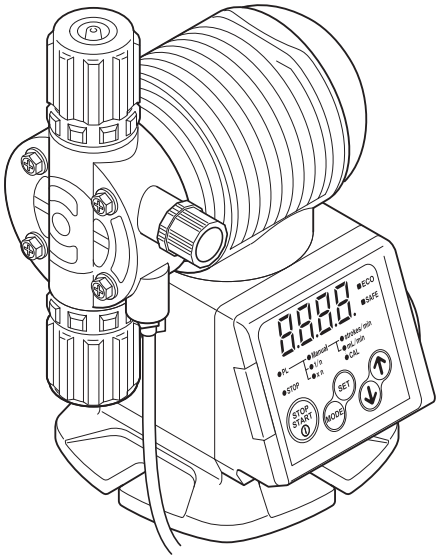
TACMINA

Solenoid-driven Diaphragm Metering Pump

PW Series

OPERATION MANUAL

**Please read this OPERATION MANUAL carefully before use.
Operating the pump incorrectly in disregard of these instructions may lead to death, injury and/or cause property damage.**



This illustration is for the PW-30R

Applicable Models

PW/PWM/PWT
DCLPW/DCLPWM/DCLPWT
CLPW/CLPWM/CLPWT

- Thank you for purchasing this TACMINA product. Please read this OPERATION MANUAL carefully in order to ensure that you will use the product safely and correctly.
- Be sure to keep this OPERATION MANUAL in a place where it will be easily available for reference.
- If the product you purchased conforms to special specifications not described in this OPERATION MANUAL, handle the product according to details of separate meetings, drawings and approved documents.

- TACMINA accepts no liability whatsoever for any damage caused by malfunction of this product and other damage caused by use of this product.

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How to operate the pump safely

In order to ensure that the pump will be operated correctly and safely, this OPERATION MANUAL contains some guidelines for the user in the form of important safety precautions and considerations which, depending on their seriousness, are categorized as set forth below. Be absolutely sure to heed these precautions and considerations.

⚠ WARNING

- **This is used to indicate a condition or action which may result in death or serious injury if the instructions given are ignored and the operations are performed incorrectly.**

⚠ CAUTION

- **This is used to indicate a condition or action which may result in injury and/or damage to personal property if the instructions given are ignored and the operations are performed incorrectly.**

IMPORTANT

- **This is used to indicate 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 is used to indicate supplementary information.**

Conditions of Use

⚠ WARNING

- **This pump cannot be used in explosion-proof regions or in explosive or combustible atmospheres.**

⚠ CAUTION

- **This 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.**
- **This pump cannot be used to transfer or inject any liquids containing slurry.**
- **This pump's discharge volume cannot be adjusted by operating the valve on its discharge pipe.**
- **The characteristics of this pump are such that pulsation will arise. If pulsation threatens to be a problem, install an air chamber or some other device for reducing the effects of pulsation.**
- **Do not use the pump outside the following usage ranges. Doing so may cause malfunctions.**

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

*1 Transport and store the pump at temperatures within the −10°C to +50°C range. Do not subject the pump to strong impacts.

*2 The maximum viscosity for the high-viscosity type is 3,000 mPa • s.

✻ Install the tank at a position higher than the pump (so that the pipe is connected to force the chemical downward).

✻ 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

- **This pump does not have explosion-proof specifications. Do not install it in explosion-proof regions or in explosive or combustible atmospheres.**
- **Install the pump in a location that cannot be accessed by anyone but control personnel.**

⚠ ϟ CAUTION

- **If this pump has been dropped or damaged, consult your vender or a TACMINA 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 so make every attempt to avoid installing it in a position that will shorten its service life (such as a position where it will be exposed to direct sunlight, wind or rain).**
- **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 even if the hose/tube should break.**
- **When using a pump with a relief-valve function, always attach a hose for relief purposes, and lead the end of the pipe back to a tank or other container.**
- **When using a pump without a relief-valve function, be absolutely sure to install a relief valve on the pipe right outside the pump on the discharge side. If the user has forgotten to open the valve or foreign matter is clogged inside the pump's discharge-side pipe, this may cause the pressure to rise above the pump's specifications range, liquid to gush out, the pipes to become damaged and/or the pump to malfunction, all of which are dangerous.**
- **When using the pump in cold regions, the chemical may freeze inside the pump head or pipes, possibly damaging the pump and its surroundings. Be absolutely sure to install a heating unit or heat-insulating unit.**
- **The water used for the shipment tests may be left on the liquid-end parts (the parts that come into contact with the liquid) of the pump. If the pump is to be used for chemical that may harden or give off gas if it reacts with water, be absolutely sure 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 available on the market, be absolutely sure to use the ones which are resistant to chemical and which can withstand the temperatures and pressures under which the pump will be used.**
- **The durability of a hose/tube differs significantly depending on the chemicals with which it is used, on the temperatures and pressures and on the presence of ultraviolet rays. Inspect the hoses/tubes, and replace them if they have deteriorated.**
- **The control panel cover is made of plastic so do not subject it to excessive force. Otherwise, it may break or be damaged.**

Electrical Wiring

WARNING

- **This pump cannot be used in explosion-proof regions or in explosive or combustible atmospheres.**
- **Take steps to 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 the protective earth terminal, and be absolutely sure to install a ground fault circuit interrupter. Otherwise, you may receive electric shocks.**
- **Do not attempt to disassemble the pump body or the circuit parts.**

CAUTION

- **The wiring must be done by a qualified electrician or somebody with electrical knowledge.**
- **Connect the wires after checking the supply voltage. Do not connect the wires to a power supply that is not within the rated voltage range.**

Operation & Maintenance

WARNING

- **Ensure that nobody other than the operators and control personnel will operate the pump.**
- **Take steps to 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.**
- **When trouble has occurred (such as when smoke appears or there is a smell of burning), shut down the pump's operation immediately, and contact your vender or a TACMINA 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 releasing, chemical may suddenly gush out from the pipes and other parts. Lead the end of the air-release hose bank to the tank or other container, and secure it so that it will not become disconnected.**
- **A situation in which the valve inside the pipe at the discharge side of the pump is shut off or becomes blocked with foreign matter is dangerous in that it may lead to an excessive rise in pressure that will exceed the pump's specification range, causing liquid to gush out, 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 protective gear suited to the chemical concerned (such as rubber gloves, a mask, protective goggles and work overalls that are resistant to chemical).**
- **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 and check their tightness.**
- **While the pump is operating, the pump's surfaces may become hot, reaching a temperature of 60°C or more.**
- **Idling the pump for prolonged periods of time can lead to malfunctions.**
- **When diluting sodium hypochlorite, use pure water or water processed with a water softener. Otherwise the pump may malfunction or discharge trouble may result.**

Other Precautions

⚠ CAUTION

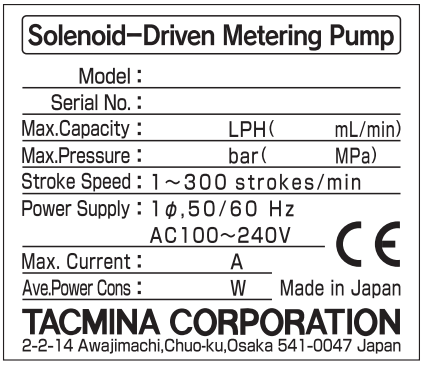
- **Do not attempt to remodel the pump.**
- **Install a protective barrier or other preventive action to cope with a chemical spill just in case one occurs. Also take steps to ensure that the pump will not get wet from the chemical.**
- **When it comes time to dispose of the pump, entrust its disposal to an industrial waste disposal company whose operations have been authorized in accordance with applicable laws and regulations.**

Contents

Checking out the product

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?
- Is 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 fallen out?

Every care is taken by TACMINA in the shipment of its pumps, but if you come across anything untoward, please contact your vender or a TACMINA representative.



Accessories list

✻ When a PTS chemical injection system with an analog input-type model (□ PWM) mounted was purchased, a signal cable is connected.

■ **PW/PWM/PWT (General chemical injection type)**
VTCE/VTCF

Relief-valve function	w/ relief valve			w/o relief valve			
Model	30R	60R	100R	30	60	100	200
Hose/tube (3m)	PVC braided hose (4×9) PE tube (6×8 or 1/4"×3/8")	PVC braided hose (6×11) PE tube (6×8 or 1/4"×3/8")		PVC braided hose (4×9) PE tube (6×8 or 1/4"×3/8")	PVC braided hose (6×11) PE tube (6×8 or 1/4"×3/8")		
Relief/air-release hose (1m)	Soft PVC hose (4×6, installed)			Soft PVC hose (4×6)			-
INSULOK (spare) for relief hose	1 piece			-			
Anti-siphon check valve	1 set (R1/2)						
Foot valve	1 set						
Ceramic weight	1 set ✻ Only when PE tube is selected.						
Cable	2 m						
Pump-mounting nuts/bolts	2 sets (M5×30)						
Operation manual	1 copy						

FTCE/FTCF

Relief-valve function	w/ relief valve			w/o relief valve		
Model	30R	60R	100R	30	60	100
Tube (3m)	PE tube (6×8 or 1/4"×3/8")					
Relief/air-release hose (1m)	Soft PVC hose (4×6, installed)			Soft PVC hose (4×6)		
INSULOK (spare) for relief hose	1 piece			-		
Anti-siphon check valve	1 set (R1/2)					
Foot valve	1 set					
Ceramic weight	1 set					
Cable	2 m					
Pump-mounting nuts/bolts	2 sets (M5×30)					
Operation manual	1 copy					

FTCT

Relief-valve function	w/ relief valve			w/o relief valve		
Model	30R	60R	100R	30	60	100
Tube (3m)	FEP tube (6×8 or 1/4"×3/8")					
Relief/air-release hose (1m)	Soft PVC hose (4×6, installed)			Soft PVC hose (4×6)		
INSULOK (spare) for relief hose	1 piece			-		
Anti-siphon check valve	1 set (R1/2 or R3/8)					
Foot valve	1 set					
Ceramic weight	1 set					
Cable	2 m					
Pump-mounting nuts/bolts	2 sets (M5×30)					
Operation manual	1 copy					

Accessories list

6TCT

Model	30	60	100
Tube (3m)	PTFE tube (6×8)		
Anti-siphon check valve	1 set (R1/2 or R3/8)		
Foot valve	1 set		
Hose pump for air-release	1 set		
Cable	2 m		
Pump-mounting nuts/bolts	2 sets (M5×30)		
Operation manual	1 copy		

■ **PW/PWM/PWT (High-viscosity type)**
VTCF

Model	60	100
Hose (3m)	PVC braided hose (12×18)	
Hose pump for air-release	1 set	
Cable	2 m	
Pump-mounting nuts/bolts	2 sets (M5×30)	
Operation manual	1 copy	

■ **PW/PWM/PWT (Boiler type)**
VTCET

Relief-valve function	w/ relief valve	w/o relief valve
Model	30R	30
Tube for discharge side (2m)	PA tube (4×6)	
Tube for suction side (1m)	PVC braided hose (4×9)	
Relief/air-release hose (1m)	Soft PVC hose (4×6, installed)	Soft PVC hose (4×6)
INSULOK (spare) for relief hose	1 piece	
Anti-siphon check valve	1 set (R1/2)	
Foot valve	1 set	
Cable	2 m	
Pump-mounting nuts/bolts	2 sets (M5×30)	
Operation manual	1 copy	

■ **PW/PWM/PWT (High-pressure type)**
VTCET

Model	30
Tube for discharge side (2m)	PA tube (4×6)
Hose for suction side (1m)	PVC braided hose (4×9)
Air-release hose (1m)	Soft PVC hose (4×6)
Anti-siphon check valve	1 set (R1/2)
Foot valve	1 set
Cable	2 m
Pump-mounting nuts/bolts	2 sets (M5×30)
Operation manual	1 copy

Accessories list

■ **DCLPW/DCLPWM/DCLPWT (For injection of sodium hypochlorite type w/ air block)**
ATCF

Relief-valve function	w/ relief valve			w/o relief valve		
Model	30R	60R	100R	30	60	100
Hose (3m)	PVC braided hose (4×9)	PVC braided hose (6×11)		PVC braided hose (4×9)	PVC braided hose (6×11)	
Relief/air-release hose (1m)	Soft PVC hose (4×6, installed)			Soft PVC hose (4×6)		
INSULOK (spare) for relief hose	1 piece			-		
Degassing joint *1	1 set					
Degassing joint hose (already attached)	1.5m (1/4"×3/8")					
Anti-siphon check valve w/ duck-bill cap	1 set (R1/2)					
Cable	2 m					
Pump-mounting nuts/bolts	2 sets (M5×30)					
Operation manual	1 copy					

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

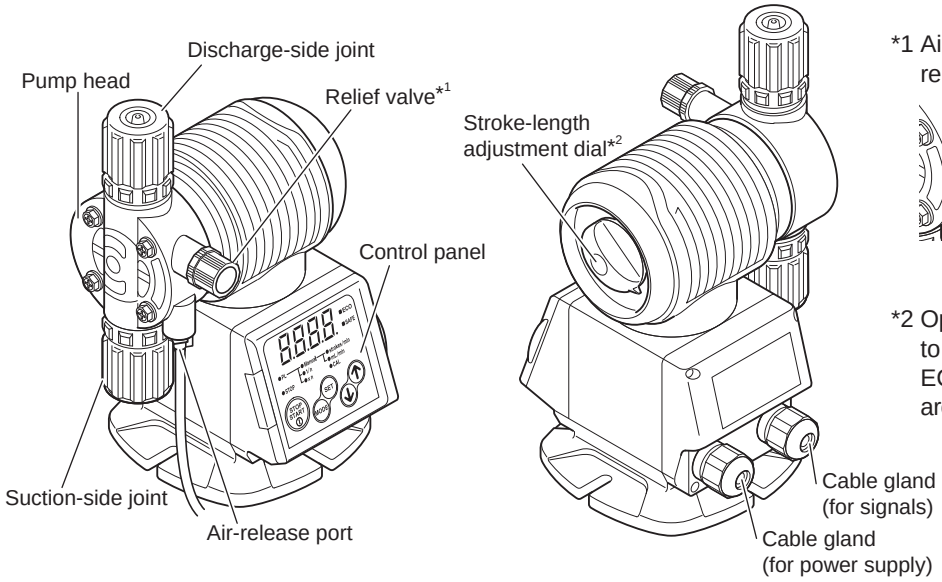
■ **CLPW/CLPWM/CLPWT (For injection of sodium hypochlorite type)**
ATCF

Relief-valve function	w/ relief valve			w/o relief valve		
Model	30R	60R	100R	30	60	100
Hose (3m)	PVC braided hose (4×9)	PVC braided hose (6×11)		PVC braided hose (4×9)	PVC braided hose (6×11)	
Relief/air-release hose (1m)	Soft PVC hose (4×6, installed)			Soft PVC hose (4×6)		
INSULOK (spare) for relief hose	1 piece			-		
Anti-siphon check valve w/ duck-bill cap	1 set (R1/2)					
Foot valve	1 set					
Cable	2 m					
Pump-mounting nuts/bolts	2 sets (M5×30)					
Operation manual	1 copy					

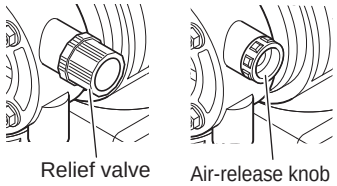
Description of product

This is a solenoid-driven diaphragm metering pump with liquid-end parts which are resistant to chemicals and with a compact body. It can be operated on any supply voltage from AC 100V to AC 240V (±10%). Its discharge capacity has been adjusted so that it will remain constant over the supply voltage range.

Names of the parts



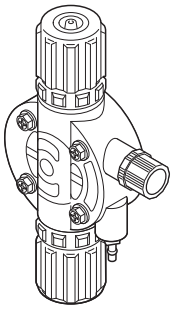
*1 Air-release knob on models w/o relief-valve function.



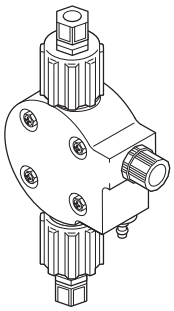
*2 Operate with the stroke length set to 100% when the SAFE mode, ECO mode or ALARM functions are to be enabled.

General chemical injection type

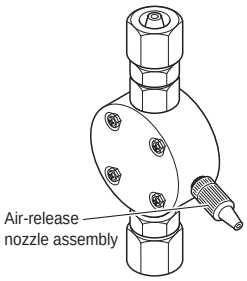
PVC



PVDF

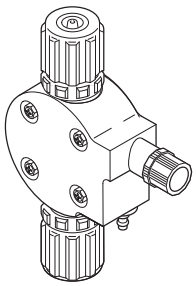


Stainless

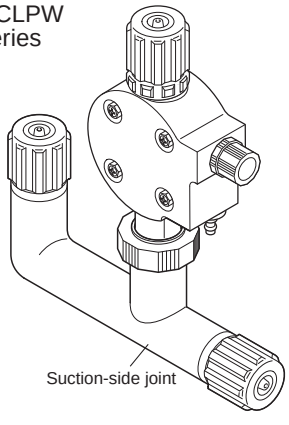


For injection of sodium hypochlorite type

CLPW series

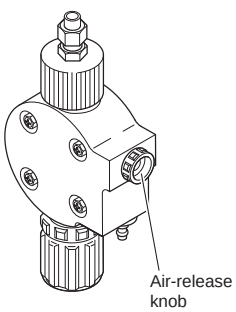


DCLPW series

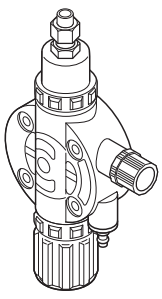


High-pressure type

✻ W/o relief valve

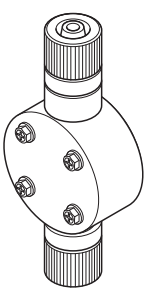


Boiler type



High-viscosity type

✻ W/o relief valve



✻ Parts may have different shapes to those shown in the figure depending on the model. Refer to "Exploded views of liquid-end parts and external dimension.

