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## Solenoid-driven Diaphragm Metering Pump

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# SM Series

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## 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.**

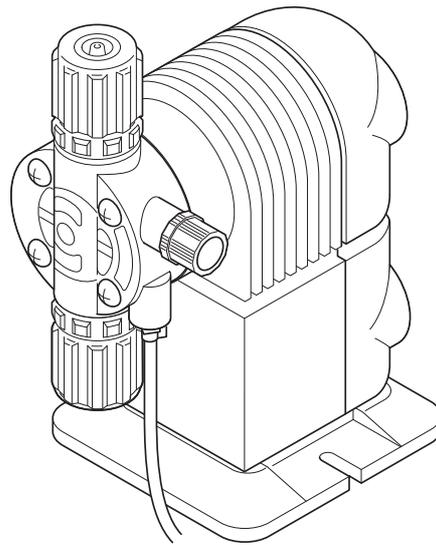


Illustration of SM-03R

- 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* (32 to 104 °F*)
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
Altitude of installation location	Less than 1,000 m (3,281 ft.)

\* Transport and store the pump at temperatures within the -10 to +50°C (32 to 122 °F) range. Do not subject the pump to strong impacts.

\* 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 clogging 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.

## Electrical Wiring



- 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.



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

## Operation & Maintenance



- 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 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.



- 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.

## 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 19 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?

<b>CE</b> Solenoid-driven Metering Pump			
Model:			
Max. capacity	Max. Pressure	Max. stroke speed	Max. current
L/H	bar	spm	A
Power Supply: 1Ø 50/60Hz AC100-240V			
Serial No.:			
 			
1204 Chestnut Avenue Minneapolis, MN 55403 USA			

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.

## Accessories list

### Model with relief-valve function for injection of general chemicals

Liquid-end type	PE/PF		
	Model	03R	06R
Tube (3m)	PE tube (6x8)		
Relief/air-release hose (1m, installed)	Soft PVC hose (4x6)		
Hose band (spare) for relief/air-release hose	1 piece		
Anti-siphon check valve	1 set (R1/2)		
Foot valve	1 set		
Ceramic weight	1 set		
Pump mounting nuts/bolts	2 sets (M5x30)		
IOM MANUAL	1 copy		

Liquid-end type	KE/KF		
	Model	03R	06R
Tube (3m)	PE tube (6x8)		
Relief/air-release hose (1m, installed)	Soft PVC hose (4x6)		
Hose band (spare) for relief/air-release hose	1 piece		
Anti-siphon check valve	1 set (R1/2)		
Foot valve	1 set		
Ceramic weight	1 set		
Pump mounting nuts/bolts	2 sets (M5x30)		
IOM MANUAL	1 copy		

Liquid-end type	KP		
	Model	03R	06R
Tube (3m)	FEP tube (6x8)		
Relief/air-release hose (1m, installed)	Soft PVC hose (4x6)		
Hose band (spare) for relief/air-release hose	1 piece		
Anti-siphon check valve	1 set (R1/2 or R3/8)		
Foot valve	1 set		
Ceramic weight	1 set		
Pump mounting nuts/bolts	2 sets (M5x30)		
IOM MANUAL	1 copy		

# Accessories list

## Model without relief-valve function for injection of general chemicals

Liquid-end type	PE/PF		
Model	030	060	100
Tube (3m)	PE tube (6×8)		
Air-release hose (1m)	Soft PVC hose (4×6)		
Anti-siphon check valve	1 set (R1/2)		
Foot valve	1 set		
Ceramic weight	1 set		
Pump mounting nuts/bolts	2 sets (M5×30)		
IOM MANUAL	1 copy		

Liquid-end type	KE/KF		
Model	030	060	100
Tube (3m)	PE tube (6×8)		
Air-release hose (1m)	Soft PVC hose (4×6)		
Anti-siphon check valve	1 set (R1/2)		
Foot valve	1 set		
Ceramic weight	1 set		
Pump mounting nuts/bolts	2 sets (M5×30)		
IOM MANUAL	1 copy		

Liquid-end type	KP		
Model	030	060	100
Tube (3m)	FEP tube (6×8)		
Air-release hose (1m)	Soft PVC hose (4×6)		
Anti-siphon check valve	1 set (R1/2 or R3/8)		
Foot valve	1 set		
Ceramic weight	1 set		
Pump mounting nuts/bolts	2 sets (M5×30)		
IOM MANUAL	1 copy		

Liquid-end type	ST		
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		
Pump mounting nuts/bolts	2 sets (M5×30)		
Air-release hose pump	1 set		
IOM MANUAL	1 copy		

# Accessories list

## Model with relief-valve function for injection of boiler chemicals

Liquid-end type	BH
Model	03R
Discharge side tube (2m)	PA tube (4×6)
Suction side hose (1m)	PVC braided hose (4×9)
Relief/air-release hose (1m, installed)	Soft PVC hose (4×6)
Hose band (spare) for Relief/air-release hose	1 piece
Anti-siphon check valve	1 set (R1/2)
Foot valve	1 set
Pump mounting nuts/bolts	2 sets (M5×30)
IOM MANUAL	1 copy

## Model without relief-valve function for injection of boiler chemicals

Liquid-end type	BH
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
Pump mounting nuts/bolts	2 sets (M5×30)
IOM MANUAL	1 copy

## Model with relief-valve function for injection of sodium hypochlorite

Liquid-end type	CL		
Model	03R	06R	10R
Tube (3m)	PE tube (6×8)		
Relief/air-release hose (1m, installed)	Soft PVC hose (4×6)		
Hose band (spare) for relief/air-release hose	1 piece		
Anti-siphon check valve with duckbill cap	1 set (R1/2)		
Foot valve	1 set		
Ceramic weight	1 set		
Pump mounting nuts/bolts	2 sets (M5×30)		
IOM MANUAL	1 copy		

## Model without relief-valve function for injection of sodium hypochlorite

Liquid-end type	CL		
Model	030	060	100
Tube (3m)	PE tube (6×8)		
Air-release hose (1m)	Soft PVC hose (4×6)		
Anti-siphon check valve with duckbill cap	1 set (R1/2)		
Foot valve	1 set		
Ceramic weight	1 set		
Pump mounting nuts/bolts	2 sets (M5×30)		
IOM MANUAL	1 copy		

## Model with automatic air-release function for injection of sodium hypochlorite

Liquid-end type	CA		
Model	030	060	100
Tube (3m)	PE tube (6×8)		
Air-release hose (1m)	Soft PVC hose (4×6)		
Anti-siphon check valve with duckbill cap	1 set (R1/2)		
Foot valve	1 set		
Ceramic weight	1 set		
Pump mounting nuts/bolts	2 sets (M5×30)		
IOM MANUAL	1 copy		

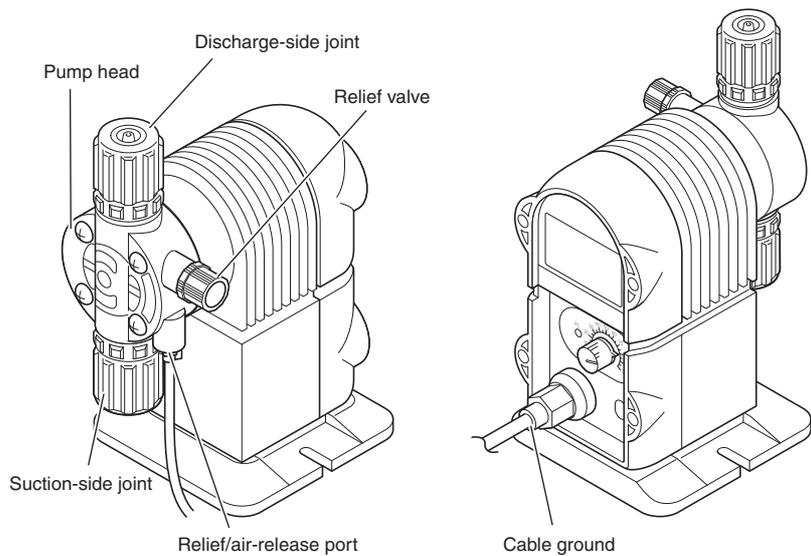
# Product description

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.

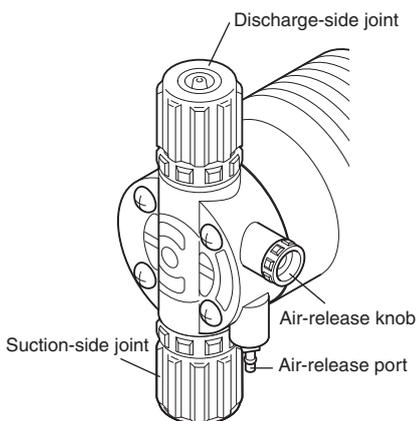
# Parts identification

\* The shapes of pump heads and joints differ slightly depending on the liquid-end material and connection type.

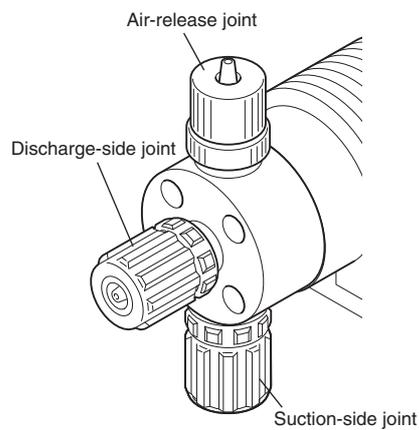
## Model with relief-valve function



## Model without relief-valve function



## Model with automatic air-release function



# 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.

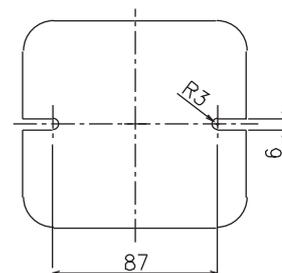


## Mounting bolt positions

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.).



# 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.
- 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 clogging 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.
- 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.

## 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.

\* Refer to the "Explanation of terms" on page 64.

# Piping

## ■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 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.

Pumping procedure described by pump type

Type	Relief-valve function	Model	Page
Injection of general chemicals	Yes	SM-03R/06R/10R-PE/PF/KE/KF/KP	12
	No	SM-030/060/100-PE/PF/KE/KF/KP/ST	13
Injection of boiler chemicals	Yes	SM-03R-BH	14
	No	SM-030-BH	15
Injection of sodium hypochlorite	Yes	SM-03R/06R/10R-CL	16
	No	SM-030/060/100-CL	17
Model with automatic air-release function for injection of sodium hypochlorite	No	SM-030/060/100-CA	18

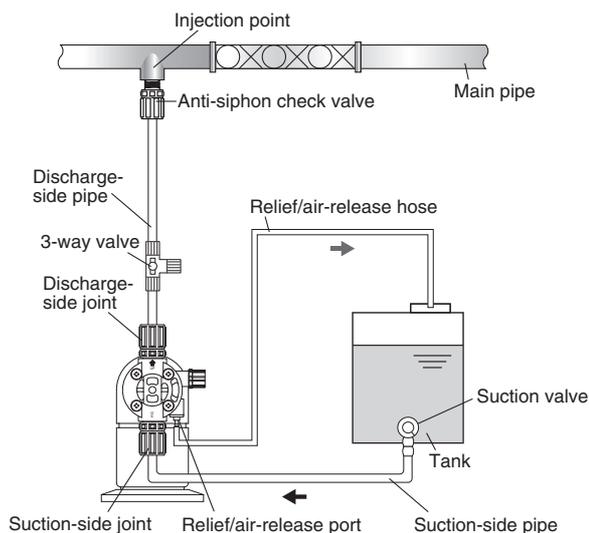
# Piping

## Model with relief-valve function for injection of general chemicals: SM-03R/06R/10R-PE/PF/KE/KF/KP

- If a valve is closed or foreign matter is clogging the pipe at the discharge side of the pump, the chemical will escape from the relief/air-release port. Therefore, always have a relief/air-release hose installed, and run its end back into the tank or another appropriate container.
- Install a valve for releasing abnormal pressure built up inside the discharge-side pipe. The 3-way valve on the water flush line may be used instead.

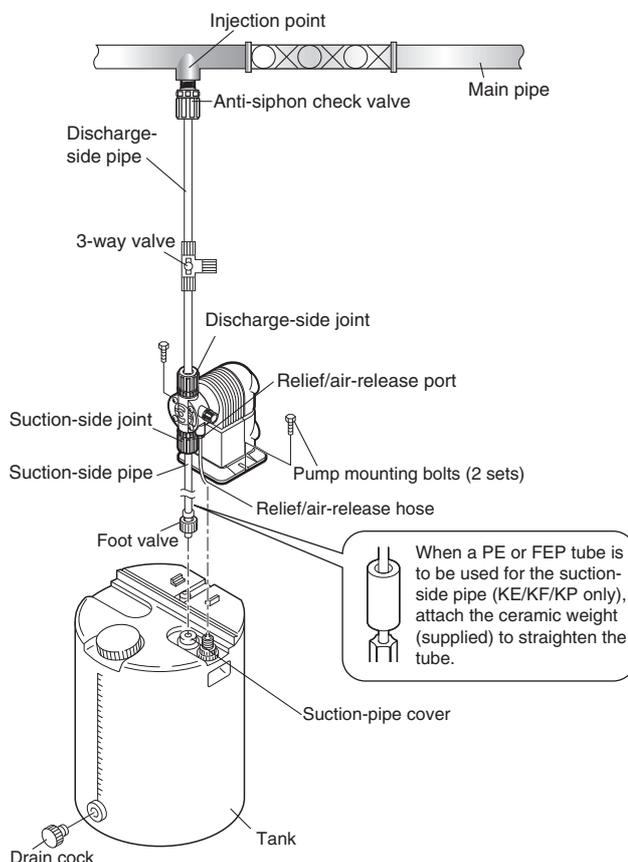
### ■ Pump installation below the tank

- (1) Connect the suction valve of the tank and the suction-side joint of the pump using the hose/tube.
  - (2) Connect the discharge-side joint of the pump and main pipe (injection point) using the hose/tube. When doing this, attach the anti-siphon check valve at the injection-point side end of the hose/tube.
  - (3) Return the end of the relief/air-release hose which has already been attached to the relief/air-release port to the tank or another appropriate container.
- \* It is recommended that a valve, meter, etc. be installed for efficient maintenance repairs and parts replacement.



### ■ Pump installation above the tank

- (1) Using the pump mounting bolts included, secure the pump to the indicated position on top of the tank.
  - (2) Pass the suction-side hose/tube with foot valve and ceramic weight (tube only) attached through the hole in the suction-pipe cover on top of the tank and connect it to the suction-side joint of the pump. At this time, adjust the length of the hose/tube and cut it so that the foot valve is 30 mm higher than the bottom of the tank.
  - (3) Connect the discharge-side joint of the pump and main pipe (injection point) using the hose/tube. When doing this, attach the anti-siphon check valve at the injection-point side end of the hose/tube.
  - (4) Return the end of the relief/air-release hose which has already been attached to the relief/air-release port to the tank or another appropriate container.
- \* Installing the pump above the tank is not recommended for chemicals in which air bubbles tend to form.
- \* This pump's static suction head is  $-1.5\text{ m}$  ( $-5\text{ ft.}$ ) for water. Its suction capability may decrease when the valve seats inside the pump head are dry.
- \* Connect the foot valve included to the end of the suction-side hose/tube to prevent dirt or foreign matter from entering the pump head and valve seat area.
- \* It is recommended that a valve, meter, etc. be installed for efficient maintenance repairs and parts replacement.



# Piping

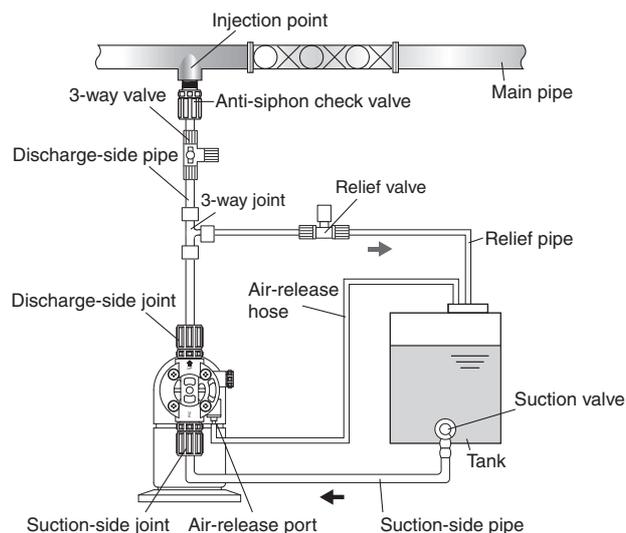
## Model without relief-valve function for injection of general chemicals: SM-030/060/100-PE/PF/KE/KF/KP/ST

- \* No air-release hose is needed for ST type.
- It is extremely dangerous for the user to forget to open the valve or for there to be foreign matter clogging the pump's discharge-side pipe. Ensure installation a relief valve, which will automatically release abnormally high pressure levels on the discharge-side pipe.
- Install a valve for releasing abnormal pressure built up inside the discharge-side pipe. The 3-way valve on the water flush line may be used instead.

### ■ Pump installation below the tank

- (1) Connect the suction valve of the tank and the suction-side joint of the pump using the hose/tube.
- (2) Connect the hose/tube to the discharge-side joint of the pump.
- (3) Attach a 3-way joint to the discharge-side hose/tube (above the pump's discharge-side joint) and install a relief valve. Return the end of the relief pipe to the tank or another appropriate container.
- (4) Connect the end of the other discharge-side hose/tube extending from the 3-way joint to the main pipe (injection point). When doing this, attach the anti-siphon check valve at the injection-point side end of the hose/tube.
- (5) Attach one end of the air-release hose to the air-release port and return the other end to the tank or another appropriate container.

- \* It is recommended that a valve, meter, etc. be installed for efficient maintenance repairs and parts replacement.



### ■ Pump installation above the tank

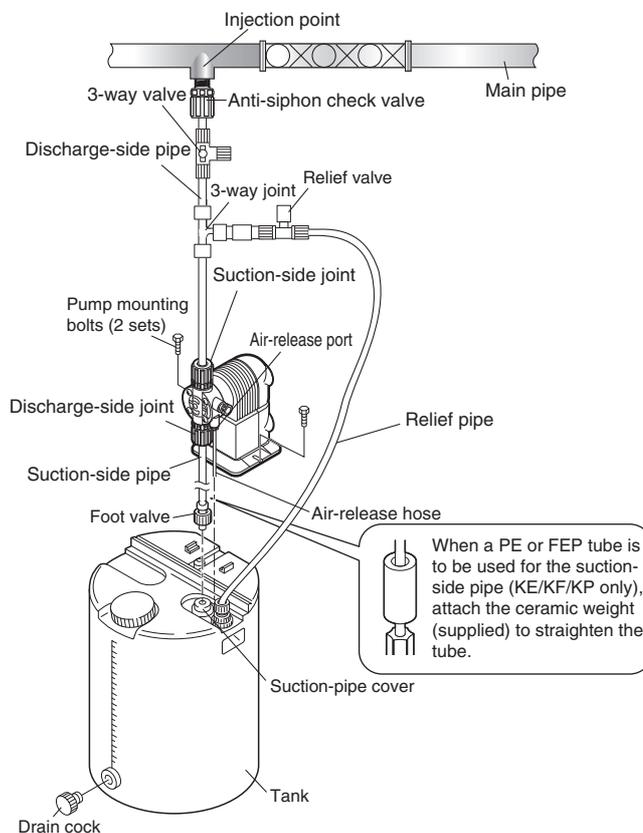
- (1) Using the pump mounting bolts included, secure the pump to the indicated position on top of the tank.
- (2) Pass the suction-side hose/tube with foot valve and ceramic weight (tube only) attached through the hole in the suction-pipe cover on top of the tank and connect it to the suction-side joint of the pump. At this time, adjust the length of the hose/tube and cut it so that the foot valve is 30 mm higher than the bottom of the tank.
- (3) Connect the hose/tube to the discharge-side joint of the pump.
- (4) Attach a 3-way joint to the discharge-side hose/tube (near the pump's discharge-side joint) and install a relief valve. Return the end of the relief pipe to the tank or another appropriate container.
- (5) Connect the end of the other discharge-side hose/tube extending from the 3-way joint to the main pipe (injection point). When doing this, attach the anti-siphon check valve at the injection-point side end of the hose/tube.
- (6) Attach the air-release hose to the air-release port.
- (7) Drill a hole in the suction-pipe cover of the tank and return the end of the air-release hose to the tank.

