	B-1	C-1	
	030/060/100		II	VI	A-2	B-1	C-1	

# Connections

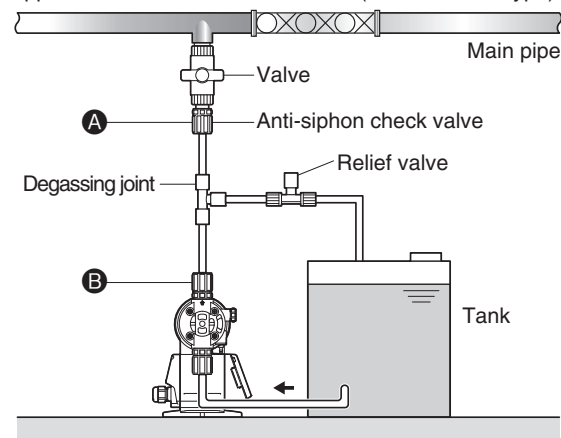
## I. Pump below-tank mounting position (with relief valve)

Applicable models: 03R/06R/10R (other than CD type)



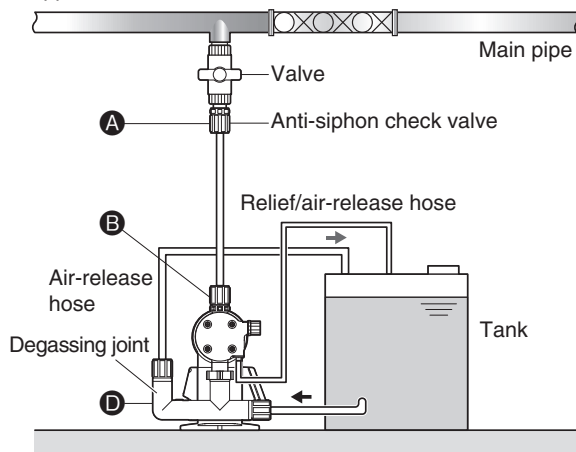
## II. Pump below-tank mounting position (without relief valve)

Applicable models: 030/060/100/200 (other than CD type)



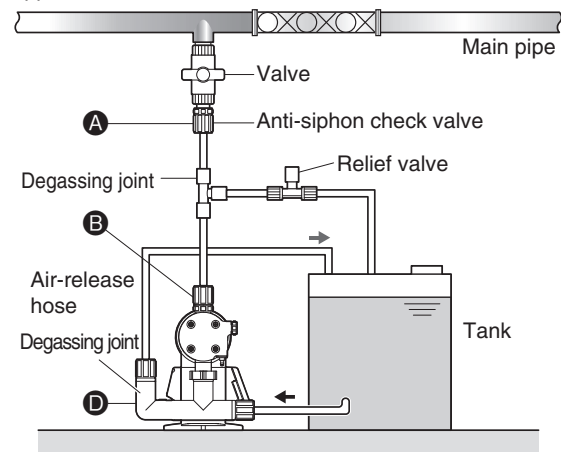
## III. Pump below-tank mounting position (with relief valve)

Applicable models: 03R/06R/10R-CD



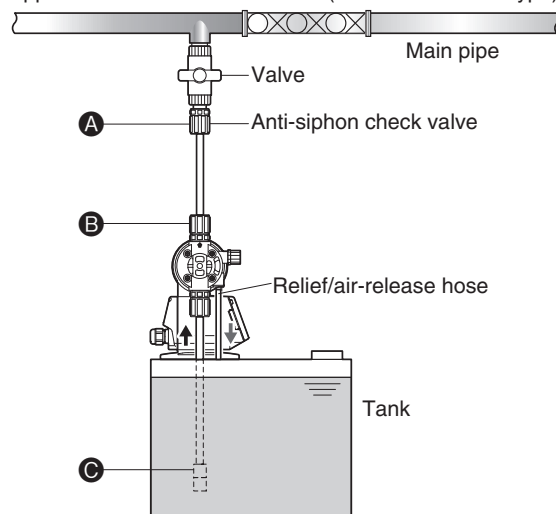
## IV. Pump below-tank mounting position (without relief valve)

Applicable models: 030/060/100/200-CD



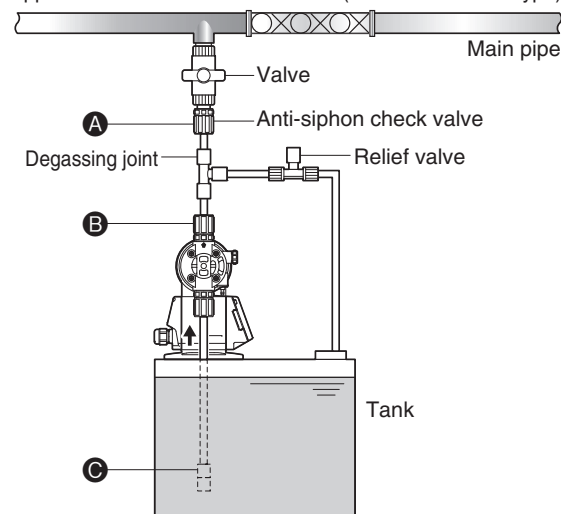
## V. Pump above-tank mounting (with relief valve)

Applicable models: 03R/06R/10R (other than CD/HV type)



## VI. Pump above-tank mounting (without relief valve)

Applicable models: 030/060/100/200 (other than CD/HV type)



\* Pump above-tank mounting cannot be used for the CD/HV type.

\* If at all possible, use pump below-tank mounting position for the CN type.

\* When using the pump in an above-tank mounting position, moisten the valve seat area with some water or chemical before operating the pump.

\* This pump has a maximum suction height of -1.5 m (-5 ft.) for water with the valve seat area moistened. The suction capability may decrease when the valve seat area is dry. (Except CD/CN/HV type)

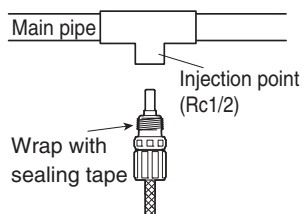
# Connections

## Injection point connections

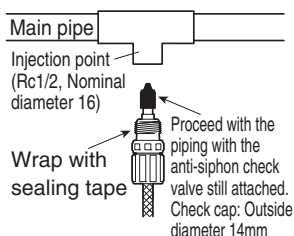
The anti-siphon check valve has a different shape depending on the material used for the liquid-end material of the pump. First check the model of the pump to be used, then refer to the applicable diagram below.

\* An anti-siphon check valve is not included for the high-viscosity type.

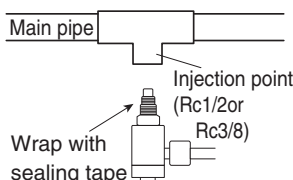
A-1. PE/PF/KE/KF type



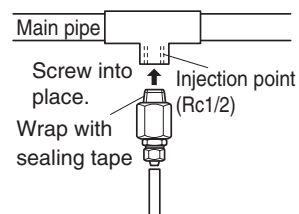
A-2. CN/CD type



A-3. KP/ST type



A-4. BH/CH type

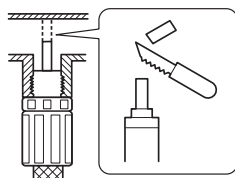


### NOTE

- When using a PVC or PVDF anti-siphon check valve

Install the valve so that the end of the injection nozzle is positioned at the center of the main pipe. If the nozzle is too long, cut to the correct length, finish the cut-off surface, and discard the metal scraps.

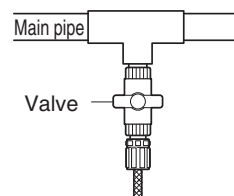
\* In the case of an anti-siphon check valve used for out-gassing fluids, attach the shut-off cap to the body after cutting.



- Maintenance:

It is recommended that the tube be attached to the main pipe through a valve to enable the anti-siphon check valve to be replaced or cleaned, etc.

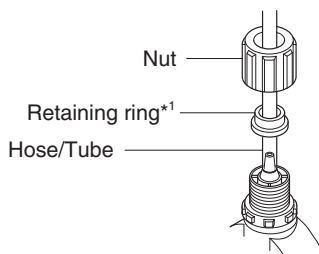
\* Use a valve made of corrosion resistant materials for specified chemicals.



## Pipe connections

B-1. PE/PF/HV/ST/CN/CD type

Insert the hose/tube firmly so that it will not become disconnected, and tighten the nuts securely. Do not excessively tighten the nuts. Doing so may damage or break the joint. Tighten the nut appropriately after operation has started.



\* Not provided on the ST type.

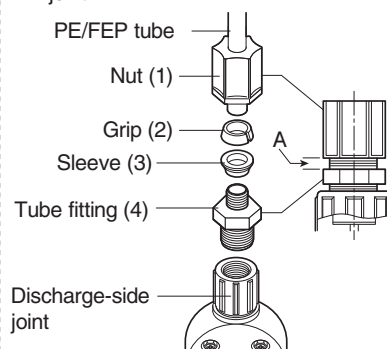
\* For details on the hose connection, see "NOTE" on page 14.

B-2. KE/KF/KP type

When bending the tube, be sure to leave sufficient leeway (R100 or more) in the curve so that the tube will not break.

- (1) Wrap sealing tape around the threaded part of the tube fitting.
- (2) Pass the tube through the nut (1), grip (2) and sleeve (3), and insert its end until it touches the back end of the tube-fitting body (4) on the inside.
- (3) Tighten the tightening nut (1) manually.
- (4) Tighten the nut (1) until the gap (area a in the figure) between the tube-fitting body (4) and the nut (1) is approximately 1.5 mm (0.06 in.).

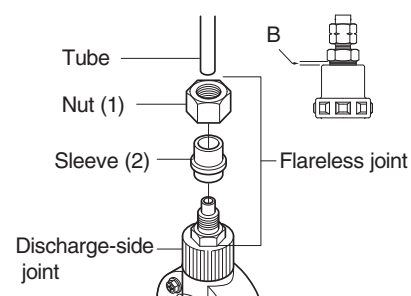
\* Excessive tightening may break the joint.



B-3. BH/CH type

- (1) Pass the nut (1) and sleeve (2) over the tube. Insert the tube so that its end touches the back of the groove in the body.
- (2) Manually tighten the nut. Use an adjustable wrench or spanner to secure the flareless joint. Tighten the nut until secure.

\* Leave a gap (area "B" in the figure) of 2 mm (0.08 in.) between the discharge-side joint and the flareless joint.



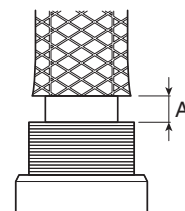
\* Do not over tighten.

# Connections

## NOTE

- Use dimension A in the figure as a guideline to connect the hose to the joint.
- \* Applying excessive force may damage the hose.
- \* This dimension should be taken only as a guideline as it may vary depending on the usage conditions.

Hose type	Hose diameter	Dimension A
PVC braided hose	12 x 18	2 mm or less
PTFE hose	6 x 8	3 mm or less



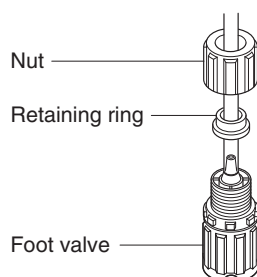
## Foot valve connection

The foot valve has a different shape depending on the material used for the liquid-end material of the pump. First check the model of the pump to be used and then refer to the applicable diagram below.

\* A foot valve is not included for the HV and CD types.

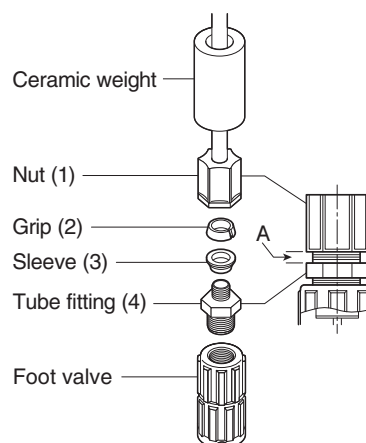
### C-1. PE/PF/ST/BH/CH type

Insert the hose/tube firmly so that it will not become disconnected, and tighten the nut securely. Do not overtighten the nut. Doing so may damage or break the joint. Tighten the nut appropriately after operation has started.



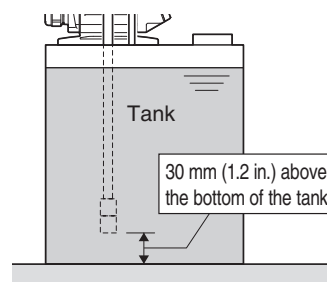
### C-2. KE/KF/KP type

- (1) Wrap sealing tape around the threaded part of the tube fitting.
  - (2) Pass the tube through the nut (1), grip (2) and sleeve (3), and insert its end until it touches the back end of the tube-fitting body (4) on the inside.
  - (3) Tighten the tightening nut (1) manually.
  - (4) Tighten the nut (1) until the gap (area a in the figure) between the tube-fitting body (4) and the nut (1) is approximately 1.5 mm (0.06 in.).
- \* Excessive tightening may break the joint.



## IMPORTANT

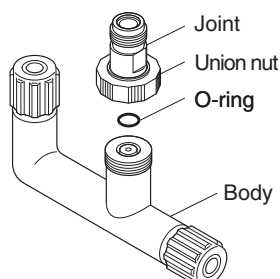
When installing the foot valve, cut the hose to the appropriate length so that the foot valve is positioned 30 mm (1.2 in.) above the bottom of the tank. Adjust its height.



# Connections

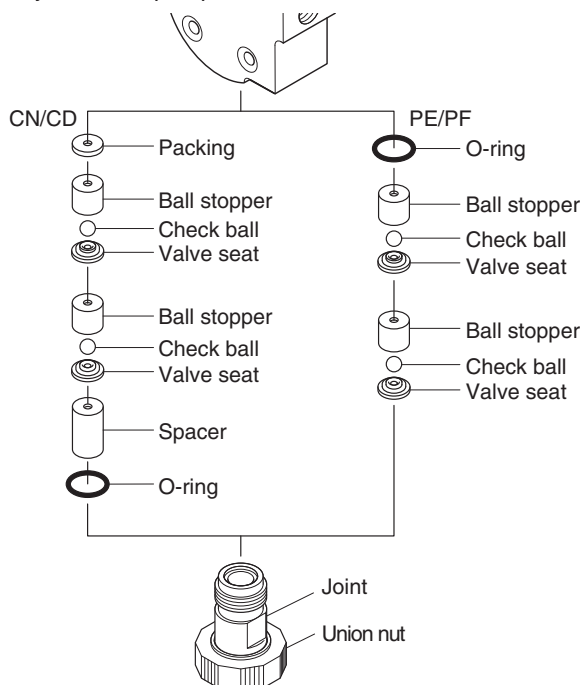
## Degassing joint connection

(1) Loosen the union nut. Remove the joint and body.



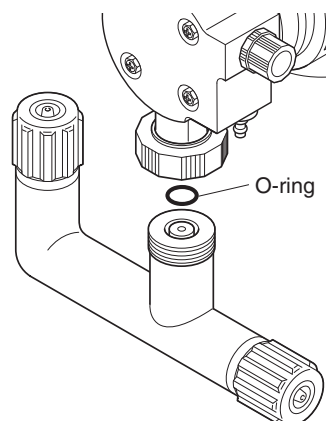
(2) Remove the suction side joint of the pump, and take out the valve seat sets.

(3) Install the valve seat sets on the joint, and connect the joint to the pump.



(4) Install the union nut on the body.

Note: Ensure that the O-ring is implemented on the body, then tighten the union nut.



### IMPORTANT

• **When connecting the degassing joint to the CD type:**

The valve seat sets, joint and union nut are installed on the pump body before the pump is shipped. Before use, install the degassing joint using step (4) above as a reference.

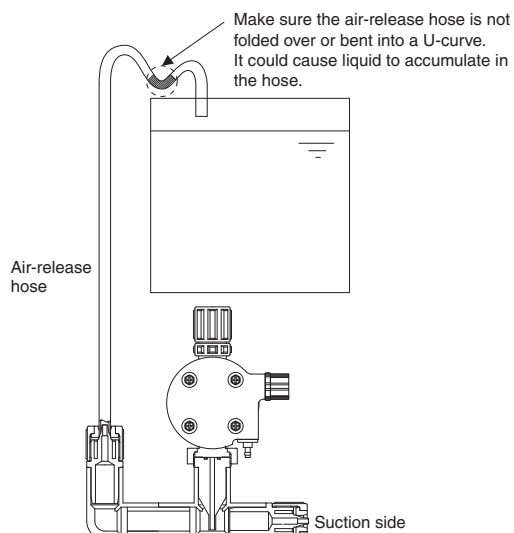
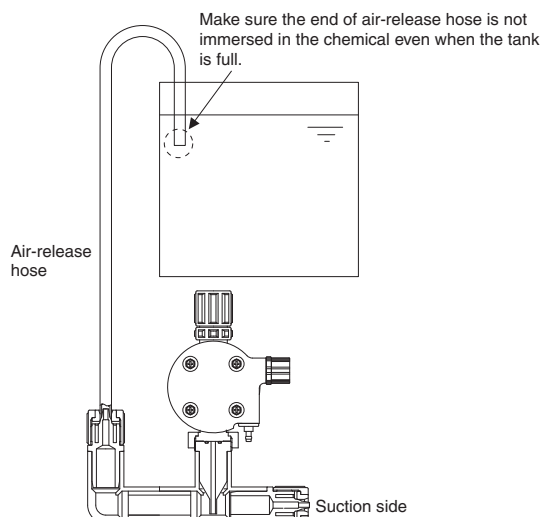
• **When connecting the degassing joint to pumps other than CD type:**

Remove the suction side joint, take out the valve seat sets, and install them on the pump following steps (1) to (4) in sequence.

\* The hose joint, retaining ring, or hose nut of pump (suction side) are not used.

## Example of unacceptable installation

The air will not be released if the pipes are connected as shown below, so avoid this kind of connection.



# Electrical wiring



## WARNING

- This pump cannot be used in explosion-proof areas or in explosive or combustible atmospheres.
- Ensure that the power will not be turned on during the course of work. Hang a sign on the power switch indicating that work is in progress.
- Do not operate the pump with wet hands. Doing so may result in electric shocks.
- Securely ground by plugging into a properly grounded receptacle. Install a ground fault circuit interrupter to avoid electric shocks.
- Do not attempt to disassemble the pump body or the circuit parts.

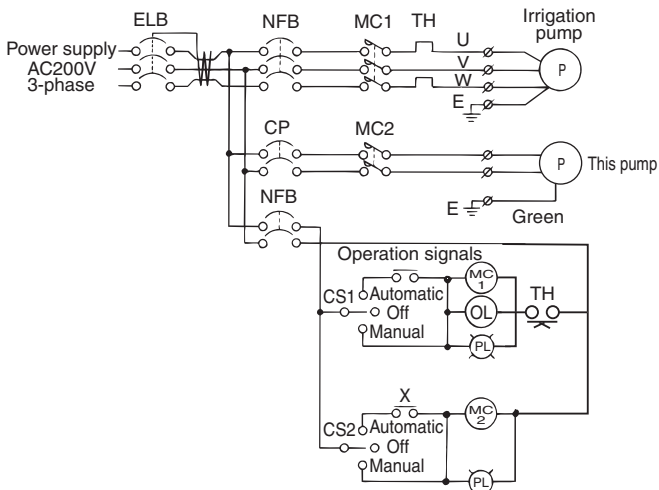


## CAUTION

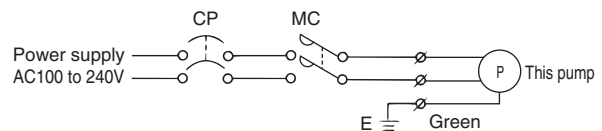
- The wiring must be done by a qualified electrician.
- Check the supply voltage. If within appropriate range, connect the wires.

### Example of wiring

#### ● Operating the pump in tandem with an irrigation pump:



#### ● Running the pump on its own:



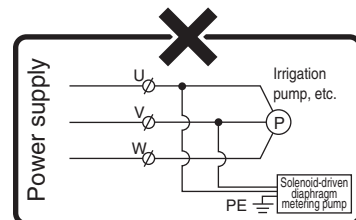
- ELB : Current leakage breaker  
 NFB : No-fuse breaker  
 MC1, 2: Electromagnetic contactor  
 TH : Thermal relay  
 CP : Circuit protector  
 CS1, 2: Changeover switch  
 OL : Overload relay  
 PL : Pilot lamp

### IMPORTANT

- It is necessary to use a commercial power source (the power supplied by an electric power company) for supplying the power.  
**DO NOT USE:**  
 Power sources in which an AC power regulator is installed.  
 Power sources on the output side of an inverter.
- High voltage is generated when the power is cut off or interrupted under certain circumstances. This may create hazardous conditions; therefore, **DO NOT** connect power to the same terminals as the induction motor of an irrigation pump or any other pump or accessory.

### NOTE

- When installing an overcurrent protection device for the solenoid-driven diaphragm metering pump, always install a circuit protector (CP) in consideration of the operating time and the breaking current characteristics.
- The circuit protector (CP) shown as the recommended protection device can also be used as the power switch, thus simplifying the wiring connections.
- A thermal relay (TH) is used to protect against heat generation due to motor overload, which makes it suitable for motor pumps or other equipment operated continuously. A thermal relay **IS NOT** suitable for this solenoid-driven pump, which is operated non-continuously and may not operate properly.



# Electrical wiring

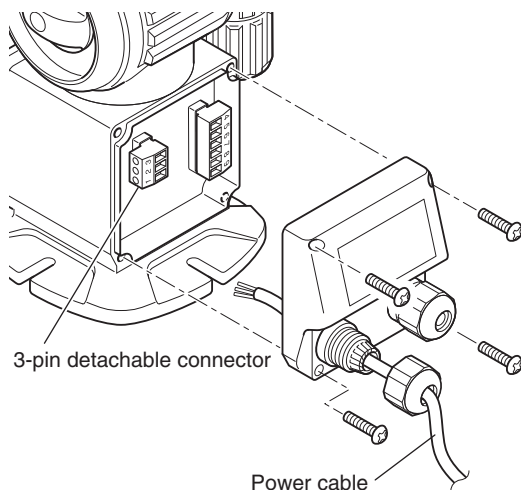
NOTE: There are two cable grounds, one for the power supply and one for the signals.

## Connecting the power supply & protective earth

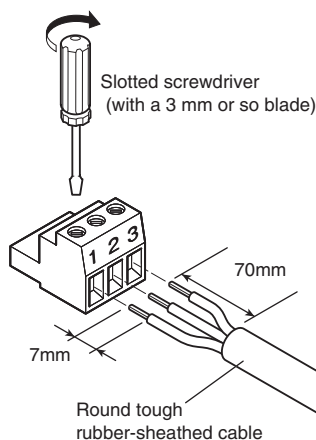
A 3-pin detachable connector (including the protective earth) is used to connect to the AC power supply.

- Use a round tough rubber-sheathed cable (VCTF-3C or 4C) as the power cable.
- \* With the VCTF-4C, cut one of the wires.
- When using a power cable other than included accessories, use a power cable which has a cross sectional area of at least 2 mm<sup>2</sup> and an outside diameter of 5 to 10 mm.

- (1) Remove the four screws at the back of the circuit box and open the cover.



- (2) Pull out the 3-pin detachable connector.
- (3) Strip away about 7 mm of the covering over the conductors.
- (4) Insert the conductors into the connector holes and use a slotted screwdriver to secure them firmly.