Installing the product

WARNING

- **This pump does not have explosion-proof specifications. Do not install it in explosion-proof regions or in explosive or combustible atmospheres.**
- **Install the pump in a location that cannot be accessed by anyone but 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 so make every attempt to avoid installing it in a position that will shorten its service life (such as a position where it will be exposed to direct sunlight, wind or rain).**

Installation location

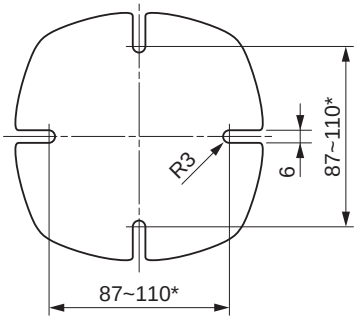
- Avoid installing the pump in a location exposed to direct sunlight or wind and rain. Although it features a water-proof construction (equivalent to IP65 under the IEC standards), direct sunlight may cause the temperature of the metal parts to rise, ultraviolet rays may cause the plastic parts to deteriorate, 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 where the ventilation is good 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 discharge trouble or in the inability of pump to discharge.

Mounting bolt positions

Use the pump-mounting bolts (×2) provided to secure the pump.

✻ Secure the pump in two places opposite each other among the four possible places.

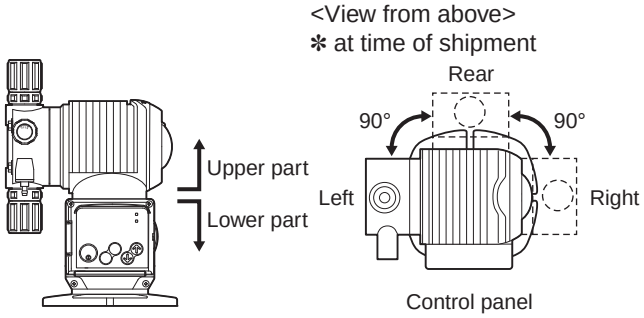
* The pump can be installed at any pitch ranging from 87 to 110 mm.



Assembling the pump

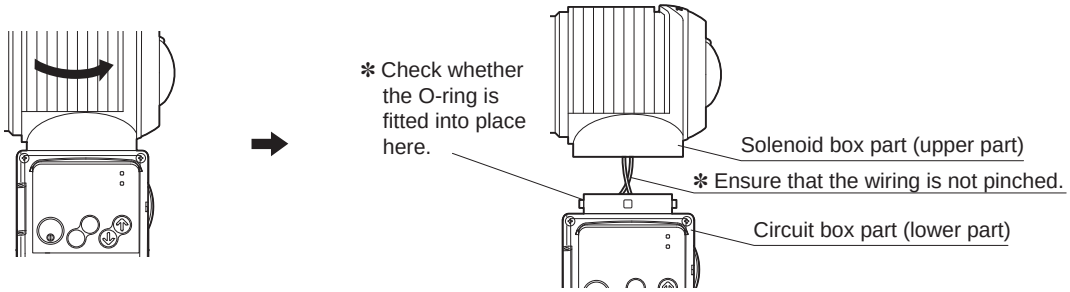
The direction in which the pump head and solenoid box part (upper part) and circuit box part (lower part) are assembled can be changed to one of three directions.

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



Installing the product

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



(2) Twist the upper part in the desired direction, align the groove in the coupling of the upper part and the protrusion in the coupling of the lower part, and insert.
(3) Twist the upper part clockwise, and secure.

IMPORTANT

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

NOTE

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

Piping

Bear in mind the following points when connecting the pipes.

⚠ 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 even if the hose/tube should break.**
- **When using a pump with a relief-valve function, always attach a hose for relief purposes, and lead the end of the pipe back to a tank or other container.**
- **It is dangerous to operate a pump with the discharge side pipe closed off due to valve closing or clogging with foreign matter, for example, because abnormal pressure will buildup inside the pipe. As a safety measure, take the action in I or II, whichever is applicable.**

  I. When the pump is provided with a relief-valve function
  Connect a relief hose to the air-release port, bring the end of the hose back to the chemical liquid tank and secure it.

  II. When the pump is not provided with a relief valve function
  Attach a relief hose and relief valve to the discharge side pipe, and bring the end of the hose back to the chemical liquid tank and secure it.
- **When using the pump in cold regions, the chemical may freeze inside the pump head or pipes, possibly damaging the pump and its surroundings. Be absolutely sure to install a heating unit or heat-insulating unit.**
- **When the hoses/tubes become very hot, their ability to withstand pressure will deteriorate. When using hoses/tubes available on the market, be absolutely sure to use the ones which are resistant to chemical and which can withstand the temperatures and pressures under which the pump will be used.**
- **The durability of a hose/tube differs significantly depending on the chemicals with which it is used, on the temperatures and pressures and on the presence of ultraviolet rays. Inspect the hoses/tubes, and replace them if they have deteriorated.**

Piping

IMPORTANT

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

* **Refer to the "Explanation of terms" on page 60.**

■Pulsation

- The occurrence of pulsation will cause the pump's hoses/tubes to vibrate. Secure the hoses/tubes so that they will not swing about.
- In order to reduce pulsation, the installation of a damper is recommended. Ask a TACMINA representative for more information.

■Pipe length

- An excessively long hose/tube may result in increased pressure loss, may cause the pressure to exceed the pump's allowable pressure, or may give rise to overfeed and/or 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, thicker pipes 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 TACMINA representative.

■During maintenance

- When disconnecting the hose/tube for maintenance or other purposes and then reconnecting the same hose/tube, cut about 10 mm off the end of the hose/tube before reconnecting.
- When conducting maintenance, release the pressure of the discharge hose/tube.

■When curving a hose/tube

- Provide a sufficient margin so that the hose/tube will not bend instead of curve round.
- Take steps to ensure that the hose/tube will not bend, rub against other parts, be cut or stepped on. Such actions can damage the hose/tube.
- Take steps to minimize the number of tight curves in the pipes, joints and other parts that may restrict the flow.

Connecting

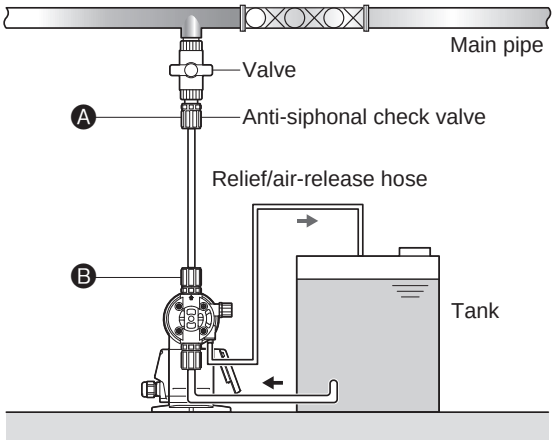
The piping procedure will be described by pump type.

Model	Series	Liquid-end material	Pump position		Connections of parts			
			Below-tank mounting	Above-tank mounting	Injection point	Piping	Foot valve	Degassing joint
For injection of general chemicals	PW□-30R/60R/100R	VTCE/VTCF	Ⅰ	Ⅴ	A-1	B-1	C-1	D
		FTCE/FTCF	Ⅰ	Ⅴ	A-1	B-2	C-2	
		FTCT	Ⅰ	Ⅴ	A-3	B-2	C-2	
	PW□-30/60/100/200	VTCE/VTCF	Ⅱ	Ⅵ	A-1	B-1	C-1	
	PW□-30/60/100	FTCE/FTCF	Ⅱ	Ⅵ	A-1	B-2	C-2	
		FTCT	Ⅱ	Ⅵ	A-3	B-2	C-2	
		6TCT	Ⅱ	Ⅵ	A-3	B-1	C-1	
For injection of high-viscosity chemicals	PW□-60/100	VTCF	Ⅱ	-	-	B-1	-	
For injection of boiler chemicals	PW□-30R	VTCET	Ⅰ	Ⅴ	A-4	Discharge side: B-3	C-1	
	PW□-30		Ⅱ	Ⅵ	A-4	Suction side: B-1	C-1	
For injection of high-pressure	PW□-30	VTCET	Ⅱ	Ⅵ	-	Discharge side: B-3 Suction side: B-1	C-1	
For injection of sodium hypochlorite	DCLPW□-30R/60R/100R	ATCF	Ⅲ	-	A-2	B-1	-	
	DCLPW□-30/60/100		Ⅳ	-	A-2	B-1	-	
	CLPW□-30R/60R/100R	ATCF	Ⅰ	Ⅴ	A-2	B-1	C-1	
	CLPW□-30/60/100		Ⅱ	Ⅵ	A-2	B-1	C-1	

Connecting

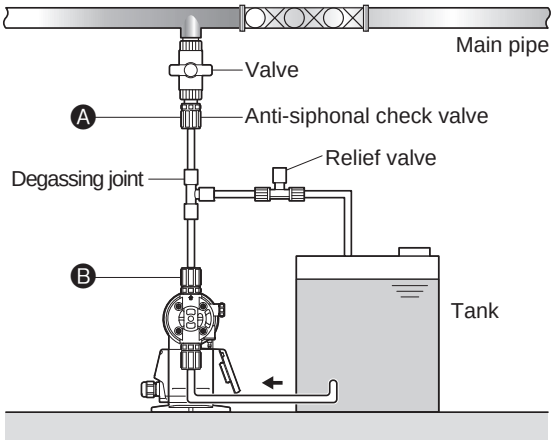
I. Pump below-tank mounting position (w/ relief valve)

Applicable models:PW□/CLPW□-30R/60R/100R



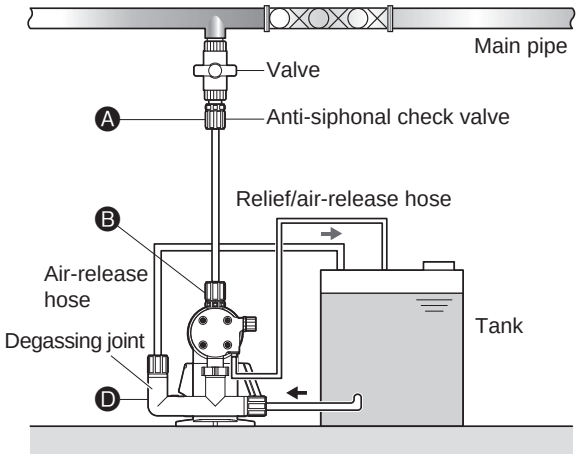
II. Pump below-tank mounting position (w/o relief valve)

Applicable models:PW□/CLPW□-30/60/100/200



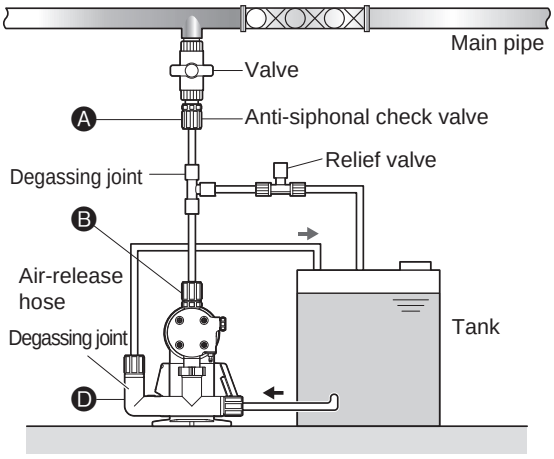
III. Pump below-tank mounting position (w/ relief valve)

Applicable models:DCLPW□-30R/60R/100R



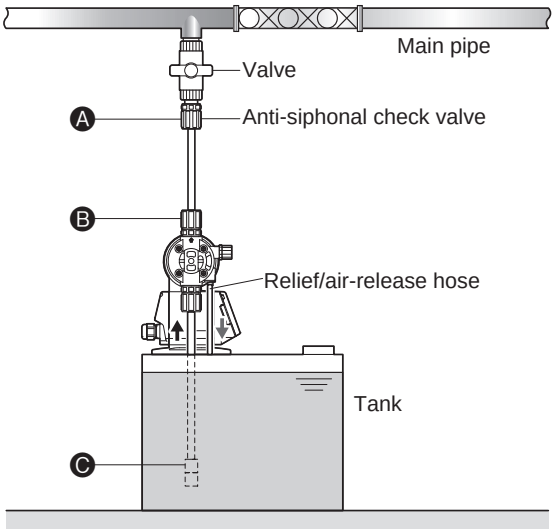
IV. Pump below-tank mounting position (w/o relief valve)

Applicable models:DCLPW□-30/60/100



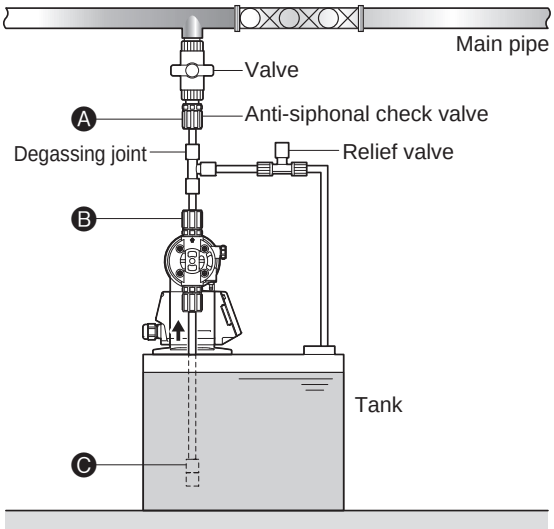
V. Pump above-tank mounting (w/ relief valve)

Applicable models:PW□/CLPW□-30R/60R/100R



VI. Pump above-tank mounting (w/o relief valve)

Applicable models:PW□/CLPW□-30/60/100/200



✻ Pump above-tank mounting cannot be used for the DCLPW□ and high-viscosity type.
✻ If at all possible, use pump below-tank mounting position for the CLPW□.
✻ When using the pump in an above-tank mounting position, moisten the valve seat area with some water or chemical liquid before operating the pump.
✻ This pump has a maximum suction height of -1.5 m for water in the condition with the valve seat area moistened. The suction capability may decrease when the valve seat area is dry. (Except the DCLPW□, CLPW□ and high-viscosity types)

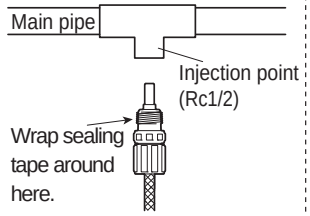
Connecting

Injection point connections

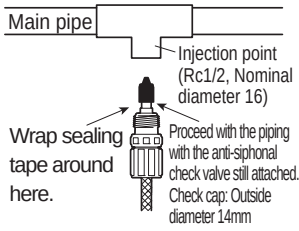
The anti-siphonal check valve has a different shape depending on the material used for the liquid-end material of the pump. First check the model of the pump to be used, and then refer to the applicable diagram below.

✻ An anti-siphonal check valve is not provided for the high-viscosity type.

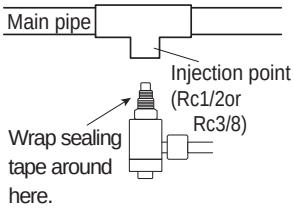
A-1. VTCE/VTCF
FTCE/FTCF type



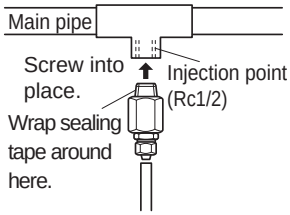
A-2. ACTF type



A-3. FTCT/6TCT type



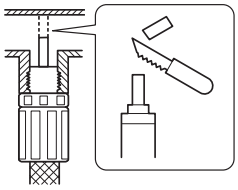
A-4. VTCET type



NOTE

• When using a PVC or PVDF anti-siphonal check valve

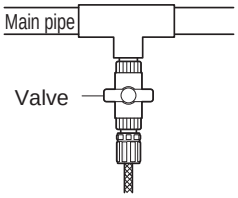
Install the valve so that the end of the injection nozzle is positioned at the center of the main pipe.
If the nozzle is too long, use a saw or other tool to cut off its end, use a file or other means to finish the cut-off surface, and discard the metal scraps.



✻ In the case of an anti-siphonal check valve used for sodium hypochlorite, attach the shut-off cap to the body after cutting it.

• For maintenance

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

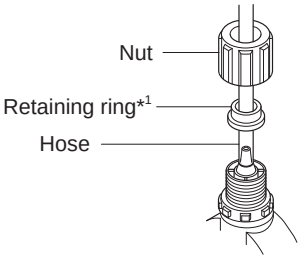


✻ Use a valve made of materials which will resist any corrosion resulting from the chemical used.

Pipe connections

B-1. Hose connection
Model: VTCE/VTCF/6TCT/ATCF type

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



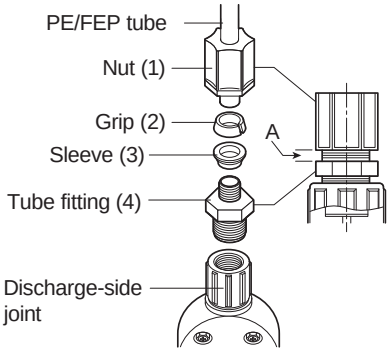
* This part is not provided on the 6TCT type.

B-2. Tube connection
Model: FTCE/FTCF/FTCT type

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

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

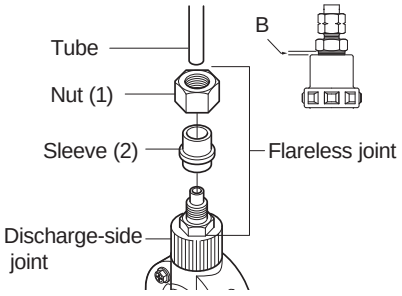
✻ Bear in mind that the joint may break if tightening nut (1) is tightened too much.



B-3. PA tube connection
Model: VTCET (boiler) type

(1) Pass the nut (1) and sleeve (2) over the tube, and insert the tube so that its end touches the back of the groove in the body.
(2) After manually tightening up the nut all the way, use a monkey wrench or spanner to secure the flareless joint, and tighten up the nut by two or so turns.

✻ Leave a gap (area "B" in the figure) of 2 mm or more between the discharge-side joint and the flareless joint.



✻ Take care not to tighten the nut too much.

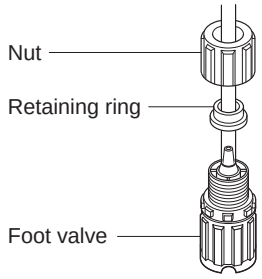
Connecting

Foot valve connection

The foot valve has a different shape depending on the material used for the liquid-end material of the pump.
First check the model of the pump to be used, and then refer to the applicable diagram below.
✻ A foot valve is not provided for the high-viscosity type and DCLPW□ series.