- \* Installing the pump above the tank is not recommended for chemicals in which air bubbles tend to form.

- \* This pump's static suction head is  $-1.5\text{ m}$  ( $-5\text{ ft.}$ ) for water. Its suction capability may decrease when the valve seats inside the pump head are dry.

- \* Connect the foot valve included to the end of the suction-side hose/tube to prevent dirt or foreign matter from entering the pump head and valve seat area.

- \* It is recommended that a valve, meter, etc. be installed for efficient maintenance repairs and parts replacement.



When a PE or FEP tube is to be used for the suction-side pipe (KE/KF/KP only), attach the ceramic weight (supplied) to straighten the tube.

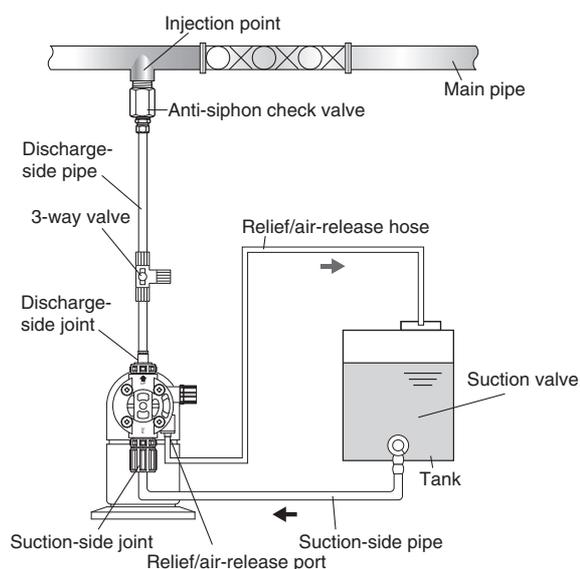
# Piping

## Model with relief-valve function for injection of boiler chemicals: SM-03R-BH

- If a valve is closed or foreign matter is clogging the pipe at the discharge side of the pump, the chemical will escape from the relief/air-release port. Therefore, always have a relief/air-release hose installed, and run its end back into the tank or another appropriate container.
- Install a valve for releasing abnormal pressure built up inside the discharge-side pipe. The 3-way valve on the water flush line may be used instead.

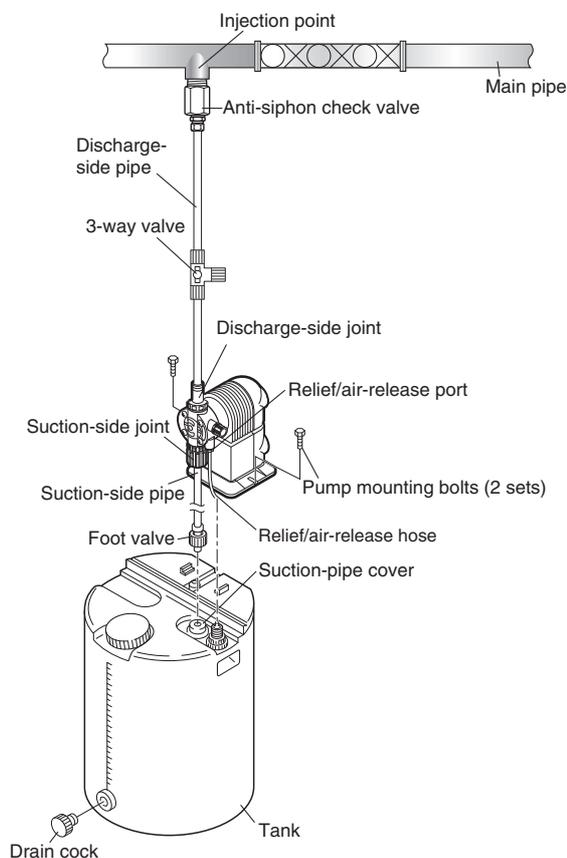
### ■ Pump installation below the tank

- (1) Connect the suction valve of the tank and the suction-side joint of the pump using the hose.
  - (2) Connect the discharge-side joint of the pump and main pipe (injection point) using the tube. When doing this, attach the anti-siphon check valve at the injection-point side end of the tube.
  - (3) Return the end of the relief/air-release hose which has already been attached to the relief/air-release port to the tank or another appropriate container.
- \* It is recommended that a valve, meter, etc. be installed for efficient maintenance repairs and parts replacement.



### ■ Pump installation above the tank

- (1) Using the pump mounting bolts included, secure the pump to the indicated position on top of the tank.
  - (2) Pass the suction-side hose with foot valve attached through the hole in the suction-pipe cover on top of the tank and connect it to the suction-side joint of the pump. At this time, adjust the length of the hose and cut it so that the foot valve is 30 mm higher than the bottom of the tank.
  - (3) Connect the discharge-side joint of the pump and main pipe (injection point) using the tube. When doing this, attach the anti-siphon check valve at the injection-point side end of the tube.
  - (4) Return the end of the relief/air-release hose which has already been attached to the relief/air-release port to the tank or another appropriate container.
- \* Installing the pump above the tank is not recommended for chemicals in which air bubbles tend to form.
- \* This pump's static suction head is  $-0.8\text{ m}$  ( $-2.6\text{ ft.}$ ) for water. Its suction capability may decrease when the valve seats inside the pump head are dry.
- \* Connect the foot valve included to the end of the suction-side hose to prevent dirt or foreign matter from entering the pump head and valve seat area.
- \* It is recommended that a valve, meter, etc. be installed for efficient maintenance repairs and parts replacement.



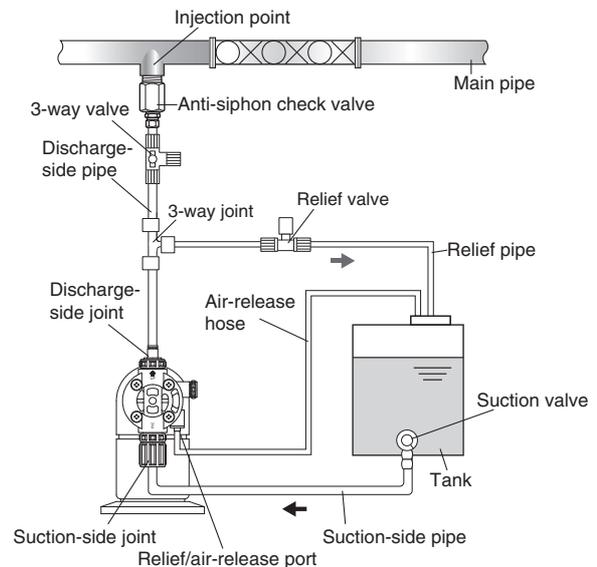
# Piping

## Model without relief-valve function for injection of boiler chemicals: SM-030-BH

- It is extremely dangerous for the user to forget to open the valve or for there to be foreign matter clogging the pump's discharge-side pipe. Ensure installation a relief valve, which will automatically release abnormally high pressure levels on the discharge-side pipe.
- Install a valve for releasing abnormal pressure built up inside the discharge-side pipe. The 3-way valve on the water flush line may be used instead.

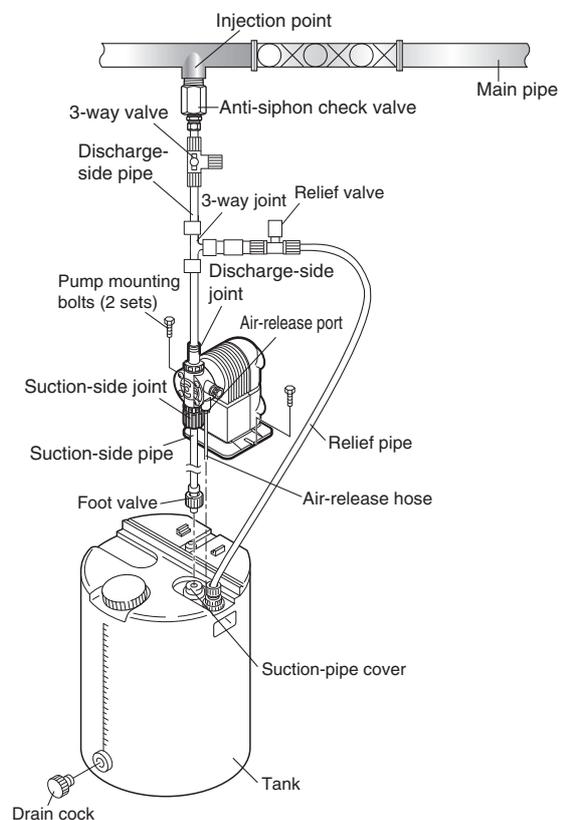
### ■ Pump installation below the tank

- (1) Connect the suction valve of the tank and the suction-side joint of the pump using the hose.
  - (2) Connect the tube to the discharge-side joint of the pump.
  - (3) Attach a 3-way joint to the discharge-side tube (above the pump's discharge-side joint) and install a relief valve. Return the end of the relief pipe to the tank or another appropriate container.
  - (4) Connect the end of the other discharge-side tube extending from the 3-way joint to the main pipe (injection point). When doing this, attach the anti-siphon check valve at the injection-point side end of the tube.
  - (5) Attach one end of the air-release hose to the air-release port and return the other end to the tank or another appropriate container.
- \* It is recommended that a valve, meter, etc. be installed for efficient maintenance repairs and parts replacement.



### ■ Pump installation above the tank

- (1) Using the pump mounting bolts included, secure the pump to the indicated position on top of the tank.
  - (2) Pass the suction-side hose with foot valve attached through the hole in the suction-pipe cover on top of the tank and connect it to the suction-side joint of the pump. At this time, adjust the length of the hose or cut it so that the foot valve is 30 mm above the bottom of the tank.
  - (3) Connect the tube to the discharge-side joint of the pump.
  - (4) Attach a 3-way joint to the discharge-side tube (near the pump's discharge-side joint) and install a relief valve. Return the end of the relief pipe to the tank or another appropriate container.
  - (5) Connect the end of the other discharge-side tube extending from the 3-way joint to the main pipe (injection point). When doing this, attach the anti-siphon check valve at the injection-point side end of the tube.
  - (6) Attach the air-release hose to the air-release port.
  - (7) Drill a hole in the suction-pipe cover of the tank and return the end of the air-release hose to the tank.
- \* Installing the pump above the tank is not recommended for chemicals in which air bubbles tend to form.
- \* This pump's static suction head is  $-0.8\text{ m}$  ( $-2.6\text{ ft.}$ ) for water. Its suction capability may decrease when the valve seats inside the pump head are dry.
- \* Connect the foot valve included to the end of the suction-side hose to prevent dirt or foreign matter from entering the pump head and valve seat area.
- \* It is recommended that a valve, meter, etc. be installed for efficient maintenance repairs and parts replacement.



# Piping

## Model with relief-valve function for injection of sodium hypochlorite: SM-03R/06R/10R-CL

- If a valve is closed or foreign matter is clogging the pipe at the discharge side of the pump, the chemical will escape from the relief/air-release port. Therefore, always have a relief/air-release hose installed, and run its end back into the tank or another appropriate container.
- Install a valve for releasing abnormal pressure built up inside the discharge-side pipe. The 3-way valve on the water flush line may be used instead.
- To prevent gas lock and other such types of malfunction, best practice is to use the pump with a push-in pipe (when the pump is to be placed lower than the tank).
- In order to prevent gas lock caused by gases generated and building up inside the pipes, make the pipe connections as short as possible.

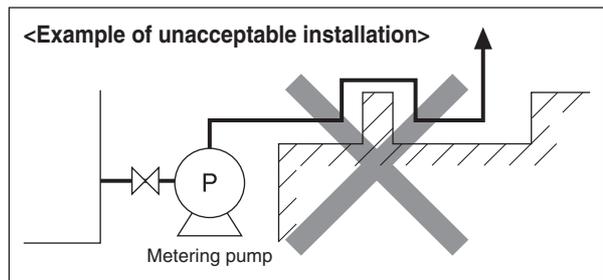
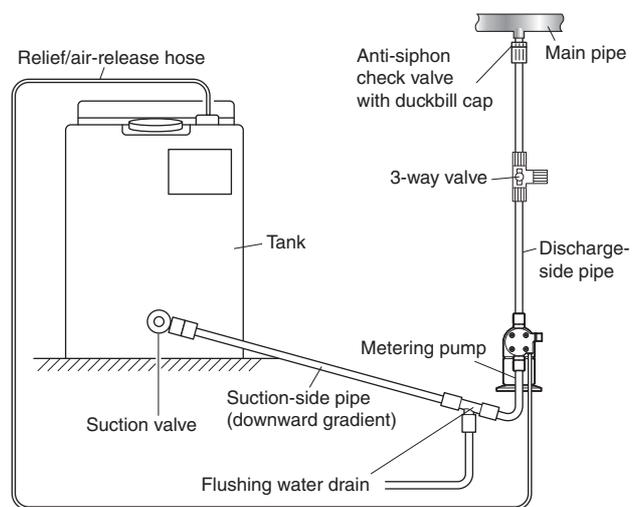
### ■ Pump installation below the tank

\* Do not install the pump above the tank.

- (1) Connect the suction valve of the tank and the suction-side joint of the pump using the hose/tube. When doing this, tilt the pipe at a downward gradient so that air will not be trapped inside the pipe.
- (2) Connect the discharge-side joint of the pump to the main pipe (injection point) using the hose/tube. When doing this, attach the anti-siphon check valve with duckbill cap at the injection-point side end of the hose/tube.
- (3) Return the end of the relief/air-release hose which has already been attached to the relief/air-release port to the tank or another appropriate container.

\* If it is unavoidable for the pump to be placed higher than the tank, connect the foot valve supplied to the end of the suction-side hose/tube to prevent dirt or foreign matter mixing inside the pump head or valve seat.

\* It is recommended that a valve, meter, etc. be installed for efficient maintenance repairs and parts replacement.



### IMPORTANT

#### Water flush line:

- It is recommended that a water flush line be incorporated in the piping.  
(A 3-way valve for releasing abnormally high pressure levels may be used instead.)

#### Sodium hypochlorite:

- Deplete the sodium hypochlorite in as short a period as possible (10 to 20 days in hot weather).
- When diluting sodium hypochlorite, use one of the following: (1) purified water, (2) processed softened water or (3) purified city water.

# Piping

## Model without relief-valve function for injection of sodium hypochlorite: SM-030/060/100-CL

- It is extremely dangerous for the user to forget to open the valve or for there to be foreign matter clogging the pump's discharge-side pipe. Ensure installation of a relief valve, which will automatically release abnormally high pressure levels on the discharge-side pipe.
- Install a valve for releasing abnormal pressure built up inside the discharge-side pipe. The 3-way valve on the water flush line may be used instead.
- To prevent gas lock and other such types of malfunction, best practice is to use the pump with a push-in pipe (when the pump is to be placed lower than the tank).
- In order to prevent gas lock caused by gases generated and building up inside the pipes, make the pipe connections as short as possible.

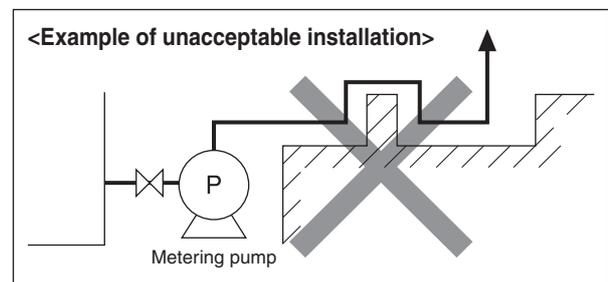
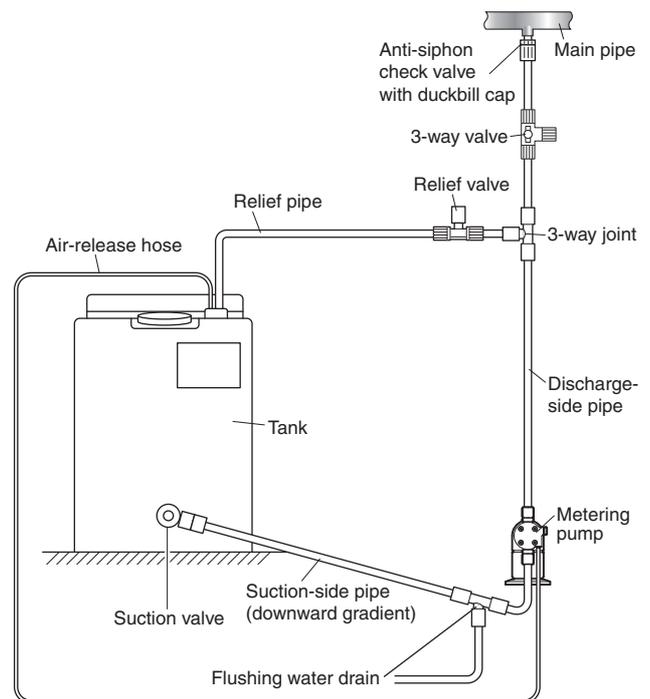
### ■ Pump installation below the tank

\* Do not install the pump above the tank.

- (1) Connect the suction valve of the tank and the suction-side joint of the pump using the hose/tube. When doing this, tilt the pipe at a downward gradient so that air will not be trapped inside the pipe.
- (2) Connect the hose/tube to the discharge-side joint of the pump.
- (3) Attach a 3-way joint to the discharge-side hose/tube (above the pump's discharge-side joint) and install a relief valve. Return the end of the relief pipe to the tank or another appropriate container.
- (4) Connect the end of the other discharge-side hose/tube extending from the 3-way joint to the main pipe (injection point). When doing this, attach the anti-siphon check valve with duckbill cap at the injection-point side end of the hose/tube.
- (5) Attach one end of the air-release hose to the air-release port and return the other end to the tank or another appropriate container.

\* If it is unavoidable for the pump to be placed higher than the tank, connect the foot valve supplied to the end of the suction-side hose/tube to prevent dirt or foreign matter mixing inside the pump head or valve seat.

\* It is recommended that a valve, meter, etc. be installed for efficient maintenance repairs and parts replacement.



### IMPORTANT

#### Water flush line:

- It is recommended that a water flush line be incorporated in the piping.  
(A 3-way valve for releasing abnormally high pressure levels may be used instead.)

#### Sodium hypochlorite:

- Deplete the sodium hypochlorite in as short a period as possible (10 to 20 days in hot weather).
- When diluting sodium hypochlorite, use one of the following: (1) purified water, (2) processed softened water or (3) purified city water.

# Piping

## Model with automatic air-release function for injection of sodium hypochlorite: SM-030/060/100-CA

- Unlike other models, this pump has a discharge-side joint at the front of the pump head and an air-release side joint on its top.
- It is extremely dangerous for the user to forget to open the valve or for there to be foreign matter clogging the pump's discharge-side pipe. Ensure the installation of a relief valve, which will automatically release abnormally high pressure levels on the discharge-side piping.
- Install a valve for releasing abnormal pressure built up inside the discharge-side pipe. The 3-way valve on the water flush line may be used instead.
- To prevent gas lock and other such types of malfunction, best practice is to use the pump with a push-in pipe (when the pump is to be placed lower than the tank).
- In order to prevent gas lock caused by gases generated and building up inside the pipes, make the pipe connections as short as possible.