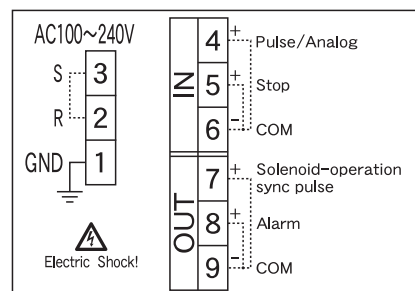
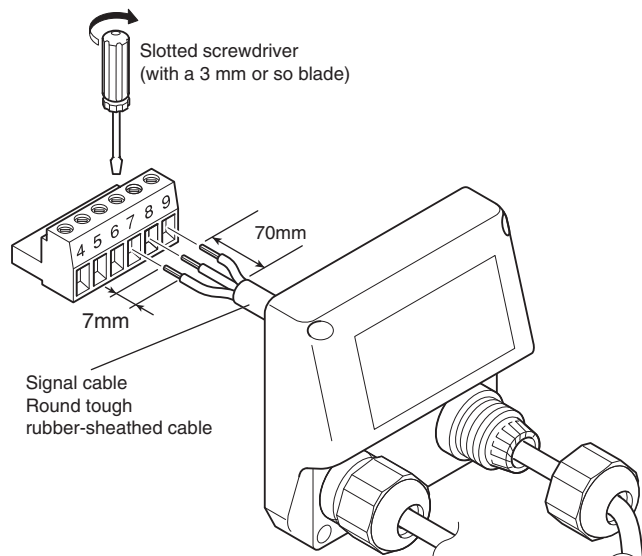


- (5) After securing the conductors, pull them gently to confirm they are secure.
- (6) Insert the connector back in its original position and screw down the cover.

## Connecting the signal cable

A 6-pin detachable cable connector is used to connect to the signal cable.

- Use a round tough rubber-sheathed cable as the power cable.
- Use a power cable which has a cross sectional area of at least 0.5 mm<sup>2</sup> and an outside diameter of 5 to 10 mm.



### NOTE

- When using the alarm output, connect the signal wire and set the parameter. Refer to page 32 for the parameter setting.

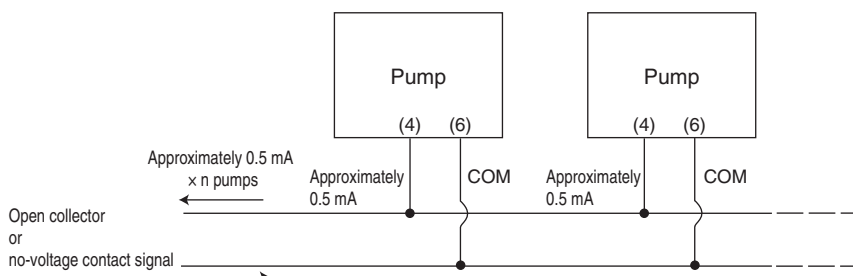
# Electrical wiring

## Signal cable distribution

### ■ When not using a signal distributor

#### ● Pulse signal

You can connect multiple instances of this pump in parallel and apply pulse signals and operation/stop signals to the pumps.



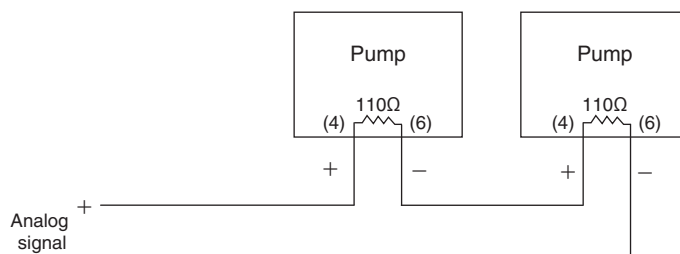
Model comparison table

	Pulse signal	Operation/Stop signal
SP	○	○
SA	×	○
ST	○*1	○

\*1 Only when the pump is operating can it be used with "timer control + pulse input-based proportional control."

#### ● Analog signal

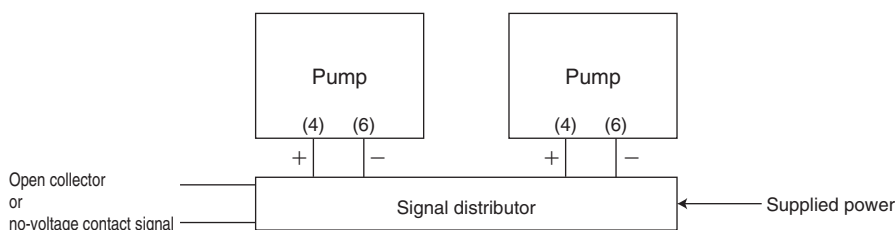
You can connect multiple instances of this pump in series and apply analog signals to the pumps.



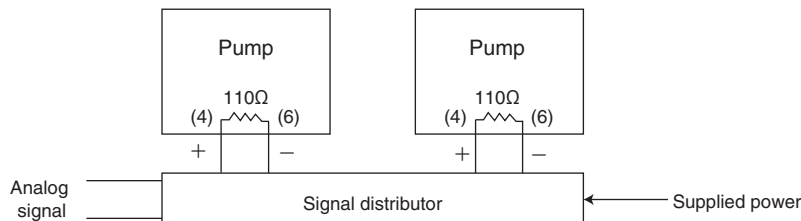
\* If you remove a pump during maintenance or similar operations or if a pump is malfunctioning, the analog signal will be interrupted and the other pumps will stop. If you want to ensure that these other pumps continue operating in these situations, install a signal distributor.

### ■ When using a signal distributor

#### ● Pulse signal



#### ● Analog signal



### ■ Pulse signal input precautions

When an open collector is used to apply the pulse signal, ensure that the leakage current is small and the residual voltage is 1 V or less. When using an SSR, we recommend the G3TA-IDZR02S manufactured by OMRON.

### ■ Pulse signal output precautions

When using an SSR to receive synchronization pulse output and warning output, be careful of the current capacity. For the SSR, we recommend the G3F-203SN manufactured by OMRON.

# Electrical wiring

## External operation and stop input

The pump can be turned on and off using signals from an external device such as an interlock or level switch. The pump runs or stops while (4) and (6) are shorted (no-voltage contacts) or while (4)+ and (6)- (open collector) are input.

To set the operation to be performed when the external operation and stop input signals are received, refer to the settings list on page 32.

\* The displayed settings blink while the pump is stopped by the stop input signal.

\* If STOP has been selected, the pump will stop operating when the signal is input regardless of the setting.

\* Even if OPERATION has been selected, the pump will not operate unless the external operation signal is input.

## Signal input

### ● About signal input (SIGNAL IN) terminals

#### a) Input of non-voltage contact signal to a pulse input-type model:

Non-voltage contact pulses produced by devices such as the pulse generator-type flow meter system are input to terminal numbers (4) and (6). In this case, no considerations are required with regard to polarity. Be sure to use a pulse signal that has low chattering noise. The contact points of a general control relay are not appropriate.

#### b) Input of open collector (drain) signal to a pulse input-type model:

The electric current direction of the contact points of semiconductor devices (such as open collector and open drain devices) is fixed due to the characteristics of these devices. Connect the collector (drain) to terminal number (4) and the emitter (source) to number (6).

#### c) Input of electric current signal to an analog input-type model:

Connect the signal wires (DC4 to 20mA) to terminal number (4) to use it as the positive terminal and to number (6) to use it as the negative terminal.

### ● For details about signal specifications, see page 52.

## Recommended protection devices

### (1) Circuit protectors

(Protects the main power supply in the event of a pump malfunction)

Manufacturer	Type
Mitsubishi Electric	CP30-BA2P1-M3A
Fuji Electric	CP32D/3
Panasonic	BAC201305

### (2) Lightning arrestors

Use an arrestor that matches the power supply to be used. The recommended arrestor models for 100V and 200V are indicated below.

Manufacturer	Type	
	For AC 100V	For AC 200V
M-System Co.	MA-100	MA-200

### (3) Line filters, sealed transformers

Manufacturer	Type
TDK	RSHN-2003

### (4) Relay

Manufacturer	Type
OMRON	G3F

\* When performing frequent on/off control, we recommend using an external stop signal to perform the control.

\* When using a contact relay to turn the power on/off, use a relay with contact capacity of 5 A or more. The contact may be welded if the contact capacity is less than 5 A. If the relay is affected by devices other than the pump, use a relay with contact capacity of 10 A or more.

# Precautions



## WARNING

- Ensure that only trained operators and control personnel will operate the pump.
- Do not operate the pump with wet hands. Doing so may result in electric shocks.
- Should a problem occur such as the appearance of smoke or a burning smell, shut down the pump's operation immediately, and contact your vendor or a Wanner Engineering representative. Otherwise, a fire, electric shocks and/or malfunctions may result.
- A closed valve or other blockage on the discharge side of the pump is dangerous. It may lead to an excessive rise in pressure that will exceed the pump's specification range, causing liquid to escape, the pipe to be damaged and the pump itself to malfunction. Prior to operating the pump, check the valves and pipes, etc.



## CAUTION

- When working on the liquid-end parts of the pump, wear personal protective gear suited to the chemical involved (such as rubber gloves, a mask, protective goggles and work overalls that are resistant to chemical reaction).
- The vibration of the pump may cause the hoses/tubes to become loose and/or disconnected. Before starting operation, secure the hoses/tubes.
- While the pump is operating, the pump's surfaces may become hot, reaching a temperature of 60°C (140°F) or more.
- Idling the pump for prolonged periods of time can lead to malfunctions.
- When diluting sodium hypochlorite, use pure water or water processed with a water softener. Otherwise the pump may malfunction or discharge hazardous chemicals.

NOTE: Check the following:

### Before operation

Check location	Details of check	Notes
Tank	The amount of liquid is sufficient. If not, replenish it.	Important: Air contact may create an adverse affect.
Pipes	Connections and condition. Reconnect, repair or replace accordingly.	—
Valves	The valves are open. If a valve is closed, open it.	Closed valves can cause dangerous situations in which the pressure rises excessively, liquid escapes and/or the pipes are damaged.
Power supply	The pump is connected properly to the prescribed power supply.	If power supply is inadequate, the electronic circuits and solenoids may burn out.

### During operation

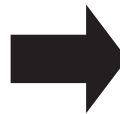
Check location	Details of check	Notes
Pump head	Liquid leaking from underneath the auxiliary ring at the back of pump head.	If a leak is detected, inspect the diaphragm. Repair or replace if damaged or deteriorated.
Joints/pipes	Liquid leaks and loose fittings or joints.	Leaking indicates a loose joint; tighten or replace. If leak persists, inspect O-rings.
Discharge-side pressure	Discharge pressure gauge.	If the gauge shows an abnormal value, a pipe or valve may be blocked. Inspect the pipes.

- When using the pump for the first time
- When resuming operation after a prolonged shutdown of operation
- When the pump is gas-locked
- When the tank is empty



**Air release & calibration**  
(see pages 22 - 26)

- When using the pump for the first time
- When resuming operation after a prolonged shutdown of operation



**Calibration**  
(see page 26)

- When using the pump for the first time
- When changing the discharge volume



**Discharge-volume setting**  
(see page 21)  
**Pump control** (see pages 28 - 31)

- When shutting down operation for a prolonged period
- When resuming operation after a prolonged shutdown of operation



**Prolonged shutdown/  
resuming operation procedure**  
(see page 26)

# Discharge-volume setting

Pump control setting options:

- (1) Setting the discharge capacity by manual operation
- (2) Setting the discharge capacity using the stroke length
- (3) Controlling operation using signal input

Methods (1) and (2) are described below.

\* For method (3), refer to the pump control functions on page 28.

## Setting the discharge capacity by manual operation

### Stroke number setting mode

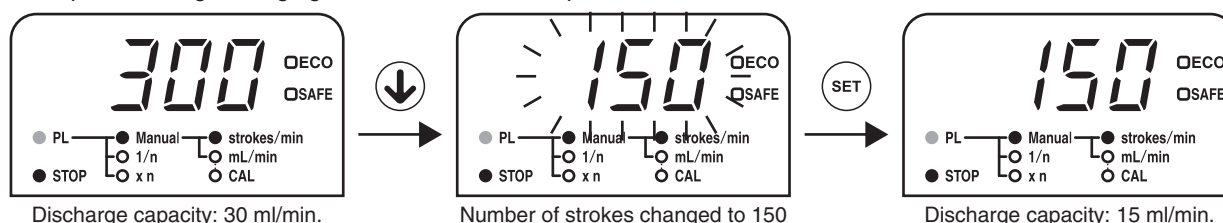
The discharge capacity can be set by increasing or reducing the number of strokes.

In the manual mode, the number of strokes can be changed using the [↑] and [↓] keys on the control panel.

After changing the setting, press the SET key to enter the change.

Setting range: 1 to 300 strokes/min.

Example of setting: Changing the number of strokes per minute from 300 to 150 for SP-030



### Discharge capacity setting mode (SP series only)

When the control type is SP, the discharge capacity can be set directly.

Proceed with calibration before use in order to ensure that the precise discharge capacity is obtained.

For details on calibration, refer to setting flow on page 32.

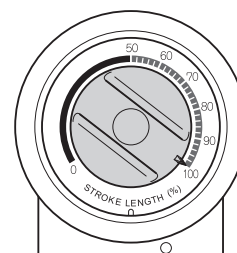
Setting range: 0.1 ml/min. to maximum discharge capacity of model

## Setting the discharge capacity using the stroke length

- The stroke length of the diaphragm can be adjusted by turning the stroke-length adjustment dial located at the back of the solenoid box.

\* When the dial is moved while the pump is stopped, the dial setting may shift during pump operation. Confirm setting, readjust the dial if shifted.

Adjustable range of stroke length: 50 to 100%



### CAUTION

- Operate with the stroke length set to 100% when the SAFE mode, ECO mode, or ALARM functions are to be enabled.

### IMPORTANT

- The description in the section on “Discharge-volume setting” assumes that the stroke length is set to 100%. Therefore, when the stroke length has been changed, reduce the maximum discharge volume and discharge volume per stroke at the same ratio.
- Mainly use the stroke speed to adjust the discharge volume, and use the stroke length in an auxiliary capacity (for fine adjustments).
- Do not set the stroke length to below 50%.

# Air release



## WARNING

- During the air release, chemical may suddenly escape from the pipes and other parts. Run the end of the relief/air-release hose back to the tank or another appropriate container and secure it so that it will not become disconnected.

## IMPORTANT

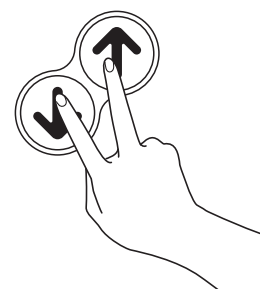
- When using the pump for the first time or when the chemical container has been replaced, proceed with the task of air release prior to operating the pump.

The air-releasing procedure will be described by pump type.

Model	Relief valve function	Liquid-end type	Air-release method	page
Injection of general chemicals	with relief valve	PE/PF	A	23
		KE/KF/KP		
	without relief valve	PE/PF (030/060/100)	B	24
		PE/PF (200)	C	25
		KE/KF/KP	B	24
		ST	D	25
Injection of high-viscosity chemicals	without relief valve	HV	E	25
Injection of boiler chemicals	with relief valve	BH	A	23
	without relief valve	BH	B	24
Injection of high-pressure	without relief valve	CH	B	24
Injection of sodium hypochlorite	with relief valve	CN/CD	A	23
	without relief valve	CN/CD	B	24

## NOTE

When the [↑] and [↓] keys are pressed simultaneously during a pump operation, the pump operates at the maximum number of strokes while the keys are held down. The air can be released quickly for all models except the ST and HV types.



## When the liquid is not discharged even after air releasing

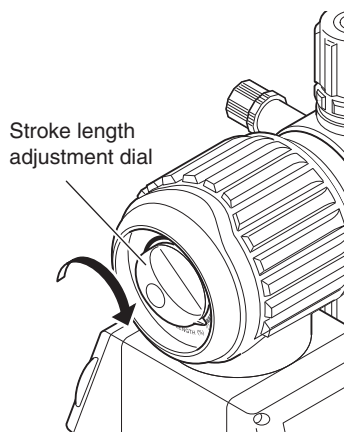
This may mean that the valve seat area (an area sealed by the check ball) on the discharge side or suction side is clogged with foreign matter. Turn off the pump's power, remove the joints, and wash the check balls and valve seats. Do not mistake the discharge side parts for the suction side parts and vice versa, reassemble the parts while still wet into the pump head.

# Air release

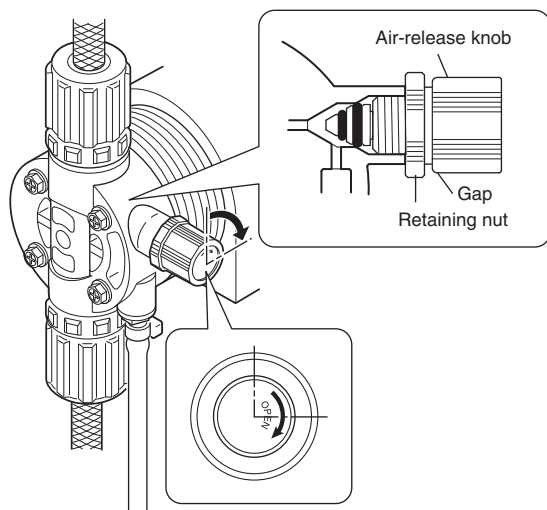
## Air-release method A

Before proceeding with the air releasing, check that the end of the relief/air-release hose has been run back to the tank or another appropriate container.

- (1) Turn off the pump's power and release the pressure inside the discharge side pipe.
- (2) Set the stroke length adjustment dial to 100%.



- (3) Turn the air-release knob clockwise by 90 degrees. The clearance between the knob and clamp nut can be seen.



- (4) Turn on the pump's power.
- (5) Set the discharge capacity to the maximum rate. (This can also be done by pressing the [↑] and [↓] keys simultaneously during operation.)
- (6) Press the [STOP/START] key to operate the pump.
- (7) After a few moments, the chemical drains off and the air is vented from the chemical escape port.
- (8) When all the air has been vented, turn the air-release knob clockwise until a clicking sound is heard.
- (9) Press the [STOP/START] key to stop the pump.
- (10) Return the stroke-length adjustment dial to the previous setting.

### IMPORTANT

- Under no circumstances should the air-release knob be turned counterclockwise.

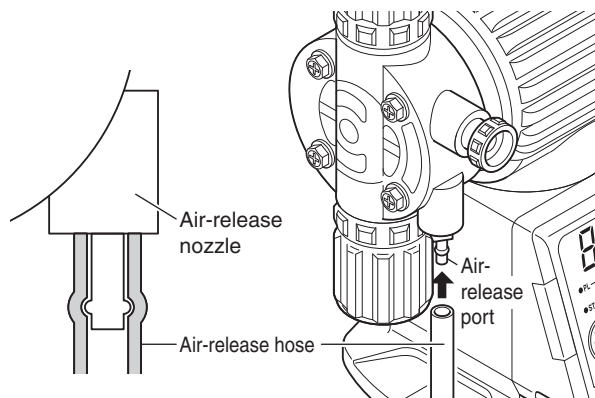
### NOTE

- If it is difficult to release the air, keep turning the air-release knob clockwise until a clicking sound is heard repeatedly.

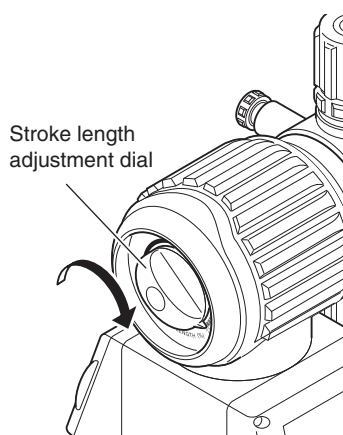
# Air release

## Air-release method B

- (1) Insert the accessory air-release hose (4 mm × 6 mm) into the air-release port. Ensure that the hose is inserted all the way to its base. Check that the other end of the hose is brought back to the tank, etc.

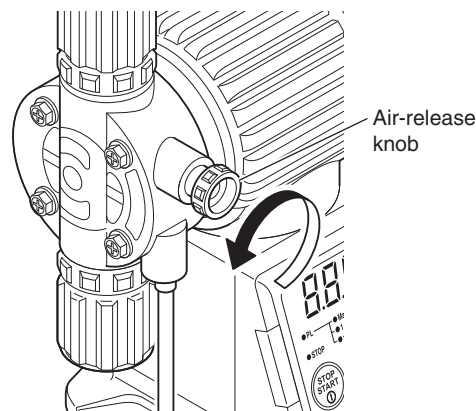


- (2) Turn off the pump's power and release the pressure inside the discharge-side pipe.
- (3) Set the stroke-length adjustment dial to the 100% mark on the scale.



- (4) Turn on the pump's power.
- (5) Press the [STOP/START] key to start operating the pump.
- (6) Press the [↑] and [↓] keys simultaneously during operation. (This can also be done by setting the discharge capacity to the maximum.)

- (7) While operating the pump, turn the air-release knob counterclockwise between 1 and 1.5 turns. The air remaining inside the suction side hose and pump head is discharged from the air-release valve and the chemical fills the inside of the pump head.



- (8) Discharge any remaining air from the air-release nozzle in the suction-side hose and pump head, check that the pump head is full of liquid, and then release the [↑] and [↓] keys.

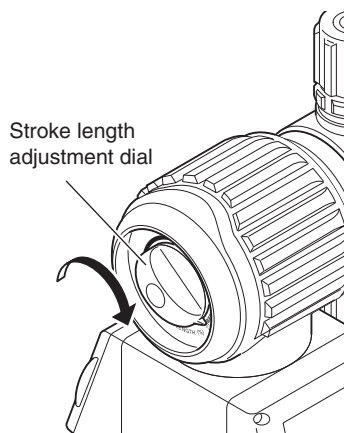
While this is happening, chemical will escape from the air-release port; therefore, tighten the air-release knob.  
\* If the air is not readily released, repeatedly open and close the air-release knob.

- (9) Press the [STOP/START] key to shut down the pump.
- (10) Return the stroke-length adjustment dial to the mark on the scale that it was previously set to.

# Air release

## Air-release method C

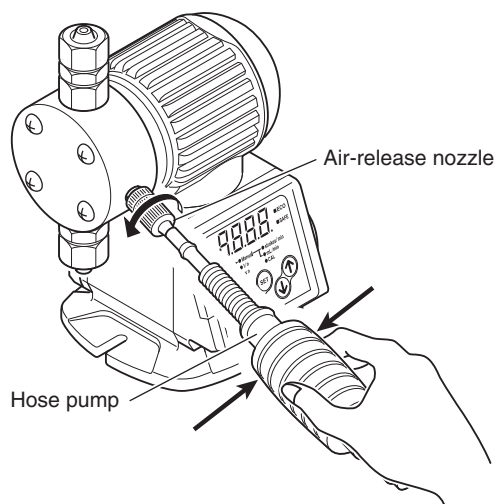
- (1) Turn off the pump's power. Release the pressure inside the discharge-side pipe.
- (2) Set the stroke-length adjustment dial to the 100% mark on the scale.



- (3) Turn on the pump's power.
- (4) Set the discharge capacity to the maximum rate. (This can also be done by pressing the [↑] and [↓] keys simultaneously during operation.)
- (5) Press the [STOP/START] key to start operating the pump.
- (6) Press the [STOP/START] key to shut down the pump.

## Air-release method D

- (1) Turn off the pump's power. Release the pressure inside the discharge-side pipe.
- (2) Slightly loosen the air-release nozzle at the bottom right of the pump head by turning it counterclockwise.
- (3) Insert the hose pump provided, compress the pump, and draw up the chemical until all the air in the pump head comes out.



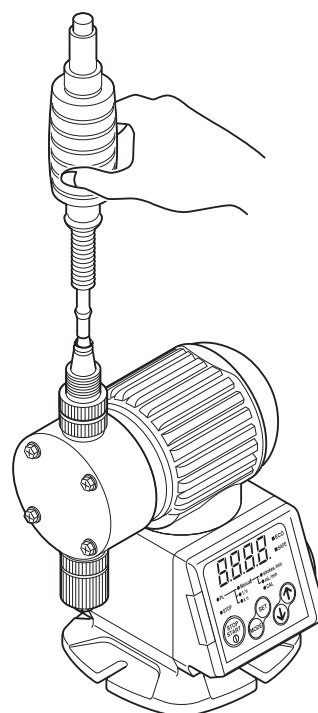
- (4) Close the air-release nozzle by turning it clockwise.

## IMPORTANT

- If the air-release nozzle is loosened too much, it will fall off, damaging the packing. Do not loosen the nozzle too far.

## Air-release method E

- (1) Turn off the pump's power. Release the pressure inside the discharge-side pipe.
- (2) Disconnect the discharge side hose.
- (3) Insert the accessory hose pump into the joint.
- (4) Compress the hose pump several times. The air remaining inside the suction side hose and pump head is discharged, and the chemical fills the inside of the pump head.
- (5) Return the pipe to its original state when chemical emerges from the hose pump.