C-1. Hose connection
Model: VTCE/VTCF/6TCT/VTCET/ATCF type

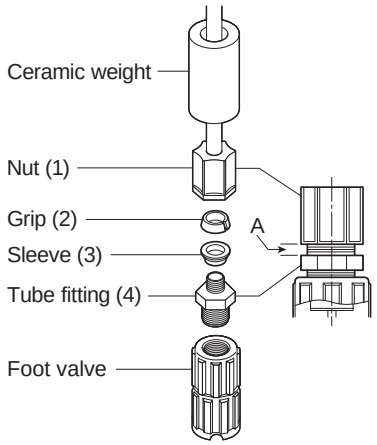
Insert the hose/tube firmly so that it will not become disconnected, and tighten the nuts securely. Do not excessively tighten the nuts. Doing so may damage or break the joint. Tighten up the nut appropriately after operation has started.



C-2. Tube connection
Model: FTCE/FTCF/FTCT type

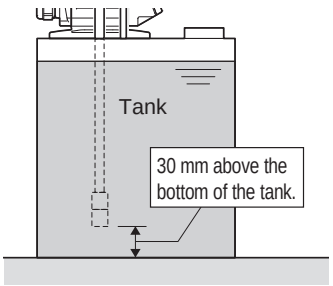
(1) Wrap sealing tape around the threaded part of the tube fitting.
(2) Pass the tube through the tightening nut (1), grip (2) and sleeve (3), and insert its end until it touches the back end of the tube-fitting body (4) on the inside.
(3) Tighten the tightening nut (1) by hand.
(4) Using the tool, tighten the tightening nut (1) in such a way that the gap (area “A” in the figure) between the tube-fitting body (4) and tightening nut (1) is approximately 1.5 mm.

✻ Bear in mind that the joint may break if tightening nut (1) is tightened too much.



IMPORTANT

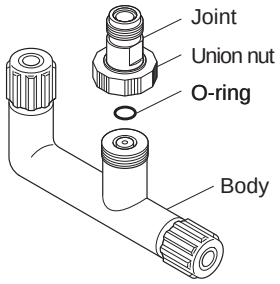
When installing the foot valve, cut the hose to the appropriate length so that the foot valve is positioned 30 mm above the bottom of the tank, and adjust its height.



Connecting

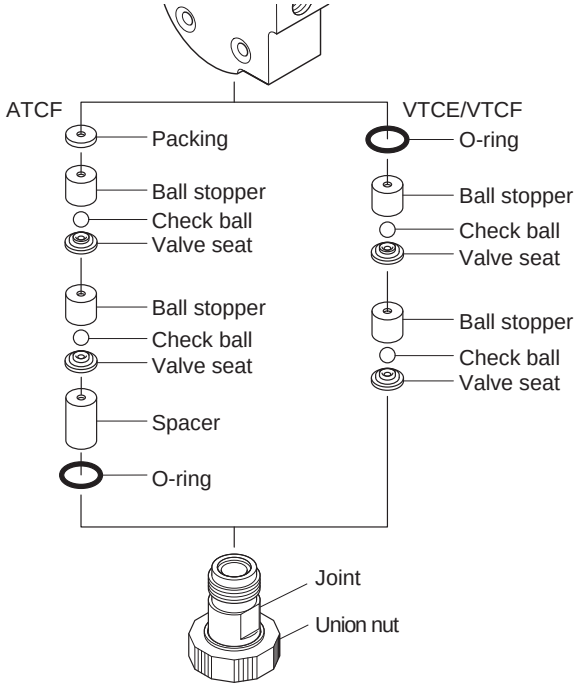
Degassing joint connection

(1) Loosen the union nut, and remove the joint and body.

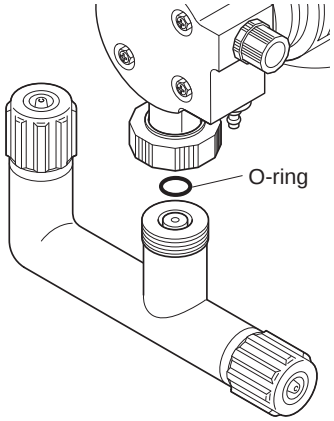


(2) Remove the suction side joint of the pump, and take out the valve seat sets.

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



(4) Install the union nut on the body.
Check that the O-ring is provided on the body, and tighten it up manually.

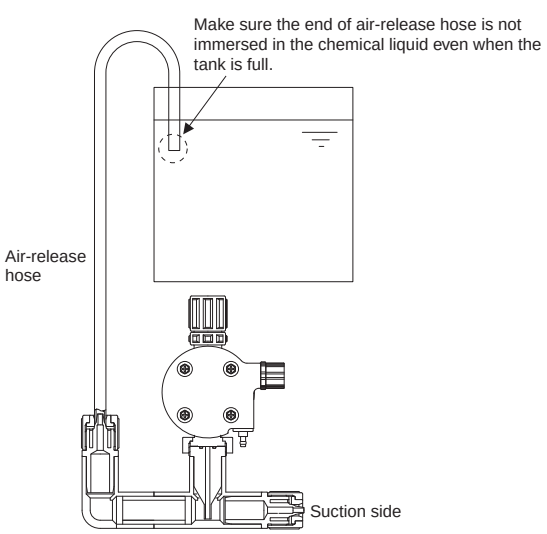


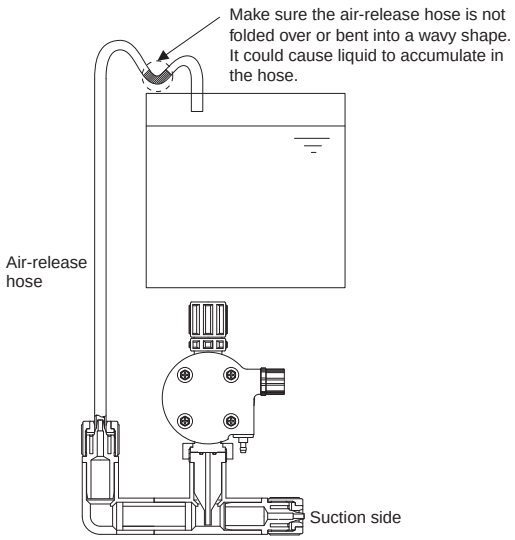
IMPORTANT

- **When connecting the degassing joint to the DCLPW□**
  The valve seat sets, joint and union nut are installed on the pump body before the pump is shipped. Before use, install the degassing joint using step (4) above as a reference.
- **When connecting the degassing joint to the PW□ or CLPW□**
  Remove the suction side joint, take out the valve seat sets, and install them on the pump following steps (1) to (4) in sequence.
  ✻ The hose joint, retaining ring, or hose nut of pump (suction side) are not used.

Example of unacceptable installation

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





Electrical wiring

WARNING

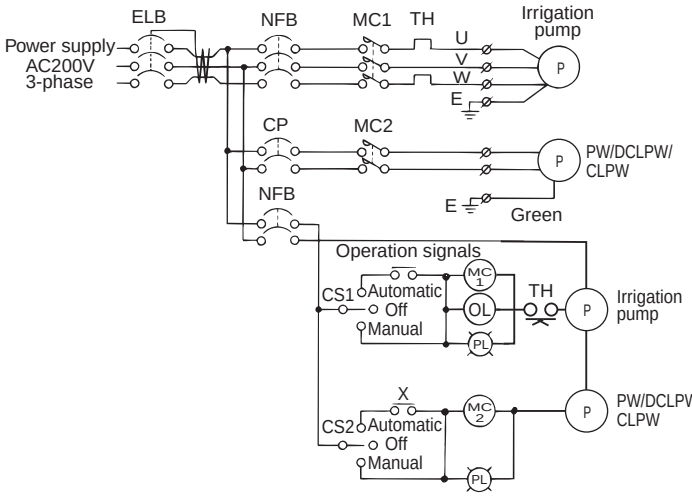
- **This pump cannot be used in explosion-proof regions or in explosive or combustible atmospheres.**
- **Take steps to ensure that the power will not be turned on during the course of work. Hang a sign on the power switch indicating that work is in progress.**
- **Do not operate the pump with wet hands. Doing so may result in electric shocks.**
- **Securely ground the protective earth terminal, and be absolutely sure to install a ground fault circuit interrupter. Otherwise, you may receive electric shocks.**
- **Do not attempt to disassemble the pump body or the circuit parts.**

CAUTION

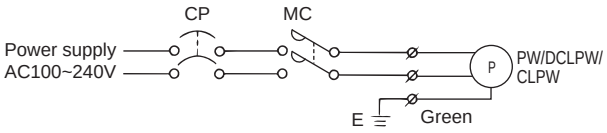
- **The wiring must be done by a qualified electrician or somebody with electrical knowledge.**
- **Connect the wires after checking the supply voltage. Do not connect the wires to a power supply that is not within the rated voltage range.**

Example of wiring

●When operating the pump in tandem with an irrigation pump, etc.



●When 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

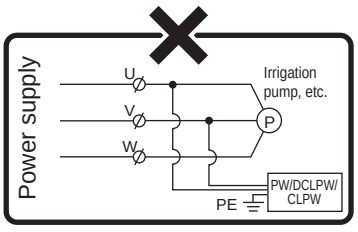
IMPORTANT

- **Be absolutely sure to use a commercial power source (the power supplied by an electric power company) for supplying the power.**

<Power sources that cannot be used>

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

- **Since a high voltage is generated when the power is cut off or in other such circumstances and this may result in trouble, do not take the power from the same terminals as the induction motor of an irrigation pump, etc.**



NOTE

- **When installing an overcurrent protection device for this 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 powerswitch, 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 that are operated continuously, but it is unsuitable for this solenoid-driven pump, which is operated non-continuously. In this case, the pump may not operate properly.**

Electrical wiring

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

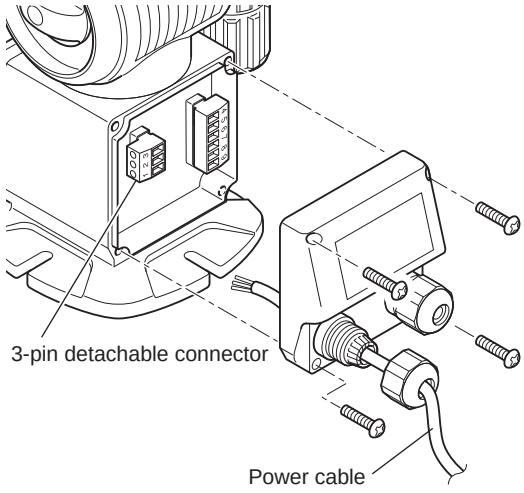
Connecting the power supply & protective earth

- A 3-pin detachable connector (including the protective earth) is used to connect to the AC power supply.
- Use a round tough rubber-sheathed cable (VCTF-3C or 4C) as the power cable.

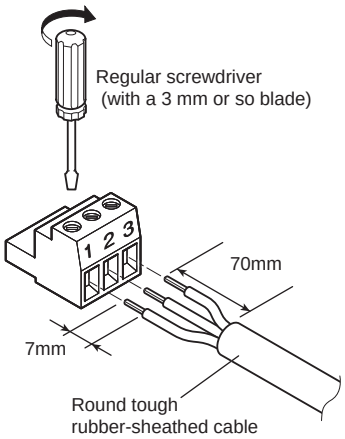
✻ With the VCTF-4C, cut one of the wires.

- When using a power cable other than accessories, use a power cable which has a cross sectional area of at least 2 mm^2 and an outside diameter of 5 to 10 mm.

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



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

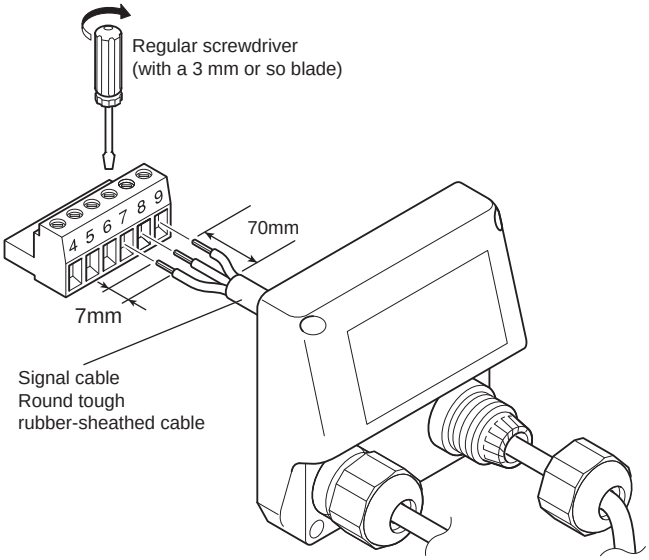


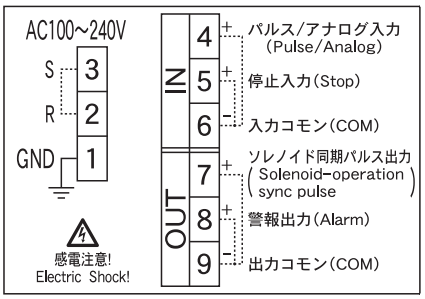
(5) After securing the conductors, pull them gently to check that they do not come free.
(6) Insert the connector back in its original position, and screw down the cover.

Connecting the signal cable

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

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





NOTE

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

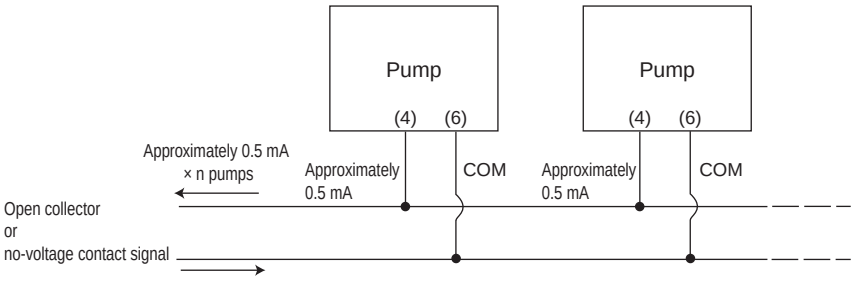
Electrical wiring

Signal cable distribution

■ When not using a signal distributor

●Pulse signal

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



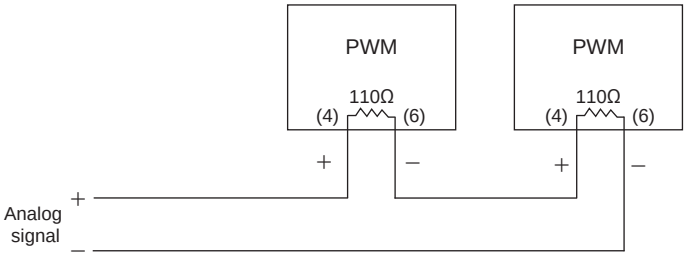
Model comparison table

	Pulse signal	Operation/Stop signal
PW	○	○
PWM	×	○
PWT	○*1	○

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

●Analog signal

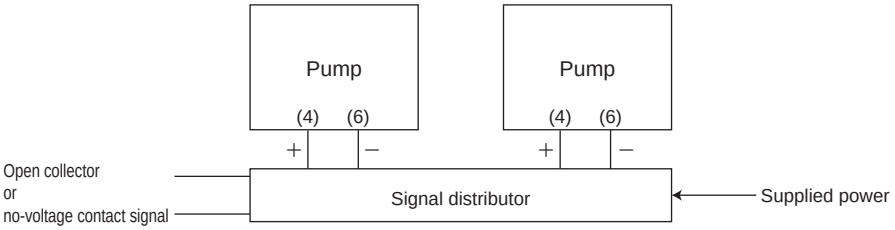
You can connect multiple instances of this pump in series and apply analog signals to the pumps.



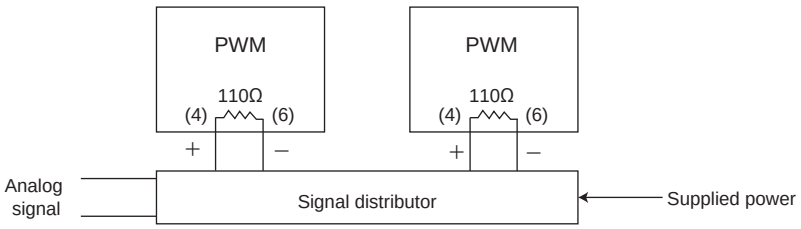
✻ If you remove a pump during maintenance or similar operations or if a pump is malfunctioning, the analog signal will be interrupted, and the other pumps will stop. If you want to ensure that these other pumps continue operating even in these situations, install a signal distributor.

■ When using a signal distributor

●Pulse signal



●Analog signal



Electrical wiring

External operation and stop input

The pump can be turned on and off using signals from an external device such as an interlock or level switch.
The pump runs or stops while (5) and (6) are shorted (no-voltage contacts) or while (5)+ and (6)- (open collector) are input.
To set the operation to be performed when the external operation and stop input signals are received, refer to the settings list on page 32.

✻ The displayed settings blink while the pump is stopped by the stop input signal.
✻ If STOP has been selected, the pump will stop operating when the signal is input regardless of the setting.
✻ Even if OPERATION has been selected, the pump will not operate unless the external operation signal has been input.

Signal input

● About signal input (SIGNAL IN) terminals

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

b) Input of open collector (drain) signal to a pulse input-type model
The electric current direction of the contact points of semiconductor devices (such as open collector and open drain devices) is fixed due to the characteristics of these devices. Connect the collector (drain) to terminal number (4) and the emitter (source) to number (6).

c) Input of electric current signal to an analog input-type model
Connect the signal wires (DC4 to 20mA) to terminal number (4) to use it as the positive terminal and to number (6) to use it as the negative terminal.

● For details about signal specifications, see page 52.

Recommended protection devices

(1) Circuit protectors
(Protects the main power supply in the event of the pump problem)

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

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

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

(3) Line filters, sealed transformers

Manufacturer	Type
TDK	RSHN-2003

Operating precautions

WARNING

- **Ensure that nobody other than the operators and control personnel will operate the pump.**
- **Do not operate the pump with wet hands. Doing so may result in electric shocks.**
- **When trouble has occurred (such as when smoke appears or there is a smell of burning), shut down the pump's operation immediately, and contact your vender or a TACMINA representative. Otherwise, a fire, electric shocks and/or malfunctions may result.**
- **A situation in which the valve inside the pipe at the discharge side of the pump is shut off or becomes blocked with foreign matter is dangerous in that it may lead to an excessive rise in pressure that will exceed the pump's specification range, causing liquid to gush out, 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 protective gear suited to the chemical concerned (such as rubber gloves, a mask, protective goggles and work overalls that are resistant to chemical).**
- **The vibration of the pump may cause the hoses/tubes to become loose and disconnected. Before starting operation, secure the hoses/tubes and check their tightness.**
- **While the pump is operating, the pump's surfaces may become hot, reaching a temperature of 60°C or more.**
- **Idling the pump for prolonged periods of time can lead to malfunctions.**
- **When diluting sodium hypochlorite, use pure water or water processed with a water softener. Otherwise the pump may malfunction or discharge trouble may result.**

Check the following points.