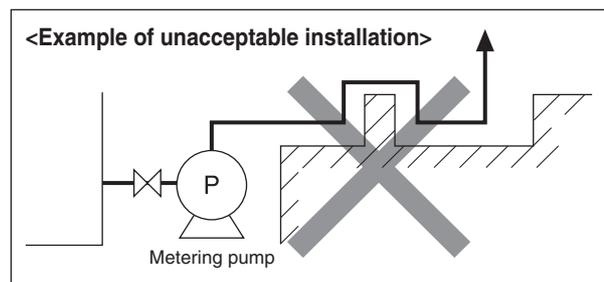
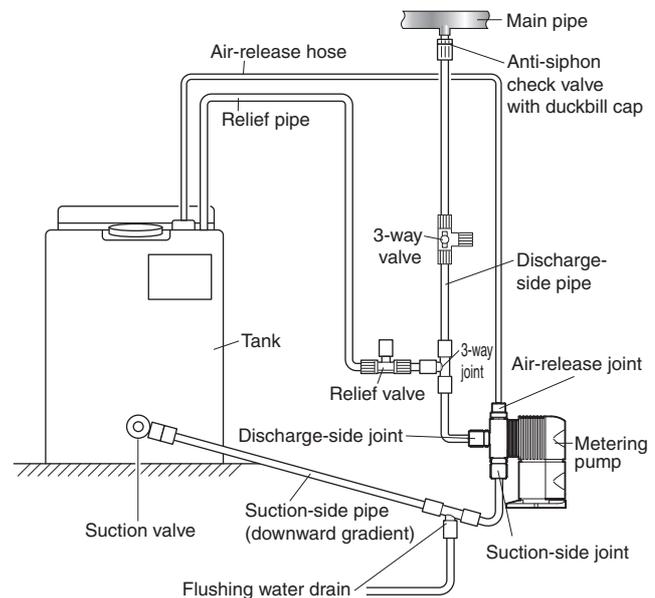
### ■ Pump installation below the tank

\* Do not install the pump above the tank.

- (1) Connect the suction valve of the tank and the suction-side joint of the pump using the hose/tube. When doing this, tilt the pipe at a downward gradient so that air will not be trapped inside the pipe.
- (2) Connect the hose/tube to the discharge-side joint of the pump.
- (3) Attach a 3-way joint to the discharge-side hose/tube (above the pump's discharge-side joint) and install a relief valve. Return the end of the relief pipe to the tank or another appropriate container.
- (4) Connect the end of the other discharge-side hose/tube extending from the 3-way joint to the main pipe (injection point). When doing this, attach the anti-siphon check valve with duckbill cap at the injection-point side end of the hose/tube.
- (5) Attach one end of the air-release hose to the air-release port and return the other end to the tank or another appropriate container.

\* If it is unavoidable for the pump to be placed higher than the tank, connect the foot valve supplied to the end of the suction-side hose/tube to preventing dirt or foreign matter mixing inside the pump head or valve seat.

\* It is recommended that a valve, meter, etc. be installed for efficient maintenance repairs and parts replacement.



### IMPORTANT

#### Water flush line:

- It is recommended that a water flush line be incorporated in the piping.  
(A 3-way valve for releasing abnormally high pressure levels may be used instead.)

#### Sodium hypochlorite:

- Deplete the sodium hypochlorite in as short a period as possible (10 to 20 days in hot weather).
- When diluting sodium hypochlorite, use one of the following: (1) purified water, (2) processed softened water or (3) purified city water.

# Connections

Connection procedure described by pump type

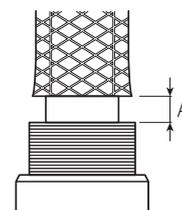
Type	Liquid-end type	Hose/tube	Page
Injection of general chemicals	PE/PF	PE tube	19
	KE/KF/KP	PE/FEP tube	21
	ST	PTFE tube	23
Injection of boiler chemicals	BH	Discharge side: PA tube Suction side: PVC braided hose	24
Injection of sodium hypochlorite	CL	PE tube	26
Model with automatic air-release function for injection of sodium hypochlorite	CA	PE tube	27

## Injection of general chemicals (PE/PF)

### ■ PE tube

- When bending the tube, allow sufficient leeway and position to prevent breaking, splitting, pinching, foot traffic.
- Insert the 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.
- If the temperature of a liquid or ambient temperature is higher than room temperature, the tightening force will be reduced and the tube may become disconnected. After operation has started, confirm connections and reinforce nut torque if applicable.
- When tightening the nuts, hold the tube to prevent it from being twisted. The joints and other areas may be loosened by the return force of the tube.
- The pump comes with a 3-meter long tube for both the discharge side and suction side. When a longer tube is used, the pressure loss may exceed the pump's maximum discharge pressure so a larger diameter tube will be required. Provide details on the (1) viscosity of the liquid, (2) length of the pipes (how they are positioned) and (3) specific gravity of the liquid to a Wanner Engineering representative who will select the appropriate tube size.
- When reusing the same tube after disconnecting it for maintenance or other reasons, cut about 10 mm (0.4 in.) from the end of the tube before reconnecting.

Hose type	Hose diameter	Dimension A
Tube	$\phi 6 \times \phi 8$	3 mm (about 1/8") or less



# Connections

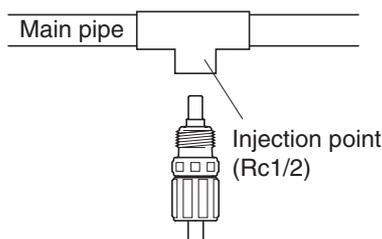
## ■ Anti-siphon check valve

An anti-siphon check valve is included with this pump. Use of this valve at the injection point is highly recommended.

**IMPORTANT:** Install the check valve at the injection point in the following instances:

- The injection point is open to the atmosphere and liquid is to be injected at a position lower than the level of the liquid in the tank (prevention of siphoning)
- The liquid is to be injected inside the suction-side pipe of a volute pump, etc.
- A chemical greatly exceeding the pump's rated discharge volume is being fed (prevention of overfeed)
  - \* Overfeed may occur in a vertical pipe if it is too long.

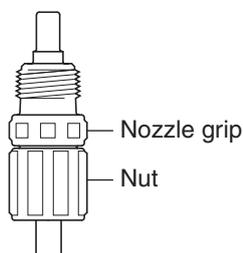
(1) The anti-siphon check valve has an R1/2 external thread. Provide an Rc1/2 internal thread at the injection point.



(2) Wrap sealing tape around the external thread of the anti-siphon check valve and screw the valve into the injection point.

\* If it is difficult to screw the valve in, grasp the nozzle grip using pliers and tighten the valve gently.

\* When connecting the tube with the anti-siphon check valve already mounted on it to the main pipe, it is necessary to hold the valve body and turn the nut. If the nut is turned without holding the body, the threaded part on the nozzle may be damaged.



### NOTE

**Injecting liquid into a small-diameter pipe:**

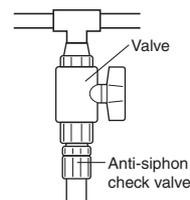
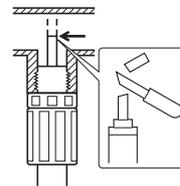
Install the valve so that the end of the injection nozzle is positioned at the center of the main pipe.

If the nozzle is too long, use a saw or other tool to cut off its end, use a file or other means to finish the cut-off surface, and discard the metal scraps.

**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 cleaned, repaired or replaced.

\* Use a valve made of materials resistant to corrosion caused by specific chemicals.



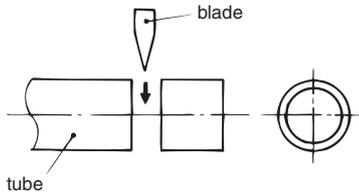
# Connections

## Injection of general chemicals (KE/KF/KP)

### ■ PE/FEP tube

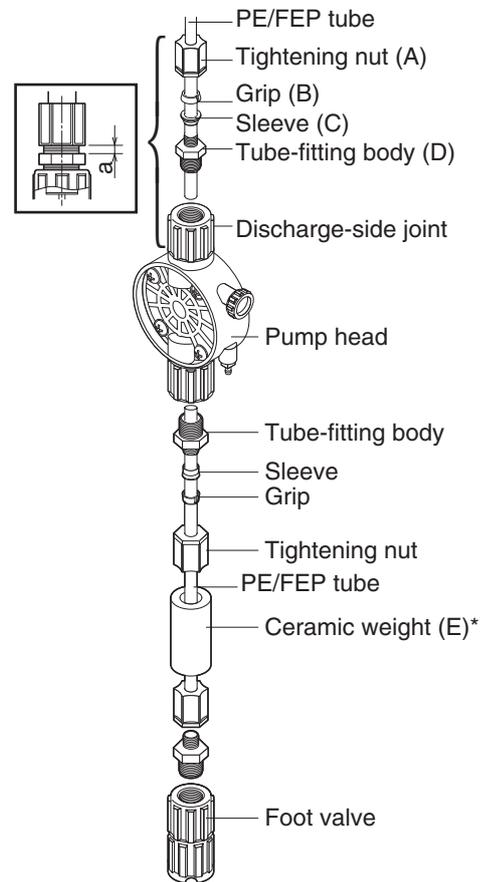
- When bending the tube, allow sufficient leeway and position to prevent breaking, splitting, pinching, foot traffic.
- Insert the tube firmly so that it will not become disconnected, and tighten the nuts securely. Do not excessively tighten the nuts. Doing so may damage or break the joint.
- If the temperature of a liquid or ambient temperature is higher than room temperature, the tightening force will be reduced, and the tube may become disconnected. After operation has started, confirm connections and reinforce nut torque if applicable.
- When tightening the nuts, hold the tube to prevent it from being twisted. The joints and other areas may be loosened by the return force of the tube.
- The pump comes with a 3-meter long tube for both the discharge side and suction side. When a longer tube is used, the pressure loss may exceed the pump's maximum discharge pressure so larger diameter tube will be required. Provide details on the (1) viscosity of the liquid, (2) length of the pipes (how they are positioned) and (3) specific gravity of the liquid to a Wanner Engineering representative who will select the appropriate tube size.
- When reusing the same tube after disconnecting it for maintenance or other reasons, cut about 10 mm (0.4 in.) from the end of the tube before reconnecting.

- (1) Cut the end of the tube at right angles using a sharp blade.



- (2) Wrap sealing tape around the tube-fitting body (D), and screw the body into the discharge-side joint using a tool. (The tube-fitting body is already mounted in place before shipment.)
- (3) Pass the tube through the tightening nut (A), grip (B) and sleeve (C), and insert its end until it touches the back end of the tube-fitting body (D) on the inside.
- (4) Tighten the tightening nut (A) by hand.
- (5) Using the tool, tighten the tightening nut (A) in such a way that the gap (area "a" in the figure) between the tube-fitting body (D) and tightening nut (A) is approximately 1.5 mm (1/16").

\* Tightening nut (A) excessively may result in damage to the joint.



\* The tube is packed in the form of a coil. Attach the ceramic weight (E) and straighten out the tube so that the liquid inside the tank will flow through it.

# Connections

## ■ Anti-siphon check valve

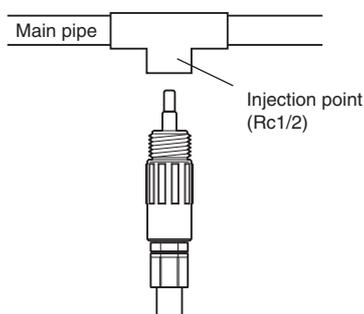
An anti-siphon check valve is included with this pump. Use of this valve at the injection point is highly recommended.

**IMPORTANT:** Install the check valve at the injection point in the following instances:

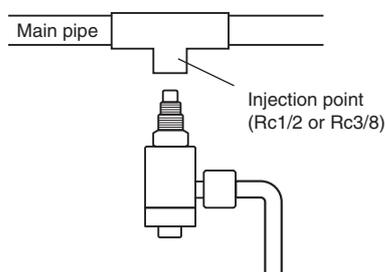
- The injection point is open to the atmosphere and liquid is to be injected at a position lower than the level of the liquid in the tank (prevention of siphoning)
- The liquid is to be injected inside the suction-side pipe of a volute pump, etc.
- A chemical greatly exceeding the pump's rated discharge volume is being fed (prevention of overfeed)
  - \* Overfeed may occur in a vertical pipe if it is too long.
- **IMPORTANT:** An anti-siphon check valve made of PVDF is fragile and can be damaged by impact.

(1) The anti-siphon check valve for the KE/KF type has an R1/2 external thread whereas the KP type has R1/2 and R3/8 external threads. Provide an Rc1/2 or Rc3/8 internal thread at the injection point that fits the anti-siphon check valve.

### KE/KF (with PE tube)



### KP (with FEP tube)

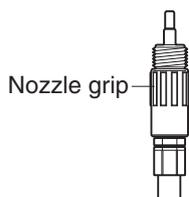


(2) Wrap sealing tape around the external thread of the anti-siphon check valve and screw the valve into the injection point.

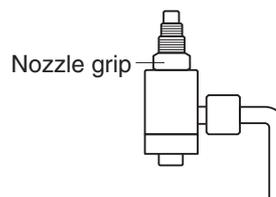
\* If it is difficult to screw the valve in, grasp the nozzle grip using pliers and tighten the valve gently.

\* When connecting the tube with the anti-siphon check valve already mounted on it to the main pipe, it is necessary to hold the valve body and turn the cap nut. If the cap nut is turned without holding the body, the threaded part on the nozzle may be damaged.

### KE/KF (with PE tube)



### KP (with FEP tube)



### NOTE

#### Injecting liquid into a small-diameter pipe:

If the end of the anti-siphon check valve is too long, cut it off so that the end will be positioned at the center of the main pipe where the chemical is to be injected prior to use.

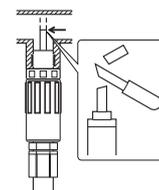
If the nozzle is too long, use a saw or other tool to cut off its end, use a file or other means to finish the cut-off surface, and discard the metal scraps.

#### Maintenance:

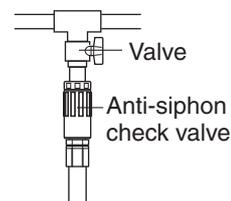
It is recommended that the tube be attached to the main pipe through a valve to enable the anti-siphon check valve to be cleaned, repaired or replaced.

\* Use a valve made of materials resistant to corrosion caused by specific chemicals.

### Example: KE/KF



### Example: KE/KF

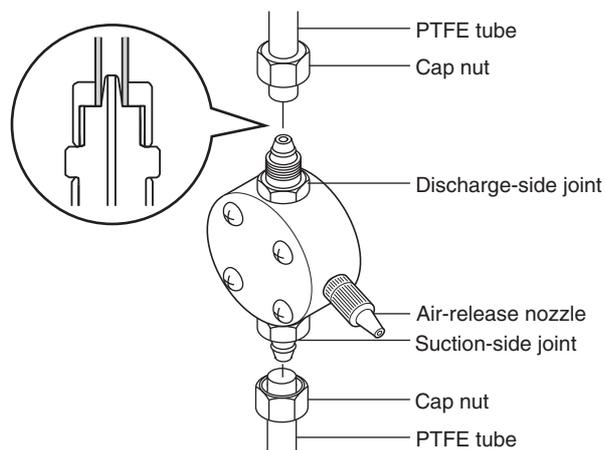


# Connections

## Injection of general chemicals (ST)

### ■PTFE tube

- When bending the tube, allow sufficient leeway and position to prevent breaking, splitting, pinching, foot traffic.
- Insert the tube firmly so that it will not become disconnected, and tighten the cap nuts securely. Do not excessively tighten the cap nuts. Doing so may damage or break the joint.
- If the temperature of a liquid or ambient temperature is higher than room temperature, the tightening force will be reduced, and the tube may become disconnected. After operation has started, tighten the cap nuts as necessary.
- When tightening the cap nuts, hold the tube to prevent it from being twisted. The joints and other areas may be loosened by the return force of the tube.
- The pump comes with a 3-meter long tube for both the discharge side and suction side. When a longer tube is used, the pressure loss may exceed the pump's maximum discharge pressure so larger diameter tube will be required. Provide details on the (1) viscosity of the liquid, (2) length of the pipes (how they are positioned) and (3) specific gravity of the liquid to a Wanner Engineering representative who will select the appropriate tube size.
- When reusing the same tube after disconnecting it for maintenance or other reasons, cut about 10 mm (0.4 in.) from the end of the tube before reconnecting.



### ■Anti-siphon check valve

An anti-siphon check valve is included with this pump. Use of this valve at the injection point is highly recommended. **IMPORTANT:** Install the check valve at the injection point in the following instances:

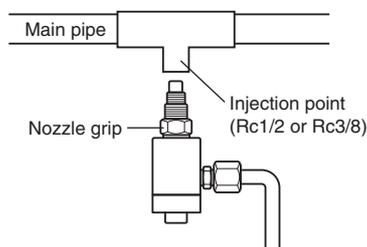
- The injection point is open to the atmosphere and liquid is to be injected at a position lower than the level of the liquid in the tank (prevention of siphoning)
  - The liquid is to be injected inside the suction-side pipe of a volute pump, etc.
  - A chemical greatly exceeding the pump's rated discharge volume is being fed (prevention of overfeed)
- \* Overfeed may occur in a vertical pipe if it is too long.

(1) The anti-siphon check valve has R1/2 and R3/8 external threads. Provide an Rc1/2 or Rc3/8 internal thread at the injection point.

(2) Wrap sealing tape around the external thread of the anti-siphon check valve and screw the valve into the injection point.

\* If it is difficult to screw the valve in, grasp the nozzle grip using pliers and tighten the valve gently.

\* When connecting the tube with the anti-siphon check valve already mounted on it to the main pipe, it is necessary to hold the valve body and turn the cap nut. If the cap nut is turned without holding the body, the threaded part on the nozzle may be damaged.

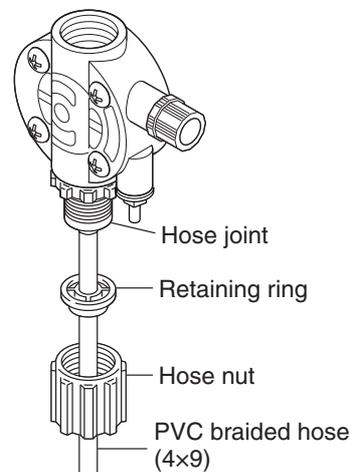


# Connections

## Injection of boiler chemicals (BH)

### ■PVC braided hose (1m, suction side)

- When bending the hose, allow sufficient leeway and position to prevent breaking, splitting, pinching, foot traffic.
- Insert the hose firmly so that it will not become disconnected, and tighten the hose nuts securely. Do not excessively tighten the hose nuts. Doing so may damage or break the joint.
- If the temperature of a liquid or ambient temperature is higher than room temperature, the tightening force will be reduced, and the hose may become disconnected. After operation has started, tighten the hose nuts as necessary.
- When tightening the hose nuts, hold the hose to prevent it from being twisted. The joints and other areas may be loosened by the return force of the hose.
- The pump comes with a 1-meter long hose for the suction side. When a longer hose is used, the pressure loss may exceed the pump's maximum discharge pressure so larger diameter hose will be required. Provide details on the (1) viscosity of the liquid, (2) length of the pipes (how they are positioned) and (3) specific gravity of the liquid to a Wanner Engineering representative who will select the appropriate hose size.
- When reusing the same hose after disconnecting it for maintenance or other reasons, cut about 10 mm (0.4 in.) from the end of the hose before reconnecting.