# Calibration

## About calibration

Calibration is a function that enables the discharge capacity to be set accurately by measuring the maximum discharge capacity under the conditions of actual use by the user and storing the measured value in the pump's memory. It works only in the discharge capacity setting mode of the SP series.

\* For details of the operation procedure for calibration, refer to the setting flow on page 32.

# Prolonged shutdown/resuming operation procedure

NOTE: Follow the steps below when shutting down the pump for a prolonged period.

## To shut down the pump

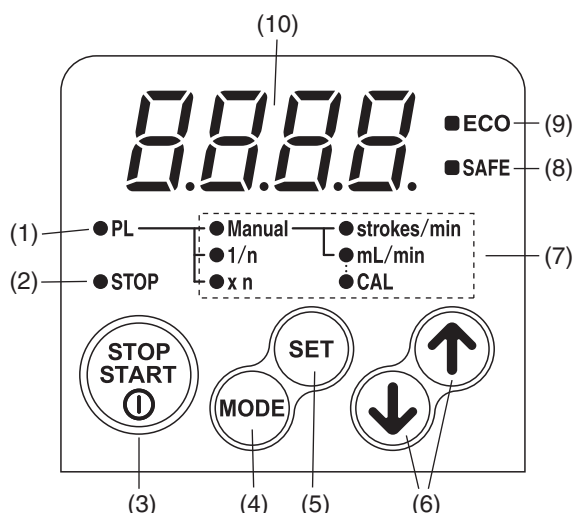
- (1) Operate the pump so that clean water is sucked in and discharged for about 30 minutes to clean the inside of the pump head.
- (2) Turn off the power completely with the inside of the pump head full of clean water.
- (3) Place the cover over the pump to protect the pump from the build-up of dust and corrosive environments.

## To resume operation

- (1) Check the inside of the tank for any sediment that may have accumulated and check the indication of deterioration such as cloudy liquid. If the liquid quality has deteriorated, clean the inside of the tank, and replace all the existing liquid with fresh chemical.
- (2) Check the liquid-end parts for deterioration, dirt and other foreign matter.
- (3) Follow instructions in the section "Before operation" on page 20.

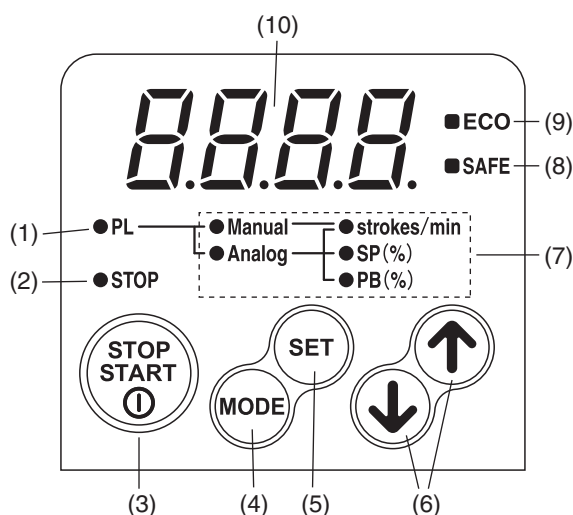
# Control panel

## ■ SP series: Pulse-input type



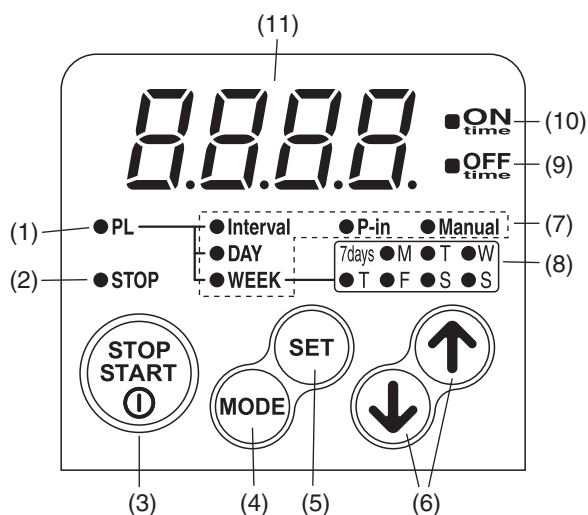
No.	Name	Function
(1)	PL Indicator	<ul style="list-style-type: none"> <li>Lights while power is supplied.</li> <li>Blinking during operation indicates pump's timing.</li> </ul>
(2)	STOP LAMP	Lights while the pump is shut down.
(3)	STOP/START KEY	Used to start or stop operation.
(4)	MODE KEY	Used to switch the operation mode.
(5)	SET KEY	<ul style="list-style-type: none"> <li>Used to enter what has been set.</li> <li>Used to transfer from the mode display screen to the setting screens.</li> </ul>
(6)	↑ ↓ KEY	Used to change the setting values.
(7)	Mode display	Real time operation and mode setting.
(8)	SAFE mode display	SAFE mode setting is ON.
(9)	ECO LAMP	Minimal power consumption. * Lights regardless of ECO mode setting.
(10)	DISPLAY	Shows setting values.

## ■ SA series: Analog-input type



No.	Name	Function
(1)	PL Indicator	<ul style="list-style-type: none"> <li>Lights while power is supplied.</li> <li>Blinking during operation indicates pump's timing.</li> </ul>
(2)	STOP LAMP	Lights while the pump is shut down.
(3)	STOP/START KEY	Used to start or stop operation.
(4)	MODE KEY	Used to switch the operation mode.
(5)	SET KEY	<ul style="list-style-type: none"> <li>Used to enter what has been set.</li> <li>Used to transfer from the mode display screen to the setting screens.</li> </ul>
(6)	↑ ↓ KEY	Used to change the setting values.
(7)	Mode display	Real time operation and mode setting.
(8)	SAFE mode display	SAFE mode setting is ON.
(9)	ECO LAMP	Minimal power consumption. * Lights regardless of ECO mode setting.
(10)	DISPLAY	Shows setting values.

## ■ ST series: Timer type



No.	Name	Function
(1)	PL Indicator	<ul style="list-style-type: none"> <li>Lights while power is supplied.</li> <li>Blinking during operation indicates pump's timing.</li> </ul>
(2)	STOP LAMP	Lights while the pump is shut down.
(3)	STOP/START KEY	Used to start or stop operation.
(4)	MODE KEY	Used to switch the operation mode.
(5)	SET KEY	<ul style="list-style-type: none"> <li>Used to enter what has been set.</li> <li>Used to transfer from the mode display screen to the setting screens.</li> </ul>
(6)	↑ ↓ KEY	Used to change the setting values.
(7)	Mode display	Real time operation and mode setting.
(8)	Day of the week display	The lamp of the current day of the week lights while the current time is displayed or while WEEK mode is established.
(9)	OFF time lamp	<ul style="list-style-type: none"> <li>Lights while OFF period/time is being set.</li> <li>Lights when OFF is set in the timer mode.</li> </ul>
(10)	ON time lamp	<ul style="list-style-type: none"> <li>Lights while ON period/time is being set.</li> <li>Lights when ON is set in the timer mode.</li> </ul>
(11)	DISPLAY	Shows setting values.

# Pump control

## Function correspondence table

Liquid-end type	PE/PF/KE/KF/KP/ST			HV	BH		CH	CN/CD	
Model	03R/06R/10R	030/060/100	200	060/100	03R	030	030	03R/06R/10R	030/060/100
Relief-valve function	●	-	-	-	●	-	-	●	-
SAFE mode	●	●	×	●	×	×	×	●	●
Alarm function	●	●	●	●	●	●	●	●	●
ECO mode	●	●	×	●	●	●	●	×	×

\* × Indicates that the function concerned should not be reset (if technically approved).

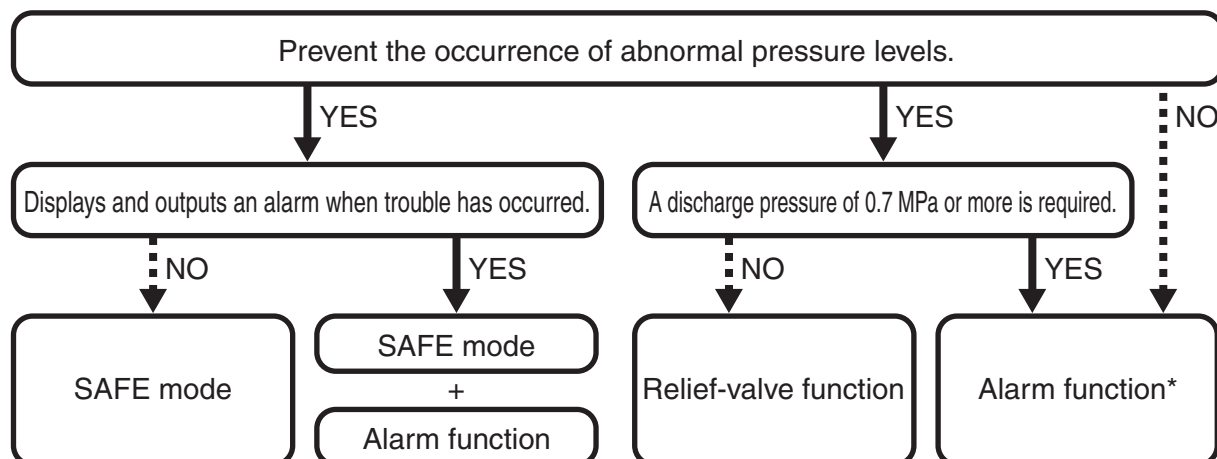


### CAUTION

- When setting the SAFE mode, use the 100% setting for the stroke length. If the stroke length is changed, the pressure may rise above the rated level.

## Safety function selection flow

START



\* Displayed during blocked operation.

## SAFE mode

When the SAFE mode is enabled, the force of the pumped chemical is controlled during a blocked operation to prevent the pressure from rising.

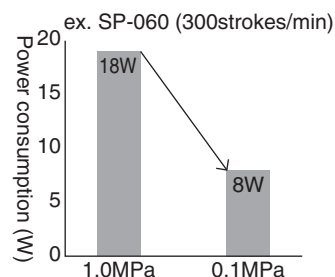
It is recommended that the SAFE mode be set when using only the pressure of the anti-siphon check valve or when the pump is used at a low pressure.

If the “P-03 Blocked operation” parameter is enabled when the SAFE mode is enabled, an alarm is displayed. Output is at a pressure level lower than normal.

## ECO mode

When the ECO mode is enabled, the power-on time is automatically reduced in accordance with the variations in the discharge pressure and the power consumption is reduced.

\* When the ECO mode is enabled for the CD or CN type, it becomes more difficult to vent the air so use ‘disabled’ as the ECO mode setting.



# Pump control

## Manual mode

### ● Basic operation

In the manual mode, the discharge capacity can be set using either of the following methods:

#### Stroke number setting mode

Set the stroke number range (1 to 300 strokes/min.) in 1-step increments.

#### Discharge capacity setting mode (SP only)

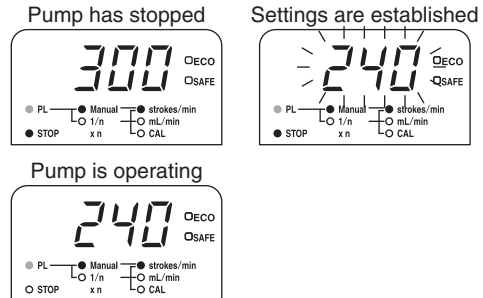
Set the discharge capacity range (0.1 ml/min. to maximum discharge capacity) in 0.1-ml/min. increments.

### ● Purposes of operation

The manual mode is used for the following purposes:

- Routine operations
- Test operations such as when the pump is installed
- Provisional operations such as when trouble occurs (no signals input) during automatic operation

### ● Display



### ● External operation and stop input signals

Though seldom necessary in the manual mode to input signals from an external source, the pump can be operated and stopped using the operation and stop signals (continuous signals) from an external source.

\* The displayed settings blink while the pump is stopped by the "stop input signal".

## Pulse input-based proportional control

The pump operates automatically in accordance with the pulse input signals supplied from the external source. Pulse input-based proportional control has two modes: pulse frequency-division mode and pulse frequency-magnification mode.

### ● Purposes of operation

- Control is used for the purpose of flow proportional injection, etc.
  - It is used when the injection amount is not appropriate without taking further action because the number of flow meter pulses is too high or too low.
  - The stroke length adjustment dial is also used to finely adjust the discharge capacity.
- \* Use the stroke length in the range of 50% to 100%.

### ● Operation control signal

No-voltage contact or open collector signal

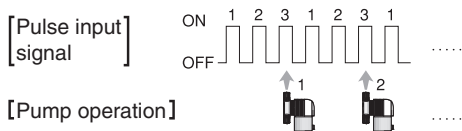
### ■ Pulse frequency-division mode

#### ● Basic operation

The pump is activated once in response to pulses that have been input 'n' number of times from the external source.

'n' setting range: 1 to 999

Setting example: n=3



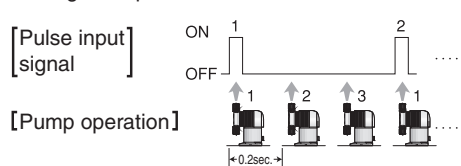
### ■ Pulse frequency-magnification mode

#### ● Basic operation

The pump is activated 'n' number of times in response to each pulse that has been input from the external source. It operates at the stroke interval of the set number of strokes.

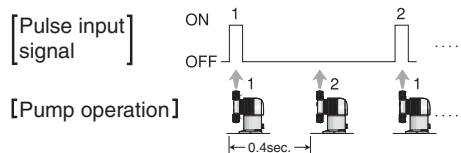
'n' setting range: 1 to 999

Setting example: n=3



Setting example: n=3

Number of strokes: 150 strokes/min.



\* With in-line injection, the chemicals are mixed more uniformly.

# Pump control

## Timer control

### ● Interval mode

ON/OFF operations are repeated by setting the ON period and OFF period.

Number of programs that can be set: 1 pattern each for ON period and OFF period

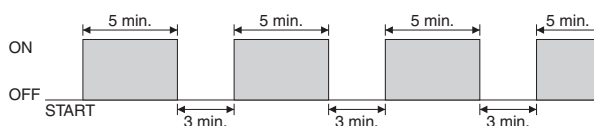
Periods that can be set: 1 to 9999 minutes

\* Whether or not to use pulse input-based proportional control can be selected.

When use of this control is selected, the pump operates at the pulse frequency-division or frequency-magnification that is set during the ON period of the interval.

Setting examples: ON period = 5 minutes

OFF period = 3 minutes



### ● DAY mode

The pump operates automatically every day at the ON time and OFF time that have been set for the same periods.

Number of programs that can be set: 9 patterns

Times that can be set: ON time = 0.00 to 23:59

OFF time = (after ON time) up to 24:00

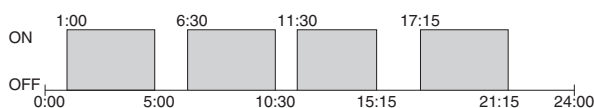
\* The same time cannot be set for the ON time and OFF time.

\* Whether to use interval operation and pulse input-based proportional control can be selected.

\* The DAY mode cannot be used together with the WEEK mode.

Setting example

Program No.	1	2	3	4
ON time	1:00	6:30	11:30	17:15
OFF time	5:00	10:30	15:15	21:15



### ● WEEK mode

The pump operates automatically every week at the ON time and OFF time that have been set for the same day of the week and for the same periods.

Number of programs that can be set: 7 patterns (1 pattern every day)

Times that can be set: ON time = 0.00 to 23:59

OFF time = (after ON time) up to 48:00

\* The same time cannot be set for the ON time and OFF time.

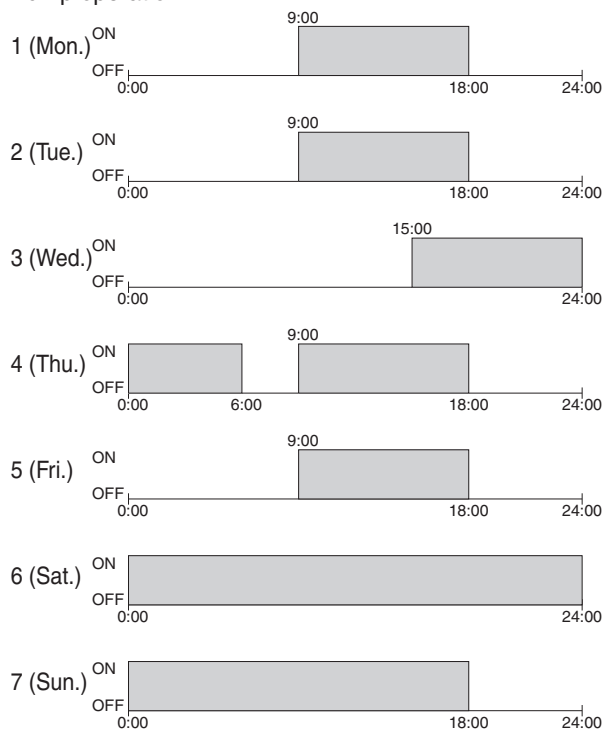
\* Whether to use interval operation and pulse input-based proportional control can be selected.

\* The WEEK mode cannot be used together with the DAY mode.

Program setting example

Program No. (day)	1 (Mon.)	2 (Tue.)	3 (Wed.)	4 (Thu.)	5 (Fri.)	6 (Sat.)	7 (Sun.)
ON time	9:00	9:00	15:00	9:00	9:00	0:00	No settings.
OFF time	18:00	18:00	30:00	18:00	18:00	42:00	No settings.

Pump operation



## NOTE

### • DAY mode or WEEK mode + interval operation

The pump repeats the interval operation within the ON period in each mode. The values set in each program serve as the number of strokes.

### • DAY mode or WEEK mode + pulse input-based proportional control

The pump operates at the pulse frequency-division or frequency-magnification that was set within the ON period in each mode.

### • DAY mode or WEEK mode + interval operation + pulse input-based proportional control

The pump operates at the pulse frequency division or frequency-magnification set when the interval operation is ON within the ON period in each mode.

### • External operation and stop input signal control

The timer modes can be used together with external operation and stop input signal control.

# Pump control

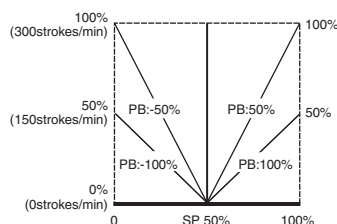
## Analog input-based proportional control

### ● Basic operation

When the proportional band (straight line gradient) and set points are set for the analog signals (4 to 20 mA) from an external source, the number of strokes is automatically controlled in accordance with the input signals.

### ● Set point (SP)

For the set point (SP), the target values are set on the X (horizontal) axis.

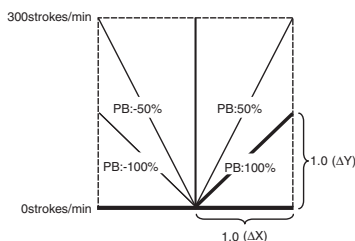


### ● Proportional band (PB)

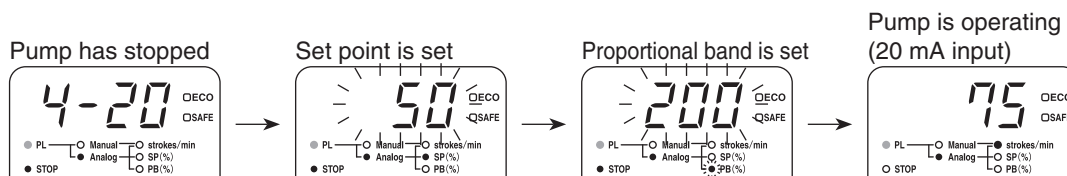
For the proportional band (PB), the reciprocal of the straight line gradient is set.

Example:

When the proportional band (PB) is 100%



### ● Display



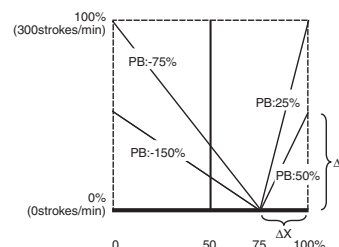
### ● Purposes of operation

Analog proportional control is used for proportional injection and other uses.

### ● Operation control signals

DC 4 to 20 mA

Proportional band (straight line gradient) is set

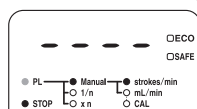


$$\text{Proportional band (PB)} = \frac{(\Delta X / \Delta Y) \times 100}{= (25 / 50) \times 100 = 50\%}$$

# Keylock

Set the key to the locked position to prevent operations from being performed by mistake.

Press the MODE key and SET key simultaneously for 2 or more seconds while the pump is stopped.



These are used to lock the keys or release the locked keys.

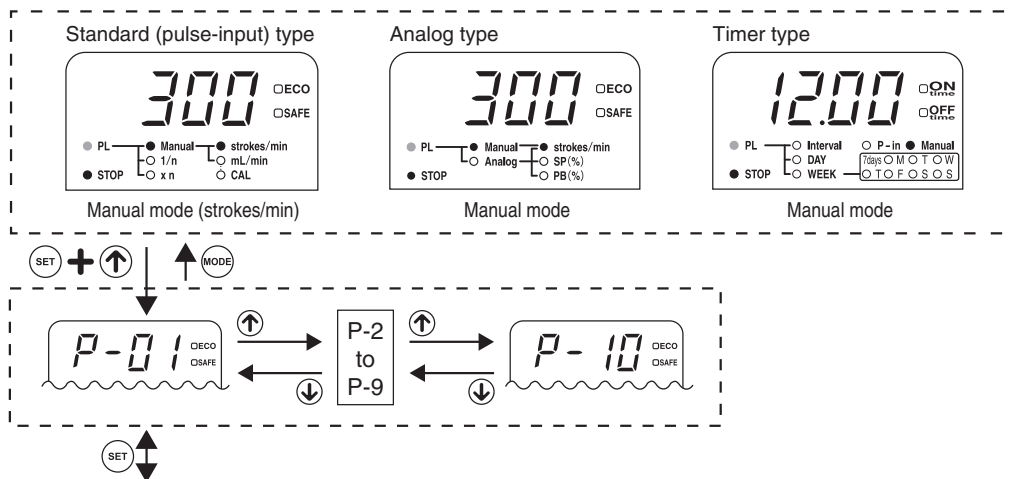
## NOTE

While the keys are locked, the only operations that can be performed are STOP/START, key lock release and MAX operation.

# Parameter settings

## Setting flow

\* For details on how to change the operation mode, refer to the setting flow instructions page 62.



## Parameter settings screen

\* The parameter settings can be changed using the [↑] and [↓] keys. For details on the parameters, refer to the settings list below.

## List of parameters

**NOTE** • A separate signal cable is required in order to use the alarm output.

No.	Item	Description	Parameter	Default	Notes
P-01	SAFE mode	Selects SAFE mode.	0: Disabled 1: Enabled	0: Disabled	Cannot be used by the SP/SA/ST-200, boiler type or high-pressure type.
P-02	Pulse overflow error *1	To display and output an alarm when a pulse overflow error has occurred.	0: Disabled 1: Enabled	0: Disabled	The setting of this parameter takes effect only for the SP and ST.
P-03	Blocked operation	To display and output an alarm during operation with the discharge side blocked.	0: Disabled 1: Enabled	0: Disabled	
P-04	Level error *1	To display and output an alarm when a level error has occurred.	0: Disabled 1: Enabled	0: Disabled	Occurs when a stop input signal is supplied with '1' selected as the parameter's setting.
P-05	Analog error *1	To display and output an alarm when the analog input value has dropped below the lower limit or risen above the upper limit.	0: Disabled 1: Enabled	0: Disabled	The setting of this parameter takes effect only for the SA.
P-06	Sensor detection	Diagnoses the sensor status.	—	—	"1" is displayed when normal, and "0" when abnormal. The ECO mode, SAFE mode and ALARM functions do not operate when the sensor status is abnormal.
P-07	External operation and stop input signals received. Setting operation to be performed.	Selects pump operation when an external operation or stop input signal is received.	0: Stop 1: Operation	0: Stop	
P-08	ECO mode setting	Selects ECO mode.	0: Disabled 1: Enabled	1: Enabled	The initial value for CN/CD type is '0.' Do not set '1' for CN/CD type.
P-09	Delay alarm time setting	Displays alarms and sets the output delay time.	0 to 600 sec	0 sec.	
P-10	Pulse input check	Checks pulses input.	—	—	"1" is displayed when pulse input is ON, and "0" when pulse input is OFF. The setting of this parameter takes effect only for the SP and ST.