Before operation

Check location	Details of check	Notes
Tank	Check whether the amount of liquid is sufficient. If it is not, replenish it.	Take special care in cases where the chemicals or processes involved would be adversely affected if air were sucked in.
Pipes	Check whether any pipes have become disconnected or damaged. If so, re-connect or make repairs.	–
Valves	Check that the valves are open. If a valve is closed, open it.	Closed valves can cause dangerous situations in which the pressure rises excessively, liquid gushes out and/or the pipes are damaged.
Power supply	Check that the pump is connected properly to the prescribed power supply.	If it is not, the electronic circuits and solenoids may burn out.

During operation

Check location	Details of check	Notes
Pump head	Check whether any liquid is leaking from the hole underneath the auxiliary ring at the back of the pump head.	If liquid is leaking, it may mean that the diaphragm is damaged. Inspect the diaphragm.
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 concerned.
Discharge-side pressure	Check the pressure gauge on the discharge side.	If the gauge shows an abnormal value, a pipe or valve may be blocked. Inspect the pipes.

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

→ **Air releasing & calibration (page 22 to 26)**

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

→ **Calibration (page 26)**

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

→ **Discharge-volume setting (page 21) Pump control function setting (page 28 to 31)**

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

→ **Procedure for prolonged shutdown of operation (page 26)**

Discharge-volume setting

This product can be controlled using the three methods described below.
(1) Setting the discharge capacity by manual operation
(2) Setting the discharge capacity using the stroke length
(3) Controlling operation using signal input

Methods (1) and (2) are described here.
✻ For method (3), refer to the control functions on page 28.

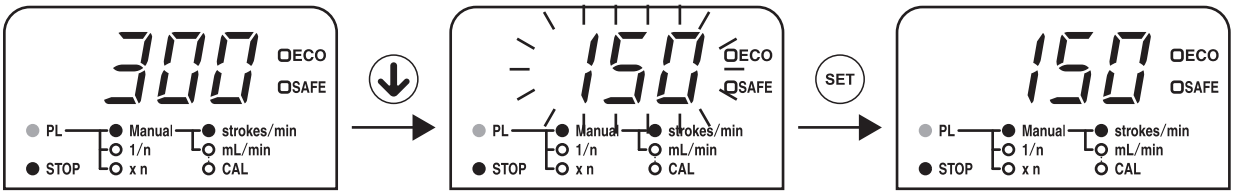
Setting the discharge capacity by manual operation

■ Stroke number setting mode

The discharge capacity can be set by increasing or reducing the number of strokes.
In the manual mode, the number of strokes can be changed using the [↑] and [↓] keys on the control panel.
After changing the setting, press the SET key to enter the change.

Setting range: 1 ~ 300strokes/min

Example of setting: Changing the number of strokes per minute from 300 to 150 for the PW-30



Discharge capacity: 30 ml/min. | Number of strokes changed to 150 | Discharge capacity: 15ml/min

■ Discharge capacity setting mode (PW, DCLPW and CLPW only)

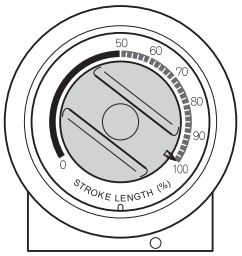
When the control type is PW, the discharge capacity can be set directly.
Proceed with calibration before use in order to ensure that the precise discharge capacity is obtained.
For details on calibration, refer to Setting flow at the end of this manual.

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

Setting the discharge capacity using the stroke length

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

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



Adjustable range of stroke length: 50 to 100%

⚠ CAUTION

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

IMPORTANT

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

Air releasing

⚠ WARNING

- **During the air releasing, chemical may suddenly gush out from the pipes and other parts. Lead the end of the relief/air-release hose bank to the tank or other container, and secure it so that it will not become disconnected.**

IMPORTANT

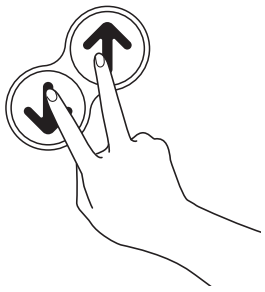
- **When using the pump for the first time or when the chemical container has been replaced, proceed with the task of air releasing prior to operating the pump.**

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

Model	Relief valve function	Liquid-end material	Air-release method	page
Model for injection of general chemicals	w/ relief valve	VTCE/VTCF	A	23
		FTCE/FTCF/FTCT		
	w/o relief valve	VTCE/VTCF (30/60/100)	B	24
		VTCE/VTC (200)	C	25
		FTCE/FTCF/FTCT	B	24
		6TCT	D	25
Model for injection of high-viscosity chemicals	w/o relief valve	VTCF	E	25
Model for injection of boiler chemicals	w/ relief valve	VTCET	A	23
	w/o relief valve	VTCET	B	24
Model for injection of high-pressure	w/o relief valve	VTCET	B	24
Model for injection of sodium hypochlorite	w/ relief valve	ATCF	A	23
	w/o relief valve	ATCF	B	24

NOTE

When the [↑] and [↓] keys are pressed simultaneously during a pump operation, the pump operates at the maximum number of strokes while the keys are held down. The air can be released speedily for all models except the 6TCT and high-viscosity types.



When the liquid is not discharged even after air releasing

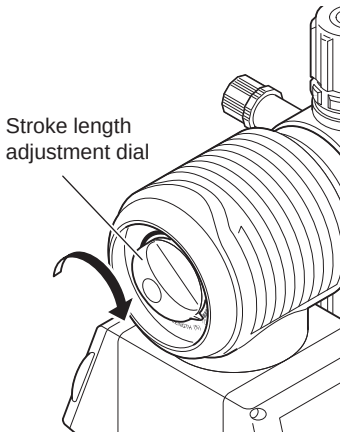
This may mean that the valve seat area (an area sealed by the check ball) on the discharge side or suction side is clogged with foreign matter. Turn off the pump's power, remove the joints, and wash the check balls and valve seats. While taking care not to mistake the discharge side parts for the suction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

Air releasing

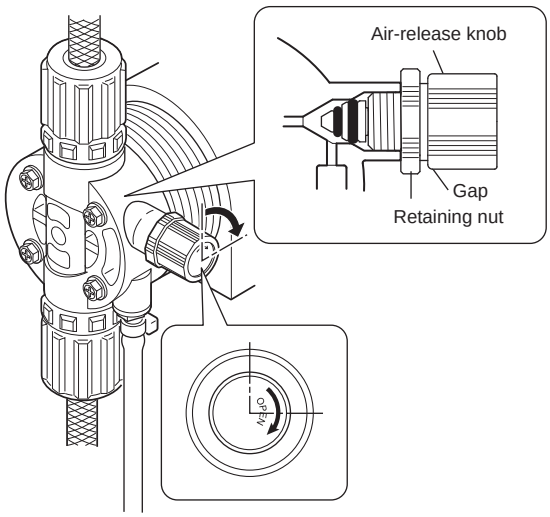
Air-release method A

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

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



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



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

IMPORTANT

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

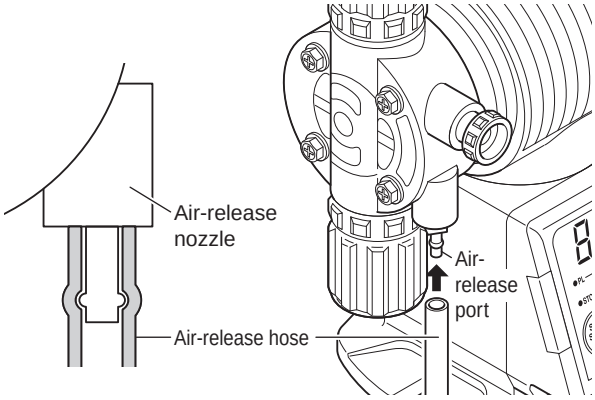
NOTE

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

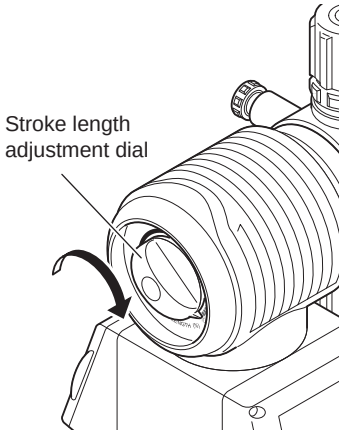
Air releasing

Air-release method B

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

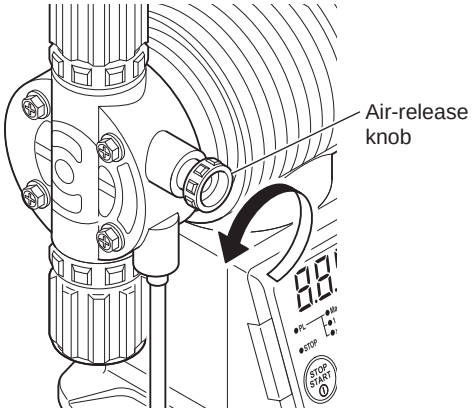


(2) Turn off the pump's power, and release the pressure inside the discharge-side pipe.
(3) Set the stroke-length adjustment dial to the 100% marking on the scale.



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

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



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

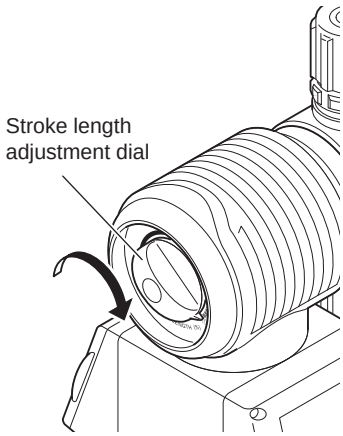
While this is happening, chemical liquid will emerge from the air-release port so tighten the air-release knob.
✻ If the air is not readily released, repeatedly open and close the air-release knob.

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

Air releasing

Air-release method C

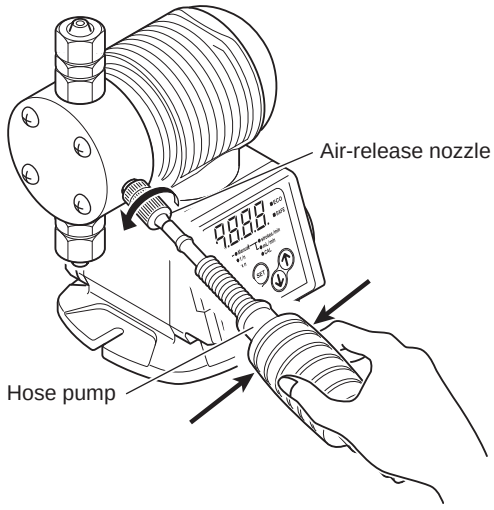
(1) Turn off the pump's power, and release the pressure inside the discharge-side pipe.
(2) Set the stroke-length adjustment dial to the 100% marking on the scale.



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

Air-release method D

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



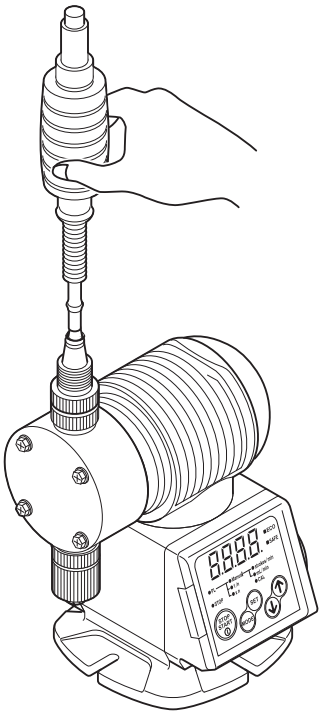
(4) Close the air-release nozzle by turning it clockwise.

IMPORTANT

- **If the air-release nozzle is loosened too much, it will fall off, damaging the packing. Take care not to loosen the nozzle too much.**

Air-release method E

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



Calibration

About calibration

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

✻ For details on the operation procedure for calibration, refer to the setting flow at the end of this manual.

Procedure for prolonged shutdown of operation

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

To shut down the pump

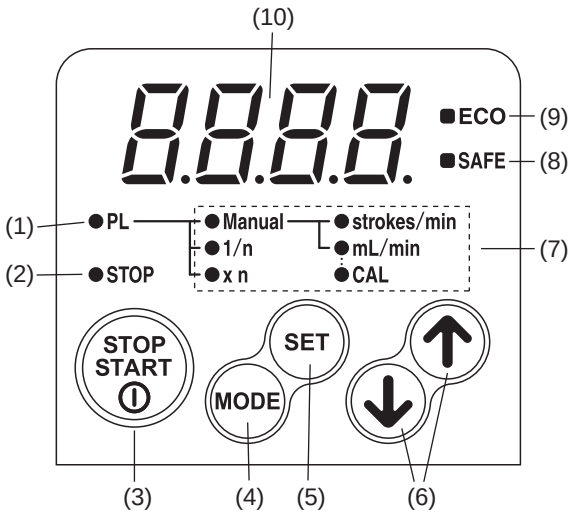
(1) Operate the pump so that clean water is sucked in and discharged for about 30 minutes to clean the inside of the pump head.
(2) Turn off the power completely with the inside of the pump head full of clean water.
(3) Place the cover over the pump to protect the pump from the build-up of dust and corrosive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

To resume operation

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

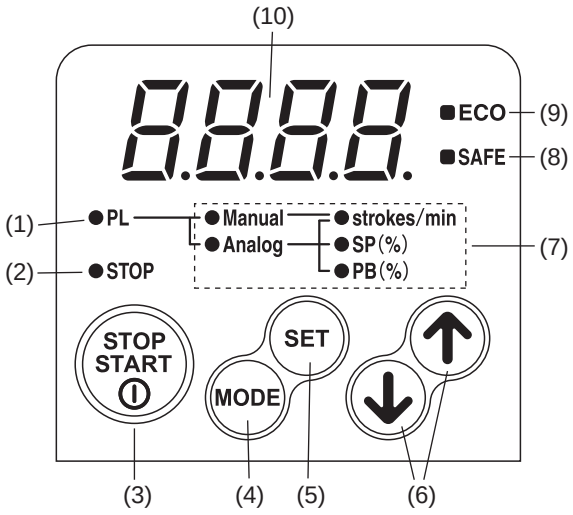
Control panel

■ PW series: Standard (pulse-input) type



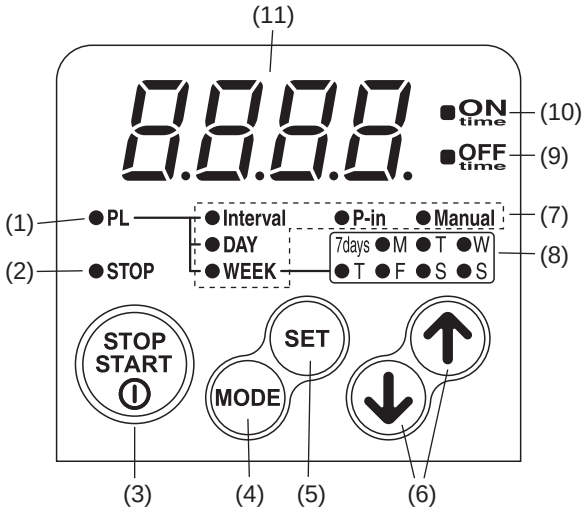
No.	Name	Function
(1)	PL LAMP	• This lights while power is supplied. • During operation, it blinks at the timing of the pump's operation.
(2)	STOP LAMP	This lights while the pump is shut down.
(3)	STOP/START KEY	This is used to start or stop operation.
(4)	MODE KEY	This is used to switch the operation mode.
(5)	SET KEY	• This is used to enter what has been set. • It is used to transfer from the mode display screen to the setting screens.
(6)	↑ ↓ KEY	These are used to change the setting values.
(7)	Mode display	The lamp alongside the now operating or now set mode lights.
(8)	SAFE mode display	This lights when the SAFE mode setting is ON.
(9)	ECO LAMP	This lights during operation that involves minimal power consumption. ✻ This lights regardless of the ECO mode setting.
(10)	DISPLAY	The setting values are displayed here.

■ PWM series: Analog-input type



No.	Name	Function
(1)	PL LAMP	• This lights while power is supplied. • During operation, it blinks at the timing of the pump's operation.
(2)	STOP LAMP	This lights while the pump is shut down.
(3)	STOP/START KEY	This is used to start or stop operation.
(4)	MODE KEY	This is used to switch the operation mode.
(5)	SET KEY	• This is used to enter what has been set. • It is used to transfer from the mode display screen to the setting screens.
(6)	↑ ↓ KEY	These are used to change the setting values.
(7)	Mode display	The lamp alongside the now operating or now set mode lights.
(8)	SAFE mode display	This lights when the SAFE mode setting is ON.
(9)	ECO LAMP	This lights during operation that involves minimal power consumption. ✻ This lights regardless of the ECO mode setting.
(10)	DISPLAY	The setting values are displayed here.

■ PWT series: Timer type



No.	Name	Function
(1)	PL LAMP	• This lights while power is supplied. • During operation, it blinks at the timing of the pump's operation.
(2)	STOP LAMP	This lights while the pump is shut down.
(3)	STOP/START KEY	This is used to start or stop operation.
(4)	MODE KEY	This is used to switch the operation mode.
(5)	SET KEY	• This is used to enter what has been set. • It is used to transfer from the mode display screen to the setting screens.
(6)	↑ ↓ KEY	These are used to change the setting values.
(7)	Mode display	The lamp alongside the now operating or now set mode lights.
(8)	Day of the week display	The lamp of the current day of the week lights while the current time is displayed or while the WEEK mode is established.
(9)	OFF time lamp	• This lights while the OFF period/time is being set. • It lights when OFF is set in the timer mode.
(10)	ON time lamp	• This lights while the ON period/time is being set. • It lights when ON is set in the timer mode.
(11)	DISPLAY	The setting values are displayed here.