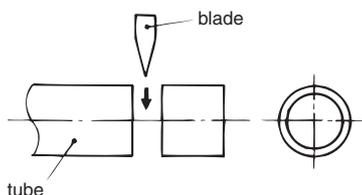


### ■PA tube (2m, discharge side)

- When bending the tube, allow sufficient leeway and position to prevent breaking, splitting, pinching, foot traffic.
- The pump comes with a 2-meter long tube for the discharge side, adjust the distance between the pump and injection point as short as possible and cut off the excess part of the tube.
- Insert the tube firmly so that it will not become disconnected.
- When reusing the same tube after disconnecting it for maintenance or other reasons, cut about 10 mm (0.4 in.) from the end of the tube before reconnecting.

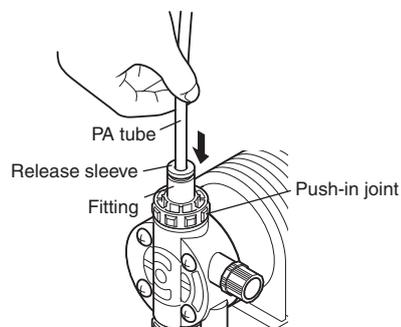
### ●Connecting

- (1) Cut the end of the tube at right angles using a sharp blade.



- (2) Insert the end of the tube straight into the fitting body of the push-in joint until it touches the back end.

\* Pull the tube gently by hand and check that it is secure.

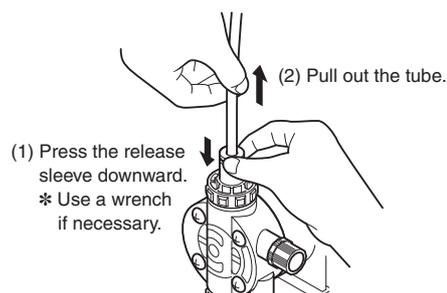


### ●Disconnecting & re-connecting



- Before disconnecting the tube, make absolutely sure that pressure is not being applied inside the tube.

- Using your thumb and forefinger, press the release sleeve against the body side and pull the tube straight out without twisting it.
- \* If the fitting tab is biting deeply into the tube making it difficult for the tube to be pulled out, use a wrench to push the release sleeve down firmly.
- \* As a guideline, the tube may be mounted in place and removed five times.
- \* When the tube has been connected, pull it up gently, and check that it is secured firmly. If it appears that the tube can be pulled out, it means that the joint tab has been damaged, in which case replace the joint.
- \* Use the tube supplied. Use of any other marketed tube may damage the joint.



# Connections

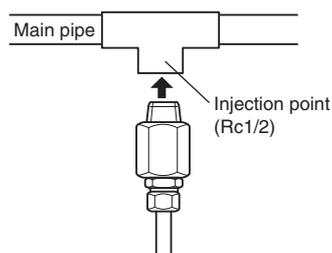
## ■ Anti-siphon check valve

An anti-siphon check valve is included with this pump. Use of this valve at the injection point is highly recommended.

**IMPORTANT:** Install the check valve at the injection point in the following instances:

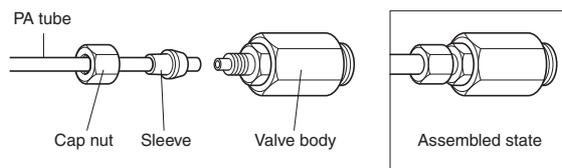
- The injection point is open to the atmosphere and liquid is to be injected at a position lower than the level of the liquid in the tank (prevention of siphoning)
- The liquid is to be injected inside the suction-side pipe of a volute pump, etc.
- A chemical greatly exceeding the pump's rated discharge volume is being fed (prevention of overfeed)
  - \* Overfeed may occur in a vertical pipe if it is too long.

(1) The anti-siphon check valve has an R1/2 external thread. Provide an Rc1/2 internal thread at the injection point.



(2) Remove the cap nut and sleeve; attach only the valve body to the main pipe (injection point).

(3) Pass the PA tube through the cap nut and sleeve; firmly insert its end until it touches the back end of the groove in the valve body.



(4) Tighten the cap nut by hand until snug.

(5) After tightening the cap nut by hand, use a wrench to tighten the cap nut two or three more turns.

### IMPORTANT

- Securely connect the PA tube and anti-siphon check valve as well as the anti-siphon check valve and injection point.
- The anti-siphon check valve will be corroded by some chemicals; therefore, such chemicals cannot be used. For special chemicals, consult with a Wanner Engineering representative.

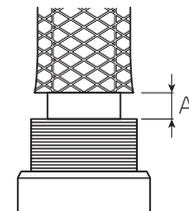
# Connections

## Injection of sodium hypochlorite (CL)

### ■PE tube

- When bending the tube, allow sufficient leeway and position to prevent breaking, splitting, pinching, foot traffic.
- Insert the 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.
- If the temperature of a liquid or ambient temperature is higher than room temperature, the tightening force will be reduced, and the tube may become disconnected. After operation has started, confirm connections and reinforce nut torque if applicable.
- When tightening the nuts, hold the tube to prevent it from being twisted. The joints and other areas may be loosened by the return force of the tube.
- The pump comes with a 3-meter long tube for both the discharge side and suction side. When a longer tube is used, the pressure loss may exceed the pump's maximum discharge pressure so larger diameter tube will be required. Provide details on the (1) viscosity of the liquid, (2) length of the pipes (how they are positioned) and (3) specific gravity of the liquid to a Wanner Engineering representative who will select the appropriate tube size.
- When reusing the same tube after disconnecting it for maintenance or other reasons, cut about 10 mm (0.4 in.) from the end of the tube before reconnecting.

Hose type	Hose diameter	Dimension A
Tube	$\phi 6 \times \phi 8$	3 mm (about 1/8")



### ■Anti-siphon check valve with duckbill cap

This pump is provided with an anti-siphon check valve with duckbill cap. Use of this valve at the injection point is highly recommended.

**IMPORTANT:** Install the check valve at the injection point in the following instances:

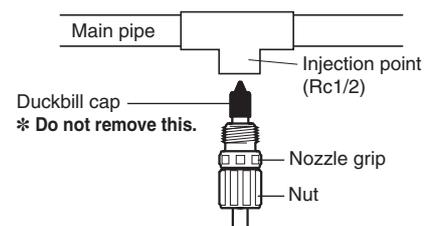
- The injection point is open to the atmosphere and liquid is to be injected at a position lower than the level of the liquid in the tank (prevention of siphoning)
- The liquid is to be injected inside the suction-side pipe of a volute pump, etc.
- A chemical greatly exceeding the pump's rated discharge volume is being fed (prevention of overfeed)
  - \* Overfeed may occur in a vertical pipe if it is too long.

(1) The anti-siphon check valve with duckbill cap has an R1/2 external thread. Provide an Rc1/2 internal thread at the injection point.

(2) Wrap sealing tape around the external thread of the anti-siphon check valve with duckbill cap and screw the valve into the injection point.

\* If it is difficult to screw the valve in, grasp the nozzle grip using pliers and tighten the valve gently.

\* When connecting the tube with the anti-siphon check valve with duckbill cap already mounted on it to the main pipe, it is necessary to hold the valve body and turn the nut. If the nut is turned without holding the body, the threaded part on the nozzle may be damaged.

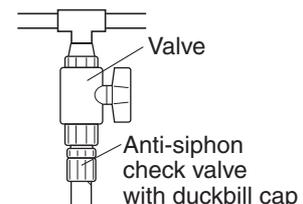


### NOTE

#### Maintenance:

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

\* Use a valve made of materials resistant to corrosion caused by specific chemicals.

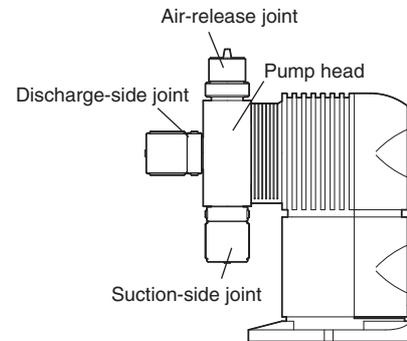


# Connections

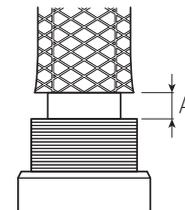
## Model with automatic air-release function for injection of sodium hypochlorite (CA)

### ■PE tube

- Unlike other models, this model has a discharge-side joint at the front side of the pump head and an air-release joint on its top.
- When bending the tube, allow sufficient leeway and position to prevent breaking, splitting, pinching, foot traffic.
- Insert the 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.
- If the temperature of a liquid or ambient temperature is higher than room temperature, the tightening force will be reduced, and the tube may become disconnected. After operation has started, confirm connections and reinforce nut torque if applicable.
- When tightening the nuts, hold the tube to prevent it from being twisted. The joints and other areas may be loosened by the return force of the tube.
- The pump comes with a 3-meter long tube for both the discharge side and suction side. When a longer tube is used, the pressure loss may exceed the pump's maximum discharge pressure so larger diameter tube will be required. Provide details on the (1) viscosity of the liquid, (2) length of the pipes (how they are positioned) and (3) specific gravity of the liquid to a Wanner Engineering representative who will select the appropriate tube size.
- When reusing the same tube after disconnecting it for maintenance or other reasons, cut about 10 mm (0.4 in.) from the end of the tube before reconnecting.

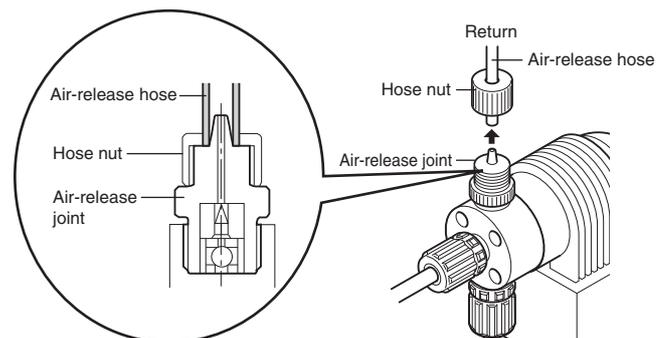


Hose type	Hose diameter	Dimension A
Tube	$\phi 6 \times \phi 8$	3 mm (about 1/8")



### ■Soft PVC hose (for air release)

- (1) Firmly insert the supplied soft PVC air-release hose as far as the base of the air-release joint on the top of the pump head.
- (2) Firmly tighten the hose.
- (3) Return the other end of the hose to the tank or another appropriate container.



# Connections

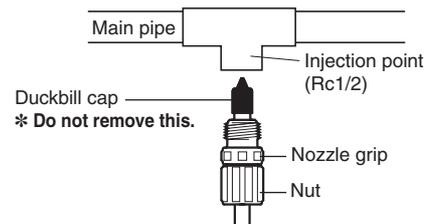
## ■Anti-siphon check valve with duckbill cap

This pump is provided with an anti-siphon check valve with duckbill cap. Use of this valve at the injection point is highly recommended.

**IMPORTANT:** Install the check valve at the injection point in the following instances:

- The injection point is open to the atmosphere and liquid is to be injected at a position lower than the level of the liquid in the tank (prevention of siphoning)
- The liquid is to be injected inside the suction-side pipe of a volute pump, etc.
- Chemicals greatly exceeding the pump's rated discharge volume are being fed (prevention of overfeed)
  - \* Overfeed may occur in a vertical pipe if it is too long.

- (1) The anti-siphon check valve with duckbill cap has an R1/2 external thread. Provide an Rc1/2 internal thread at the injection point.
- (2) Wrap sealing tape around the external thread of the anti-siphon check valve with duckbill cap and screw the valve into the injection point.
  - \* If it is difficult to screw the valve in, grasp the nozzle grip using pliers and tighten the valve gently.
  - \* When connecting the tube with the anti-siphon check valve with duckbill cap already mounted on it to the main pipe, it is necessary to hold the valve body and turn the nut. If the nut is turned without holding the body, the threaded part on the nozzle may be damaged.

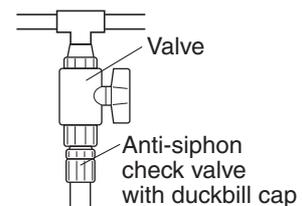


### NOTE

#### Maintenance:

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

- \* Use a valve made of materials resistant to corrosion caused by specific chemicals.



# 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.

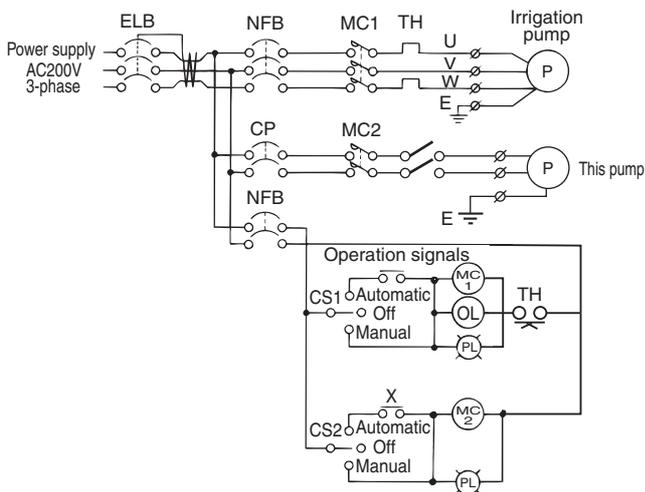
**⚠️ CAUTION**

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

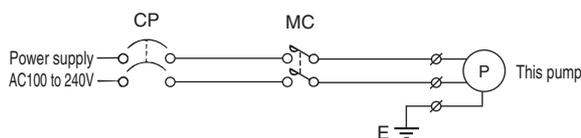
Note: Power cable (2m) is already attached.

**Example of wiring**

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



● **Running the pump on its own:**



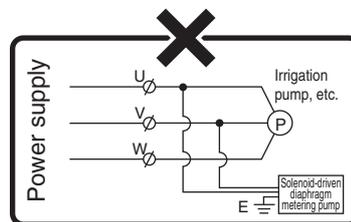
- ELB : Current leakage breaker
- NFB : No-fuse breaker
- MC1, 2: Electromagnetic contactor
- TH : Thermal relay
- CP : Circuit protector
- CS1, 2: Changeover switch
- OL : Overload relay
- PL : Pilot lamp

**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

## Recommended protection devices

### (1) Circuit protectors

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

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

### (2) Lightning arrestors

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

### (3) Line filters, sealed transformers

Manufacturer	Model
TDK	RSHN-2003

### (4) EMC filter

Manufacturer	Model
TDK	ZAC2205-00U

### (5) Relay

Manufacturer	Model
OMRON	G3F

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

## Before operation

Check location	Details of check	Notes
Tank	Check liquid level. If insufficient, replenish.	Caution: Exposure to air may affect chemical reaction or cause hazardous conditions to occur.
Pipes	Check pipe connection and condition. Reconnect, repair or replace as indicated.	-
Valves	Confirm valves are open.	Closed valves can cause dangerous situations in which the pressure rises excessively, liquid escapes and/or the pipes are damaged.
Power supply	Check that the pump is connected properly to the prescribed power supply.	Poor connection may cause electrical circuits and solenoids to burn out.

## During operation

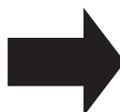
Check location	Details of check	Notes
Pump head	Check for liquid leakage from the hole underneath the auxiliary ring at the back of the pump head.	If leaking, inspect the diaphragm for damage. Service as indicated.
Joints/pipes	Check for liquid leaks and looseness.	If liquid is leaking or there is a loose joint, replace or tighten it. If liquid still leaks, inspect the O-rings in the joint indicated.
Discharge-side pressure	Check the pressure gauge.	If the gauge shows an abnormal value, inspect the pipes and valves for blockage. Service accordingly.

- 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



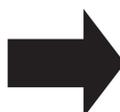
**Air release**  
(see pages 32 - 35).

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



**Discharge-volume setting**  
(see page 36).

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



**Procedure for prolonged shutdown of operation; resuming operation.**  
(see page 37).

# Air release



## WARNING

- During 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.

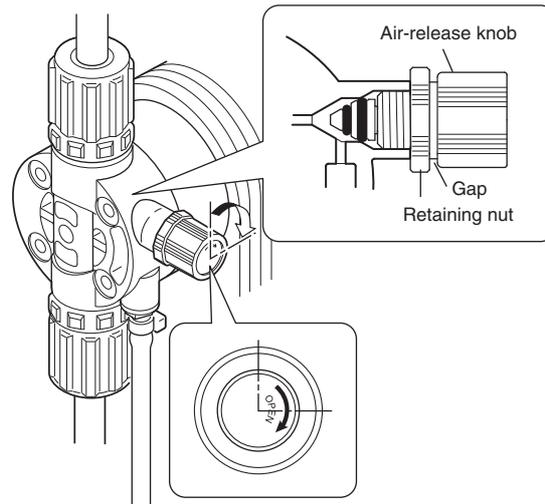
The air-releasing procedure will be described by pump type.

	Type	Page
Model with relief-valve function	SM-03R/06R/10R-PE/PF/KE/KF/KP/BH/CL	33
Model without relief-valve function * excluding ST type	SM-030/060/100-PE/PF/KE/KF/KP/BH/CL	34
ST type	SM-030/060/100-ST	35
Model with automatic air-release function	SM-030/060/100-CA	35

# Air release

## Model with relief-valve function

- (1) 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.
- (2) Turn off the pump's power and release the pressure inside the discharge-side pipe.
- (3) Set the discharge volume to the maximum level. (See page 36)
- (4) Turn on the pump's power to start operating the pump.
- (5) Rotate the air-release knob clockwise by about 90 degrees.  
The presence of a gap between the knob and retaining nut is now visible.



- (6) After a few moments air will exit from the relief/air-release port together with the liquid.
- (7) After all the air has been released, turn the air-release knob further in the clockwise direction until a clicking sound is heard.
- (8) Shut down the pump.

### IMPORTANT

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

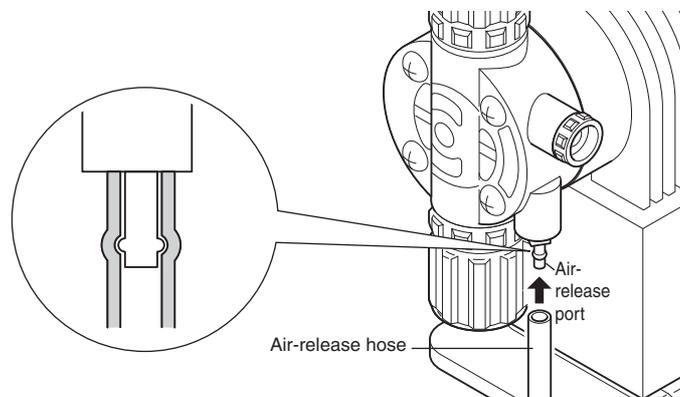
### NOTE

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

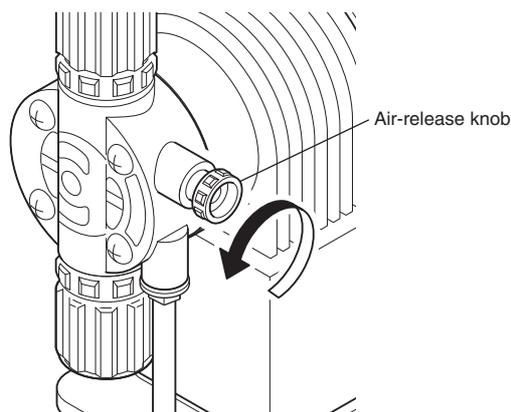
# Air release

## Model without relief-valve function \* excluding ST type

- (1) Insert the air-release hose included into the air-release port.
- (2) Return the other end of the air-release hose to the tank or another appropriate container and secure it firmly.