\*1 Refer to the alarm codes.

# Precautions



## WARNING

- Ensure that only trained operators and control personnel will operate the pump.
- Ensure that the power will not be turned on during the course of work. Hang a sign on the power switch indicating that work is in progress.
- Do not operate the pump with wet hands. Doing so may result in electric shocks.
- Should a problem occur such as the appearance of smoke or a burning smell, shut down the pump's operation immediately, and contact your vendor or a Wanner Engineering representative. Otherwise, a fire, electric shocks and/or malfunctions may result.
- Do not attempt to disassemble the pump body or the circuit parts.



## CAUTION

- When working on the liquid-end parts of the pump, wear personal protective gear suited to the chemical involved (such as rubber gloves, a mask, protective goggles and work overalls that are resistant to chemical reaction).
- Before attempting to maintain or repair the pump, release the pressure in the discharge pipe, discharge the liquid in the pump head, and clean the liquid-end parts.

## Routine inspections

- Check whether the level of the chemical in the tank is high enough.
- Check that the chemical is not leaking from the joint areas or from around the pump head.
- Check the pump for chemical leakage.
- Tighten the hose connections at periodic intervals.
- Check that the pressure gauge on the pump discharge indicates a normal value.

## Periodic inspections

- At the 10,000-hour mark after starting the pump operation



**Replacing the spare parts**  
(see pages 57 - 59)

## When trouble has occurred

- When the relief-valve function has been activated



**Replacing the relief valve**  
(see page 34)

- When trouble has occurred during operation



**Troubleshooting**  
(see pages 44 - 46)

# Precautions

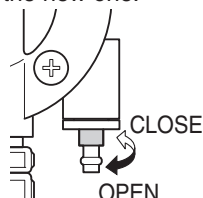
## ■ Replacing the relief valve

When the relief-valve function has been triggered by blockage of the discharge side pipe or by some other factor, take the following steps:

- Immediately stop the pump, remove the cause of the trouble and take steps to prevent recurrence.
- The relief valve is a wear item and needs to be replaced once this has occurred.

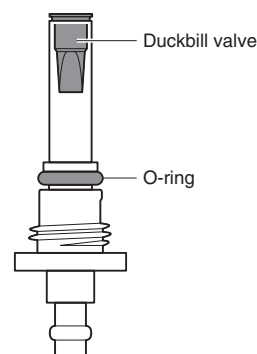
## ■ Replacing the air-release nozzle

Hold the shaded area in the figure in place using a wrench (7 mm width across flat wrench), remove the old nozzle and install the new one.



### NOTE

- The duckbill valve can sometimes come out from the air-release nozzle. Be careful not to lose the duckbill valve when handling it.
- \* The duckbill valve is not included for the air-release nozzle of KE/KF/KP types.



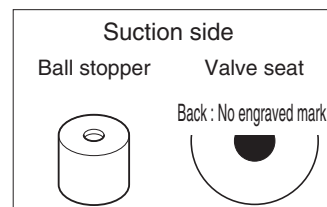
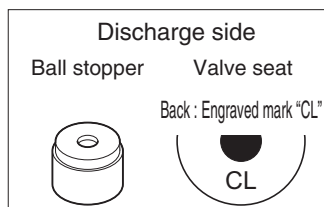
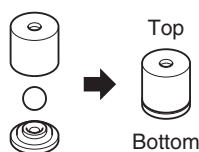
## ■ Replacing the valve seat area or diaphragm:

- Install the O-ring, ball stopper and check ball while ensuring that they are oriented in the correct directions.
- When removing the top and bottom joints and then reassembling them, check that the top joint is not mistaken for the bottom joint and vice-versa.
- Check that the O-ring and check ball are not damaged and that the valve seat area is free of damage and dirt.

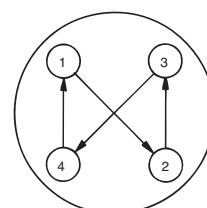
### IMPORTANT

- When re-assembling the valve seat set in the pump head, check that it is not installed upside-down.

- If, with the CN/CD type, the discharge side and suction side valve seats are installed in reverse, the pump's performance will be reduced. Refer to the figure on the right and assemble these seats correctly.



- When securing the pump head using the head bolts, tighten each bolt uniformly by small intervals in sequence as shown in the figure on the right. If, for example, the bolts are tightened in the sequence of 1 → 3 → 2 → 4, the tightening will be uneven, and the chemical may leak from the pump head.



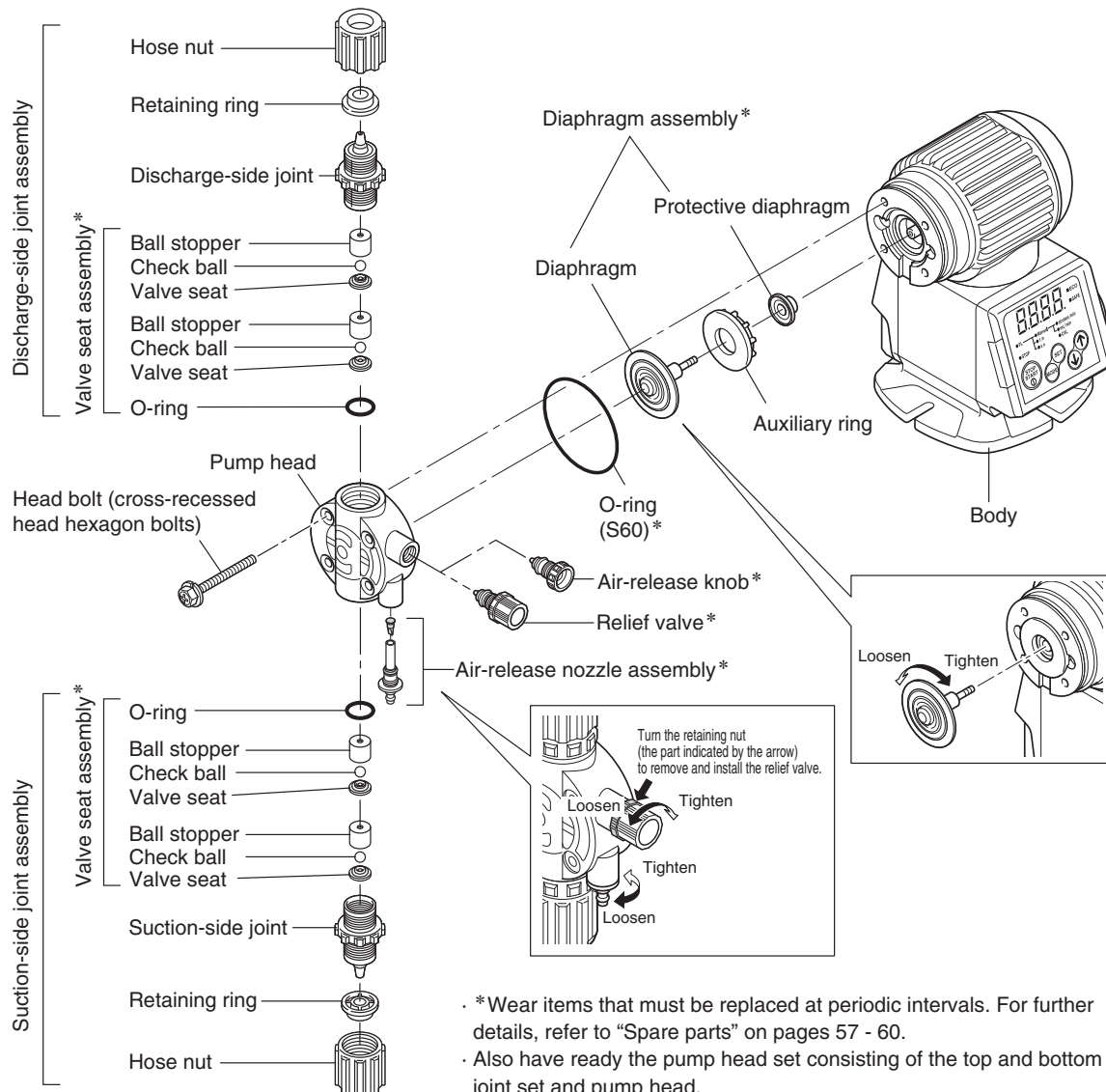
- When attaching the diaphragm, turn it in the clockwise direction until tightened. If the diaphragm is loose, it will come in contact with the pump head, which may cause malfunctions and damage.

# Exploded views of liquid-end parts and external dimensions

## General chemical injection type

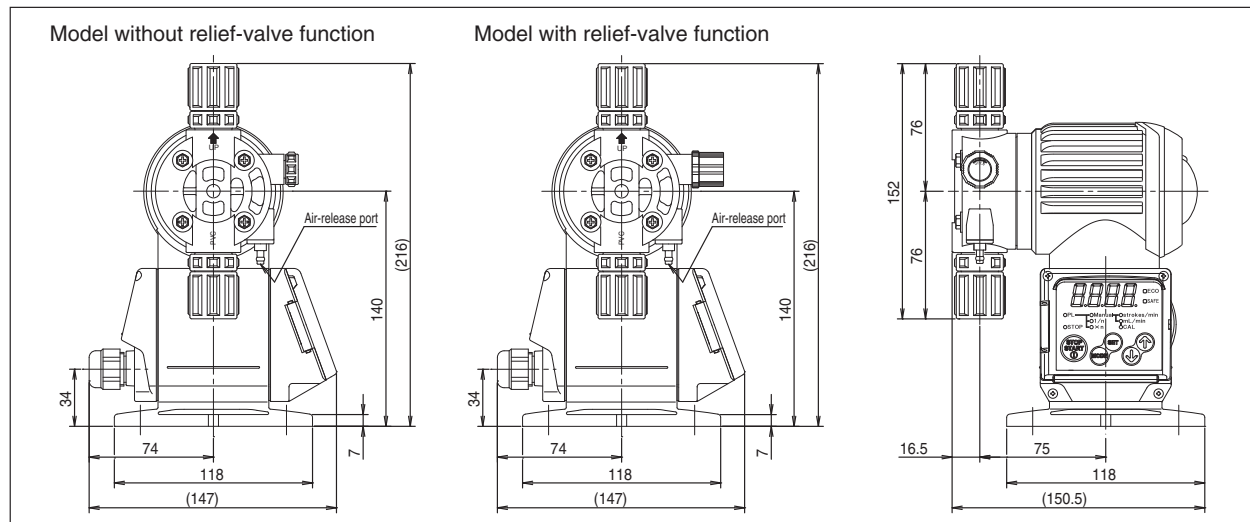
Model: 030/03R/060/06R/100/10R Liquid-end type: PE/PF

### Exploded views of liquid-end parts



- \* Wear items that must be replaced at periodic intervals. For further details, refer to "Spare parts" on pages 57 - 60.
- \* Also have ready the pump head set consisting of the top and bottom joint set and pump head.

### External dimensions

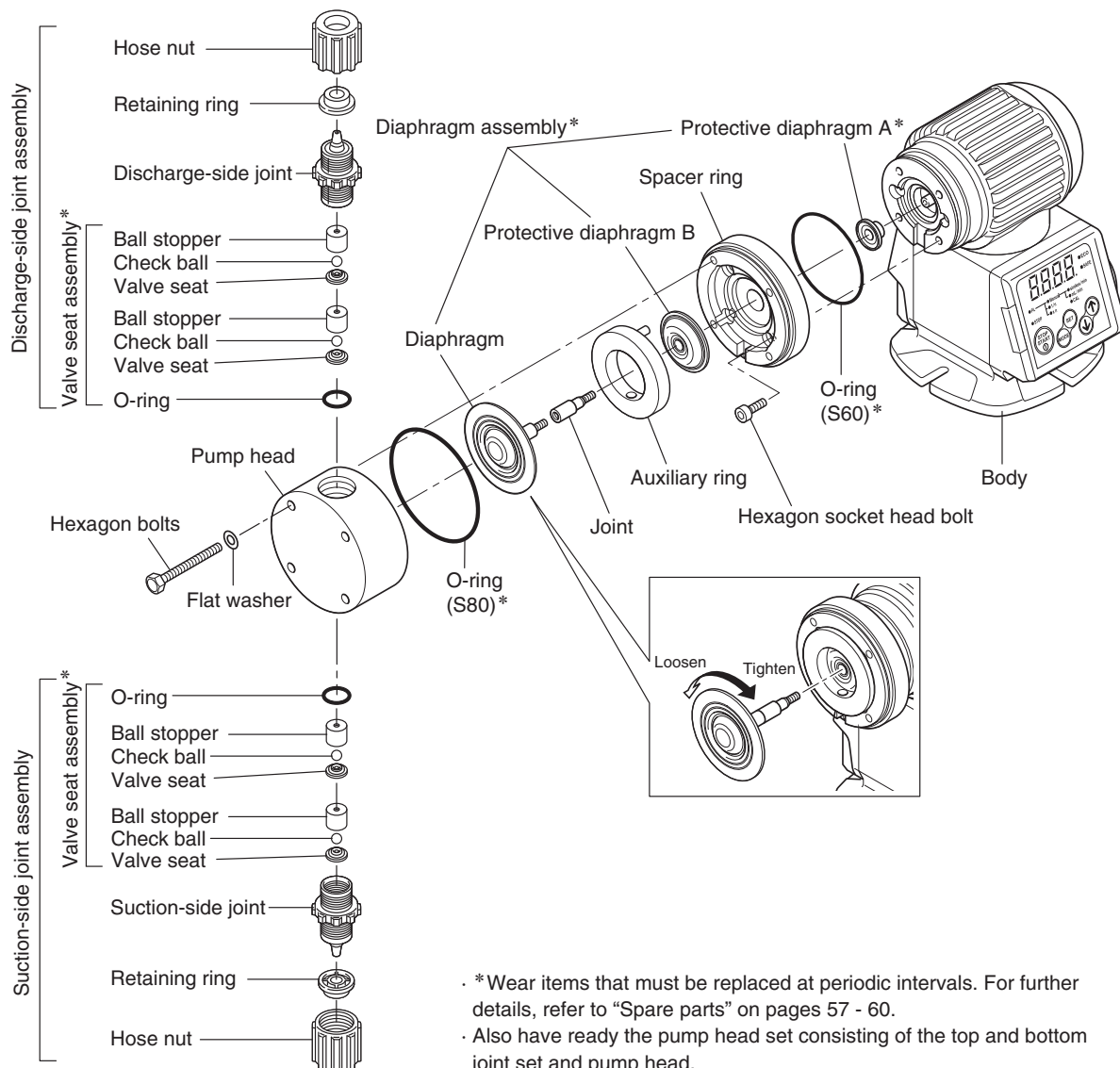


# Exploded views of liquid-end parts and external dimensions

## General chemical injection type

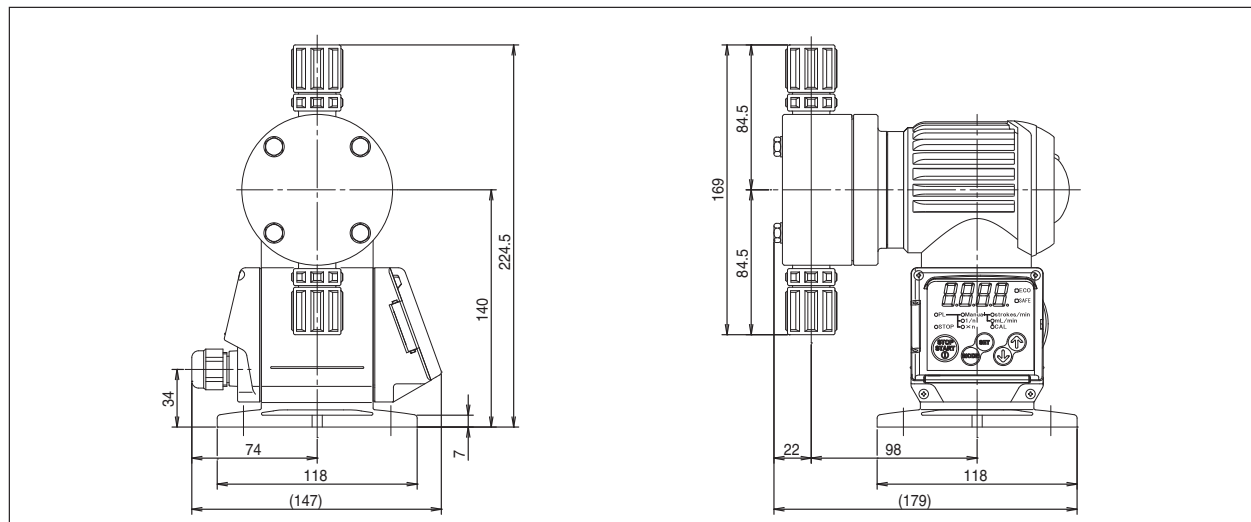
Model: 200 Liquid-end type: PE/PF

### Exploded views of liquid-end parts



- \* Wear items that must be replaced at periodic intervals. For further details, refer to "Spare parts" on pages 57 - 60.
- Also have ready the pump head set consisting of the top and bottom joint set and pump head.