Pump control functions

Function correspondence table

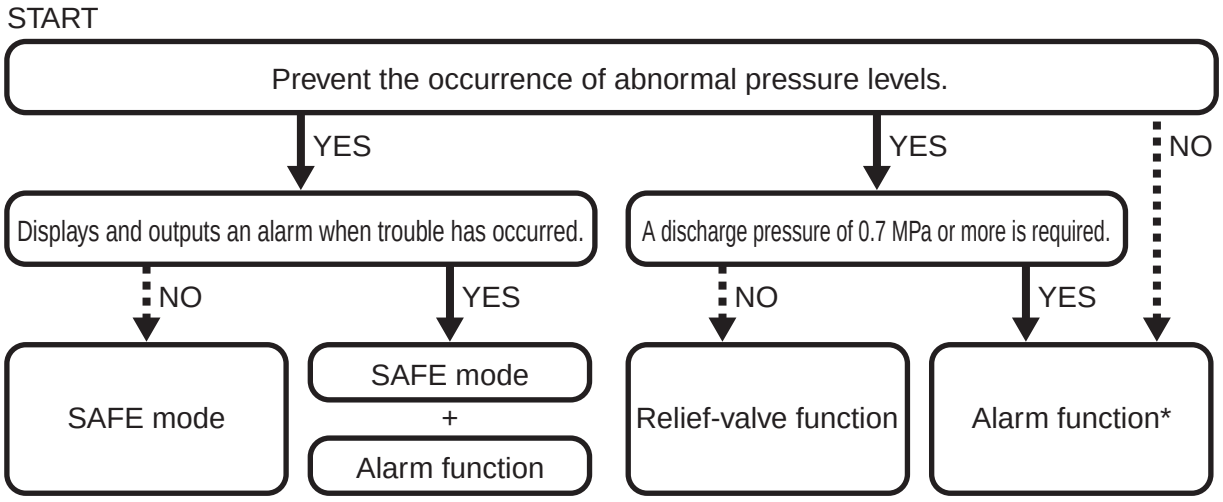
Series	PW/PWM/PWT							DCLPW/DCLPWM/DCLPWT CLPW/CLPWM/CLPWT	
Model	General chemical injection			High-viscosity	Boiler		High-pressure	Sodium hypochlorite	
	30R/60R/100R	30/60/100	200	60/100	30R	30	30	30R/60R/100R	30/60/100
Relief-valve function	●	-	-	-	●	-	-	●	-
SAFE mode	●	●	×	●	×	×	×	●	●
Alarm function	●	●	●	●	●	●	●	●	●
ECO mode	●	●	×	●	●	●	●	×	×

✻ × indicates that the function concerned should not be set although it can be set.

CAUTION

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

Safety function selection flow



* Displayed and output during blocked operation.

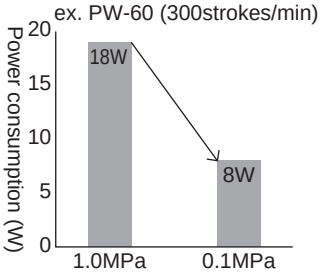
SAFE mode

When the SAFE mode is enabled, the force of the pumped chemical liquid is controlled during a blocked operation to prevent the pressure from rising.
It is recommended that the SAFE mode be set when using only the pressure of the anti-siphonal check valve or at other times when the pump is used at a low pressure.
If the “P-03 Blocked operation” parameter is enabled when the SAFE mode is enabled, an alarm is displayed and output at a pressure level that is lower than normal.

ECO mode

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

✻ When the ECO mode is enabled for the DCLPW☐ or CLPW☐, it becomes harder to vent the air so use ‘disabled’ as the ECO mode setting.



Pump control functions

Manual mode

● Basic operation

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

Stroke number setting mode

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

Discharge capacity setting mode (PW only)

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

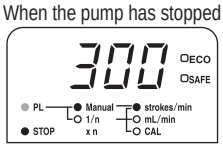
● Purposes of operation

The manual mode is used for the following purposes:

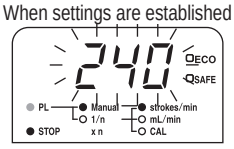
- Routine operations
- Test operations such as when the pump is installed
- Provisional operations such as when trouble occurs (no signals input) during automatic operation

● Display

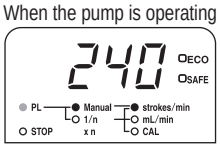
When the pump has stopped



When settings are established



When the pump is operating



● External operation and stop input signals

Although there is basically no need in the manual mode to input signals from an external source, the pump can be operated and stopped using the operation and stop signals (continuous signals) from an external source.

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

Pulse input-based proportional control

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

● Purposes of operation

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

✻ Use the stroke length in the range of 50% to 100%.

● Operation control signal

No-voltage contact or open collector signal

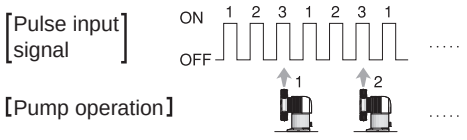
■ Pulse frequency-division mode

● Basic operation

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

'n' setting range: 1 to 999

Setting example: n=3



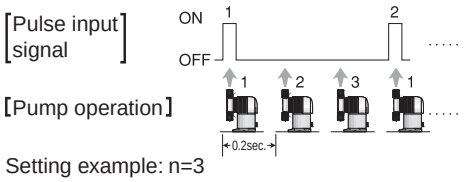
■ Pulse frequency-magnification mode

● Basic operation

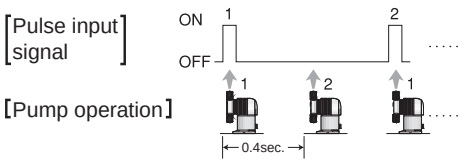
The pump is activated 'n' number of times in response to each pulse that has been input from the external source. It operates at the stroke interval of the set number of strokes.

'n' setting range: 1 to 999

Setting example: n=3



Setting example: n=3
Number of strokes:150strokes/min



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

Pump control functions

Timer control

● Interval mode

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

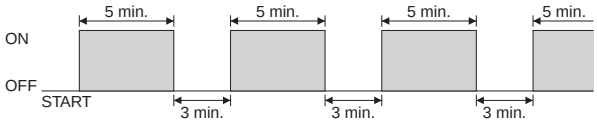
Number of programs that can be set: 1 pattern each for ON period and OFF period

Periods that can be set: 1 to 9999 minutes

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

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

Setting examples: ON period = 5 minutes
OFF period = 3 minutes



● DAY mode

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

Number of programs that can be set: 9 patterns

Times that can be set: ON time = 0.00 to 23:59
OFF time = (after ON time) up to 24:00

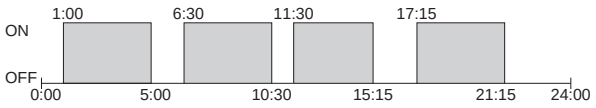
✻ The same time cannot be set for the ON time and OFF time.

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

✻ The DAY mode cannot be used together with the WEEK mode.

Setting example

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



● WEEK mode

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

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

Times that can be set: ON time = 0.00 to 23:59
OFF time = (after ON time) up to 48:00

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

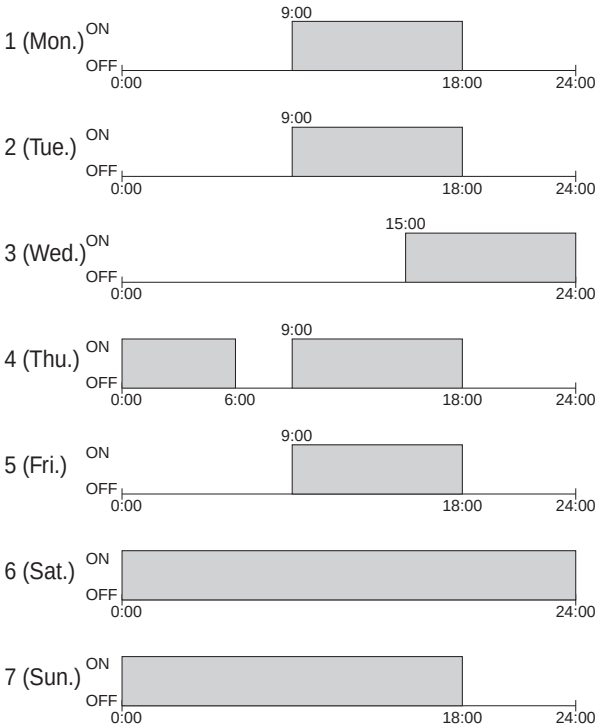
✻ Whether to use interval operation and pulse input-based proportional control can be selected.

✻ The WEEK mode cannot be used together with the DAY mode.

Program setting example

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

Pump operation



NOTE

- **DAY mode or WEEK mode + interval operation**
  The pump repeats the interval operation within the ON period in each mode. The values set in each program serve as the number of strokes.
- **DAY mode or WEEK mode + pulse input-based proportional control**
  The pump operates at the pulse frequency-division or frequency-magnification that was set within the ON period in each mode.
- **DAY mode or WEEK mode + interval operation + pulse input-based proportional control**
  The pump operates at the pulse frequency division or frequency-magnification set when the interval operation is ON within the ON period in each mode.
- **External operation and stop input signal control**
  The timer modes can be used together with external operation and stop input signal control.

Pump control functions

Analog input-based proportional control

● **Basic operation**

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

● **Purposes of operation**

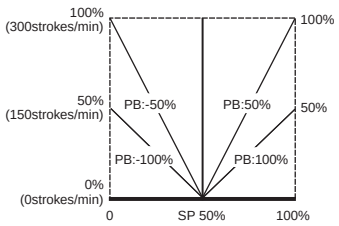
Analog proportional control is used for proportional injection and other uses.

● **Operation control signals**

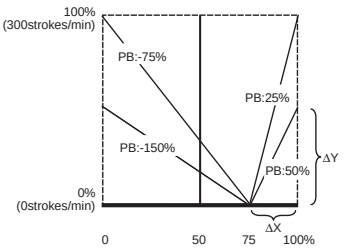
DC 4 to 20 mA

● **Set point (SP)**

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



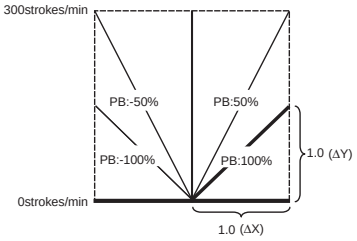
When the proportional band (straight line gradient) and set



● **Proportional band (PB)**

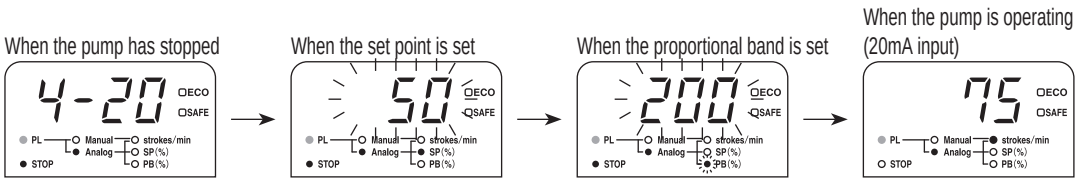
For the proportional band (PB), the reciprocal of the straight line gradient is set.

ex.
When the proportional band (PB) is 100%



proportional band (PB)= (ΔX / ΔY) × 100
= (25 / 50) × 100 = 50%

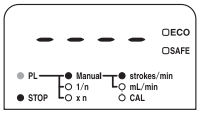
● **Display**

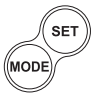


Keylock

The key can be locked to prevent operations from being performed by mistake.

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





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

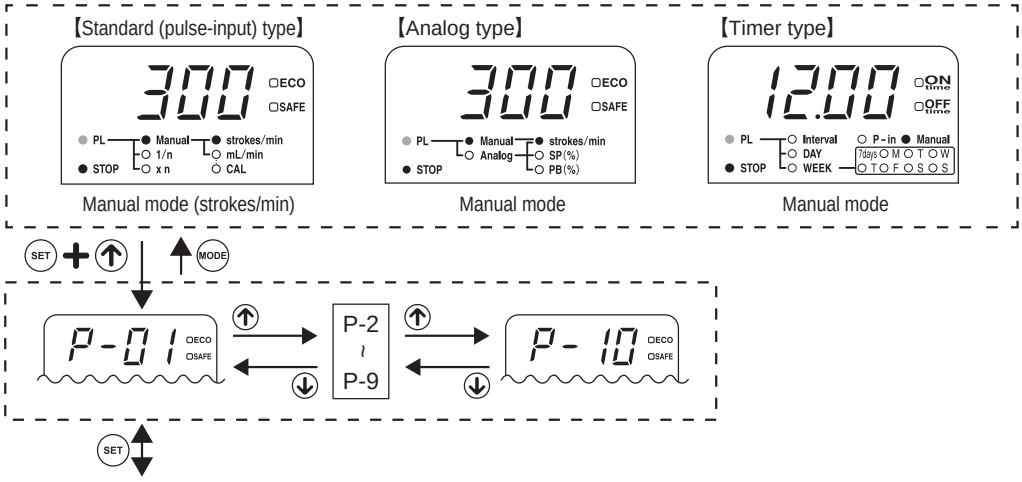
NOTE

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

Parameter settings

Setting flow

✻ For details on how to change the operation mode, refer to the setting flow at the end of this manual.



Parameter settings screen

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

List of parameters

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

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

*1 Refer to the alarm codes.

Maintenance precautions

WARNING

- **Ensure that nobody other than the operators and control personnel will operate the pump.**
- **Take steps to 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.**
- **When trouble has occurred (such as when smoke appears or there is a smell of burning), shut down the pump's operation immediately, and contact your vender or a TACMINA 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 protective gear suited to the chemical concerned (such as rubber gloves, a mask, protective goggles and work overalls that are resistant to chemical).**
- **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.**

Check the following points.

Routine inspections

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

Periodic inspections

- At the 10,000-hour mark after starting the pump operation → **Replacing the consumables (see the page 57 to 59)**

When trouble has occurred

- When the relief-valve function has been activated → **Replacing the relief valve (see the page 34)**
- When trouble has occurred during operation → **Troubleshooting (see the page 44 to 46)**

Maintenance precautions

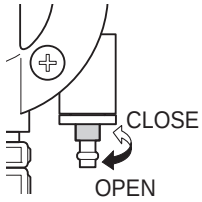
■ Replacing the relief valve

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

- Immediately stop the pump, remove the cause of the trouble and take steps to prevent recurrence.
- The relief valve is a consumable part so replace it once it has been triggered.

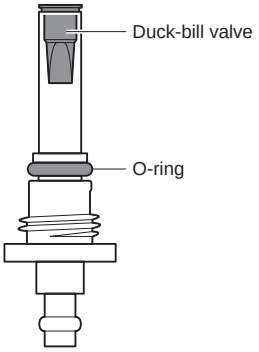
■ Replacing the air-release nozzle

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



NOTE

- **The duckbill valve can sometimes come out from the air-release nozzle. Be careful not to lose the duckbill valve when handling it.**
  ✻ The duck bill valve is not provided for the air-release nozzle of FTCE/FTCF/FTCT types.

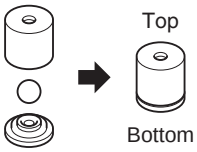


■ When replacing the valve seat area or diaphragm

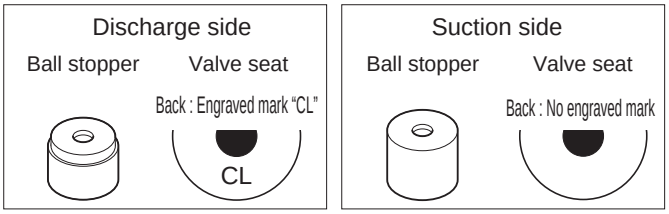
- Install the O-ring, ball stopper and check ball while ensuring that they are oriented in the correct directions.
- When removing the top and bottom joints and then re-assembling them, check that the top joint is not mistaken for the bottom joint and vice-versa.
- Check that the O-ring and check ball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

IMPORTANT

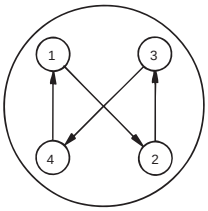
- **When re-assembling the valve seat set in the pump head, check that it is not installed upside-down.**



- **If, with the DCLPW□ or CLPW□, the discharge side and suction side valve seats are installed in reverse, the pump's performance will be reduced. Refer to the figure on the right, and assemble these seats correctly.**



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



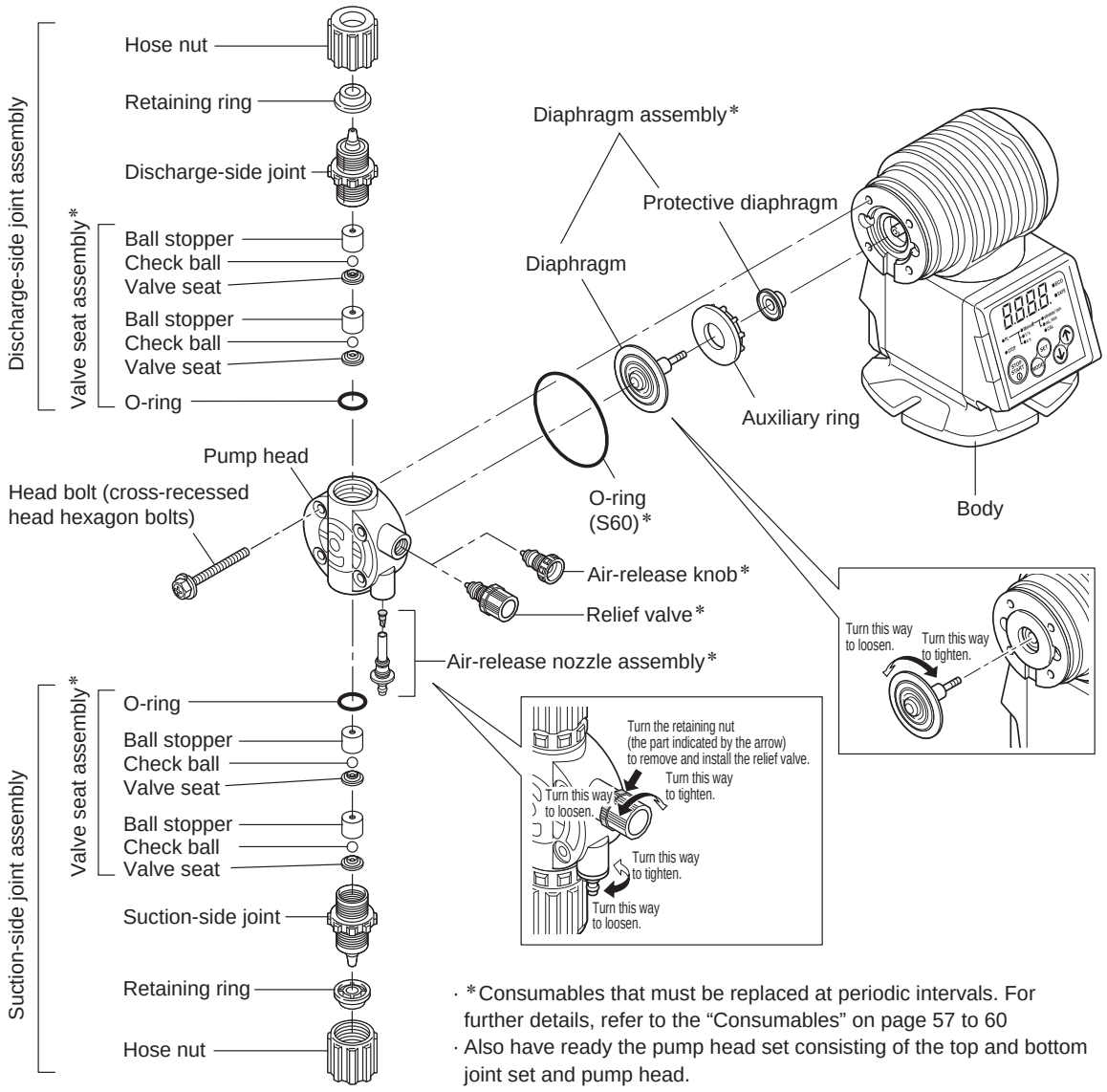
- **When attaching the diaphragm, turn it in the clockwise direction until it stiffens. If the diaphragm is loose, it will come in contact with the pump head, which may cause malfunctions and damage.**