- (3) Turn off the pump's power and release the pressure inside the discharge-side pipe.
- (4) Turn on the pump's power to start operating the pump.
- (5) Set the discharge volume to the maximum level. (See page 36)
- (6) While operating the pump, turn the air-release knob counterclockwise for 1 to 1-1/2 turns.



- (7) After a few moments air will exit from the air-release port together with the liquid.
- (8) After all the air has been released, turn the air-release knob clockwise, and tighten it securely.
- (9) Shut down the pump.

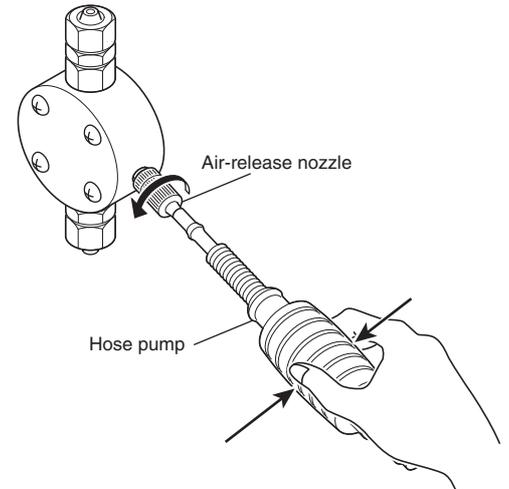
### NOTE

- If it is difficult to release the air completely, repeatedly open and close the air-release knob.

# Air release

## ST type

- (1) Turn off the pump's power and release the pressure inside the discharge-side pipe.
- (2) Slightly loosen (avoid dropping) the air-release nozzle at the bottom right of the pump head by turning it counterclockwise.
- (3) Insert the hose pump included, operate the pump, and draw up the chemical until all the air in the pump head is expelled.
- (4) Close the air-release nozzle by turning it clockwise.



## IMPORTANT

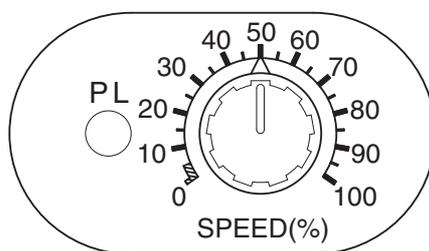
- If the air-release nozzle is loosened too much, it will fall off, damaging the packing. Avoid loosening the nozzle beyond the extent necessary to complete air-release.

## Model with automatic air-release function

- (1) Before proceeding with the air releasing, check that the end of the air-release hose has been run back to the tank or another appropriate container.
- (2) Turn off the pump's power and release the pressure inside the discharge-side pipe.
- (3) Turn on the pump's power to start operating the pump.
- (4) Set the discharge volume to the maximum level. (See page 36)
- (5) After a few moments air will exit from the air-release port together with the liquid.
- (6) After all the air has been released, shut down the pump.

## Discharge-volume setting

- The stroke speed can be adjusted by turning the stroke-speed adjuster dial located at the back of the pump.



Adjustable range of stroke speed: 15 to 300 strokes/min

- \* When the dial is moved while the pump is stopped, the dial setting may shift during pump operation. If this happens, adjust the dial again.

# Prolonged shutdown/resuming operation procedure

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 or cleaning fluid is sucked in and discharged for about 30 minutes to clean the inside of the pump head.
- (2) Turn off the power completely.
- (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 for indications 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 valve seat areas and check balls inside the joints for dirt and other foreign matter.
- (3) Follow instructions in the section "Before operation" on page 31.

# 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**

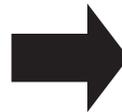
- When working on the liquid-end parts of the pump, wear personal protective gear suited to the chemical involved (such as rubber gloves, a mask, protective goggles and work overalls that are resistant to chemical reaction).
- Before attempting to maintain or repair the pump, release the pressure in 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 the pump for chemical leakage.
- 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
- When discharge trouble has occurred (reduced discharge volume)
- When chemical is leaking from around the pump head



Refer to  
**“Replacing the diaphragm”**  
 (see pages 39 and 40).

- At the 10,000-hour mark after starting the pump operation
- When discharge trouble has occurred (reduced discharge volume)



Refer to  
**“Replacing the valve seats and check balls”**  
 (see pages 41 - 44).

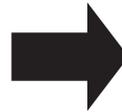
## When trouble has occurred

- When the relief-valve function has been activated



Refer to  
**“Replacing the relief valve”**  
 (see page 45).

- When trouble has occurred during operation

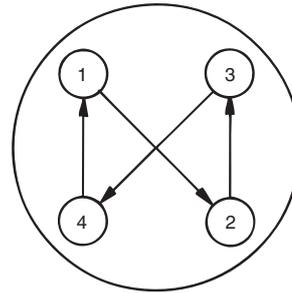


Refer to  
**“Troubleshooting”**  
 (see pages 46 and 47).

# Diaphragm replacement

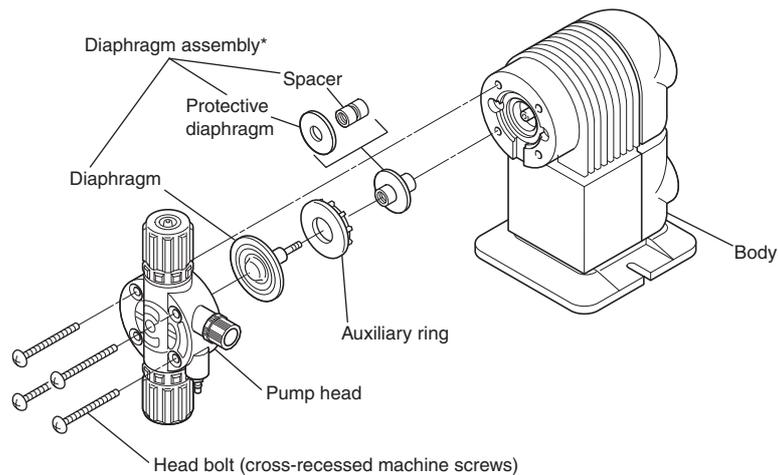
## IMPORTANT

- When securing the pump head using the head bolts, tighten them evenly a little at a time in the sequence shown in the figure on the right. If, for instance, the bolts are tightened in the sequence of 1 → 3 → 2 → 4, the bolts will be tightened unevenly, potentially causing chemical to leak from the pump head.



## Removing the diaphragm

- (1) Remove the head bolts.
- (2) Remove the pump head.
- (3) Take hold of the outer circumference part of the diaphragm and remove the diaphragm while turning it counterclockwise.
- (4) Remove the auxiliary ring and remove the protective diaphragm.
- (5) Remove the spacer from the protective diaphragm.



\* Wear items that must be replaced at periodic intervals. For further details, refer to the “Spare Parts” section on page 63 to 64.

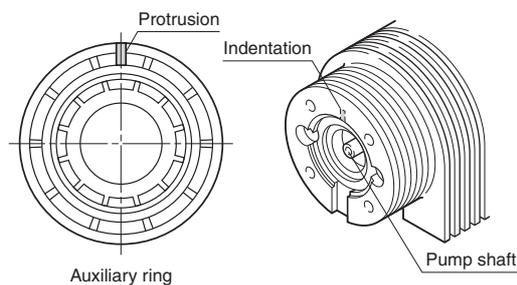
# Diaphragm replacement

## IMPORTANT

- Replace the protective diaphragm at the same time as the diaphragm.

## Installing the diaphragm

- (1) Align the groove in the spacer with the new protective diaphragm and assemble them properly.
- (2) Fit the new protective diaphragm with spacer into the pump shaft.
- (3) Align the auxiliary ring at the fixed position shown below.



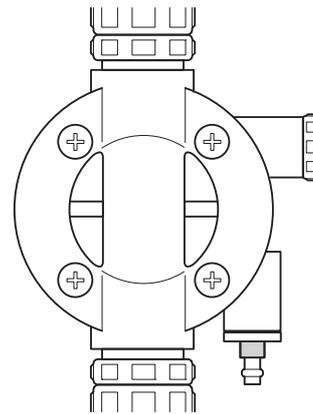
Align the indentation in the pump body with the protrusion of the auxiliary ring.

- (4) Install the new diaphragm by turning it clockwise until tightened.
  - \* If loose, it will make contact with the pump head, possibly causing malfunctions and/or damage.
- (5) Install the pump head and secure using the head bolts.

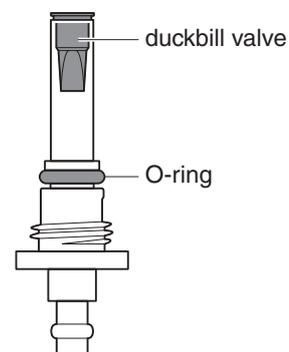
# Air-release nozzle replacement

## Replacing the air-release nozzle

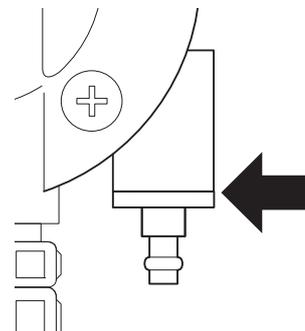
- (1) If a relief hose or air-release hose is connected, remove the hose.
- (2) Remove the air-release nozzle.  
Use a wrench (span: 7 mm) to hold the colored section in the figure in place; turn the nozzle in the counterclockwise direction to remove.



- (3) Attach a new air-release nozzle.
  - Before attaching a new air-release nozzle, check that the duckbill valve is inserted into the end of the air-release nozzle (side that attaches onto the pump head). The air-bleeding effect will not be obtained unless the duckbill valve is used.
  - Check that an O-ring (P6) is mounted on the new air-bleeding valve.



- Turn the nozzle in the clockwise direction until the two sections come together (as shown by the arrow).



### NOTE

- Handle the air-release nozzle with caution as the duckbill valve could potentially fall from the nozzle and be lost.

- (4) Attach the pump head.
- (5) Attach the relief hose if using a pump with simple relief valve.

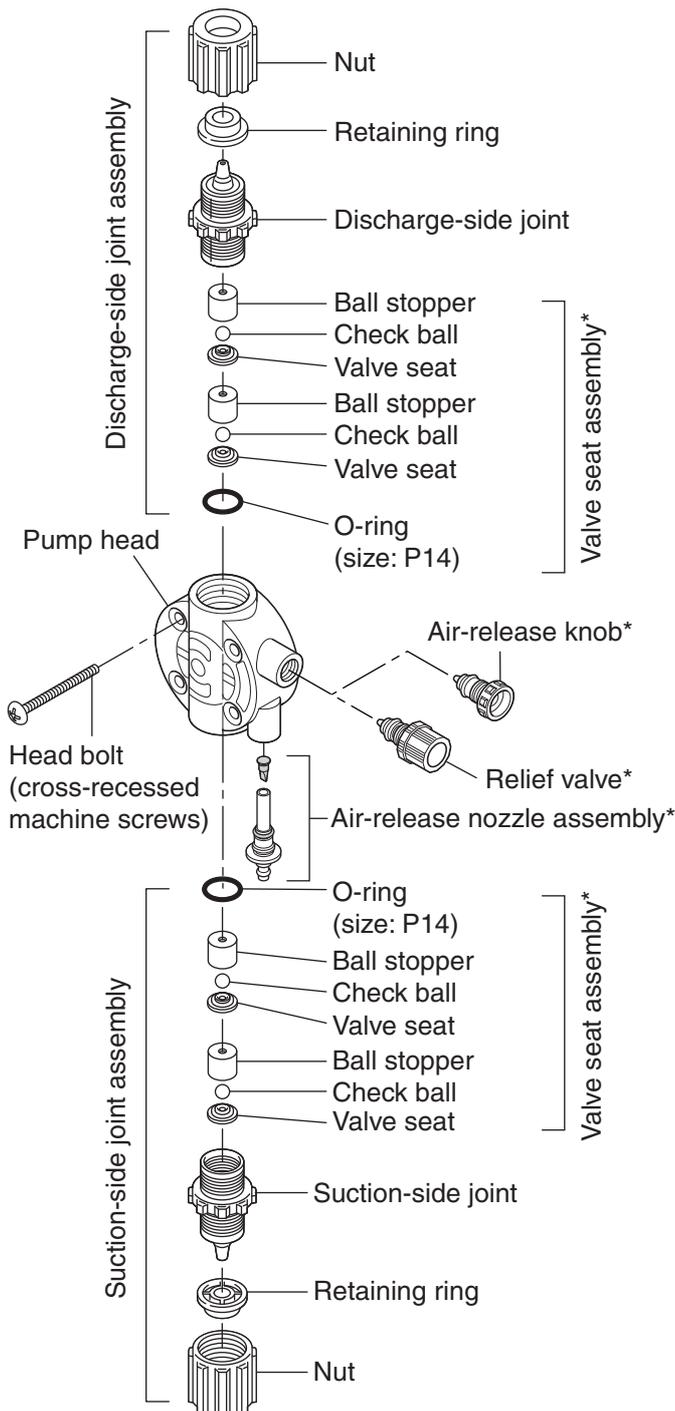
# Valve seats and check balls replacement

## IMPORTANT

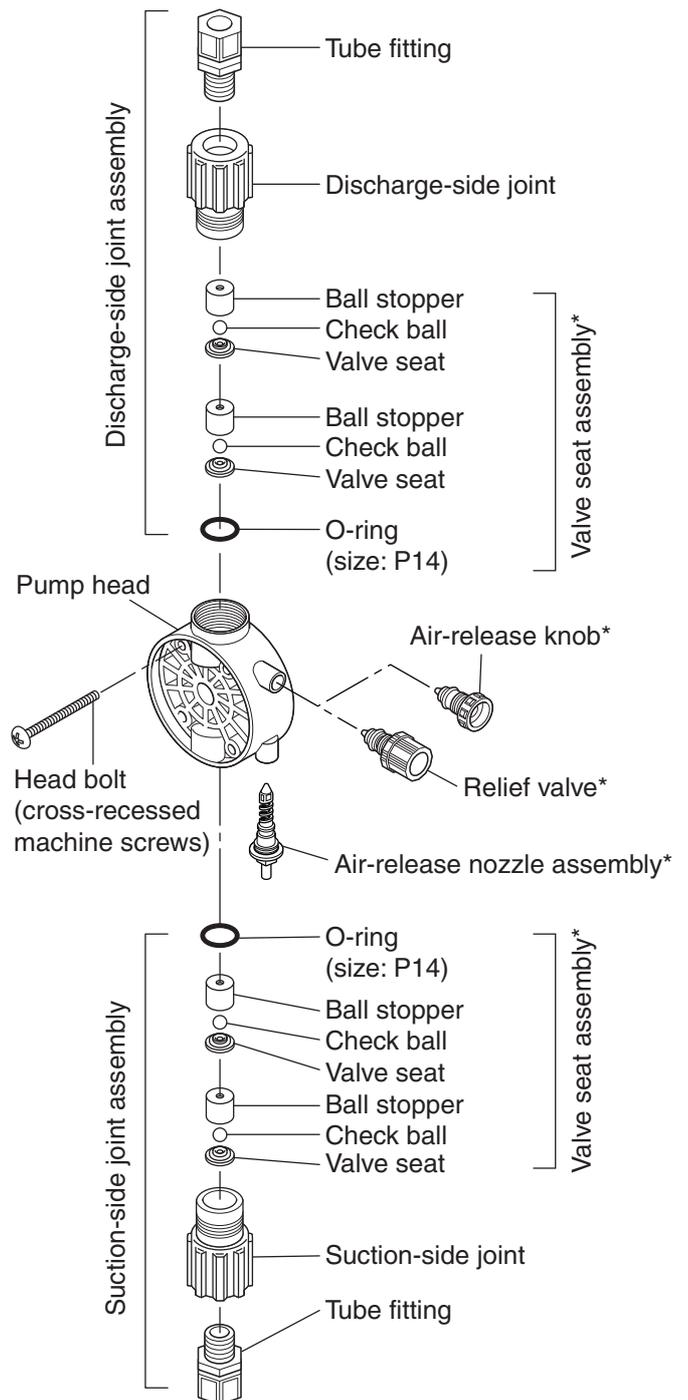
- Install the parts in the correct sequence according to the directions.
- Give particular attention to the sequence and directions for the joints and valve seat assemblies.
- Check the O-ring, check balls and valve seats for damage and dirt.

## Injection of general chemicals

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



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



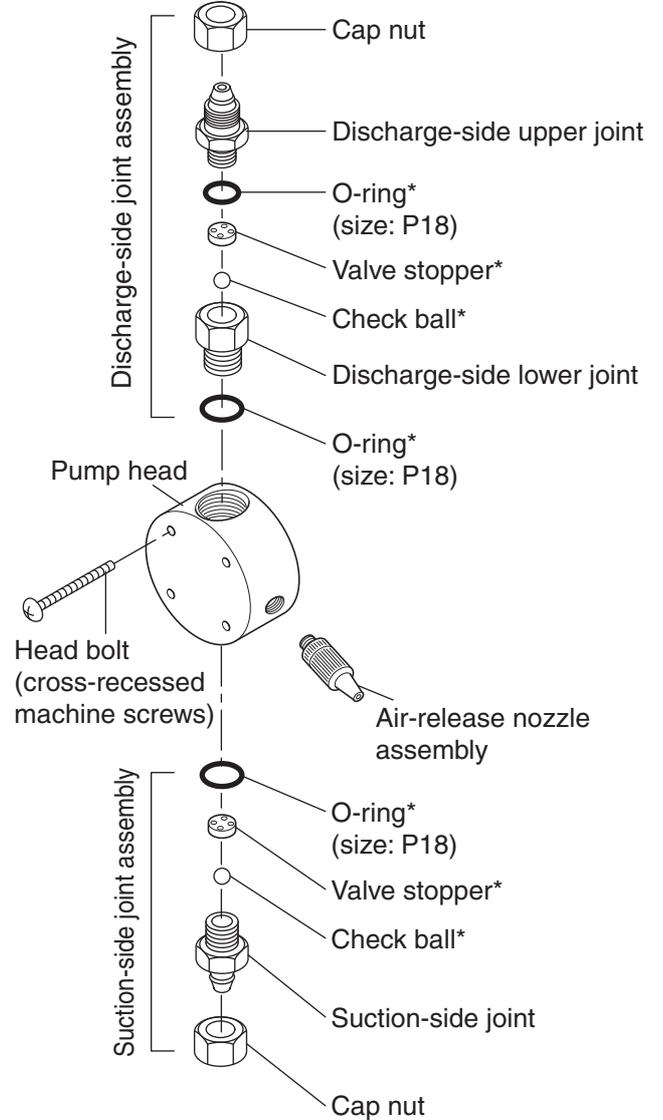
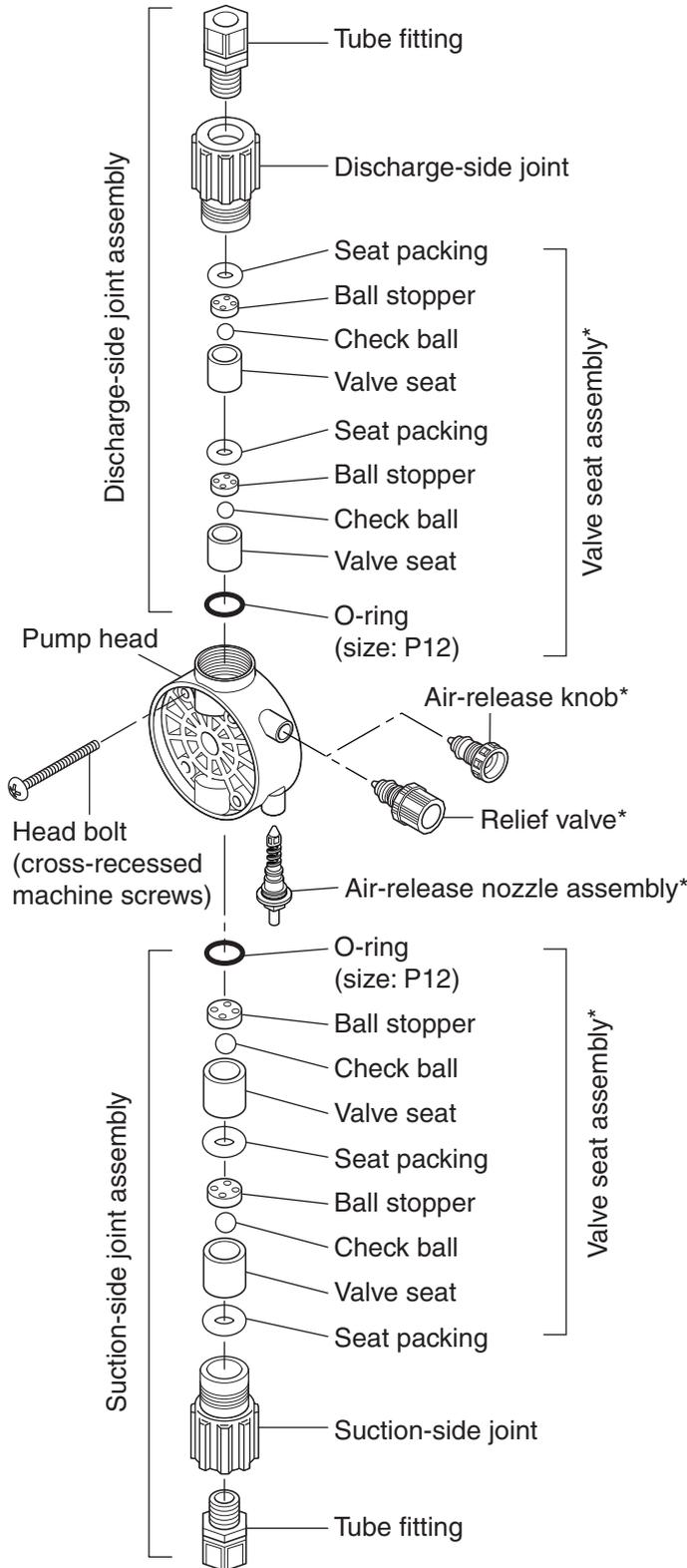
\* Wear items that must be replaced at periodic intervals. For further details, refer to "Spare Parts" section on pages 63 and 64.  
\* Also available is "Pump head assembly" containing all of the above parts.