### External dimensions

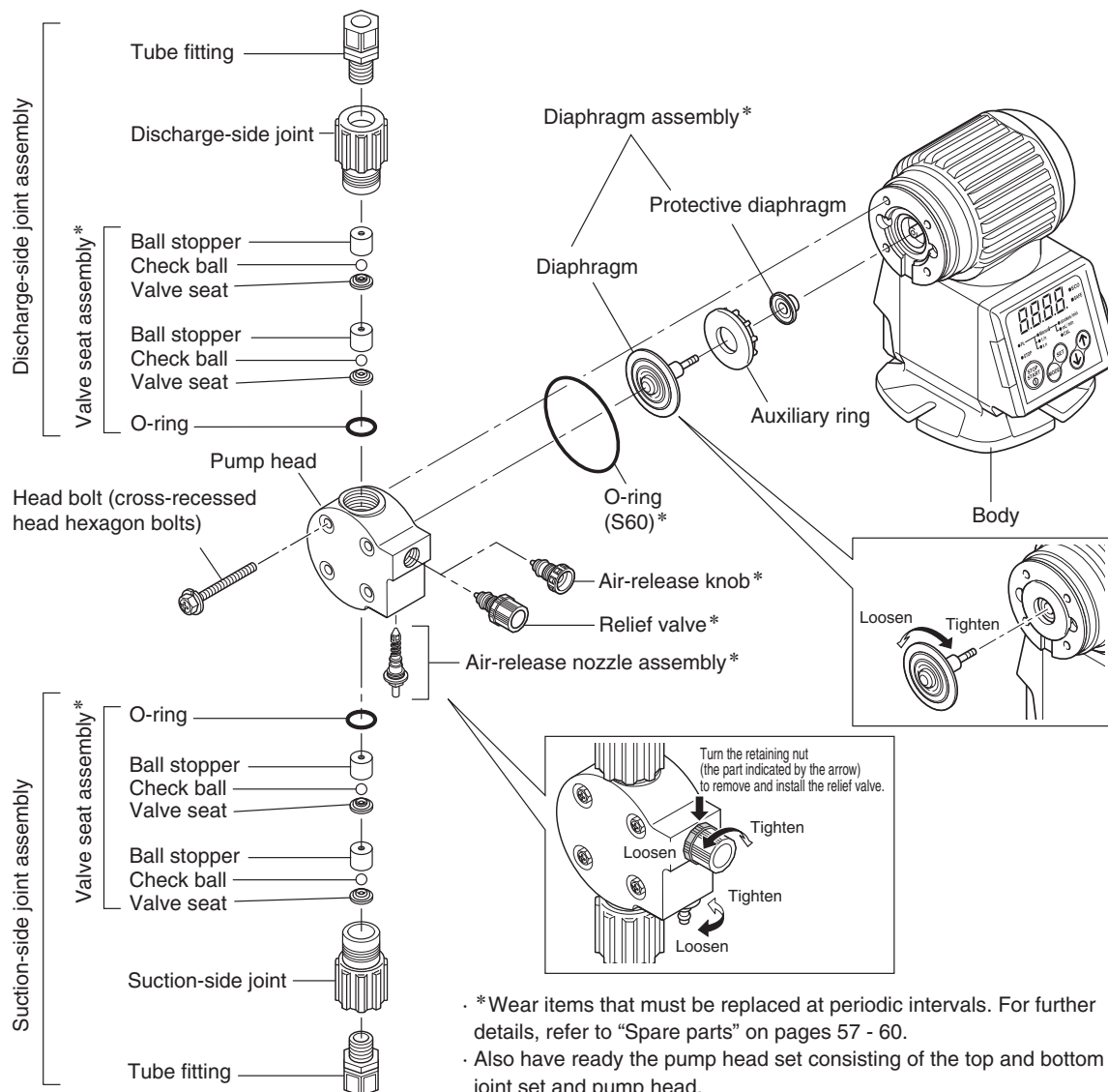


# Exploded views of liquid-end parts and external dimensions

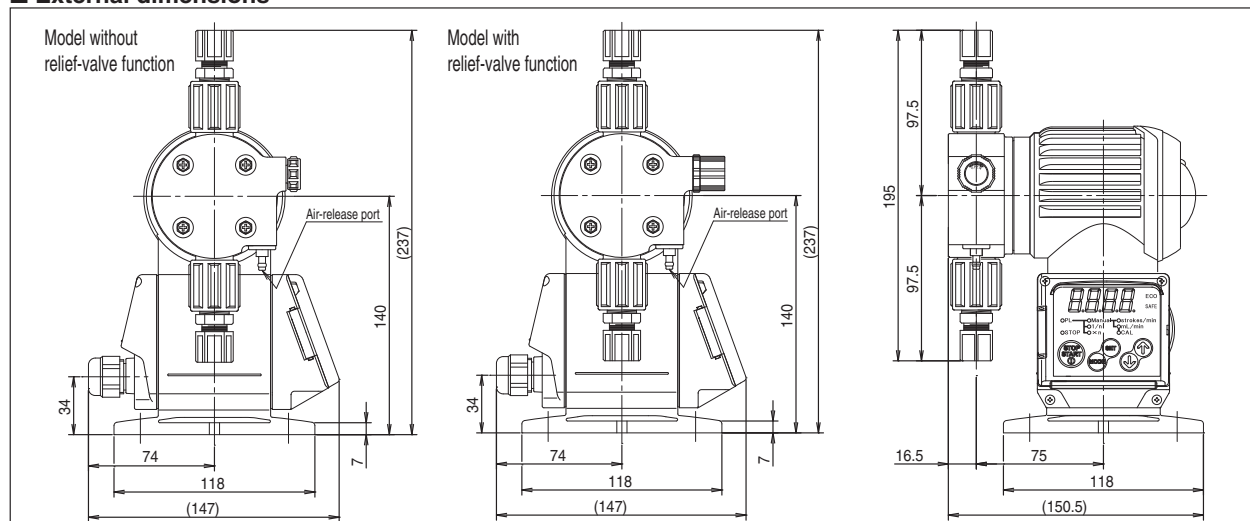
## General chemical injection type

Model: 030/03R/060/06R/100/10R Liquid-end type: KE/KF/KP

### Exploded views of liquid-end parts



### External dimensions

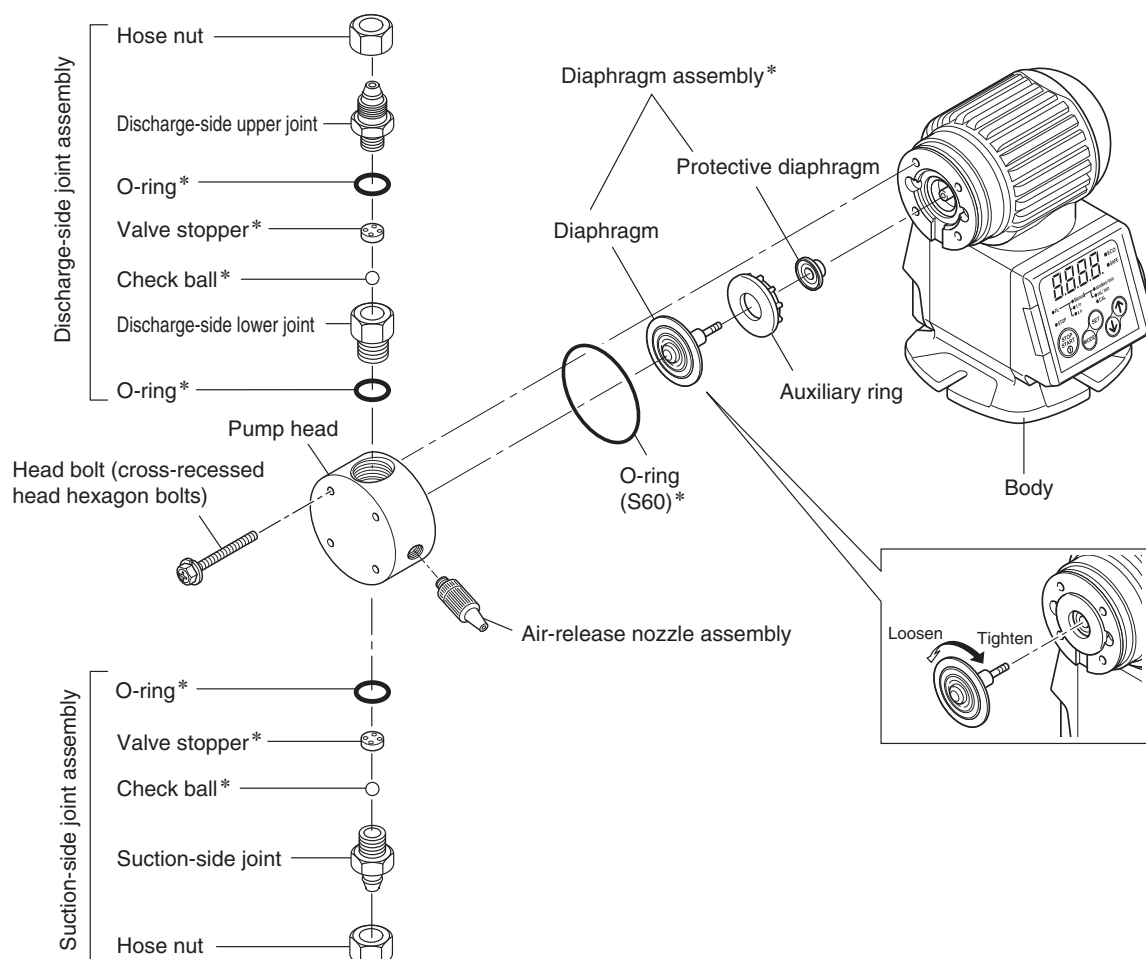


# Exploded views of liquid-end parts and external dimensions

## General chemical injection type

Model: 030/060/100 Liquid-end type: ST

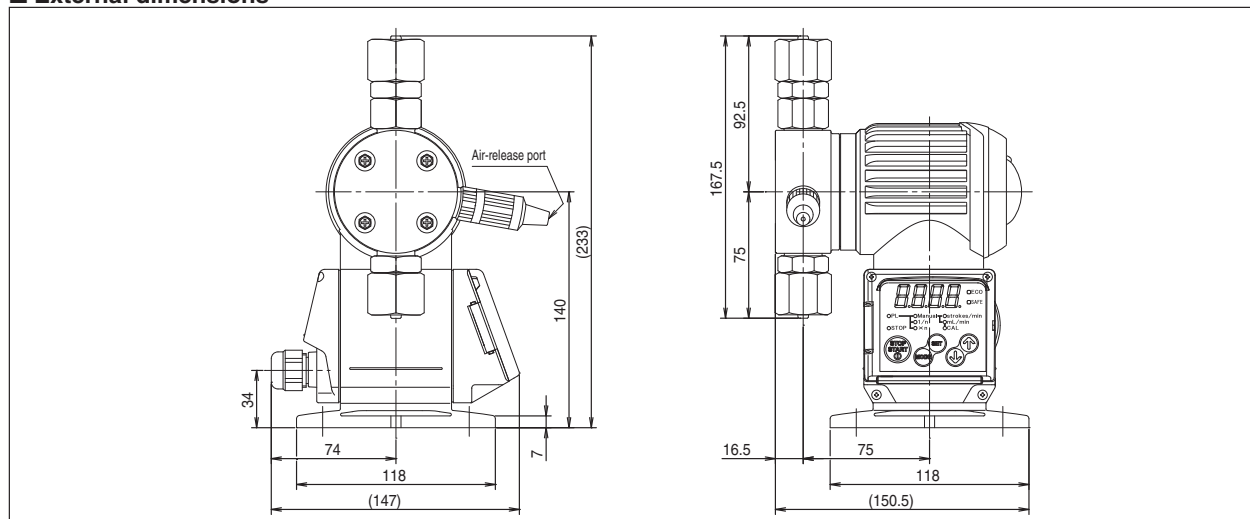
### ■ Exploded views of liquid-end parts



\* Wear items that must be replaced at periodic intervals. For further details, refer to "Spare parts" on pages 57 - 60.

Also have ready the pump head set consisting of the top and bottom joint set and pump head.

### ■ External dimensions

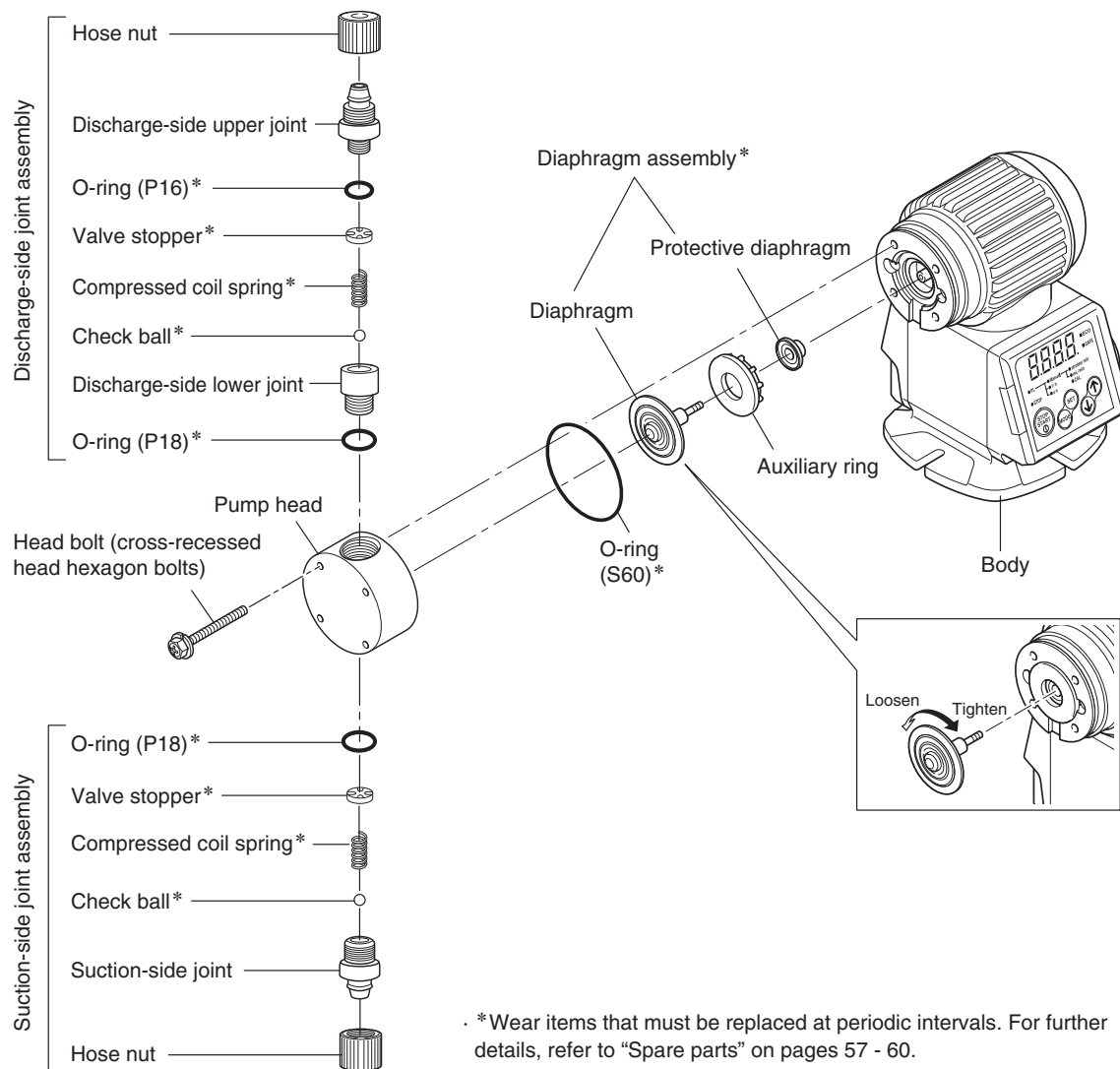


# Exploded views of liquid-end parts and external dimensions

## High-viscosity type

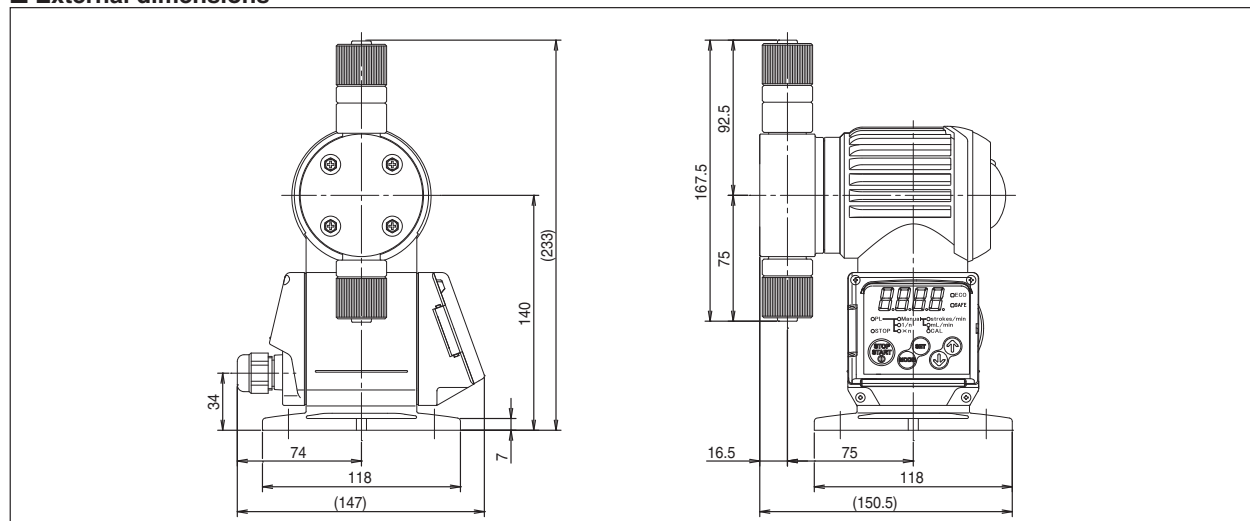
Model: 060/100 Liquid-end type: HV

### Exploded views of liquid-end parts



- \*Wear items that must be replaced at periodic intervals. For further details, refer to "Spare parts" on pages 57 - 60.
- Also have ready the pump head set consisting of the top and bottom joint set and pump head.

### External dimensions



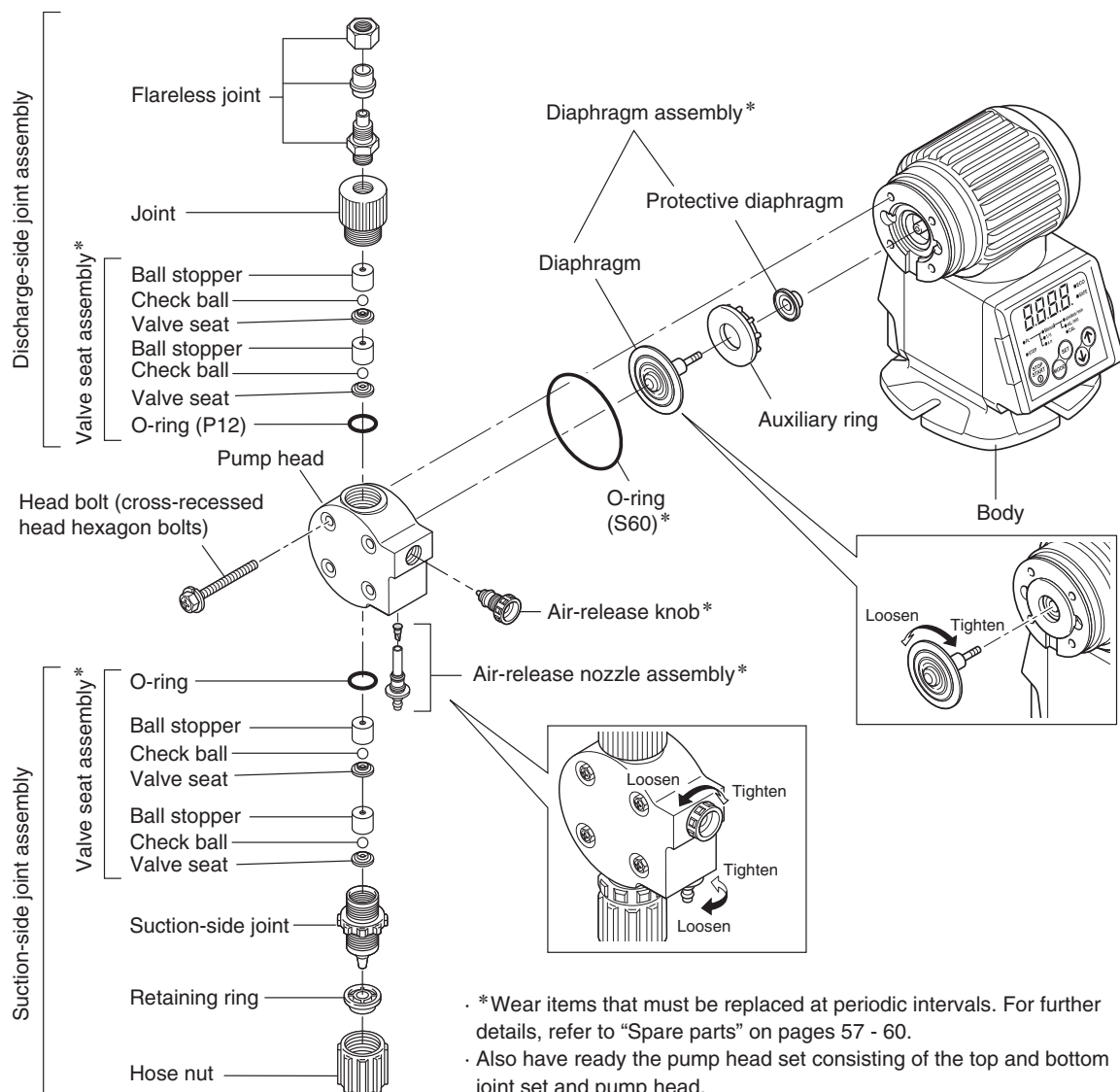


# Exploded views of liquid-end parts and external dimensions

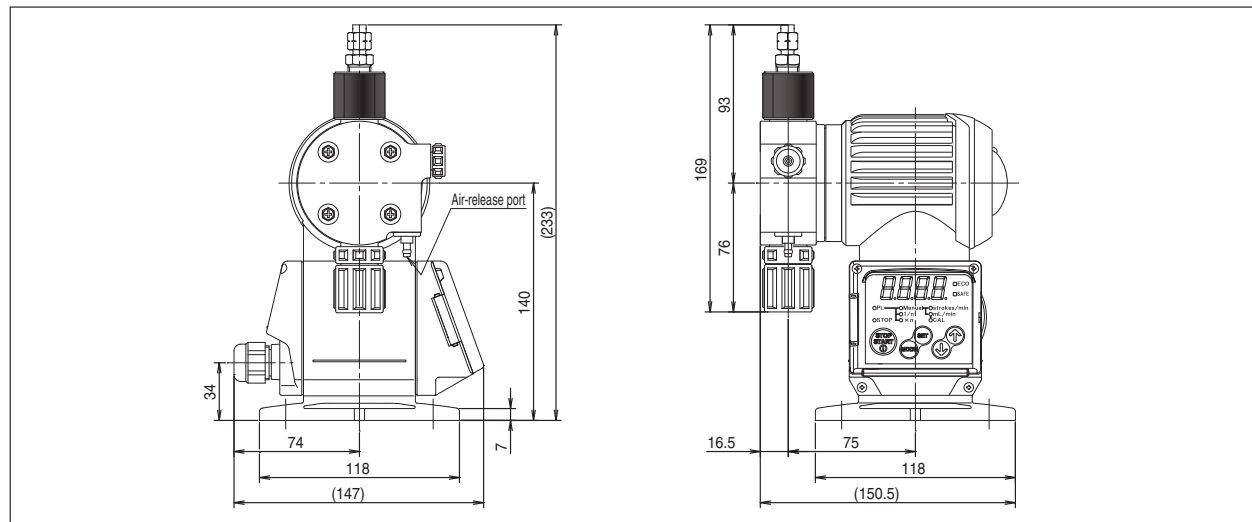
## High-pressure type

Model: 030 Liquid-end type: CH

### Exploded views of liquid-end parts



### External dimensions

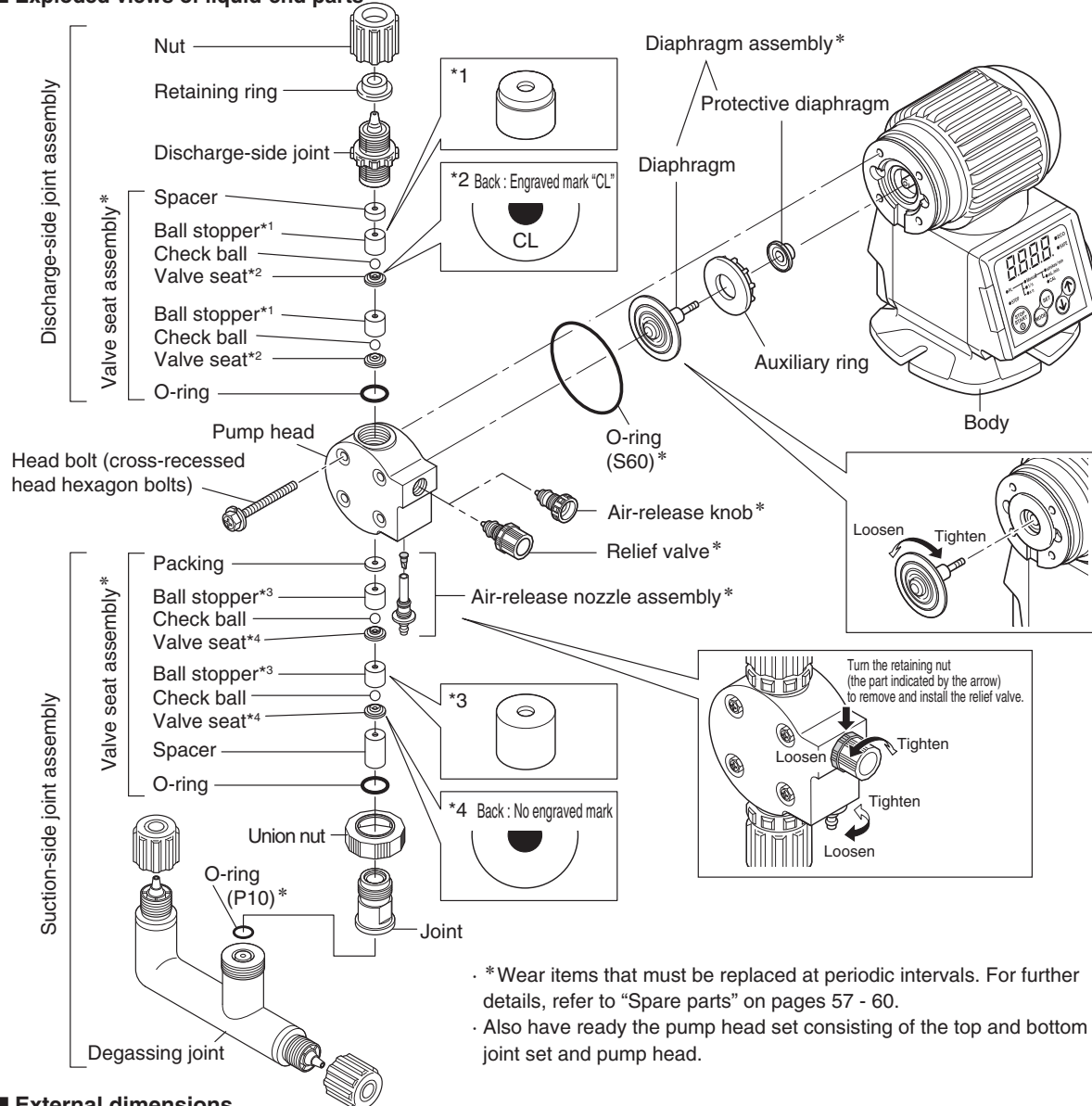


# Exploded views of liquid-end parts and external dimensions

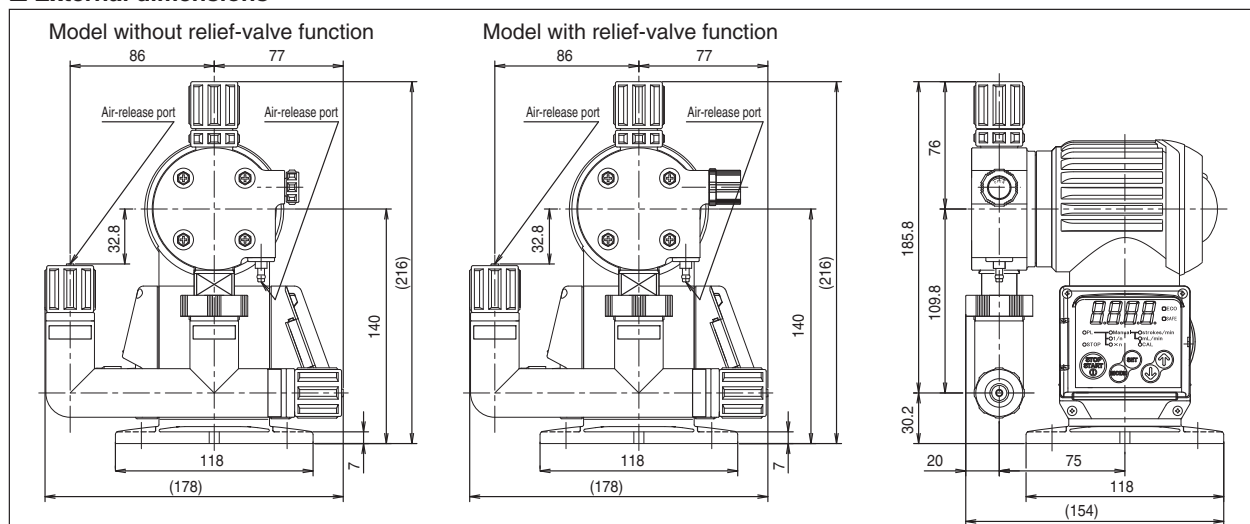
## For injection of sodium hypochlorite type with air-block