Exploded views of liquid-end parts and external dimension

General chemical injection type

Series: PW/PWM/PWT Model: 30R/30/60R/60/100R/100 Liquid-end material: VTCE/VTCF

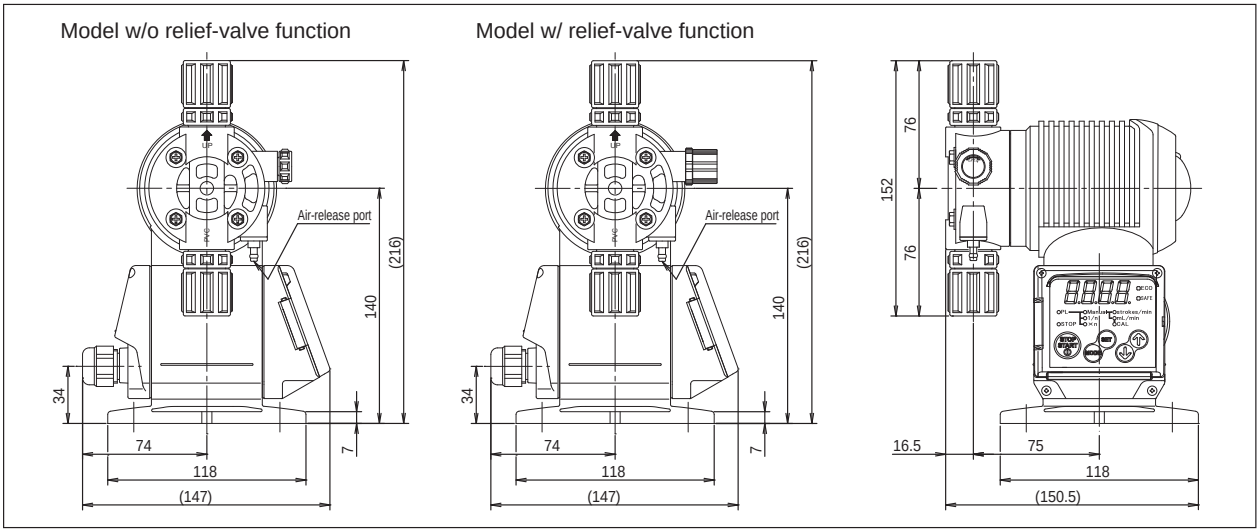
■ **Exploded views of liquid-end parts**



· *Consumables that must be replaced at periodic intervals. For further details, refer to the “Consumables” on page 57 to 60

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

■ **External dimension**

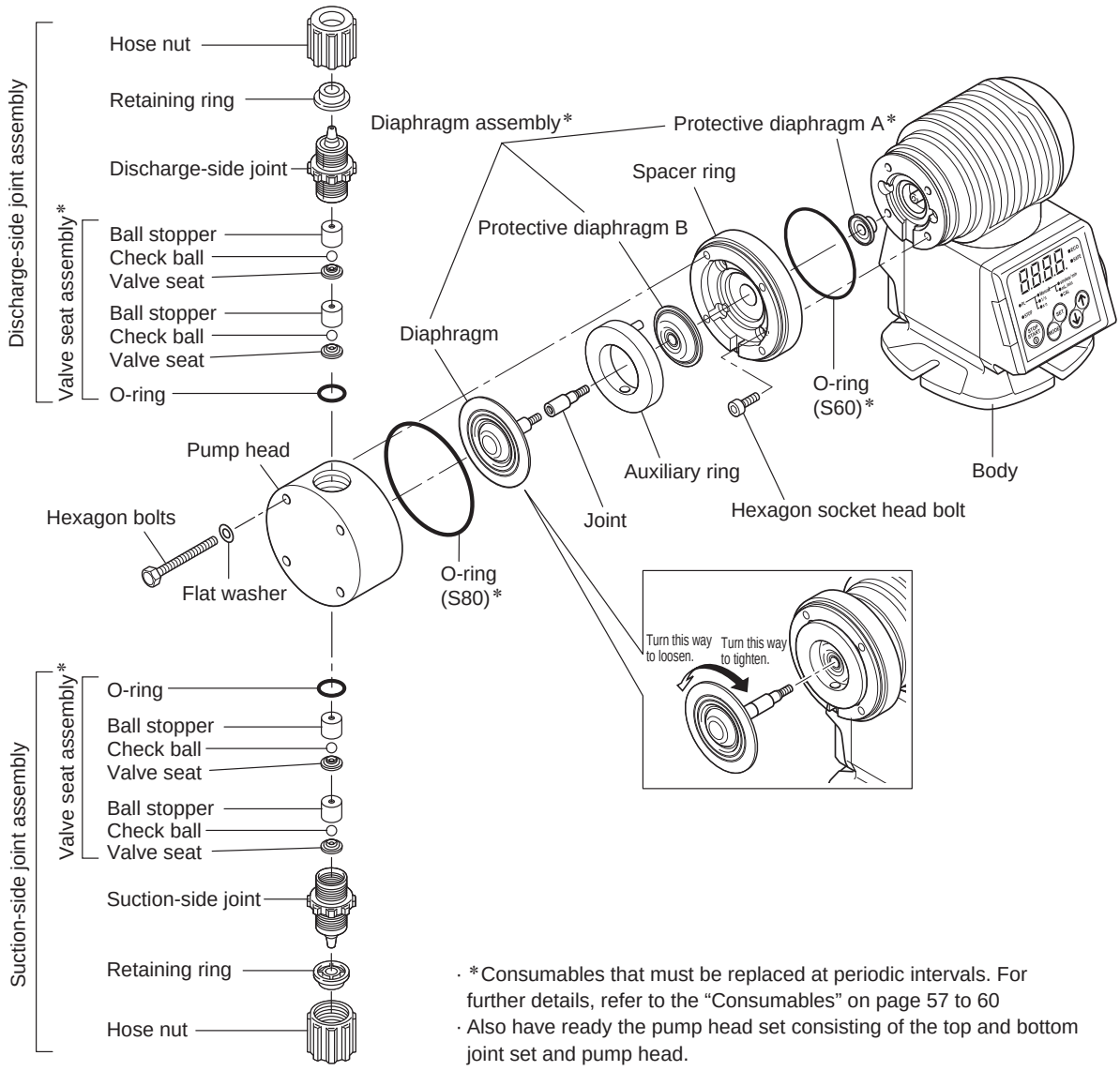


Exploded views of liquid-end parts and external dimension

General chemical injection type

Series: PW/PWM/PWT Model: 200 Liquid-end material: VTCE/VTCF

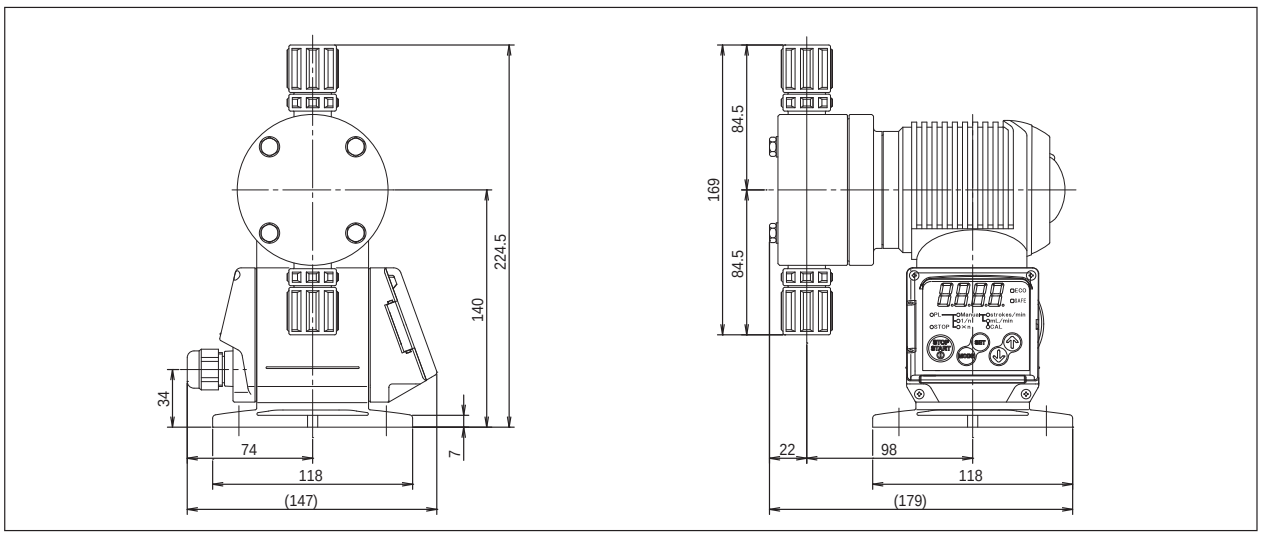
■ **Exploded views of liquid-end parts**



· *Consumables that must be replaced at periodic intervals. For further details, refer to the “Consumables” on page 57 to 60

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

■ **External dimension**

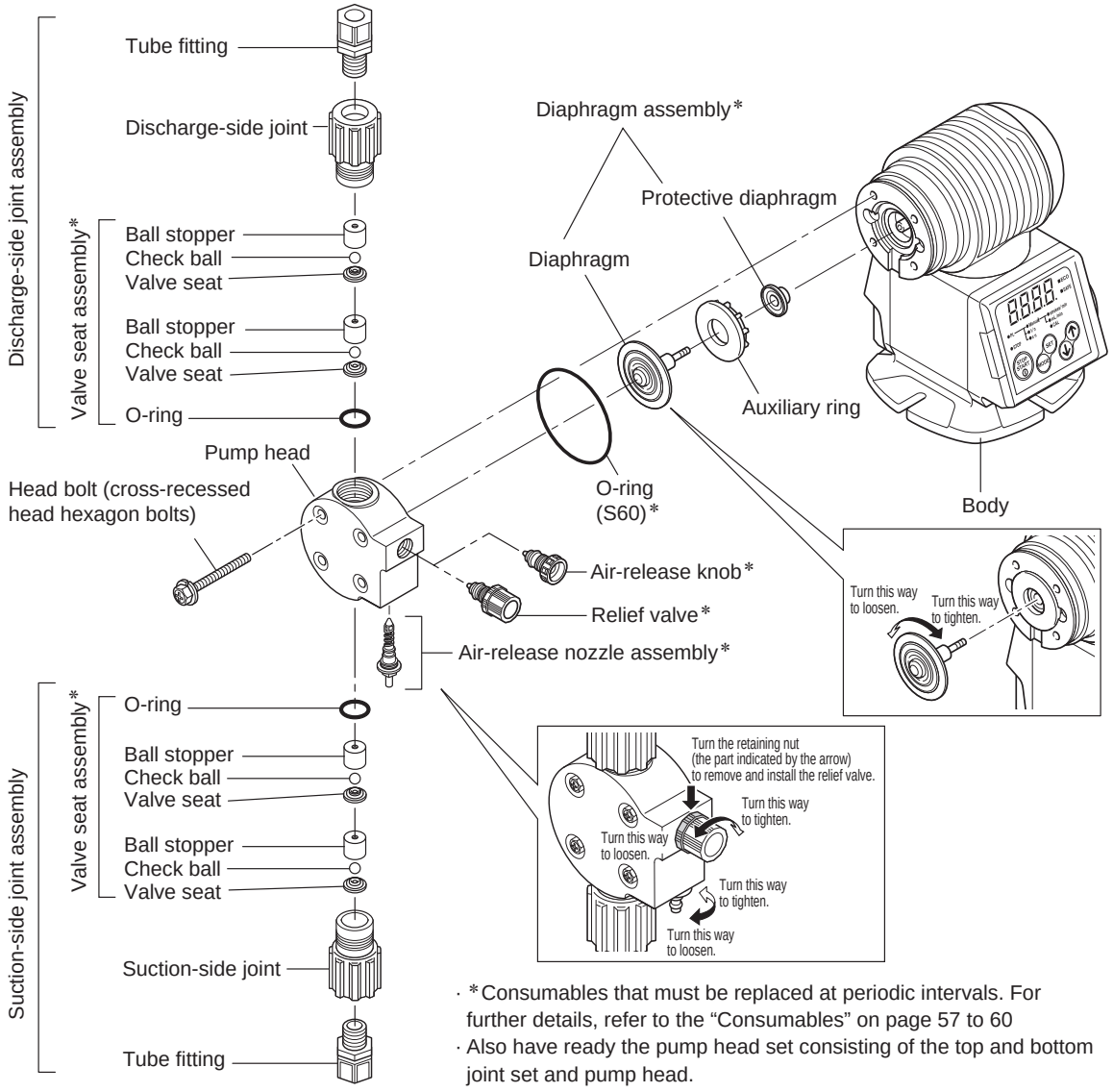


Exploded views of liquid-end parts and external dimension

General chemical injection type

Series: PW/PWM/PWT Model: 30R/30/60R/60/100R/100 Liquid-end material: FTCE/FTCF/FTCT

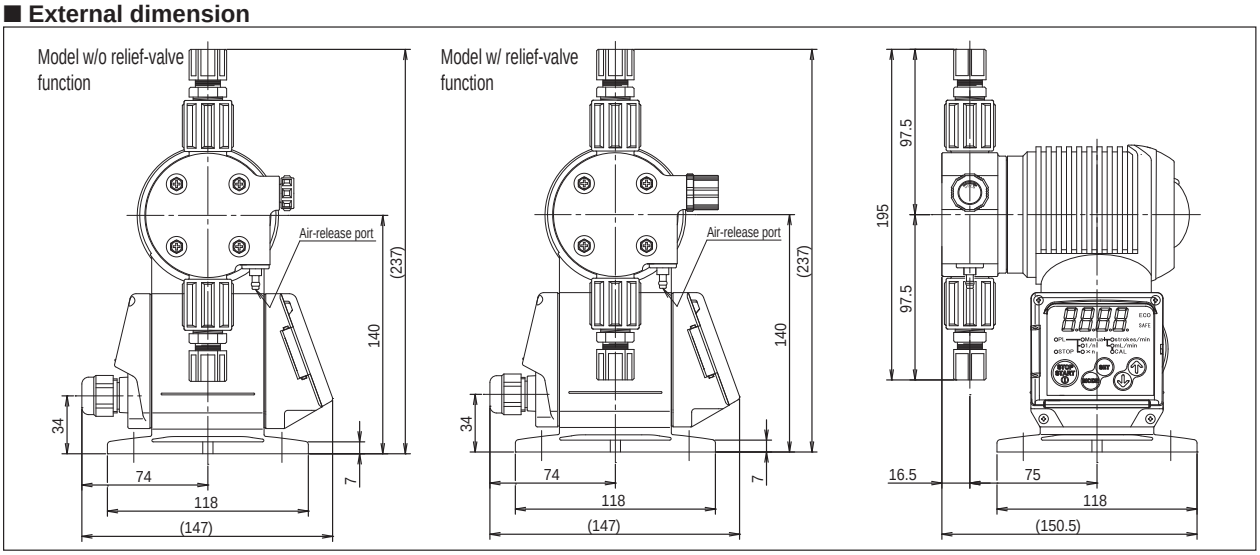
■ **Exploded views of liquid-end parts**



· *Consumables that must be replaced at periodic intervals. For further details, refer to the “Consumables” on page 57 to 60