# Valve seats and check balls replacement

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

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

Maintenance

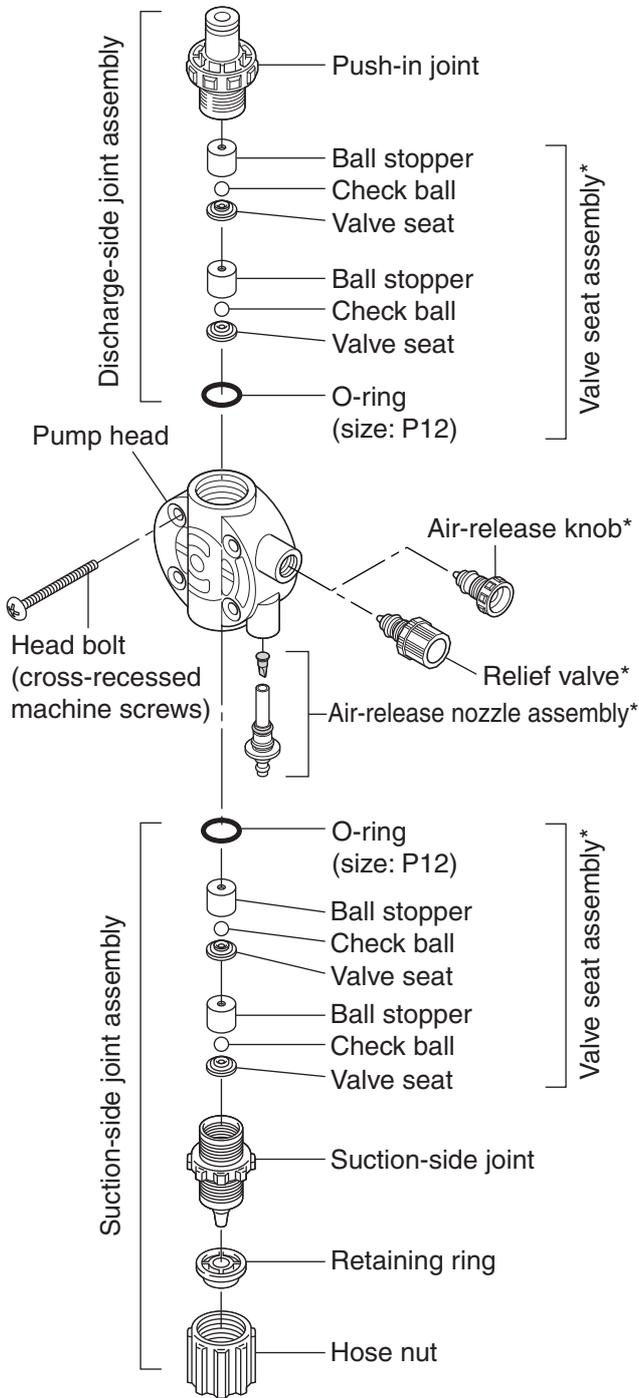


\* Wear items that must be replaced at periodic intervals. For further details, refer to "Spare Parts" section on pages 63 and 64.  
\* Also available is "Pump head assembly" containing all of the above parts.

# Valve seats and check balls replacement

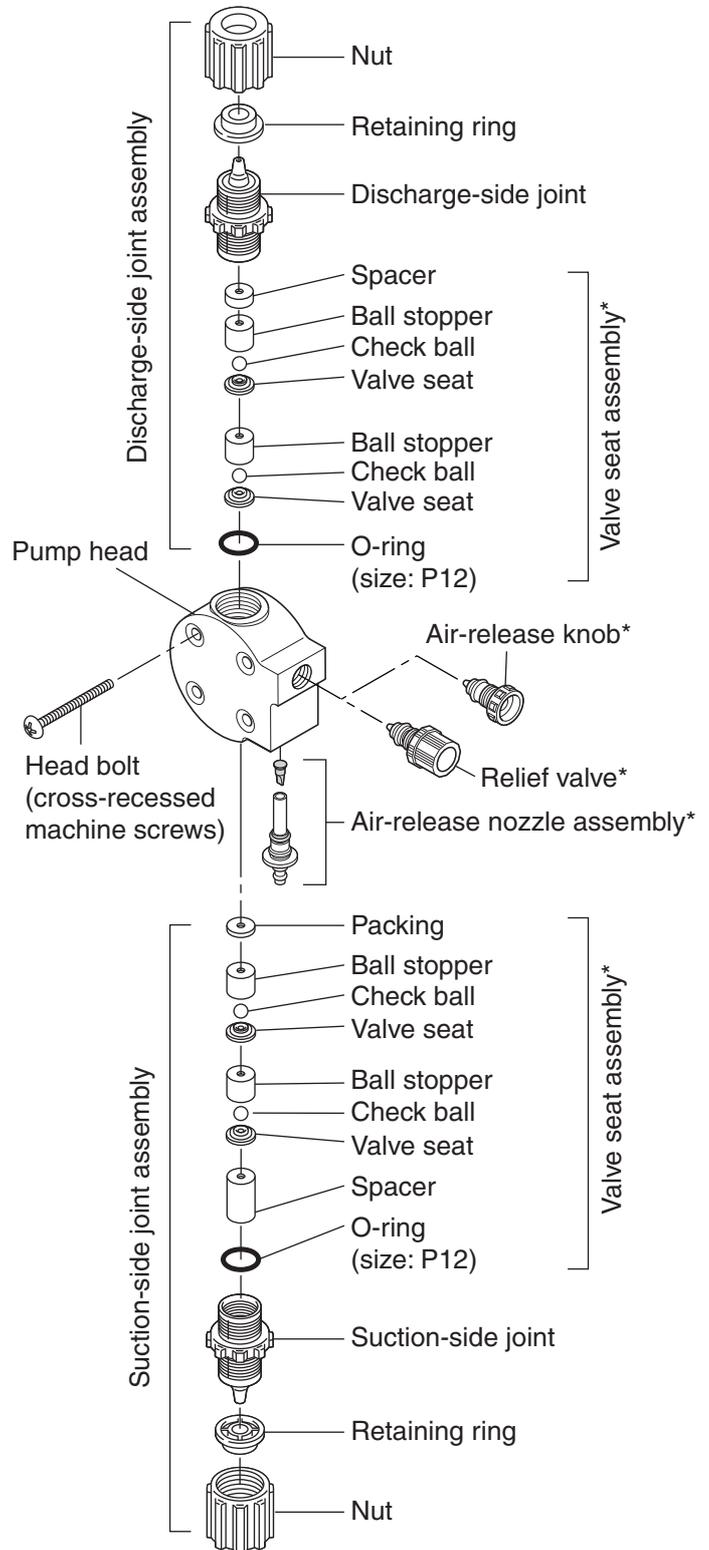
## Injection of boiler chemicals

Model : 03R/030  
Liquid-end type: BH



## Injection of sodium hypochlorite

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

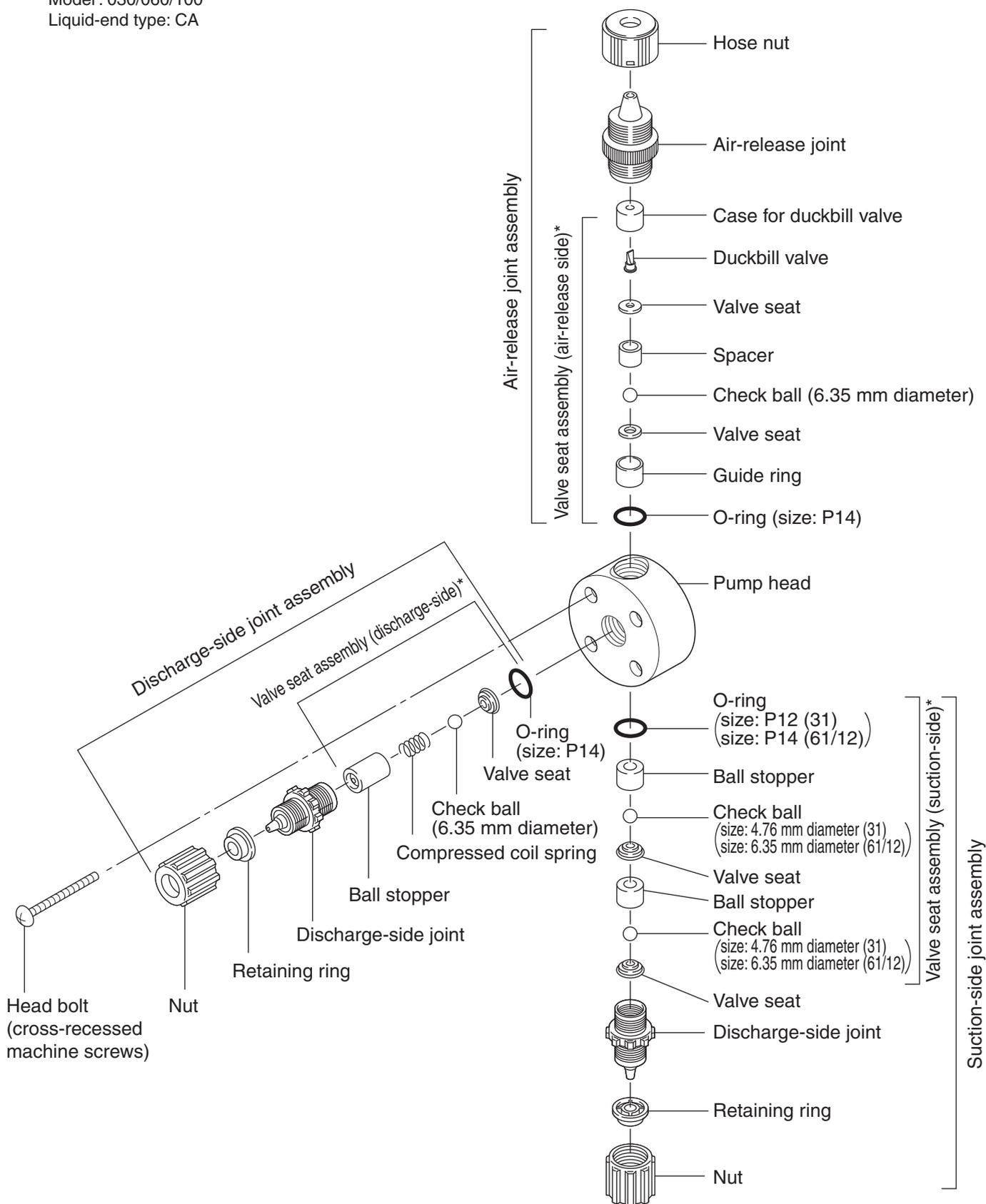


\* Wear items that must be replaced at periodic intervals. For further details, refer to "Spare Parts" section on pages 63 and 64.  
\* Also available is "Pump head assembly" containing all of the above parts.

# Valve seats and check balls replacement

## Model with automatic air-release function for injection of sodium hypochlorite

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



\* Wear items that must be replaced at periodic intervals. For further details, refer to "Spare Parts" section on pages 63 and 64.  
\* Also available is "Pump head assembly" containing all of the above parts.

# Relief valve replacement

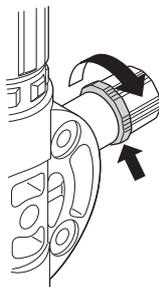
## IMPORTANT

Take the following action when the relief-valve function has been activated by clogging of the discharge-side pipe, for instance:

- Shut down the pump immediately, remove the cause of the trouble, and take steps to prevent its recurrence.
- The relief valve is a wear item. Replace it once it has been activated.

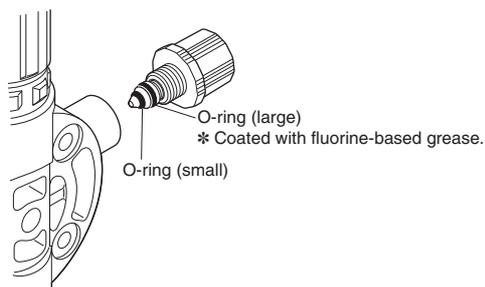
## Replacing the relief valve

- (1) Hold the retaining nut (the part shown by the arrow), and turn it counterclockwise.

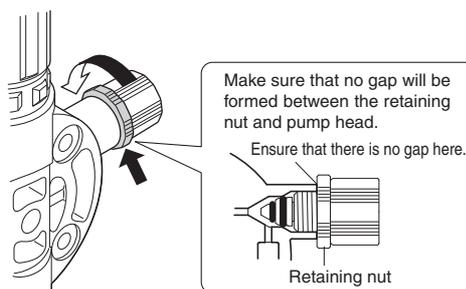


- (2) Check the O-ring of the new relief valve for dirt or foreign matter.

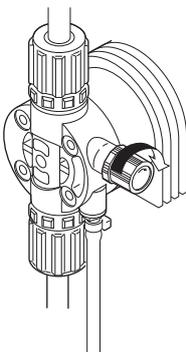
\* The large O-ring comes coated with fluorine-based grease. Use it as is.



- (3) Hold the retaining nut (the part shown by the arrow), turn it clockwise, and install it on the pump head.



- (4) After installing the relief valve, rotate the air-release knob by two turns in the clockwise direction to ensure that the O-ring is seated properly.



# 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.



## 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 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 63.

# 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.)		<ol style="list-style-type: none"> <li>(1) Power supply or voltage trouble.</li> <li>(2) Problem in the wiring connections to the pump.</li> <li>(3) Broken power cable.</li> <li>(4) Main power supply disconnection.</li> <li>(5) The breaker has tripped.</li> <li>(6) Circuit malfunction.</li> </ol>	<ol style="list-style-type: none"> <li>(1) Check the power supply and the voltage and then connect the pump to the correct power supply.</li> <li>(2) Inspect the wiring connections and connect the wires properly.</li> <li>(3) Check the power cable.</li> <li>(4) Position the switch on the correct side.</li> <li>(5) Investigate why the breaker has tripped and then reset it.</li> <li>(6) Replace the circuit.</li> </ol>
The pump operates.	No chemical is discharged. (The chemical is not pumped up.)	<ol style="list-style-type: none"> <li>(1) The chemical is too viscous.</li> <li>(2) The hose or valve is clogged.</li> <li>(3) The hose aperture is too small or the pipe is too long.</li> <li>(4) The valve seats are clogged with dirt or deformed.</li> <li>(5) The amount of chemical remaining in the tank is low.</li> <li>(6) The foot valve or the strainer is clogged.</li> <li>(7) The pump is gas locked.</li> <li>(8) The valve seat area has been assembled in the wrong direction.</li> </ol>	<ol style="list-style-type: none"> <li>(1) Lower the viscosity of the chemical.</li> <li>(2) Clean the hose and valve.</li> <li>(3) Make the hose aperture larger or the pipe shorter.</li> <li>(4) Clean the valve seats or replace them. If the valve seats become deformed in a short period of time, use valve seats of a different material.</li> <li>(5) Replenish the chemical.</li> <li>(6) Clean the foot valve, strainer, and tank.</li> <li>(7) Release the air.</li> <li>(8) Disassemble the valve seat area, and then re-assemble it correctly.</li> </ol>
	Air enters into the pump.	<ol style="list-style-type: none"> <li>(1) Gas is generated due to the properties of the chemical.</li> <li>(2) There is a leak in the joints, seal areas, or other parts.</li> <li>(3) The chemical tank is empty.</li> </ol>	<ol style="list-style-type: none"> <li>(1) Dilute the chemical.</li> <li>(2) Tighten the joints, seal areas or other parts that are leaking.</li> <li>(3) Replenish the chemical and then release the air.</li> </ol>
The pump does not operate at the maximum discharge pressure. (The drive sound registers weakly.)		<ol style="list-style-type: none"> <li>(1) The power supply is not appropriate or the supply voltage is too low.</li> <li>(2) A thermal relay has been used as a protection device.</li> </ol>	<ol style="list-style-type: none"> <li>(1) Connect the pump to the correct power supply.</li> <li>(2) Change the thermal relay to a circuit protector.</li> </ol>
Chemical leaks from the chemical escape port.		<ol style="list-style-type: none"> <li>(1) The relief valve was not replaced after it was used.</li> <li>(2) An abnormal pressure has been generated.</li> </ol>	<ol style="list-style-type: none"> <li>(1) Replace the relief valve.</li> <li>(2) Check the pressure and the specifications.</li> </ol>
Chemical is leaking.	Chemical is leaking from the joints.	<ol style="list-style-type: none"> <li>(1) The hose and nuts are not tight enough.</li> <li>(2) The discharge-side pipe is clogged with dirt or other foreign material, which has caused the pressure to increase.</li> <li>(3) The hose connections have deteriorated.</li> </ol>	<ol style="list-style-type: none"> <li>(1) Tighten the hose and nuts.</li> <li>(2) Clean inside the pipe.</li> <li>(3) Replace the hose.</li> </ol>
	Chemical is leaking from the pump head.	<ol style="list-style-type: none"> <li>(1) The head bolts are not tight enough.</li> <li>(2) The discharge-side pipe is clogged with dirt or other foreign material, which has caused the pressure to increase.</li> <li>(3) The diaphragm has suffered damage due to fatigue.</li> </ol>	<ol style="list-style-type: none"> <li>(1) Tighten the head bolts.</li> <li>(2) Clean inside the pipe.</li> <li>(3) Replace the diaphragm.</li> </ol>
The discharge capacity is too small.		<ol style="list-style-type: none"> <li>(1) Air has entered into the pump head.</li> <li>(2) The diaphragm has deteriorated or has been damaged.</li> <li>(3) The valve seat area has deteriorated or is clogged.</li> <li>(4) The pipe is clogged.</li> <li>(5) The suction height is outside of the specified range.</li> <li>(6) The chemical is too viscous.</li> <li>(7) The discharge pressure is too high.</li> <li>(8) The suction-side hose or valve is clogged.</li> <li>(9) The foot valve or the strainer is clogged.</li> </ol>	<ol style="list-style-type: none"> <li>(1) Release the air.</li> <li>(2) Replace the diaphragm.</li> <li>(3) Clean the valve seats or replace them.</li> <li>(4) Clean inside the pipe.</li> <li>(5) Set the suction height to a value within the specified range.</li> <li>(6) Reduce the viscosity of the chemical or change the joints to high-viscosity type joints.</li> <li>(7) Check the pressure and the specifications.</li> <li>(8) Clean the suction-side hose and valve or replace them.</li> <li>(9) Clean the foot valve, strainer, and chemical tank.</li> </ol>
The discharge capacity is too large.		<ol style="list-style-type: none"> <li>(1) An overfeed has occurred.</li> <li>(2) A negative pressure has occurred on the discharge side.</li> <li>(3) The push pressure is too high.</li> </ol>	<ol style="list-style-type: none"> <li>(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.</li> <li>(3) Set the discharge-side pressure to a value that is higher than the push pressure.</li> </ol>

# Model code

Note: Not all model combinations are possible. When selecting the pump model, first check "Liquid-end material" and "Specification".