Model: 030/03R/060/06R/100/10R Liquid-end type: CD

### ■ Exploded views of liquid-end parts



### ■ External dimensions

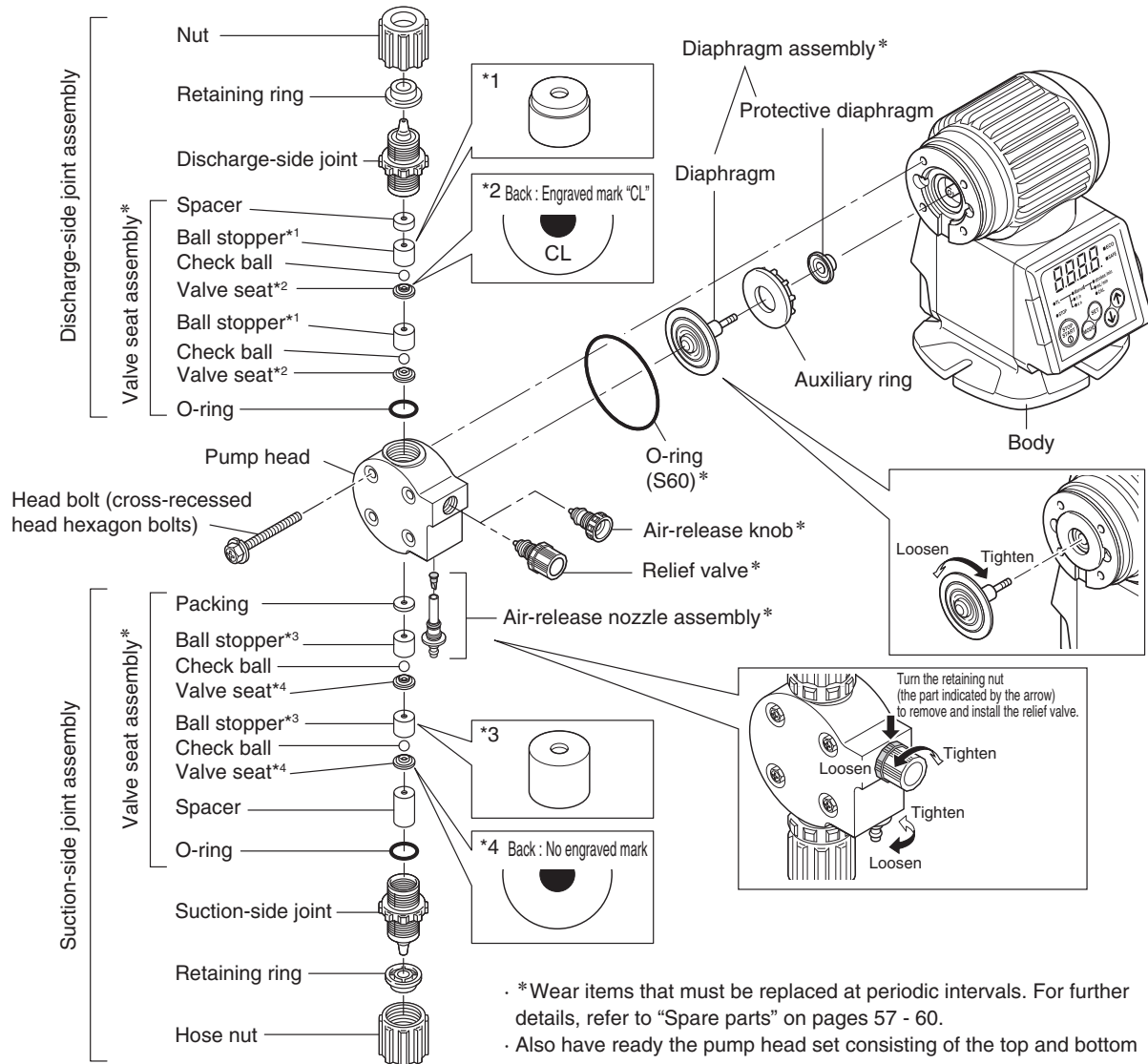


# Exploded views of liquid-end parts and external dimensions

## For injection of sodium hypochlorite type

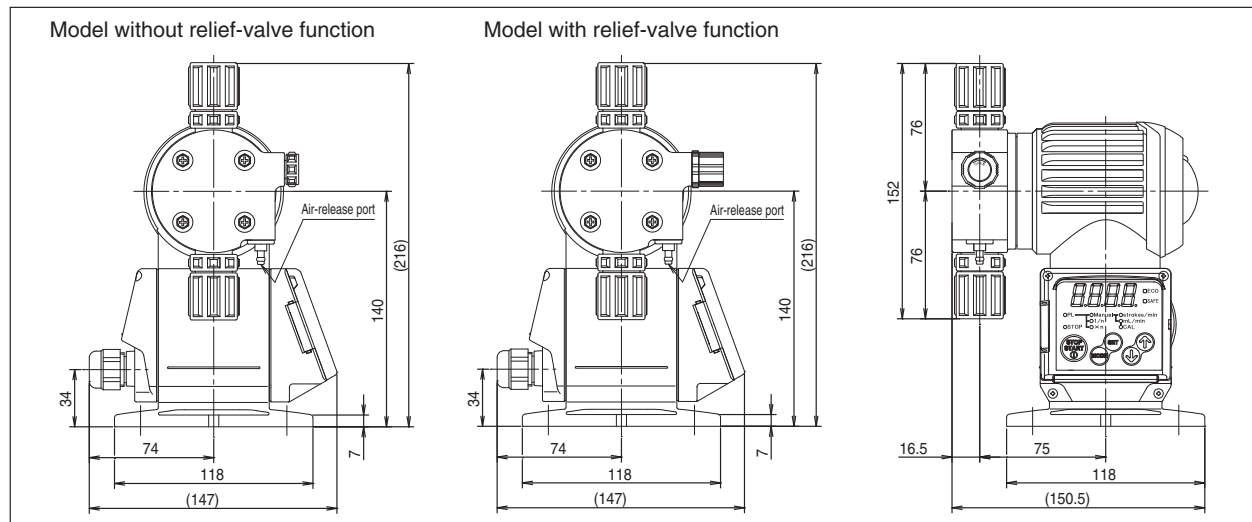
Model: 030/03R/060/06R/100/10R Liquid-end type: CN

### Exploded views of liquid-end parts



- \* Wear items that must be replaced at periodic intervals. For further details, refer to "Spare parts" on pages 57 - 60.
- Also have ready the pump head set consisting of the top and bottom joint set and pump head.

### External dimensions



# Troubleshooting



## WARNING

- Ensure that only trained operators and control personnel will operate the pump.
- Ensure that the power will not be turned on during the course of work. Hang a sign on the power switch indicating that work is in progress.
- Do not operate the pump with wet hands. Doing so may result in electric shocks.
- Should a problem occur such as the appearance of smoke or a burning smell, shut down the pump's operation immediately, and contact your vendor or a Wanner Engineering representative. Otherwise, a fire, electric shocks and/or malfunctions may result.
- Do not attempt to disassemble the pump body or the circuit parts.
- During the air release, chemical may suddenly escape from the pipes and other parts. Run the end of the relief/air-release hose back to the tank or another appropriate container, and secure it so that it will not become disconnected.
- A closed valve or other blockage on the discharge side of the pump is dangerous. It may lead to an excessive rise in pressure that will exceed the pump's specification range, causing liquid to escape, the pipe to be damaged and the pump itself to malfunction. Prior to operating the pump, check the valves and pipes, etc.
- When disassembling the liquid-end parts, be absolutely sure to turn off the power and check that no voltage is applied to the pump. Do not proceed with disassembly simply by stopping the pump using a key. Place a "work in progress" sign over the power switch to ensure that the pump power will not be turned on again while repairs are being carried out.
- Before proceeding with maintenance or repair work on the pump, first release the pressure inside the discharge pipe, drain off the chemical from the liquid-end parts, and clean these parts.



## CAUTION

- When working on the liquid-end parts of the pump, wear protective gear suited to the chemical involved (such as rubber gloves, a mask, protective goggles and work overalls that are resistant to chemical reaction).
- The vibration of the pump may cause the hoses/tubes to become loose and disconnected. Before starting operation, secure the hoses/tubes.

## NOTE

- Use of a flow indicator is recommended as a method to detect discharge trouble.  
\* Refer to "Spare parts & options" on page 60.

# Troubleshooting

## During operation

Description of trouble 1	Description of trouble 2	Cause	Remedial action
The pump does not turn on. (The display does not light.)		(1) Power supply or voltage trouble. (2) Problem in the wiring connections to the pump. (3) Broken power cable. (4) Main power supply disconnection. (5) The breaker has tripped. (6) Circuit malfunction.	(1) Check the power supply and the voltage and then connect the pump to the correct power supply. (2) Inspect the wiring connections and connect the wires properly. (3) Check the power cable. (4) Position the switch on the correct side. (5) Investigate why the breaker has tripped and then reset it. (6) Replace the circuit.
The power turns on, but the pump does not operate.		(1) The STOP signal lights. (2) The displayed value blinks.	(1) Press the [STOP/START] key. (2) Remove the stop input signal or apply an external operation input signal.
The pump operates.	No chemical is discharged. (The chemical is not pumped up.)	(1) The chemical is too viscous. (2) The hose or valve is clogged. (3) The hose aperture is too small or the pipe is too long. (4) The stroke length is too short. (5) The valve seats are clogged with dirt or deformed. (6) The amount of chemical remaining in the tank is low. (7) The foot valve or the strainer is clogged. (8) The pump is gas locked. (9) The valve seat area has been assembled in the wrong direction.	(1) Lower the viscosity of the chemical. (2) Clean the hose and valve. (3) Make the hose aperture larger or the pipe shorter. (4) Increase the stroke length. (5) Clean or replace the valve seats. If the valve seats become deformed in a short period of time, use valve seats of a different material. (6) Replenish the chemical. (7) Clean the foot valve, strainer, and tank. (8) Release the air. (9) Disassemble the valve seat area and then reassemble it correctly.
	Air enters into the pump.	(1) Gas is generated due to the properties of the chemical. (2) There is a leak in the joints, seal areas, or other parts. (3) The chemical tank is empty.	(1) Dilute the chemical. (2) Tighten the joints, seal areas or other parts that are leaking. (3) Replenish the chemical and then release the air.
The pump does not operate at the maximum discharge pressure. (The drive sound registers weakly.)		(1) The power supply is not appropriate or the supply voltage is too low. (2) SAFE mode has been enabled. (3) A thermal relay has been used as a protection device.	(1) Connect the pump to the correct power supply. (2) Disable SAFE mode. (3) Change the thermal relay to a circuit protector.
Chemical leaks from the chemical escape port.		(1) The relief valve was not replaced after it was used. (2) An abnormal pressure has been generated.	(1) Replace the relief valve. (2) Check the pressure and the specifications.
Chemical is leaking.	Chemical is leaking from the joints.	(1) The hose and nuts are not tight enough. (2) The discharge-side pipe is clogged with dirt or other foreign material, causing pressure increase. (3) The hose connections have deteriorated.	(1) Tighten the hose and nuts. (2) Clean inside the pipe. (3) Replace the hose.
	Chemical is leaking from the pump head.	(1) The head bolts are not tight enough. (2) The discharge-side pipe is clogged with dirt or other foreign material, causing pressure increase. (3) The diaphragm has suffered damage due to wear.	(1) Tighten the head bolts. (2) Clean inside the pipe. (3) Replace the diaphragm.
The discharge capacity is too small.		(1) Air has entered into the pump head. (2) The diaphragm has deteriorated or has been damaged. (3) The valve seat area has deteriorated or is clogged. (4) The pipe is clogged. (5) The suction height is outside of the specified range. (6) The chemical is too viscous. (7) The discharge pressure is too high. (8) The stroke length is too short. (9) The suction-side hose or valve is clogged. (10) The foot valve or the strainer is clogged.	(1) Release the air. (2) Replace the diaphragm. (3) Clean the valve seats or replace them. (4) Clean inside the pipe. (5) Set the suction height to a value within the specified range. (6) Reduce the viscosity of the chemical or change the joints to high-viscosity type joints. (7) Check the pressure and the specifications. (8) Increase the stroke length. (9) Clean the suction-side hose and valve or replace them. (10) Clean the foot valve, strainer, and chemical tank.
The discharge capacity is too large.		(1) An overfeed has occurred. (2) A negative pressure has occurred on the discharge side. (3) The push pressure is too high.	(1, 2) If the pump is equipped with an anti-siphon check valve, clean it. If the pump is not equipped with an anti-siphon check valve, attach one to the pump. (3) Set the discharge-side pressure to a value that is higher than the push pressure.
The keys cannot be operated.		(1) The keys have been locked.	(1) Release the key lock.
The actual discharge capacity differs significantly from the value that was set in manual mode (discharge capacity setting mode; SP only).		(1) The wrong maximum discharge capacity has been set. (2) The stroke length is different from when the maximum value was set.	(1) Perform calibration and then set the maximum value correctly. (2) Set the stroke length to the necessary value and then set the maximum value correctly.
Pulse input cannot be received (SP and ST only).		(1) Signal cable disconnection. (2) The signal input specifications are different.	(1) Check the signal cable. (2) Check the specifications.

# Troubleshooting

## When the signal input mode is established

Description of trouble	Cause	Remedial action
Operation is not performed as per the set frequency-division or magnification (when pulse signals are input).	Noise is being carried on the signal line.	Place the signal line away from the power line. Alternatively, use a shielded cable for the signal line.
There is no flow of signals up to 20 mA (when analog signals are input).	The power to drive the signals is insufficient.	Check the maximum drive resistance of the signal source.
No keys except for STOP/START work.	The keys have been locked.	Release the key lock. (See page 31)
E-OO is displayed.	Refer to the alarm codes.	Refer to the alarm codes.

## Error code

When the error occurs, the following code appears on the display.

Error code	Type	Cause of alarm	Action to take when an alarm occurs
E-02	Level error	The chemical remaining in the tank has dropped to a low level.	Replenish the chemical in the tank.
E-04	Pulse overflow	The buffer size has been exceeded in the pulse input-based proportional control. (Buffer size: 32)*	<ul style="list-style-type: none"> <li>Review the setting.</li> <li>Review the pump model.</li> </ul>
E-05	Analog error	The analog input value has dropped below the lower limit (2 mA or less) or has risen above the upper limit (22 mA or more).	Check the wiring connections.
E-06	Abnormal pressure error (when the SAFE mode is disabled)	The discharge pressure increases to an abnormally high level regardless of whether the safety function is enabled or disabled.	Return the piping pressure to the normal level.
E-07	Abnormal pressure error (when the SAFE mode is enabled)		

\* The buffer size is the upper limit of the number of unprocessed pulses that the pump body can record when pulse input is received again during pump operation by pulse input-based proportional control. When the number of unprocessed pulses exceeds the buffer size (32), subsequent pulse input is automatically canceled. To display and output an alarm in this case, set "Pulse overflow error" (P-02) to Enabled (1) in the parameter settings. (Refer to "Parameter settings.")

## Remedial action taken in the pulse modes

Mode	Cause	Remedial action
Common to both pulse modes	<ul style="list-style-type: none"> <li>Chattering in the pulse output</li> <li>The output pulses and signal specifications do not match.</li> </ul>	<ul style="list-style-type: none"> <li>Replace with a unit free from chattering.</li> <li>Change the pump.</li> </ul>
Frequency-division	<ul style="list-style-type: none"> <li>The frequency-division ratio is too high.</li> <li>The stroke speed is too slow.</li> </ul>	<ul style="list-style-type: none"> <li>Replace with a unit that meets the signal specifications.</li> <li>Increase the stroke speed (example: 50 → 300 strokes/min.)</li> </ul>
Magnification	<ul style="list-style-type: none"> <li>The magnification is too high.</li> <li>The stroke speed is too slow.</li> </ul>	<ul style="list-style-type: none"> <li>Replace with a unit that meets the signal specifications.</li> <li>Increase the stroke speed (example: 50 → 300 strokes/min.)</li> </ul>

## How to release the alarm:

- (1) Stop the pump.
- (2) Initiate automatic reset by recovering the status.
- (3) Stop the supply of power to the pump.

Not all model combinations are possible. When selecting the pump model, first check “Liquid-end material” and “Performance Specifications”.

## ■ Model code

<b>SP</b>	-	<b>30R</b>	-	<b>PE</b>	-	<b>S</b>
(1)		(2)		(3)		(4)

### (1) Series name

SP	Pulse-input type
SA	Analog-input type
ST	Timer type

### (4) Power plug

S	UL plug
L	Lead wire
E	Euro plug
B	UK plug

### (2) Model (Discharge-volume standard)\*<sup>1</sup>

030	30 mL/min
03R	30 mL/min (with relief-valve)
060	60 mL/min
06R	60 mL/min (with relief-valve)
100	100 mL/min
10R	100 mL/min (with relief-valve)
200	220 mL/min

\*<sup>1</sup> The discharge capacity differs for the ST/BH/CH/CN/CD type.

For details, refer to the specifications and capacity table.

\*<sup>2</sup> Only the PE and PF types are available as the 200 models.

### (3) Liquid-end type

PE/PF/KE/KF/KP/ST/BH/CH/HV/CN/CD

\* For details, refer to the liquid-end parts materials table.

## ■ Performance Specifications

### ● General chemical injection type

Conditions: clean water, room temperature

Liquid-end type		PE/PF						
Model		03R	030	06R	060	10R	100	200
Maximum discharge volume	mL/min	30		60		100		220
	L/H	1.8		3.6		6		13.2
	GPH	0.47		0.95		1.58		3.48
Maximum discharge pressure	MPa	0.7	1.0	0.7	1.0	0.7		0.2
	bar	7	10	7	10	7		2
	psi	101.5	145	101.5	145	101.5		29
Stroke speed	strokes/min	1 to 300 (Enables setting in 1-stroke units)						
Stroke length	mm	0.5 to 1 (Enables adjustment using the dial)						
Connection	Discharge side	4×9		6×11				
	Suction side	4×9		6×11				
	Air release	4×6						-
Viscosity of transfer liquid	mPa·s/cps	50 or less						
Temperature of transfer liquid	°C	0 to 40 (no freezing allowed)						
	°F	32 to 104 (no freezing allowed)						
Ambient temperature	°C	0 to 40 (no freezing allowed)						
	°F	32 to 104 (no freezing allowed)						
Environmental protection		IEC standard: IP65 or equivalent						
Insulation class		B						
Weight	kg	1.8		1.9				4.0
	lb	4.0		4.2				8.8

Conditions: clean water, room temperature

Liquid-end type		KE/KF/KP						ST		
Model		03R	030	06R	060	10R	100	030	060	100
Maximum discharge volume	mL/min	30		60		100		27	55	95
	L/H	1.8		3.6		6.0		1.62	3.3	5.7
	GPH	0.47		0.95		1.58		0.42	0.87	1.5
Maximum discharge pressure	MPa	0.7	1.0	0.7	1.0	0.7		0.5		
	bar	7	10	7	10	7		5		
	psi	101.5	145	101.5	145	101.5		72.5		
Stroke speed	strokes/min	1 to 300 (Enables setting in 1-stroke units)								
Stroke length	mm	0.5 to 1 (Enables adjustment using the dial)								
Connection	Discharge side	6×8								
	Suction side	6×8								
	Air release	4×6						-		
Viscosity of transfer liquid	mPa·s/cps	50 or less								
Temperature of transfer liquid	°C	0 to 40 (no freezing allowed)								
	°F	32 to 104 (no freezing allowed)								
Ambient temperature	°C	0 to 40 (no freezing allowed)								
	°F	32 to 104 (no freezing allowed)								
Environmental protection		IEC standard: IP65 or equivalent								
Insulation class		B								
Weight	kg	1.8		1.9				3.2	3.3	
	lb	4.0		4.2				7.1	7.3	

## ■ Performance Specifications

### ● High-viscosity type

Conditions: clean water, room temperature

Liquid-end type		HV	
Model		060	100
Maximum discharge volume	mL/min	60	100
	L/H	3.6	6.0
	GPH	0.95	15.84
Maximum discharge pressure	MPa	1.0	0.7
	bar	10	7
	psi	145	101.5
Stroke speed	strokes/min	1 to 300 (Enables setting in 1-stroke units)	
Stroke length	mm	0.5 to 1 (Enables adjustment using the dial)	
Connection	Discharge side	12×18	
	Suction side	12×18	
	Air release	-	
Viscosity of transfer liquid	mPa·s/cps	3000 or less	
Temperature of transfer liquid	°C	0 to 40 (no freezing allowed)	
	°F	32 to 104 (no freezing allowed)	
Ambient temperature	°C	0 to 40 (no freezing allowed)	
	°F	32 to 104 (no freezing allowed)	
Environmental protection		IEC standard: IP65 or equivalent	
Insulation class		B	
Weight	kg	1.9	
	lb	4.2	

### ● Boiler type

Conditions: clean water, room temperature

Liquid-end type		BH	
Model		03R	030
Maximum discharge volume	mL/min	28	
	L/H	1.68	
	GPH	0.44	
Maximum discharge pressure	MPa	1.5	
	bar	15	
	psi	217.5	
Stroke speed	strokes/min	1 to 300 (Enables setting in 1-stroke units)	
Stroke length	mm	0.5 to 1 (Enables adjustment using the dial)	
Connection	Discharge side	4×6	
	Suction side	4×9	
	Air release	4×6	
Viscosity of transfer liquid	mPa·s/cps	50 or less	
Temperature of transfer liquid	°C	0 to 40 (no freezing allowed)	
	°F	32 to 104 (no freezing allowed)	
Ambient temperature	°C	0 to 40 (no freezing allowed)	
	°F	32 to 104 (no freezing allowed)	
Environmental protection		IEC standard: IP65 or equivalent	
Insulation class		B	
Weight	kg	1.9	
	lb	4.2	

### ● High-pressure type

Conditions: clean water, room temperature

Liquid-end type		CH	
Model		030	
Maximum discharge volume	mL/min	25	
	L/H	1.50	
	GPH	0.39	
Maximum discharge pressure	MPa	2.0	
	bar	20	
	psi	290	
Stroke speed	strokes/min	1 to 300 (Enables setting in 1-stroke units)	
Stroke length	mm	0.5 to 1 (Enables adjustment using the dial)	
Connection	Discharge side	4×6	
	Suction side	4×9	
	Air release	4×6	
Viscosity of transfer liquid	mPa·s/cps	50 or less	
Temperature of transfer liquid	°C	0 to 40 (no freezing allowed)	
	°F	32 to 104 (no freezing allowed)	
Ambient temperature	°C	0 to 40 (no freezing allowed)	
	°F	32 to 104 (no freezing allowed)	
Environmental protection		IEC standard: IP65 or equivalent	
Insulation class		B	
Weight	kg	1.9	
	lb	4.2	

## ■ Performance Specifications

### ● Sodium hypochlorite injection type with air block

Conditions: clean water, room temperature

Liquid-end type		CD					
Model		03R	030	06R	060	10R	100
Maximum discharge volume	mL/min	30		60		90	
	L/H	1.8		3.6		5.4	
	GPH	0.47		0.95		1.42	
Maximum discharge pressure	MPa	0.7	1.0	0.7	1.0	0.7	
	bar	7	10	7	10	7	
	psi	101.5	145	101.5	145	101.5	
Stroke speed	strokes/min	1 to 300 (Enables setting in 1-stroke units)					
Stroke length	mm	0.5 to 1 (Enables adjustment using the dial)					
Connection	Discharge side	4×9		6×11			
	Suction side	4×9		6×11			
	Air release	4×6					
	Degassing joint	1/4"×3/8"					
Viscosity of transfer liquid	mPa·s/cps	50 or less					
Temperature of transfer liquid	°C	0 to 40 (no freezing allowed)					
	°F	32 to 104 (no freezing allowed)					
Ambient temperature	°C	0 to 40 (no freezing allowed)					
	°F	32 to 104 (no freezing allowed)					
Environmental protection		IEC standard: IP65 or equivalent					
Insulation class		B					
Weight	kg	2.0		2.1			
	lb	4.4		4.6			

### ● Sodium hypochlorite injection type

Conditions: clean water, room temperature

Liquid-end type		CN					
Model		03R	030	06R	060	10R	100
Maximum discharge volume	mL/min	30		60		90	
	L/H	1.8		3.6		5.4	
	GPH	0.47		0.95		1.42	
Maximum discharge pressure	MPa	0.7	1.0	0.7	1.0	0.7	
	bar	7	10	7	10	7	
	psi	101.5	145	101.5	145	101.5	
Stroke speed	strokes/min	1 to 300 (Enables setting in 1-stroke units)					
Stroke length	mm	0.5 to 1 (Enables adjustment using the dial)					
Connection	Discharge side	4×9		6×11			
	Suction side	4×9		6×11			
	Air release	4×6					
Viscosity of transfer liquid	mPa·s/cps	50 or less					
Temperature of transfer liquid	°C	0 to 40 (no freezing allowed)					
	°F	32 to 104 (no freezing allowed)					
Ambient temperature	°C	0 to 40 (no freezing allowed)					
	°F	32 to 104 (no freezing allowed)					
Environmental protection		IEC standard: IP65 or equivalent					
Insulation class		B					
Weight	kg	1.8		1.9			
	lb	4.0		4.2			

## ■ Liquid-end material

### ● General chemical injection type

Liquid-end type	PE	PF	KE	KF	KP	ST
Pump head	PVC	PVC	PVDF	PVDF	PVDF	SUS316
Diaphragm	PTFE	PTFE	PTFE	PTFE	PTFE	PTFE
Check ball	Ceramic	Ceramic	Ceramic	Ceramic	Ceramic	Ceramic
O-ring	EPDM	FKM	EPDM	FKM	FFKM	PTFE
Valve seat	EPDM	FKM(G-801)	EPDM	FKM(G-801)	PTFE	-
Packing	-	-	-	-	PTFE	-
Joint	PVC	PVC	PVDF, PP	PVDF, PP	PVDF	SUS316
Ball stopper	PVC	PVC	PVDF	PVDF	PTFE	PTFE

### ● High-viscosity type

Liquid-end type	HV
Pump head	PVC
Diaphragm	PTFE
Check ball	Ceramic
O-ring	FKM
Joint	PVC
Valve stopper	PE
Compressed coil spring	SUS304

### ● Boiler type

Liquid-end type	BH
Pump head	PVC
Diaphragm	PTFE
Check ball	Ceramic
O-ring	EPDM
Valve seat	PTFE
Joint	PVC, SUS304
Ball stopper	PVC

### ● High-pressure type

Liquid-end type	CH
Pump head	PVC
Diaphragm	PTFE
Check ball	Ceramic
O-ring	EPDM
Valve seat	PTFE
Joint	PVC, SUS304
Ball stopper	PVC

### ● Sodium hypochlorite injection type

Liquid-end type	CD	CN
Pump head	Acrylic (PMMA)	
Diaphragm	PTFE	
Check ball	Ceramic	
O-ring	FKM	
Valve seat	FKM(G-801)	
Packing	PTFE	
Joint	PVC	
Ball stopper	PVC	
Degassing joint	PVC	-

## ■ Power Supply Specifications

	030/03R (Other than BH/CH type)	030/03R (BH/CH type)	060/06R	100/10R	200
Rated voltage	AC100 to 240V(±10%)				
Phases	1-phase				
Frequency	50/60Hz				
Maximum current	2.0A	2.5A			
Maximum power consumption	200VA	250VA			
Average power consumption	15W	18W			

- Use the maximum current in calculating the required power capacity.
- Use a commercial power source (the power supplied by an electric power company) for supplying the power.