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

■ **External dimension**

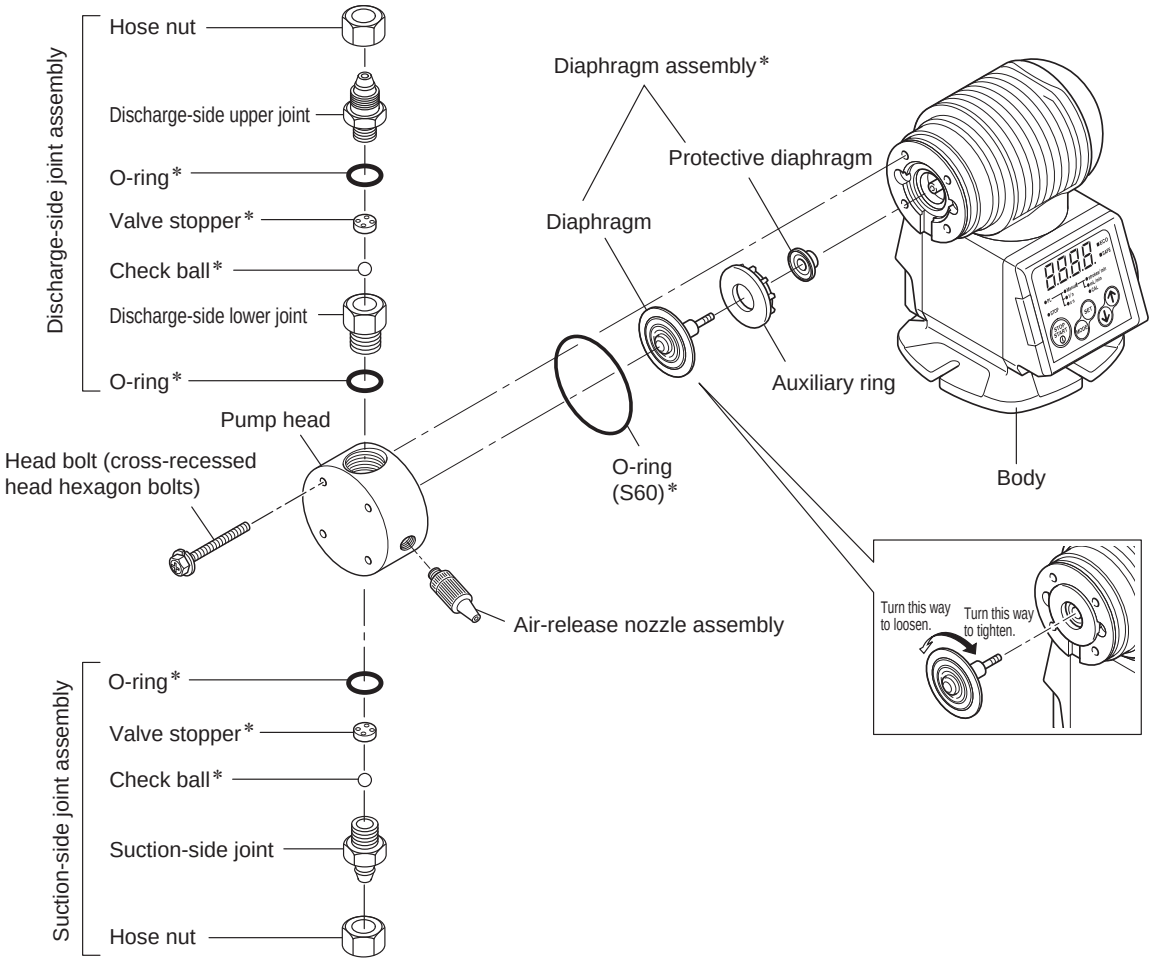


Exploded views of liquid-end parts and external dimension

General chemical injection type

Series: PW/PWM/PWT Model: 30/60/100 Liquid-end material: 6TCT

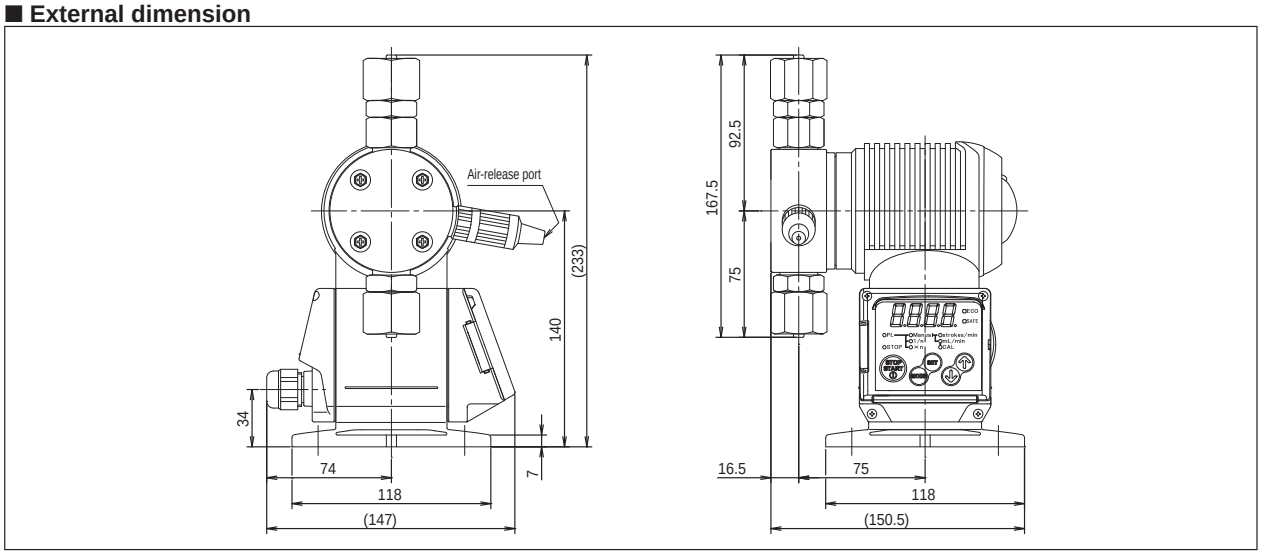
■ Exploded views of liquid-end parts



· *Consumables that must be replaced at periodic intervals. For further details, refer to the “Consumables” on page 58 to 60

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

■ External dimension



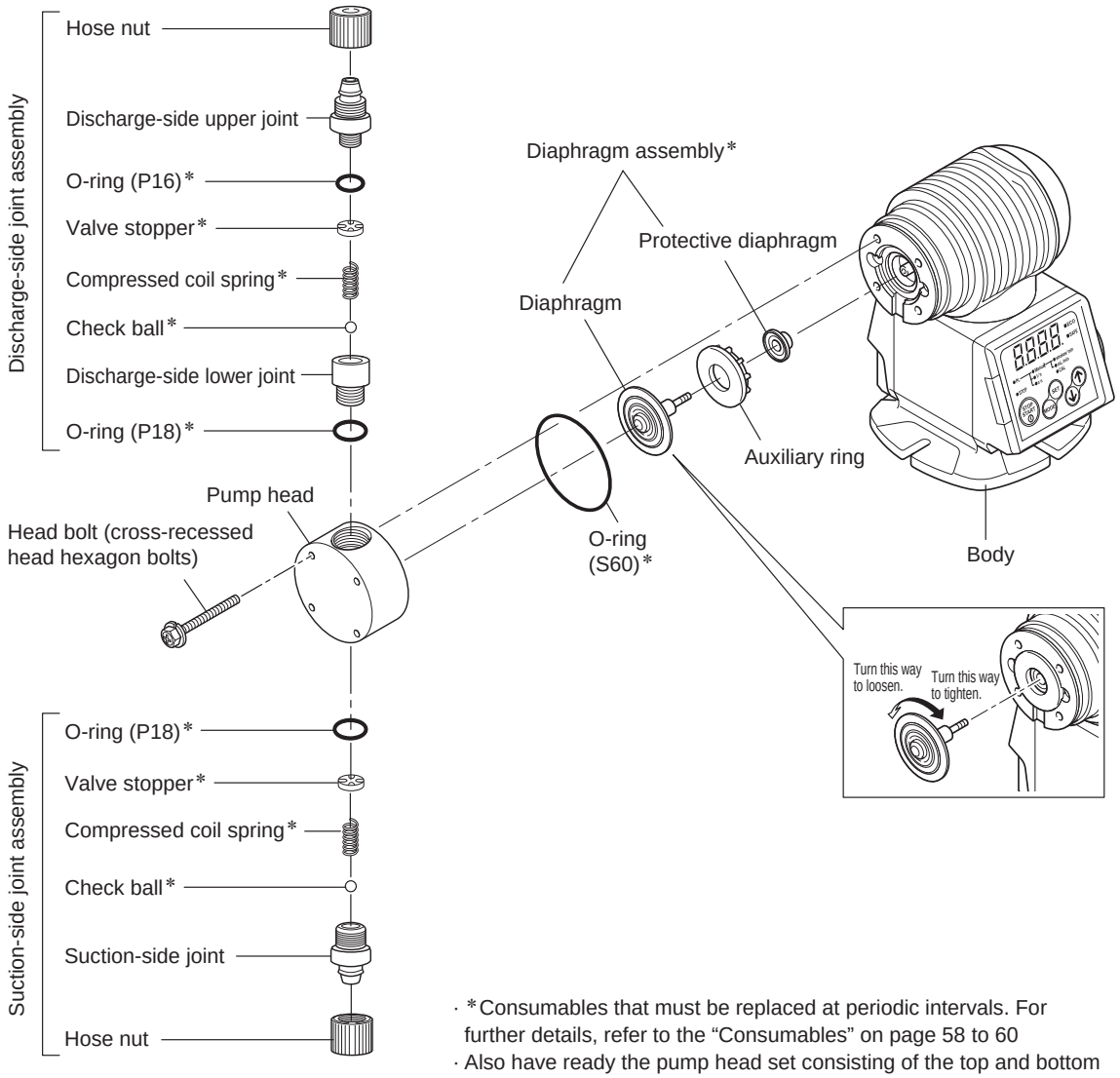
Maintenance

Exploded views of liquid-end parts and external dimension

High-viscosity type

Series: PW/PWM/PWT Model: 60/100 Liquid-end material: VTCF

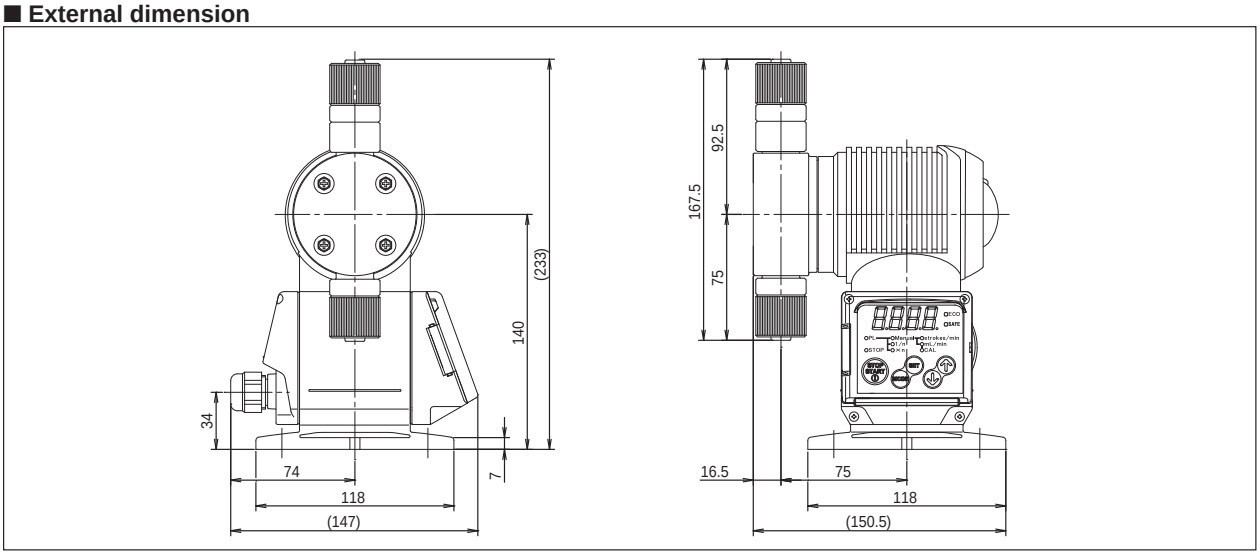
■ **Exploded views of liquid-end parts**



· *Consumables that must be replaced at periodic intervals. For further details, refer to the “Consumables” on page 58 to 60

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

■ **External dimension**

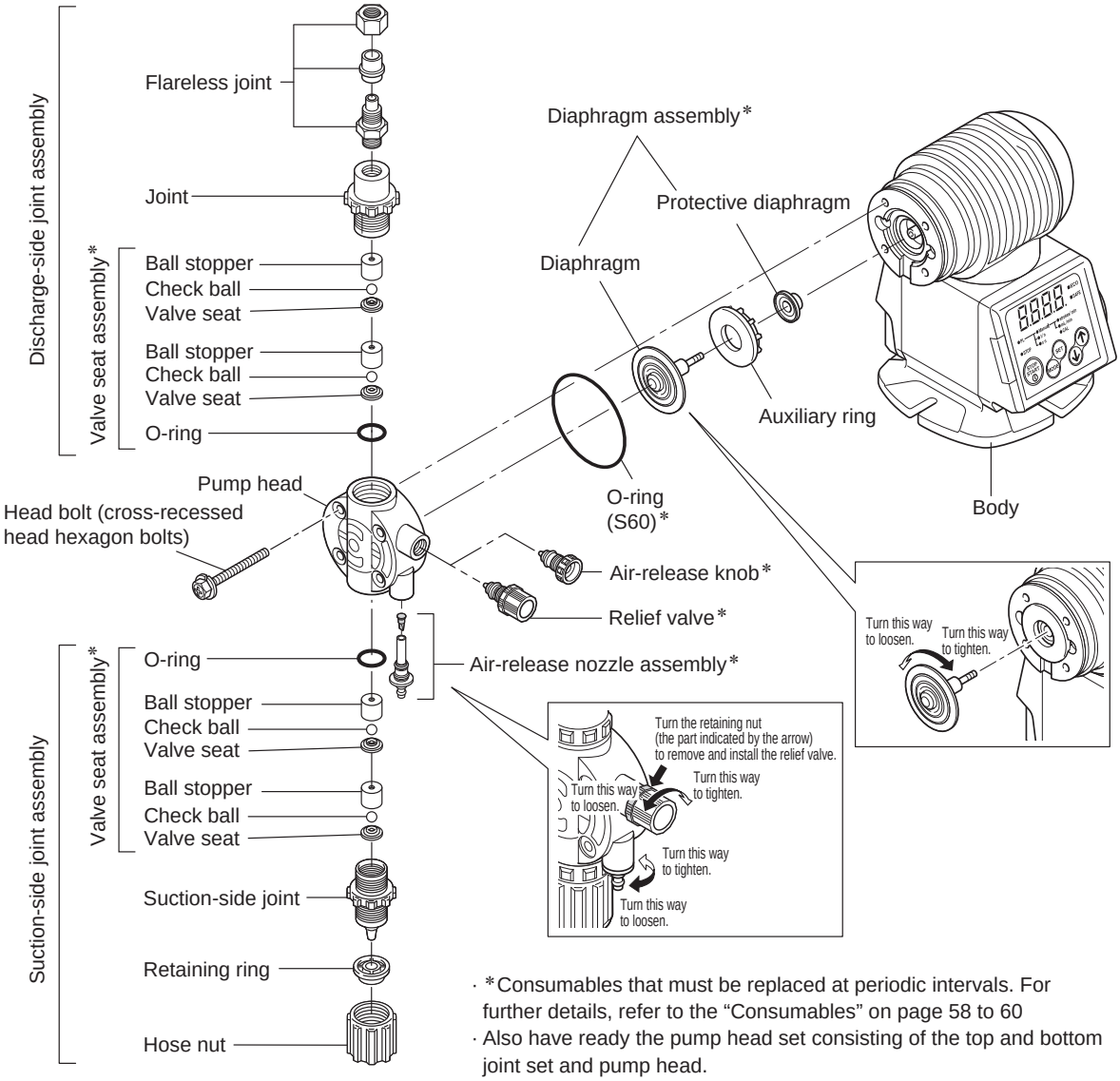


Exploded views of liquid-end parts and external dimension

Boiler type

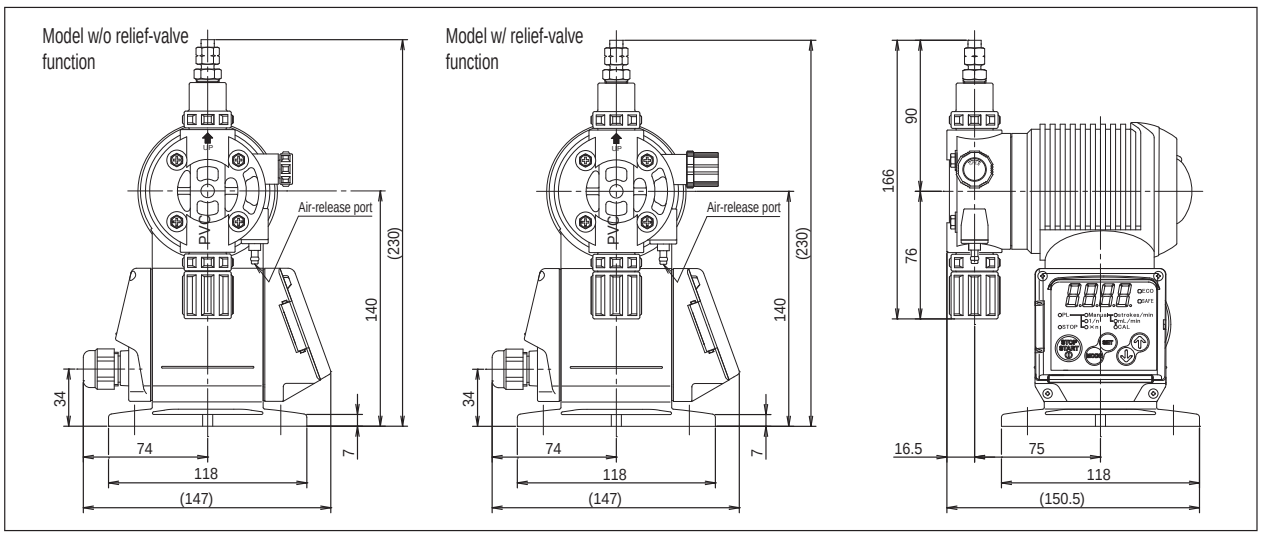
Series: PW/PWM/PWT Model: 30R/30 Liquid-end material: VTCET

■ Exploded views of liquid-end parts



· *Consumables that must be replaced at periodic intervals. For further details, refer to the “Consumables” on page 58 to 60
· Also have ready the pump head set consisting of the top and bottom joint set and pump head.