## Injection of general chemicals

SM - 03R - PE - S  
(1)            (2)            (3)

(1) Model (discharge volume standard)

Model	Discharge volume
030	30 mL/min
03R	30 mL/min (with relief-valve function)
060	60 mL/min
06R	60 mL/min (with relief-valve function)
100	100 mL/min
10R	100 mL/min (with relief-valve function)

(2) Liquid-end material

Type	Applicable models
PE	03R/06R/10R/030/060/100
PF	03R/06R/10R/030/060/100
KE	03R/06R/10R/030/060/100
KF	03R/06R/10R/030/060/100
KP	03R/06R/10R/030/060/100
ST	030/060/100

(3) Power plug

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

## Injection of boiler chemicals

SM - 03R - BH - S  
(1)            (2)

(1) Model (discharge volume standard)

Model	Discharge volume
030	30 mL/min
03R	30 mL/min (with relief-valve function)

(2) Power plug

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

# Model code

## Injection of sodium hypochlorite

SM - 03R - CL - S

(1)

(2)

(1) Model (discharge volume standard)

Model	Discharge volume
030	30 mL/min
03R	30 mL/min (with relief-valve function)
060	60 mL/min
06R	60 mL/min (with relief-valve function)
100	100 mL/min
10R	100 mL/min (with relief-valve function)

(2) Power plug

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

## Model with automatic air-release function for injection of sodium hypochlorite

SM - 030 - CA - S

(1)

(2)

(1) Model (discharge volume standard)

Model	Discharge volume
030	30 mL/min
060	60 mL/min
100	100 mL/min

(2) Power plug

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

# Liquid-end material

Model Part	Injection of general chemicals						Injection of boiler chemicals	Injection of sodium hypochlorite	Model with automatic air-release function for injection of sodium hypochlorite
	PE	PF	KE	KF	KP	ST	BH	CL	CA
Pump head	PVC		PVDF			SUS316	PVC	Acrylic (PMMA)	
Diaphragm	PTFE								
Check ball	Ceramic								
O-ring	EPDM	FKM	EPDM	FKM	FFKM	PTFE	EPDM	FKM	
Valve seat	EPDM	FKM (G-801)	EPDM	FKM (G-801)	PTFE	–	PTFE	FKM (G-801)	
Joint	PVC		PVDF			SUS316	PVC		
Ball stopper	PVC		PVDF	PTFE (valve stopper)			PVC		
Compressed coil spring	–								Hastelloy C

# Specifications

## Model with relief-valve function for injection of general chemicals

Specification		Model		03R					06R					10R				
		PE	PF	KE	KF	KP	PE	PF	KE	KF	KP	PE	PF	KE	KF	KP		
Maximum discharge volume*1	mL/min	30					60					100						
	L/h	1.8					3.6					6.0						
	GPH	0.47					0.95					1.58						
Maximum discharge pressure*1	MPa	0.7*2										0.4						
	Bar	7*2										4						
	psi	101.5										58						
Stroke speed		15 to 300 strokes/min (dial setting)																
Stroke length		Fixed at 1.0 mm																
Connection (hose/tube: I.D×O.D)	Discharge side	6×8 (PE)			6×8 (FEP)		6×8 (PE)			6×8 (FEP)		6×8 (PE)			6×8 (FEP)			
	Suction side																	
	Relief valve/ air release	4×6 (soft PVC hose)																
Maximum allowable viscosity		50 mPa·s/cps																
Allowable temperature		Ambient temperature: 0 to 40°C (32 to 104°F) / Transferring liquid: 0 to 40°C (32 to 104°F) (no freezing allowed)																
Ambient humidity		35 to 85% RH																
Environmental protection		IEC standard: IP65 or equivalent (water- and dust-proof)																
Altitude of installation location		Less than 1,000 m																
Noise level		Less than 85 dB																
Power supply	Rated voltage	AC 100 to 240 V (±10%)																
	No. of phases/ Frequency	1-phase/50 or 60 Hz																
	Maximum current	2.2 A																
	Power consumption	Maximum: 220 VA/Average: 16 W																
Weight	kg	1.7																
	lb	3.8																

\*1 Conditions: Clean water, room temperature

\*2 Though the maximum discharge pressure of the 03R/06R models is 1.0 MPa (10 bar), the relief-valve function operates when 0.7 MPa (7 bar) is exceeded. In applications requiring a discharge pressure of 0.7 MPa (7 bar) or more, ask for a model without the relief-valve function and install a separate relief valve for additional safety.

# Specifications

## Model without relief-valve function for injection of general chemicals

Specification		Model		030						060						100																					
		PE	PF	KE	KF	KP	ST	PE	PF	KE	KF	KP	ST	PE	PF	KE	KF	KP	ST																		
Maximum discharge volume*	mL/min	30						27						60						55						100						95					
	L/h	1.8						1.62						3.6						3.3						6.0						5.7					
	GPH	0.47						0.42						0.95						0.87						1.58						1.5					
Maximum discharge pressure*	MPa	1.0						0.5						0.8						0.5						0.4						0.4					
	Bar	10						5						8						5						4						4					
	psi	145						72.5						116						72.5						58						58					
Stroke speed		15 to 300 strokes/min (dial setting)																																			
Stroke length		Fixed at 1.0 mm																																			
Connection (hose/tube: I.D×O.D)	Discharge side	6×8 (PE)						6×8 (FEP)		6×8 (PTFE)		6×8 (PE)						6×8 (FEP)		6×8 (PTFE)		6×8 (PE)						6×8 (FEP)		6×8 (PTFE)							
	Suction side																																				
	Air release	4×6 (soft PVC hose)																																			
Maximum allowable viscosity		50 mPa·s/cps																																			
Allowable temperature		Ambient temperature: 0 to 40°C (32 to 104°F) / Transferring liquid: 0 to 40°C (32 to 104°F) (no freezing allowed)																																			
Ambient humidity		35 to 85% RH																																			
Environmental protection		IEC standard: IP65 or equivalent (water- and dust-proof)																																			
Altitude of installation location		Less than 1,000 m																																			
Noise level		Less than 85 dB																																			
Power supply	Rated voltage	AC 100 to 240 V (±10%)																																			
	No. of phases/ Frequency	1-phase/50 or 60 Hz																																			
	Maximum current	2.2 A																																			
	Power consumption	Maximum: 220 VA/Average: 16 W																																			
Weight	kg	1.7																																			
	lb	3.8																																			

\* Conditions: Clean water, room temperature

# Specifications

## Injection of boiler chemicals

Specification		Model	
		03R	030
		BH	BH
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		15 to 300 strokes/min (dial setting)	
Stroke length		Fixed at 1.0 mm	
Connection (hose/tube: I.D×O.D)	Discharge side	4×6 (PA tube)	
	Suction side	4×9 (PVC braided hose)	
	Relief valve/ air release	4×6 (soft PVC hose)	
Maximum allowable viscosity		50 mPa·s/cps	
Allowable temperature		Ambient temperature: 0 to 40°C (32°F to 104°F) / Transferring liquid: 0 to 40°C (32°F to 104°F) (no freezing allowed)	
Ambient humidity		35 to 85% RH	
Environmental protection		IEC standard: IP65 or equivalent (water- and dust-proof)	
Altitude of installation location		Less than 1,000 m	
Noise level		Less than 85 dB	
Power supply	Rated voltage	AC 100 to 240 V (±10%)	
	No. of phases/ Frequency	1-phase/50 or 60 Hz	
	Maximum current	2.2 A	
	Power consumption	Maximum: 220 VA/Average: 16 W	
Weight	kg	1.7	
	lb	3.8	

\* Conditions: Clean water, room temperature

# Specifications

## Injection of sodium hypochlorite

Specification		Model	03R	06R	10R	030	060	100
			CL	CL	CL	CL	CL	CL
Maximum discharge volume* <sup>1</sup>	mL/min		30	60	100	30	60	100
	L/h		1.8	3.6	6.0	1.8	3.6	6.0
	GPH		0.47	0.95	1.58	0.47	0.95	1.58
Maximum discharge pressure* <sup>1</sup>	MPa		0.7* <sup>2</sup>		0.4	1.0	0.8	0.4
	Bar		7* <sup>2</sup>		4	10	8	4
	psi		101.5		58	145	116	58
Stroke speed		15 to 300 strokes/min (dial setting)						
Stroke length		Fixed at 1.0 mm						
Connection (hose/tube: I.D×O.D)	Discharge side	6×8 (PE)						
	Suction side							
	Relief valve/ air release	4×6 (soft PVC hose)						
Maximum allowable viscosity		50 mPa·s/cps						
Allowable temperature		Ambient temperature: 0 to 40°C (32°F to 104°F) / Transferring liquid: 0 to 40°C (32°F to 104°F) (no freezing allowed)						
Ambient humidity		35 to 85% RH						
Environmental protection		IEC standard: IP65 or equivalent (water- and dust-proof)						
Altitude of installation location		Less than 1,000 m						
Noise level		Less than 85 dB						
Power supply	Rated voltage	AC 100 to 240 V (±10%)						
	No. of phases/ Frequency	1-phase/50 or 60 Hz						
	Maximum current	2.2 A	2.5 A		2.2 A	2.5 A		
	Power consumption	Maximum: 220 VA/ Average: 16 W	Maximum: 250 VA/ Average: 18 W		Maximum: 220 VA/ Average: 16 W	Maximum: 250 VA/ Average: 18 W		
Weight	kg	1.7	1.8		1.7	1.8		
	lb	3.8	4.0		3.8	4.0		

\*1 Conditions: Clean water, room temperature

\*2 Though the maximum discharge pressure of the 03R/06R models is 1.0 MPa (10 bar), the relief-valve function operates when 0.7 MPa (7 bar) is exceeded. In applications requiring a discharge pressure of 0.7 MPa (7 bar) or more, ask for a model without the relief-valve function and install a separate relief valve for additional safety.

# Specifications

## Model with automatic air-release function for injection of sodium hypochlorite

Specification		Model	030	060	100
			CA	CA	CA
Maximum discharge volume*	mL/min		27	54	93
	L/h		1.62	3.24	5.58
	GPH		0.42	0.85	1.47
Maximum discharge pressure*	MPa		1.0	0.8	0.4
	Bar		10	8	4
	psi		145	116	58
Stroke speed		15 to 300 strokes/min (dial setting)			
Stroke length		Fixed at 1.0 mm			
Connection (hose/tube: I.D×O.D)	Discharge side	6×8 (PE)			
	Suction side				
	Air release	4 x 8 (soft PVC hose)			
Maximum allowable viscosity		50 mPa·s/cps			
Allowable temperature		Ambient temperature: 0 to 40°C (32°F to 104°F) / Transferring liquid: 0 to 40°C (32°F to 104°F) (no freezing allowed)			
Ambient humidity		35 to 85% RH			
Environmental protection		IEC standard: IP65 or equivalent (water- and dust-proof)			
Altitude of installation location		Less than 1,000 m			
Noise level		Less than 85 dB			
Power supply	Rated voltage	AC 100 to 240 V (±10%)			
	No. of phases/ Frequency	1-phase/50 or 60 Hz			
	Maximum current	2.2 A	2.5 A		
	Power consumption	Maximum: 220 VA/ Average: 16 W	Maximum: 250 VA/Average: 18 W		
Weight	kg	1.7	1.8		
	lb	3.8	4.0		

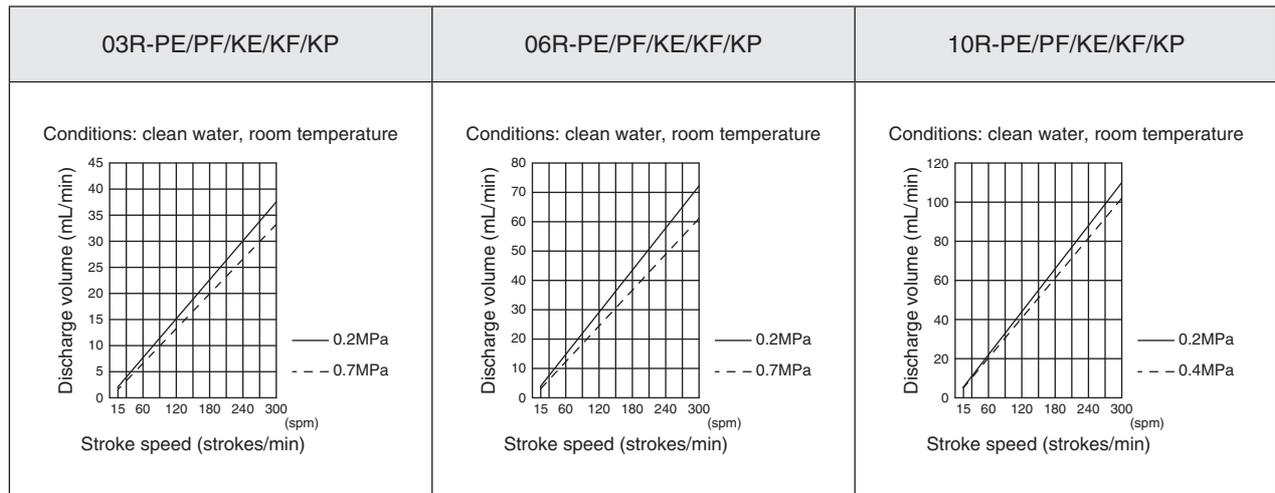
\* Conditions: Clean water, room temperature

# Performance curves

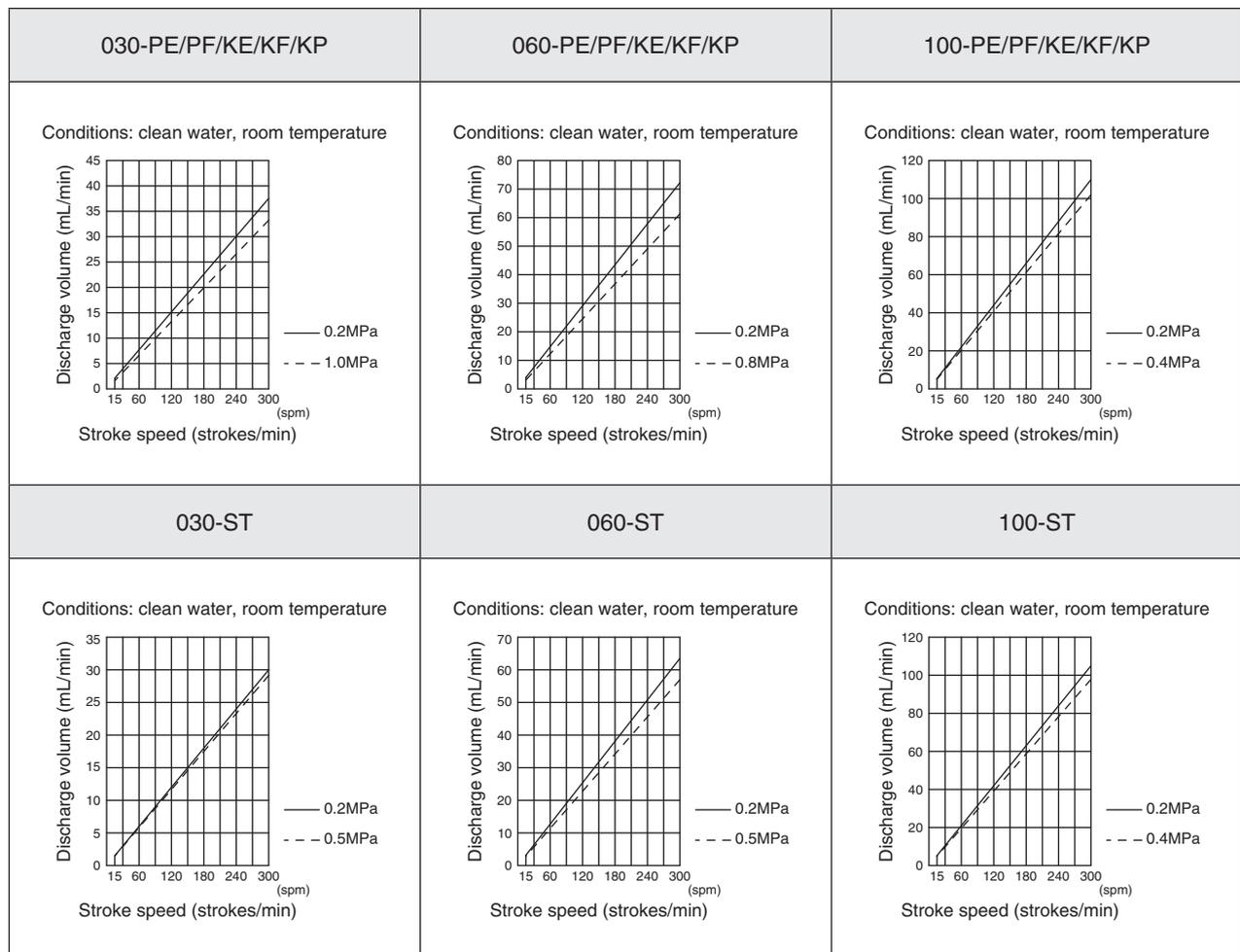
- The performance curves below represent the measurements taken under the conditions prevailing at Wanner Engineering's test facilities, and are provided here as examples.
- The individual conditions prevailing on-site and differences between models may produce minor variations from these curves.
- Measure 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.