### ■ Power sources that cannot be used

1. Power sources in which an AC power regulator is installed
2. Power sources on the output side of an inverter

## ■ I/O Signal Specifications

Item			SP	ST	SA
Signal	Analog input		-		One port: analog signal (DC 4 to 20 mA, input resistance: approximately 110 Ω)
	Digital	Input	One port: pulse signal (no-voltage contact or open collector, maximum no. of pulses: 1200 pulses/minute, minimum pulse width: 25 ms [ON period]) One port: pump operation/stop signal (switchable) (no-voltage contact or open collector, maximum no. of pulses: 1200 pulses/minute, minimum pulse width: 25 ms [ON period])		One port: pump operation/stop signal (switchable) (no-voltage contact or open collector, maximum no. of pulses: 1200 pulses/minute, minimum pulse width: 25 ms [ON period])
		Output	One port: solenoid sync pulse signal (DC 25 V, 10 mA or less) One port: batch warning signal (DC 25 V, 10 mA or less)		

## ■ Operation mode

Manual operation		SP	2 patterns Stroke speed (0 to 300 strokes/min. in 1-stroke/min. increments) Discharge capacity (in 0.1-ml/min. increments)		
		SA/ST	1 pattern Stroke speed (0 to 300 strokes/min. in 1-stroke/min. increments)		
Automatic operation	Analog proportional control	SA	Proportional band (PB/variable range: ±1 to ±999%) Set point (SP/variable range: 0 to 100%)		
	Pulse proportional control	SP/ST	Frequency-division (1/1 to 1/999) Magnification (1 to 999)		
	Timer	ST	Interval mode (ON period: 1 to 9999 minutes; OFF period: 1 to 9999 minutes) DAY mode (9 patterns for 1 day) WEEK mode (1 pattern for each day of the week) DAY + interval mode WEEK + interval mode DAY + interval mode + pulse proportional control WEEK + interval mode + pulse proportional control		

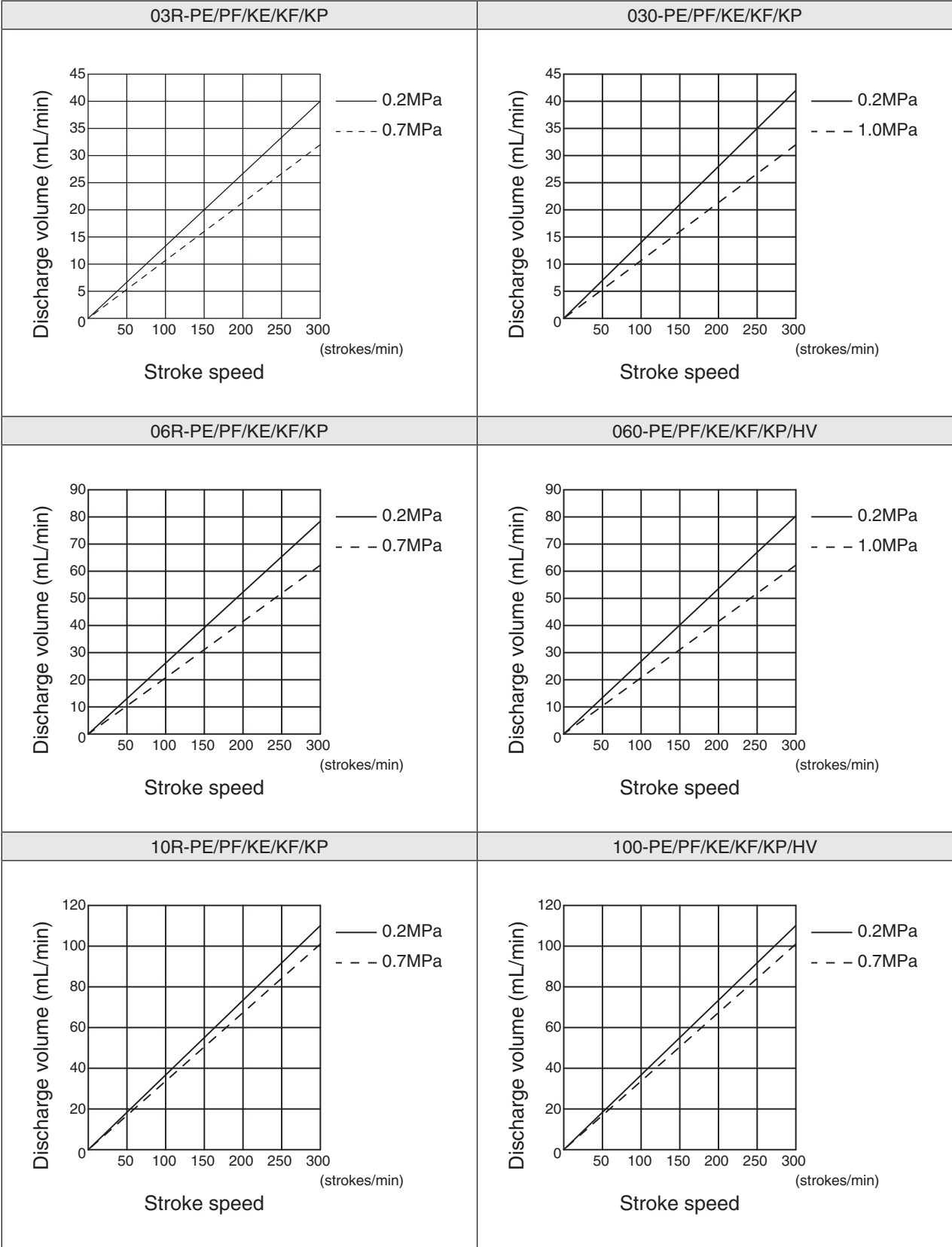
# Performance Curves

- The performance curves below represent the measurements taken under the conditions prevailing at Wanner Engineering's test facilities.
- The individual conditions prevailing on-site and differences between models may produce minor variations from these curves.
- Measure the discharge volume using the conditions under which the pump will actually be used and set the stroke speed in accordance with the applicable performance curve.

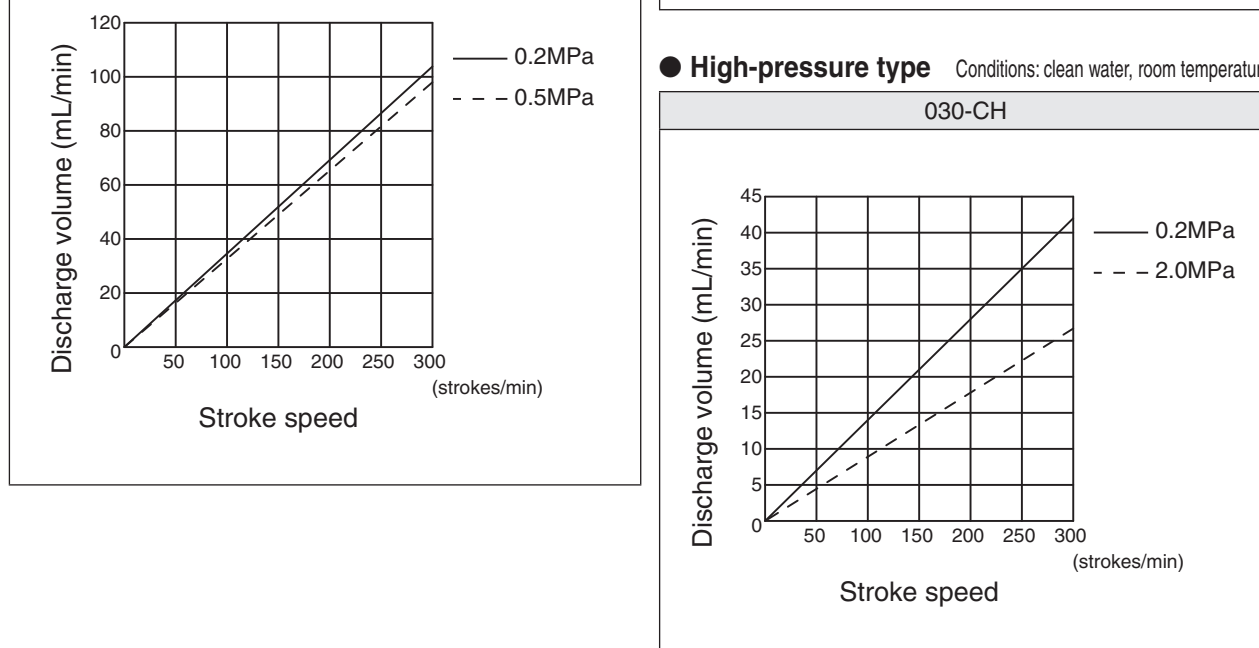
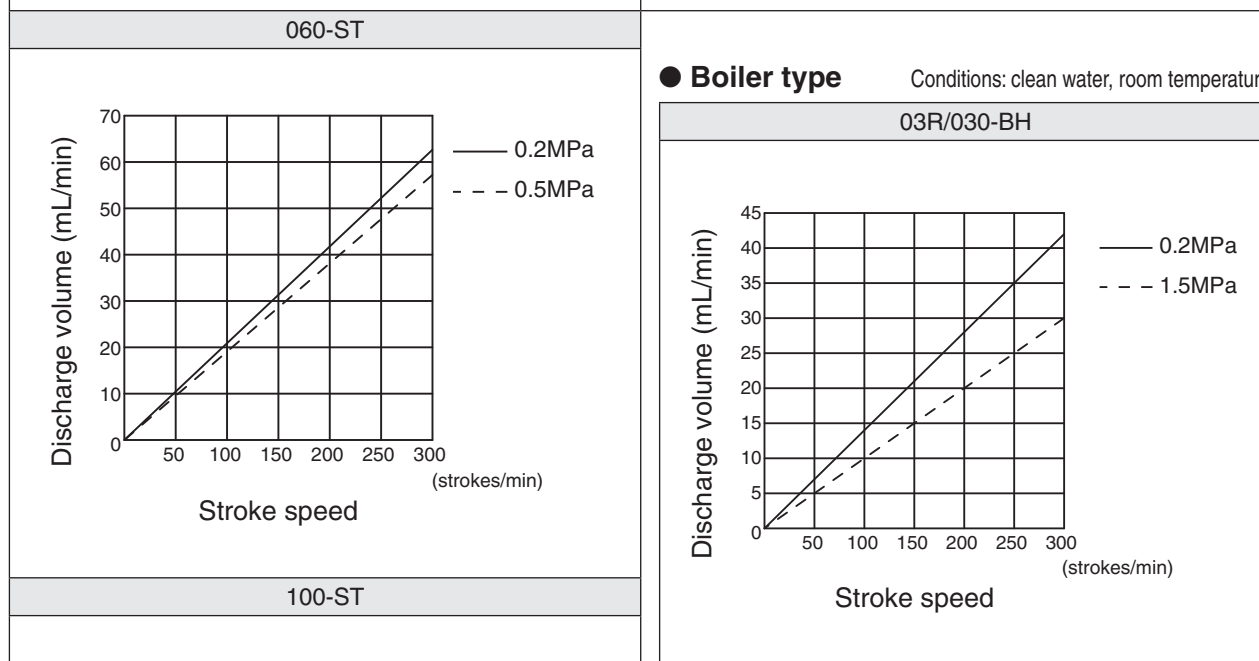
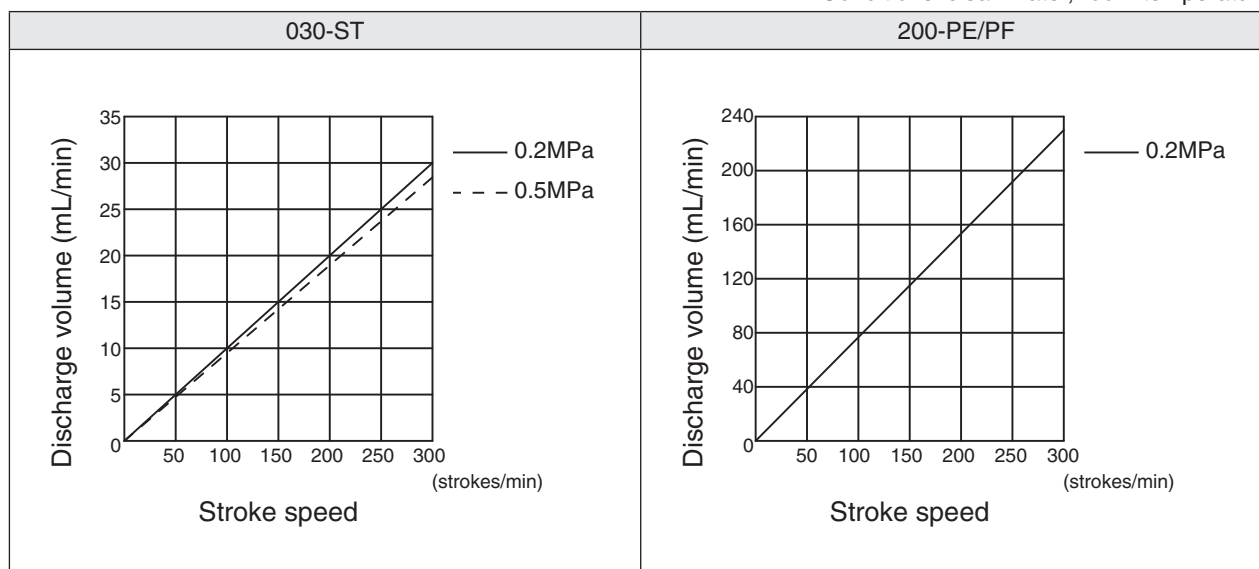
## General chemical injection type

## High-viscosity type

Conditions: clean water, room temperature

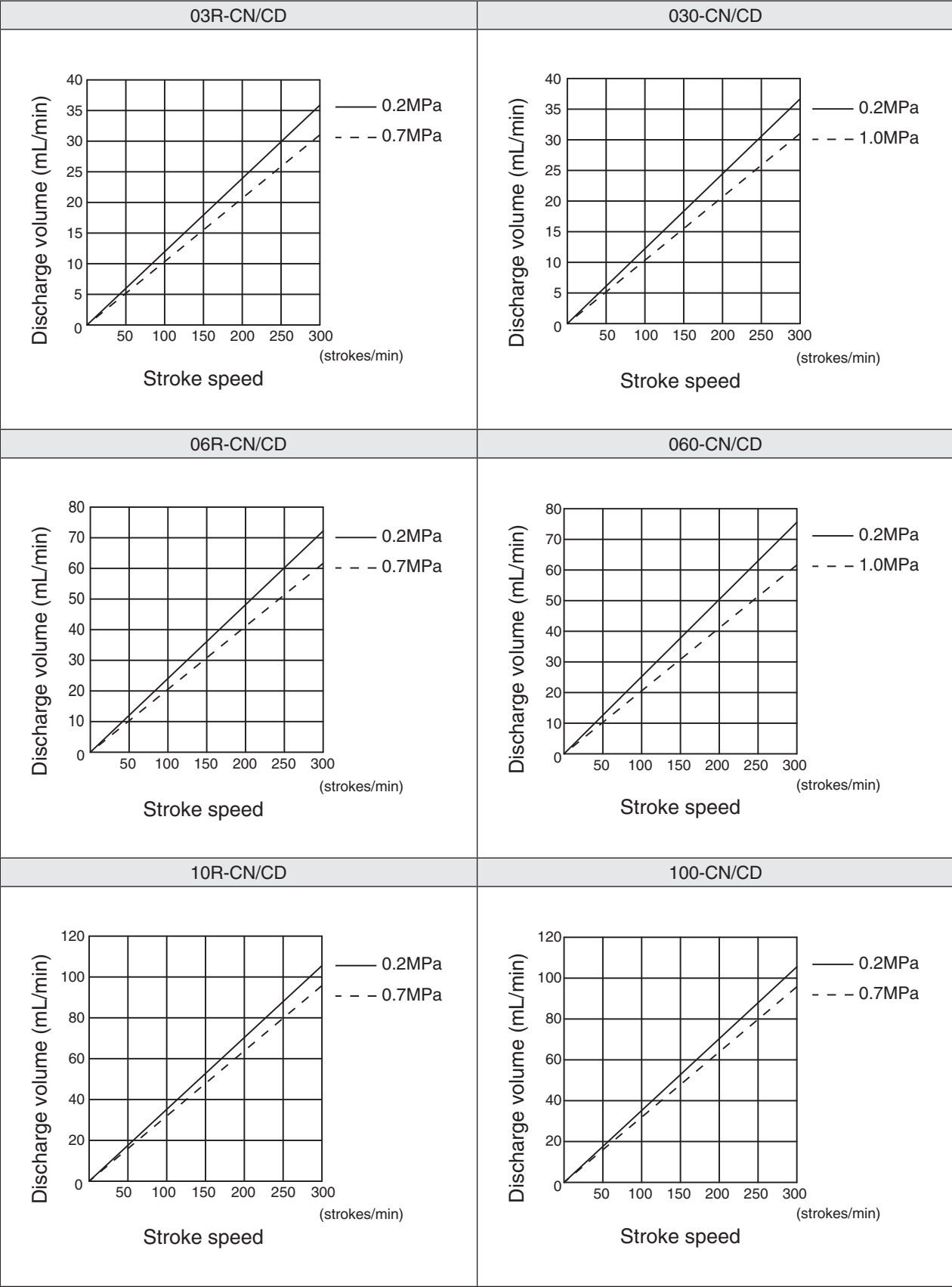


Conditions: clean water, room temperature



● Sodium hypochlorite injection type with air block  
● Sodium hypochlorite injection type

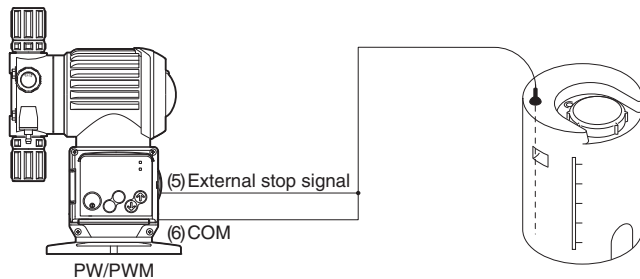
Conditions: clean water, room temperature



# Application examples

## Float switch

### ■ Stopping the pump when the tank has become empty

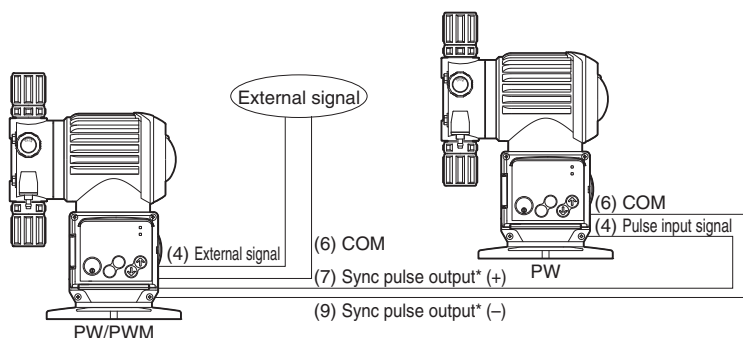


#### Explanation

- (1) When the chemical level in the tank drops, the contact signal of the float switch is set to ON.
- (2) The pump remains stopped while signals (5) and (6) are ON.  
The settings blink on the display.

### ■ Continuously operating more than one pump

The “solenoid sync pulse output” of the first pump is used for the signal input of the second pump.



First pump (controlled by external signals)

Second pump (operation linked)

\* These signals are not the same as the external signals.  
The pulse signal is output once per pump operation.

#### Explanation

- (1) The first pump, which is a signal-input type, operates automatically by means of the external signals. (It can also operate manually.)
- (2) With the first pump, which is a signal-input type, the sync pulse signals are output to pins (7) and (9) with each pump operation.
- (3) With the second pump, which is a pulse signal-input type, the sync pulse output of the first pump is received as external signals at pins (4) and (6).
- (4) The second pump, which is a pulse signal-input type, calculates the signals received and operates for the number of times from 1/999 to 1x to 999x.

### ● Operating the pumps at the same speed

The second pump, which is a pulse signal-input type, is set to 1 (1/1) in the pulse frequency-division mode or 1x in the pulse magnification mode.

### ● Operating the second pump once every time the first pump operates 5 times

Set the second pump, which is a pulse signal-input type, to the pulse frequency-division mode, and select the frequency division to 5 (1/5).

### ● Operating the second pump twice every time the first pump operates once

Set the second pump, which is a pulse signal-input type, to the pulse magnification mode, and set the magnification to 2x.

(The control precision is reduced with this kind of setting so it is recommended that the pumps be installed in such a way that the first pump operates for a greater number of times.)

# Spare parts

## ■ Spare parts

- Failure to replace the wear items may cause discharge (or injection) trouble and/or malfunctions.
- The replacement timeframes of the wear items have been determined under the prescribed conditions (clean water, room temperature) prevailing at Wanner Engineering's test facilities.
- Since these timeframes will differ under the individual conditions prevailing on-site, use them as a general guide, and replace the wear items at an earlier rather than later date.



### CAUTION

- **The durability of the hoses, tubes, relief and air-release hoses, anti-siphon check valve and valves depends significantly on the chemical used, temperature, pressure, ultraviolet rays and other factors. Inspect the parts and replace them if deteriorated. The user will be charged for the cost of these parts even when the warranty period for the pump body is still in effect.**

### NOTE

- **Wanner Engineering will continue to supply spare parts for its pumps for a period of eight (8) years after the manufacture of the pumps has been discontinued.**
- **"Parts kits" consisting of a complete set of spare parts are available for most models.**

For details on how to replace the spare parts, refer to the sections on maintenance and the exploded views of the liquid-end parts.