## Injection of general chemicals

### Model with relief-valve function

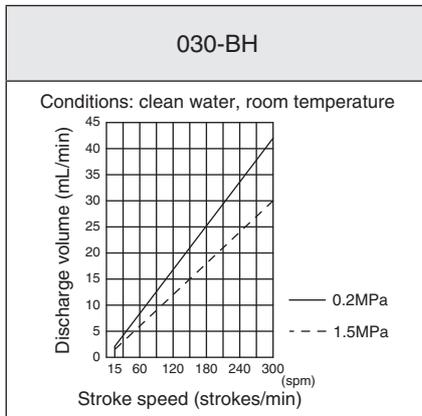


### Model without relief-valve function



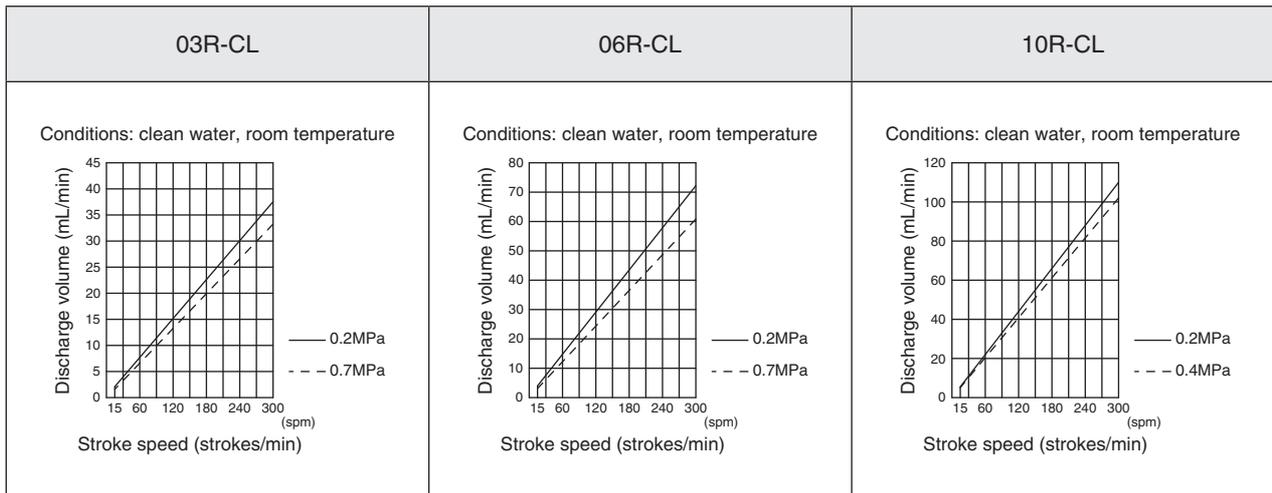
# Performance curves

## Injection of boiler chemicals

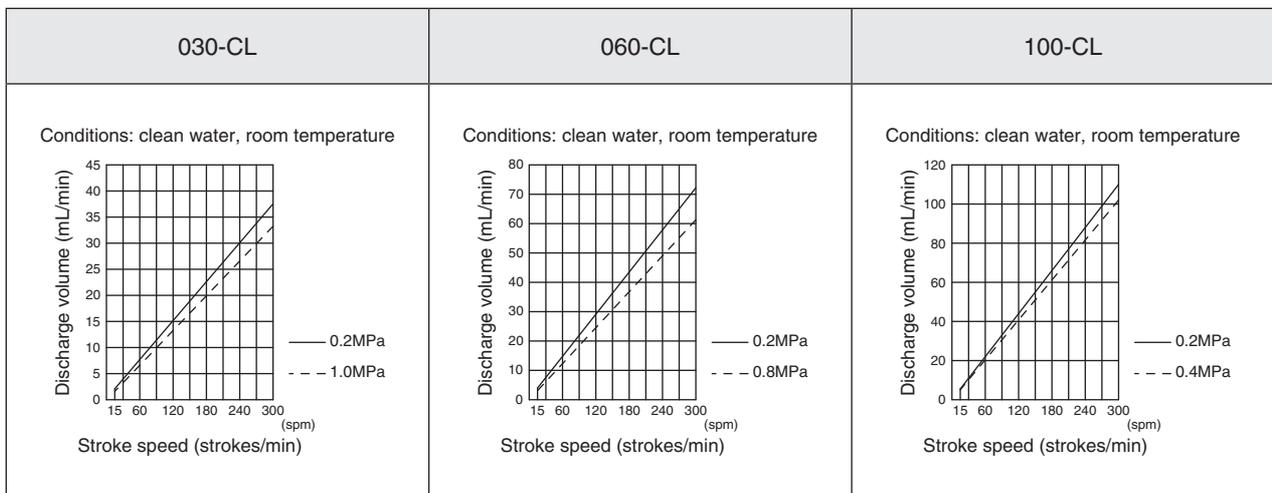


## Injection of sodium hypochlorite

### Model with relief-valve function

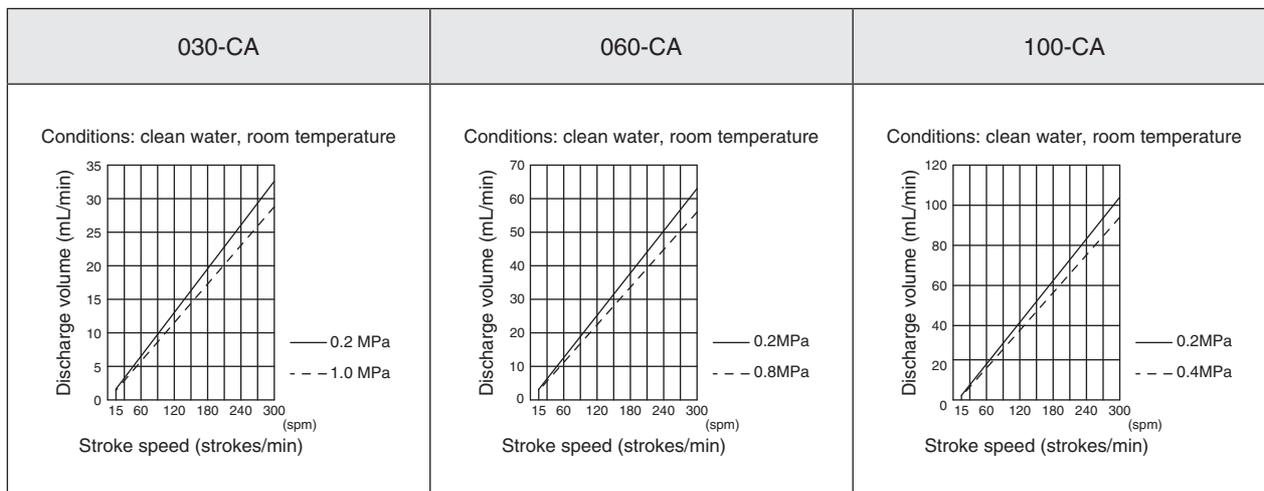


### Model without relief-valve function



# Performance curves

## Model with automatic air-release function for injection of sodium hypochlorite

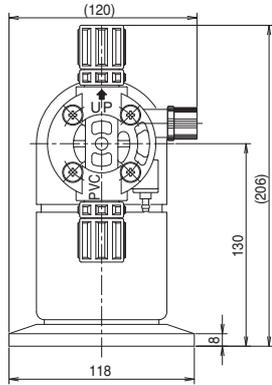


# External dimensions

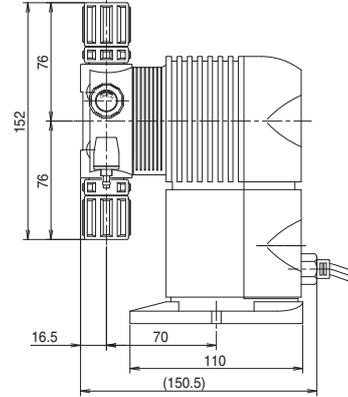
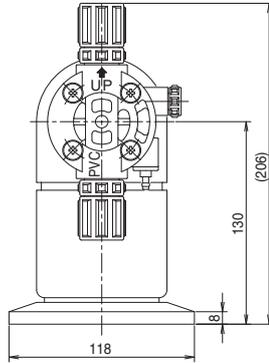
## Injection of general chemicals

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

Model with relief-valve function

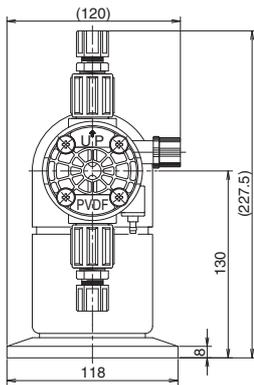


Model without relief-valve function

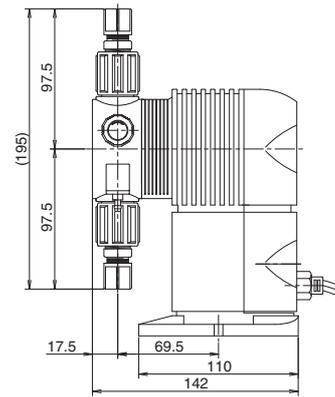
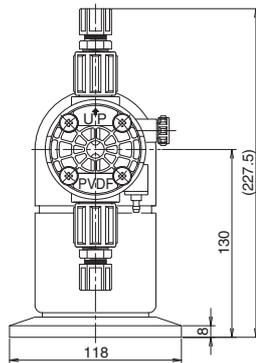


### 03R/06R/10R/030/060/100-KE/KF/KP

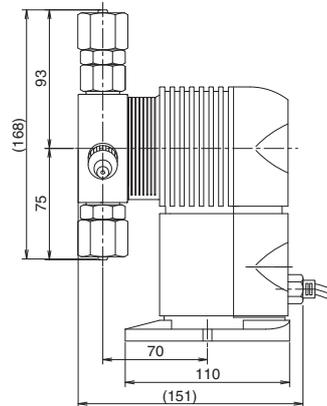
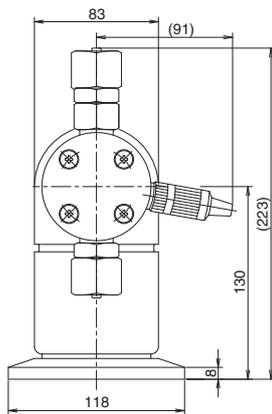
Model with relief-valve function



Model without relief-valve function

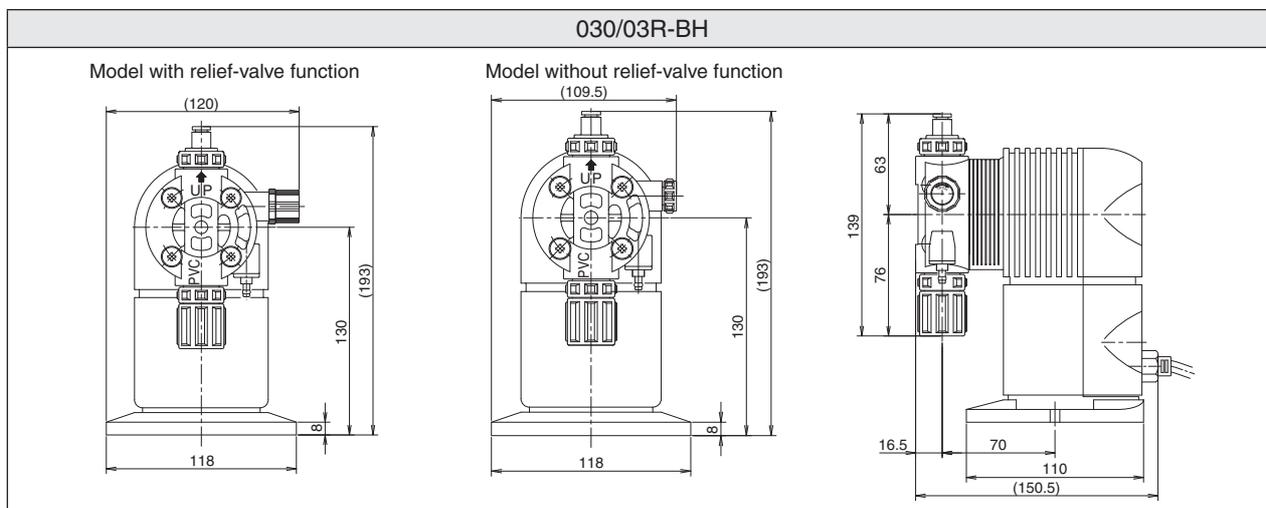


### 030/060/100-ST

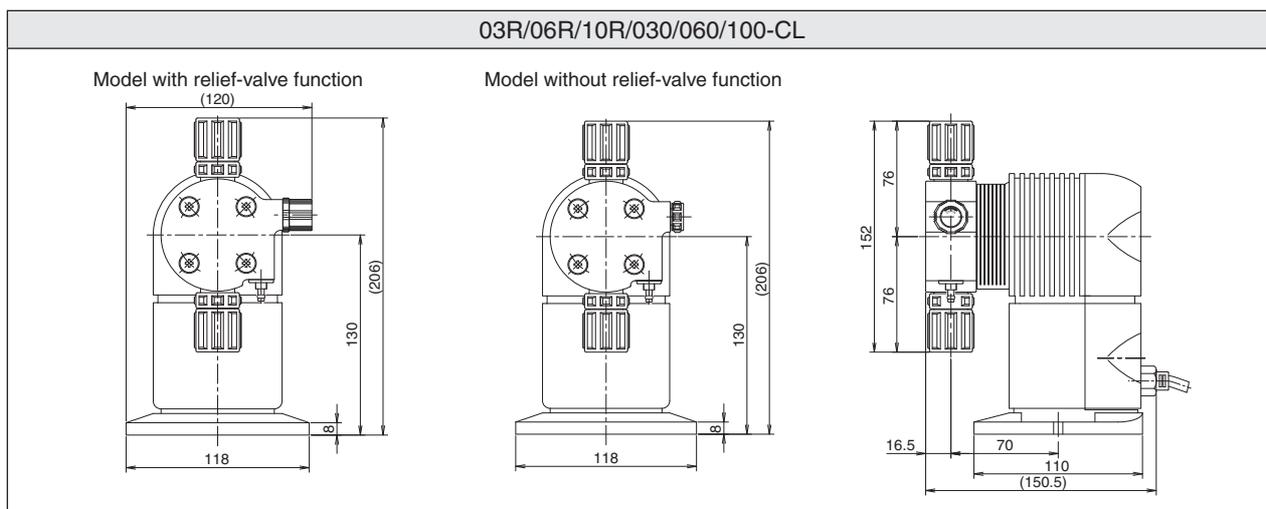


# External dimensions

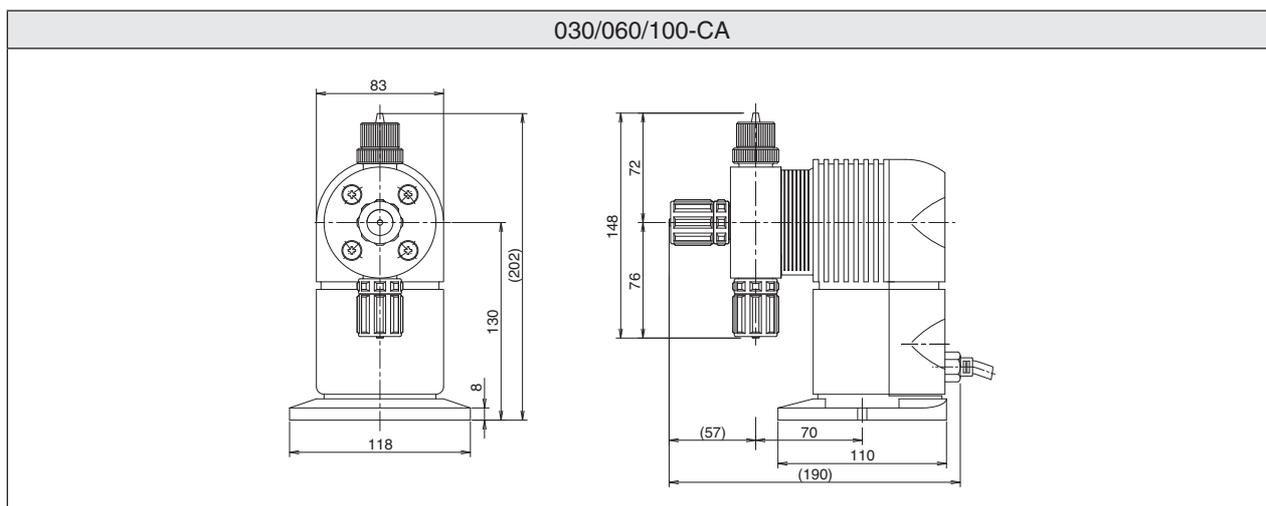
## Injection of boiler chemicals



## Injection of sodium hypochlorite



## Model with automatic air-release function for injection of sodium hypochlorite



# 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 a hose/tube/relief valve/anti-siphon check valve/foot valve/air-release hose/ differs significantly depending on the chemicals with which it is used, such as on the temperatures and pressures and on the presence of ultraviolet rays. Inspect wear items, and replace them if deteriorated.**

## 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 “Replacing the diaphragm”, “Replacing the valve seats and check balls” and “Replacing the relief valve” (on page 39 to 45).

## Injection of general chemicals

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

Part	Quantity per pump		Recommended replacement timeframe
	03R/06R/10R	030/060/100	
Valve seat assembly	2		10,000 hours after start of operation
Diaphragm assembly (diaphragm, protective diaphragm, spacer)	1		10,000 hours after start of operation
Relief valve	1	–	10,000 hours after start of operation
Air-release knob	–	1	10,000 hours after start of operation
Air-release nozzle assembly	1		10,000 hours after start of operation

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

Part	Quantity per pump		Recommended replacement timeframe
	03R/06R/10R	030/060/100	
Valve seat assembly	2		10,000 hours after start of operation
Diaphragm assembly (diaphragm, protective diaphragm, spacer)	1		10,000 hours after start of operation
Relief valve	1	–	10,000 hours after start of operation
Air-release knob	–	1	10,000 hours after start of operation
Air-release nozzle assembly	1		10,000 hours after start of operation

### 030/060/100-ST

Part	Quantity per pump	Recommended replacement timeframe
O-ring	3	10,000 hours after start of operation
Check ball	2	10,000 hours after start of operation
Valve stopper	2	10,000 hours after start of operation
Diaphragm assembly (diaphragm, protective diaphragm, spacer)	1	10,000 hours after start of operation
Air-release valve assembly	1	10,000 hours after start of operation

# Spare parts

## Injection of boiler chemicals

### 030/03R-BH

Part	Quantity per pump		Recommended replacement timeframe
	03R	030	
Valve seat assembly	2		10,000 hours after start of operation
Diaphragm assembly (diaphragm, protective diaphragm, spacer)	1		10,000 hours after start of operation
Relief valve	1	–	10,000 hours after start of operation
Air-release knob	–	1	10,000 hours after start of operation
Air-release nozzle assembly	1		10,000 hours after start of operation

## Injection of sodium hypochlorite

### 03R/06R/10R/030/060/100-CL

Part	Quantity per pump		Recommended replacement timeframe
	03R/06R/10R	030/060/100	
Valve seat assembly (discharge side)	1		10,000 hours after start of operation
Valve seat assembly (suction side)	1		10,000 hours after start of operation
Diaphragm assembly (diaphragm, protective diaphragm, spacer)	1		10,000 hours after start of operation
Relief valve	1	–	10,000 hours after start of operation
Air-release knob	–	1	10,000 hours after start of operation
Air-release nozzle assembly	1		10,000 hours after start of operation

## Model with automatic air-release function for injection of sodium hypochlorite

### 030/060/100-CA

Part	Quantity per pump	Recommended replacement timeframe
Valve seat assembly (discharge side)	1	10,000 hours after start of operation
Valve seat assembly (suction side)	1	10,000 hours after start of operation
Diaphragm assembly (diaphragm, protective diaphragm, spacer)	1	10,000 hours after start of operation
Valve seat assembly (Air-release side)	1	10,000 hours after start of operation

## Spare parts & options

### ■ Spare parts

- Nuts
- Retaining rings
- Joints
- Air-release nozzles

### ■ 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, the 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 tank of the pump.

#### • Flow indicator

The discharge operation can be monitored at a glance by attaching this indicator at the discharge side of the pump. It also helps to prevent injection trouble.

#### • Deforming 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-030/050/120

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 you need.

## 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 case of pulsation flow, the actual discharge volume might be larger than rated because of this phenomenon.

#### • Siphoning

The phenomenon that chemicals continue to dissipate 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 where 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.



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

**Hydra·Cell**<sup>®</sup>  
METERING SOLUTIONS™

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