## (1) 03R/030/06R/060/10R/100-PE/PF

Part	Quantity per pump		Recommended replacement timeframe
	03R/06R/10R	030/060/100	
Valve seat assembly	2		Every 10,000 hours
Diaphragm assembly (diaphragm, protective diaphragm)	1		Every 10,000 hours
Relief valve	1	–	Every 10,000 hours*
Air-release knob	–	1	Every 10,000 hours
Air-release nozzle assembly	1		Every 10,000 hours
O-ring (S60)	1		Every 10,000 hours

\* The timeframe applies when the relief-valve function has not been activated at all. If it has been activated, replace it regardless of how long it has been in use.

## (2) 200-PE/PF

Part	Quantity per pump	Recommended replacement timeframe
Valve seat assembly	2	Every 10,000 hours
Diaphragm assembly (diaphragm, protective diaphragm A · B)	1	Every 10,000 hours
O-ring (S80)	1	Every 10,000 hours
O-ring (S60)	1	Every 10,000 hours

## (3) 03R/030/06R/060/10R/100-KE/KF/KP

Part	Quantity per pump		Recommended replacement timeframe
	03R/06R/10R	030/060/100	
Valve seat assembly	2		Every 10,000 hours
Diaphragm assembly (diaphragm, protective diaphragm)	1		Every 10,000 hours
Relief valve	1	–	Every 10,000 hours*
Air-release knob	–	1	Every 10,000 hours
Air-release nozzle assembly	1		Every 10,000 hours
O-ring (S60)	1		Every 10,000 hours

\* The timeframe applies when the relief-valve function has not been activated at all. If it has been activated, replace it regardless of how long it has been in use.

# Spare parts

## (4) 030/060/100-ST

Part	Quantity per pump	Recommended replacement timeframe
O-ring (P18)	3	Every 10,000 hours
Check ball	2	Every 10,000 hours
Valve stopper	2	Every 10,000 hours
Diaphragm assembly (diaphragm, protective diaphragm)	1	Every 10,000 hours
Air-release nozzle assembly	1	Every 10,000 hours
O-ring (S60)	1	Every 10,000 hours

## (5) 060/100-HV (High-viscosity type)

Part	Quantity per pump	Recommended replacement timeframe
O-ring (P16)	1	Every 10,000 hours
O-ring (P18)	2	Every 10,000 hours
Check ball	2	Every 10,000 hours
Valve stopper	2	Every 10,000 hours
Compressed coil spring	2	2,000 hours of operation or 6 months*
Diaphragm assembly (diaphragm, protective diaphragm)	1	Every 10,000 hours
O-ring (S60)	1	Every 10,000 hours

\* The recommended time frame for this assembly is operation time (2,000 hours) or usage period (6 months), whichever comes first.

## (6) 03R/030-BH (Boiler type)

Part	Quantity per pump		Recommended replacement timeframe
	03R	030	
Valve seat assembly	2		Every 10,000 hours
Diaphragm assembly (diaphragm, protective diaphragm)	1		Every 10,000 hours
Relief valve	1	–	Every 10,000 hours*
Air-release knob	–	1	Every 10,000 hours
Air-release nozzle assembly	1		Every 10,000 hours
O-ring (S60)	1		Every 10,000 hours

\* The timeframe applies when the relief-valve function has not been activated at all. If it has been activated, replace it regardless of how long it has been in use.

## (7) 030-CH (High-pressure type)

Part	Quantity per pump	Recommended replacement timeframe
Valve seat assembly	2	Every 10,000 hours
Diaphragm assembly (diaphragm, protective diaphragm)	1	Every 10,000 hours
O-ring	1	Every 10,000 hours
Air-release knob	1	Every 10,000 hours
Air-release nozzle assembly	1	Every 10,000 hours
O-ring (S60)	1	Every 10,000 hours

# Spare parts

## (8) 03R/030/06R/060/10R/100-CD

Part	Quantity per pump		Recommended replacement timeframe
	03R/06R/10R	030/060/100	
Valve seat assembly (Discharge-side)	1		Every 10,000 hours
Valve seat assembly (Suction-side)	1		Every 10,000 hours
Diaphragm assembly (diaphragm, protective diaphragm)	1		Every 10,000 hours
Relief valve	1	–	Every 10,000 hours*
Air-release knob	–	1	Every 10,000 hours
Air-release nozzle assembly	1		Every 10,000 hours
O-ring (S60)	1		Every 10,000 hours
O-ring (P10)	1		Every 10,000 hours

\* The timeframe applies when the relief-valve function has not been activated at all. If it has been activated, replace it regardless of how long it has been in use.

## (9) 03R/030/06R/060/10R/100-CN

Part	Quantity per pump		Recommended replacement timeframe
	03R/06R/10R	030/060/100	
Valve seat assembly (Discharge-side)	1		Every 10,000 hours
Valve seat assembly (Suction-side)	1		Every 10,000 hours
Diaphragm assembly (diaphragm, protective diaphragm)	1		Every 10,000 hours
Relief valve	1	–	Every 10,000 hours*
Air-release knob	–	1	Every 10,000 hours
Air-release nozzle assembly	1		Every 10,000 hours
O-ring (S60)	1		Every 10,000 hours

\* The timeframe applies when the relief-valve function has not been activated at all. If it has been activated, replace it regardless of how long it has been in use.

## Spare parts & options

### ■ Spare parts (sold separately)

It is recommended to keep the following spare parts on hand in case of loss or damage.

- Nuts
- Retaining rings
- Joints

### ■ Options

#### • Back pressure valve

This valve prevents overfeeding\*<sup>1</sup> and siphoning\*<sup>2</sup> phenomena by sealing the chemical outlet with a diaphragm and applying just the right amount of pressure (back pressure) to suppress the inertia force of the fluid.

#### • Relief valve

This valve automatically releases abnormal pressure that occurs in the discharge-side piping due to blockage by foreign objects. Tightening of the valve is preventative action against accidents or possible damage to the pump and piping.

#### • Air chamber with dampener

Reciprocating pumps may develop pulsation, which causes pipe vibration and overfeed. If this is the case, use of an air chamber can regulate the chemical into a more continuous flow and alleviate the various problems associated with pulsation. When an air chamber with dampener is to be installed, a relief valve mentioned above **MUST** be installed.

#### • Accumulator

The accumulator is included to reduce pulsation and the principle behind its operation is the same as that of the air chamber with dampener. It is effective at high pressure levels above 0.5 MPa and when using liquids that are affected by air.

#### • Level Switch

When this sensor detects the low chemical level in the tank, it stops pump operation and emits an alarm to notify the operator that it is time to fill the tank. Two models, a 1-point (single-sensor) and a 2-point (double-sensor) model, are available.

#### • Flow checker

This highly acid- and alkali-resistant, low-cost flow meter allows you to monitor injection operation of the pump. It can be directly attached on the discharge side of the pump.

#### • Degassing joint

Installed on the suction side of the pump, this joint separates air bubbles and fluid to prevent air bubbles from entering the pump head.

#### • TU-30/50/120

These are chemical injection units consisting of a metering pump and PE tank with capacities of 30 L (7.9 gal.), 50 L (13.2 gal.) and 120 L (31.7 gal.).

#### • Parts kit

This kit contains a complete set of all required spare parts. It is economical and an easy way to store and manage the parts needed.

## Explanation of terms

#### • Overfeeding

A phenomenon where liquid continues to discharge from the piping for a few seconds due to the momentum of discharge (inertia) after pump operation stops. In the case of pulsation flow, the actual discharge volume might be larger than the rated one because of this phenomenon.

#### • Siphoning

The phenomenon that chemicals continue to be sucked out naturally and continue flowing when the tip of the pump's discharge-side piping is lower than the level of liquid in the suction-side tank.

#### • Cavitation

A phenomenon that the negative pressure inside the pump head causes air bubbles to form, diminishing the discharge volume and causing abnormal noises and vibration.

# After-sales services

## Hydra-Cell® Limited Warranty

Wanner Engineering, Inc. (WEI) warrants that, for a period of one year from the date of delivery, equipment manufactured by WEI shall be free of defects in materials and workmanship under normal use and service, and provided the equipment is installed, operated and maintained in accordance with instructions supplied by WEI.

**This limited warranty is WEI's sole and exclusive warranty.**

If a defect in WEI's equipment appears within one (1) year from the date of delivery, and Purchaser has given written notice of such defect within thirty (30) days from the discovery thereof, WEI will repair or replace the defective part, at its option.

WEI requires the return to a designated WEI location of the defective part, transportation prepaid, to establish Purchaser's claim. A return goods authorization must be received prior to the return of the defective part. No allowance will be made for repairs undertaken without WEI's written consent or approval.

This limited warranty does not cover normal wear, or wear caused by or related to abrasion, corrosion, abuse, negligence, accident, faulty installation, or tampering which impairs normal operation of the equipment. This limited warranty applies only to equipment manufactured by WEI. Warranties, if any, on equipment manufactured by others including but not limited to electric motors (if applicable), are assigned to the purchaser by WEI (without recourse) at time of delivery.

Any descriptions of the equipment drawings, specifications, and any samples, models, bulletins, or similar material, used in connection with this sale are for the sole purpose of identifying the equipment and are not to be construed as an express warranty that the equipment will conform to such description. Any field advisory or installation support is advisory only.

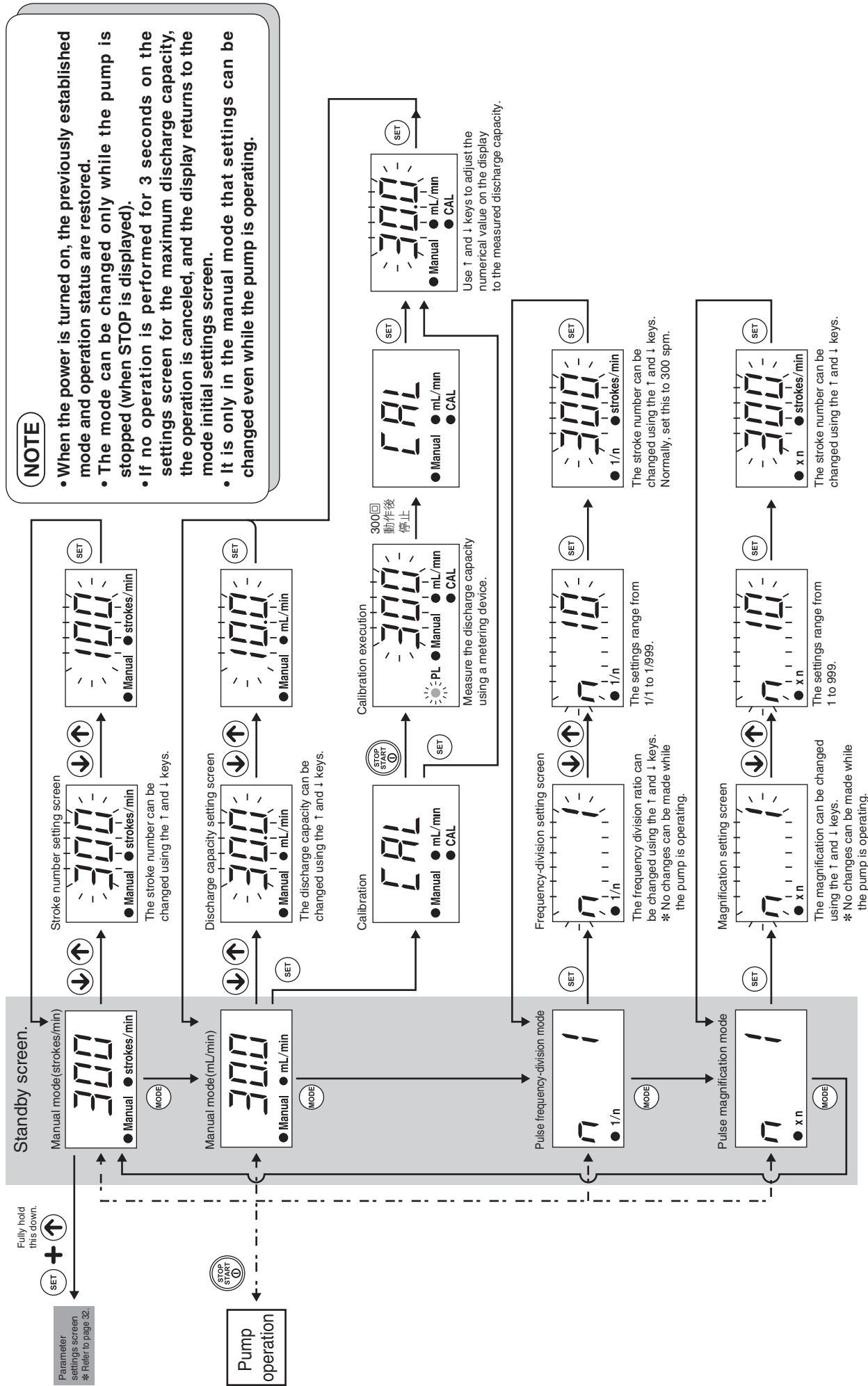
**The foregoing warranties are in lieu of all other warranties.**

**Whether oral, written, express, implied or statutory, implied warranties of merchantability and fitness for a particular purpose will not apply.**

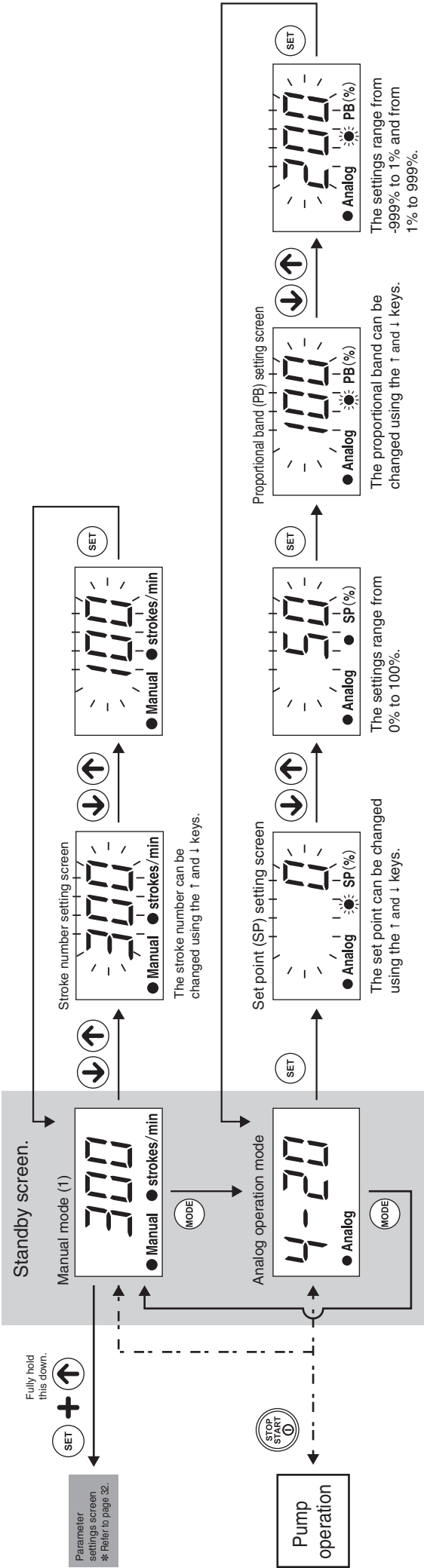
**WEI's warranty obligations and purchaser's remedies thereunder are solely and exclusively as stated herein.**

The purchaser's sole and exclusive remedy, whether based upon warranty, contract or tort, including negligence, will be to proceed under this warranty. All liability of WEI shall terminate one (1) year from the date of delivery of the equipment.

# SP series: Standard (pulse) type setting flow



## SA series: Analog type setting flow

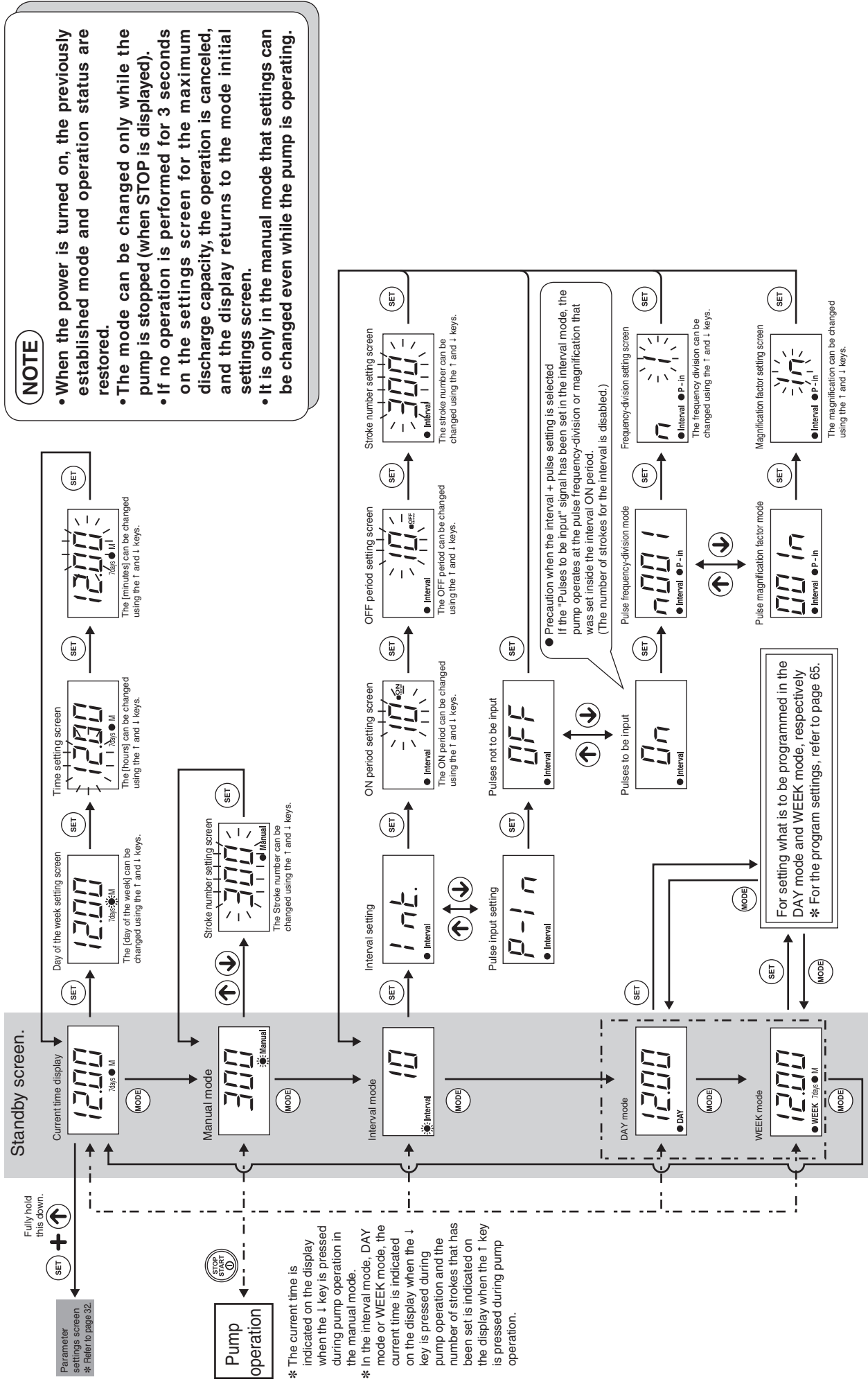


**NOTE**

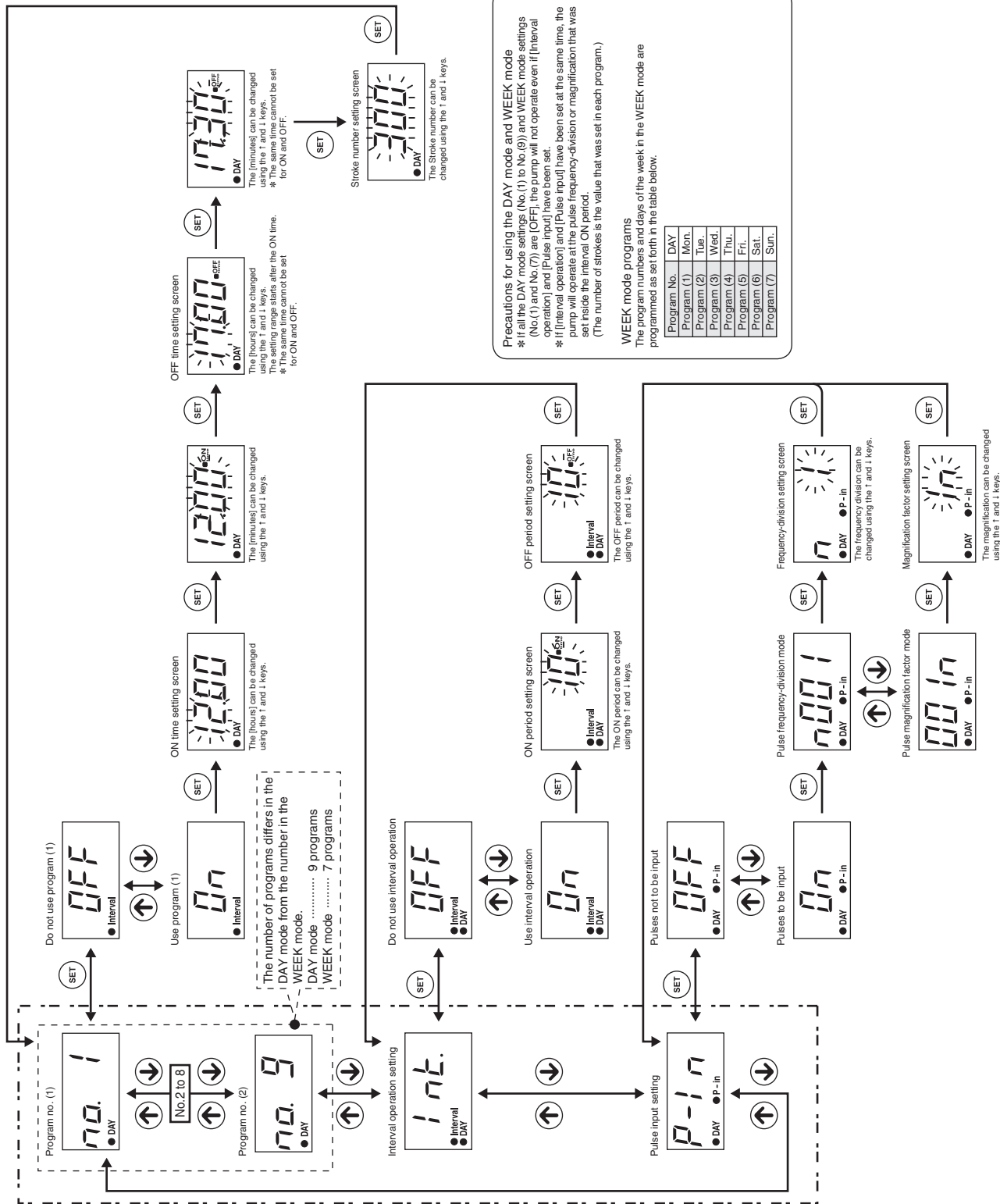
- When the power is turned on, the previously established mode and operation status are restored.
- The mode can be changed only while the pump is stopped (when STOP is displayed).
- If no operation is performed for 3 seconds on the settings screen for the maximum discharge capacity, the operation is canceled, and the display returns to the mode initial settings screen.
- It is only in the manual mode that settings can be changed even while the pump is operating.

- When the power is turned on, the previously established mode and operation status are restored.
- The mode can be changed only while the pump is stopped (when STOP is displayed).
- If no operation is performed for 3 seconds on the settings screen for the maximum discharge capacity, and the display returns to the mode initial settings screen.
- It is only in the manual mode that settings can be changed even while the pump is operating.

# ST series: Timer type setting flow



## ● Details of DAY mode & WEEK mode setting flow





Product designs and specifications are subject to change without notice for product improvement.



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