■ External dimension



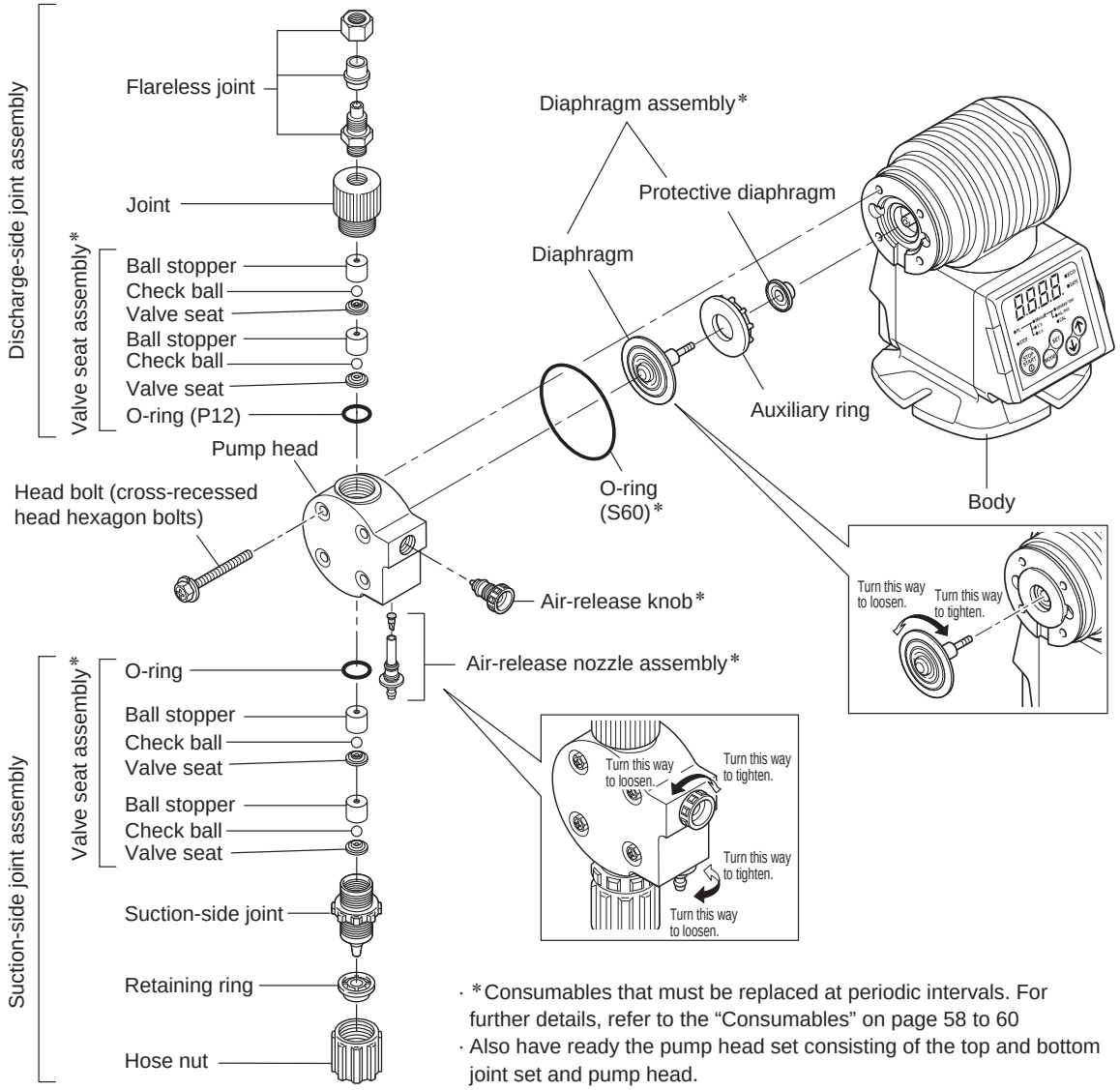
Maintenance

Exploded views of liquid-end parts and external dimension

High-pressure type

Series: PW/PWM/PWT Model: 30 Liquid-end material: VTCET

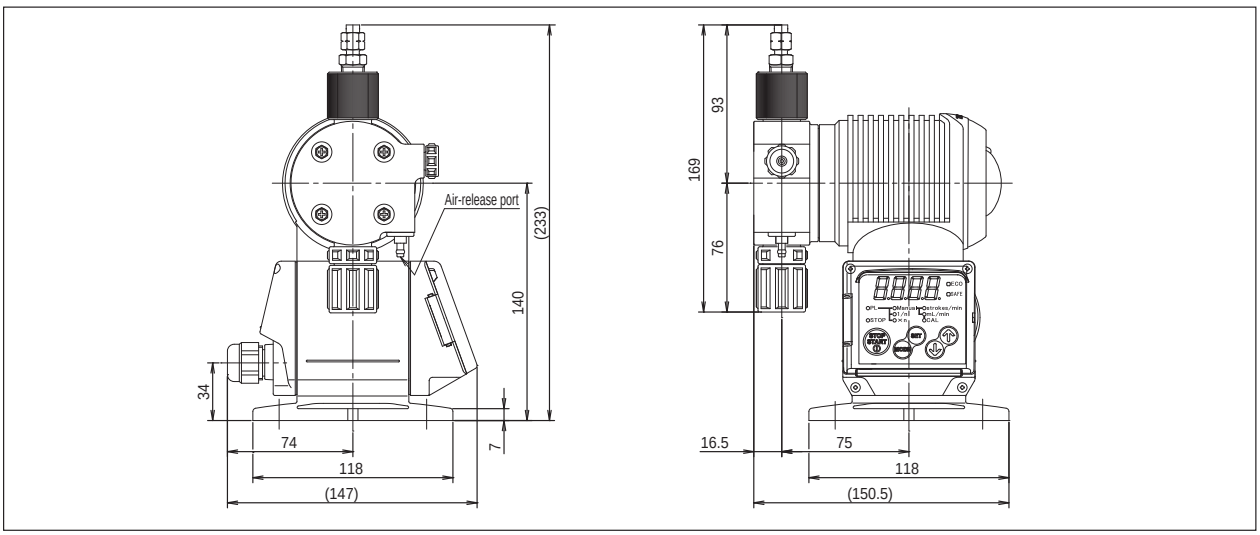
■ **Exploded views of liquid-end parts**



· *Consumables that must be replaced at periodic intervals. For further details, refer to the “Consumables” on page 58 to 60

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

■ **External dimension**



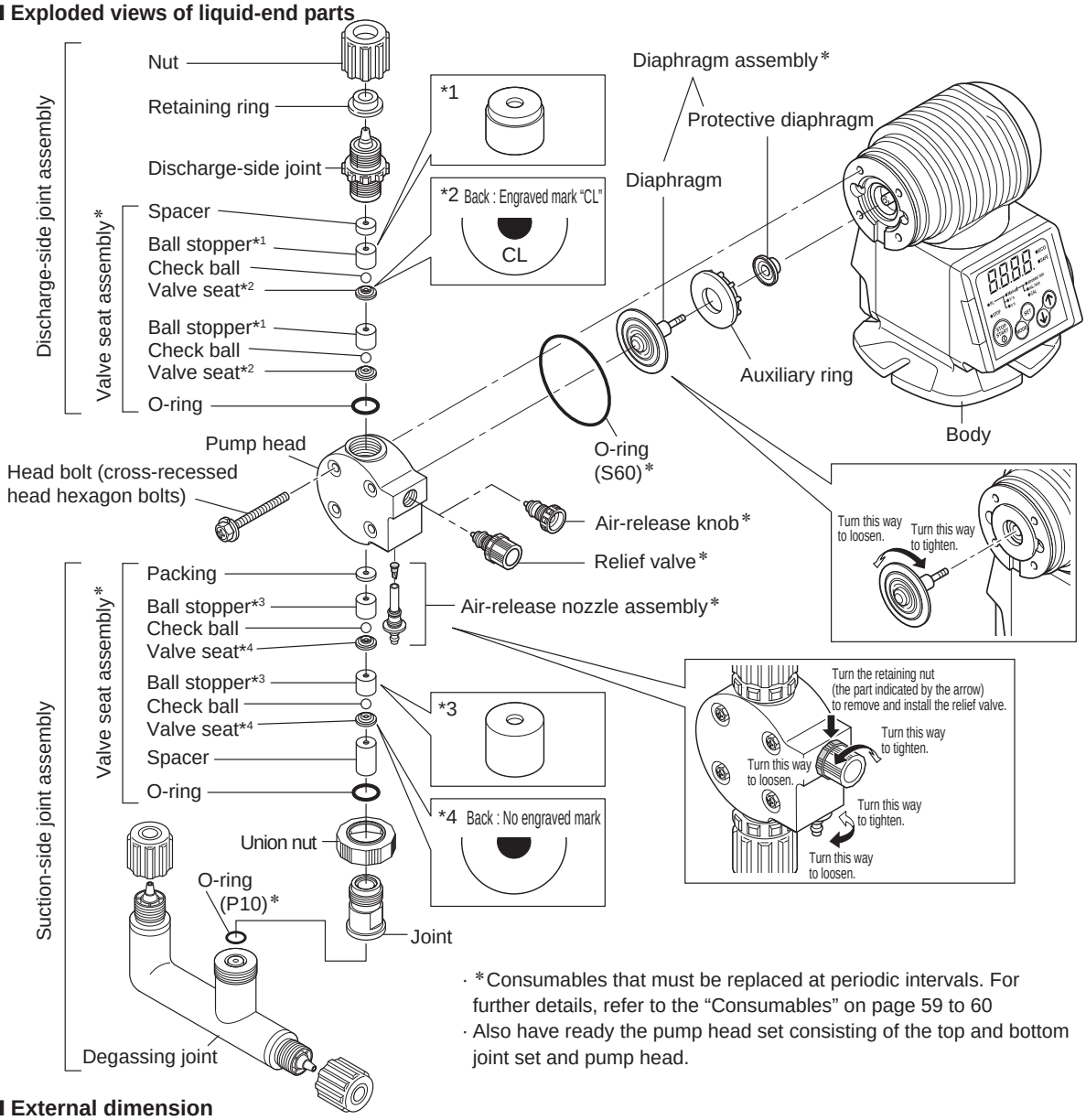
Maintenance

Exploded views of liquid-end parts and external dimension

For injection of sodium hypochlorite type w/ air-block

Series: DCLPW/DCLPWM/DCLPWT Model: 30R/30/60R/60/100R/100 Liquid-end material: ATCF

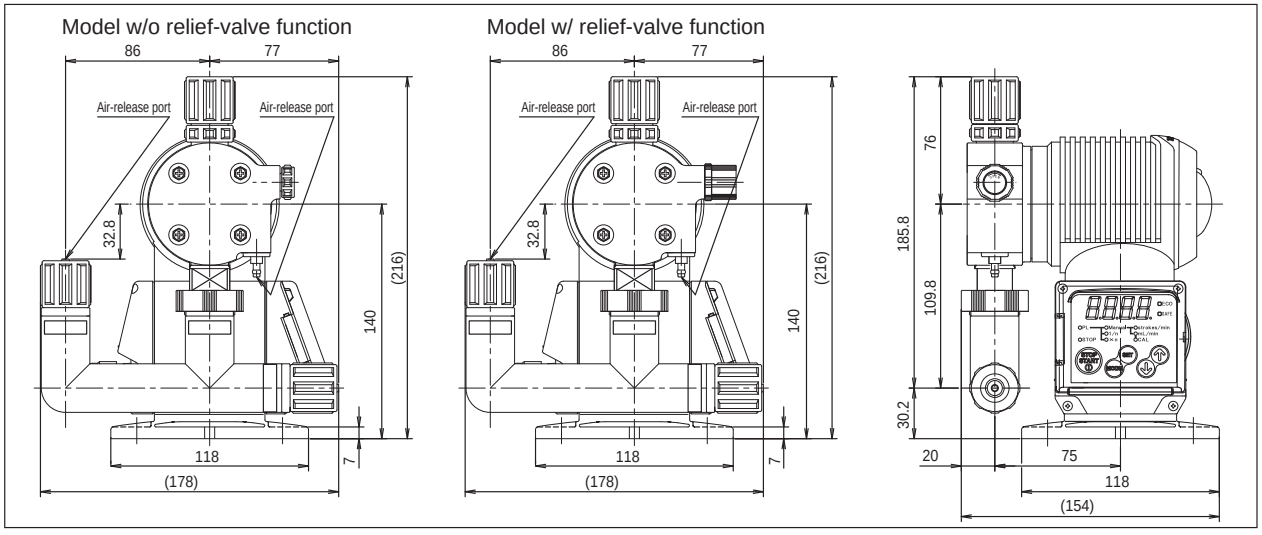
■ **Exploded views of liquid-end parts**



· *Consumables that must be replaced at periodic intervals. For further details, refer to the "Consumables" on page 59 to 60

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

■ **External dimension**



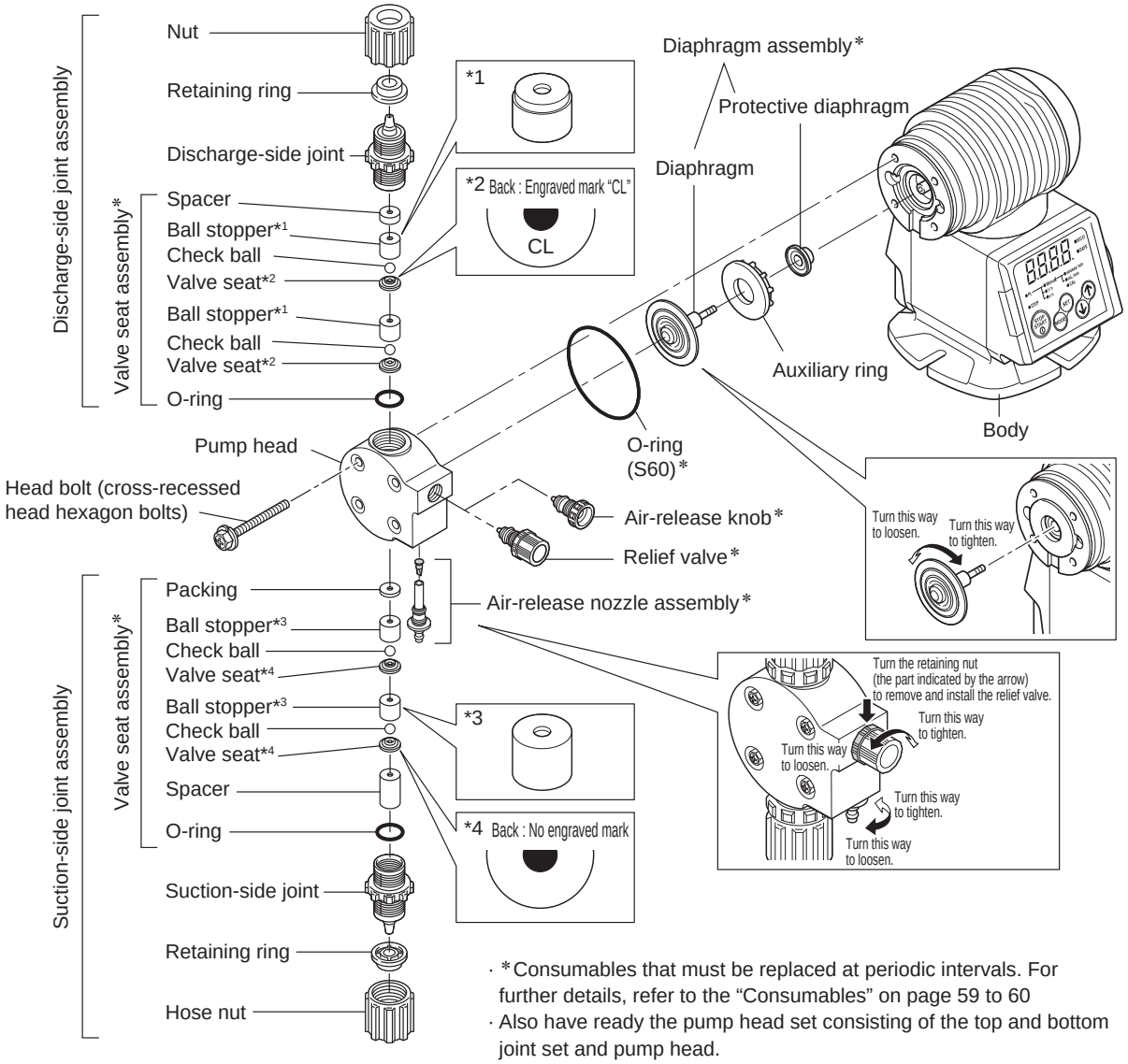
Maintenance

Exploded views of liquid-end parts and external dimension

For injection of sodium hypochlorite type

Series: CLPW/CLPWM/CLPWT Model: 30R/30/60R/60/100R/100 Liquid-end material: ATCF

■ Exploded views of liquid-end parts

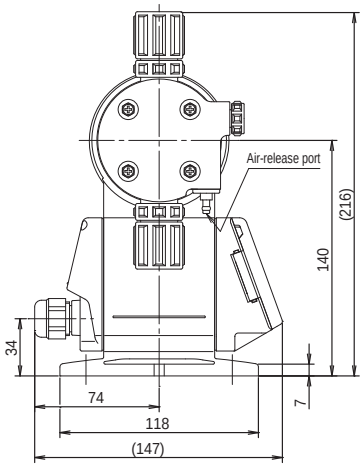


· *Consumables that must be replaced at periodic intervals. For further details, refer to the "Consumables" on page 59 to 60

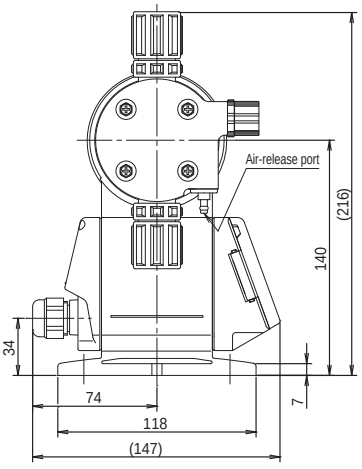
· Also have ready the pump head set consisting of the top and bottom joint set and pump head.

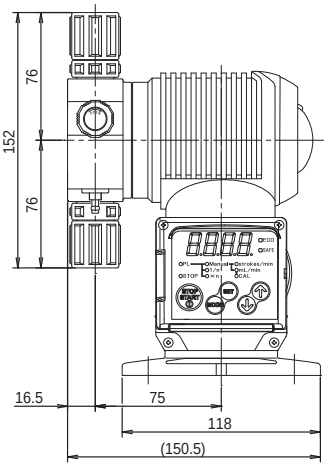
■ External dimension

Model w/o relief-valve function



Model w/ relief-valve function





Maintenance

Troubleshooting

WARNING

- **Ensure that nobody other than the operators and control personnel will operate the pump.**
- **Take steps to 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.**
- **When trouble has occurred (such as when smoke appears or there is a smell of burning), shut down the pump's operation immediately, and contact your vender or a TACMINA 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 releasing, chemical may suddenly gush out from the pipes and other parts. Lead the end of the relief/air-release hose bank to the tank or other container, and secure it so that it will not become disconnected.**
- **A situation in which the valve inside the pipe at the discharge side of the pump is shut off or becomes blocked with foreign matter is dangerous in that it may lead to an excessive rise in pressure that will exceed the pump's specification range, causing liquid to gush out, the pipe to be damaged and the pump itself to malfunction. Prior to operating the pump, check the valves and pipes, etc.**
- **When disassembling the liquid-end parts, be absolutely sure to turn off the power and check that a voltage is not applied to the pump. Do not proceed with disassembly simply by stopping the pump using a key. Place a "work in progress" sign over the power switch to ensure that the pump power will not be turned on again while repairs are being carried out.**
- **Before proceeding with maintenance or repair work on the pump, first release the pressure inside the discharge pipe, drain off the chemical liquid from the liquid-end parts, and clean these parts.**

CAUTION

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

NOTE

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

Troubleshooting

During operation

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

Troubleshooting

When the signal input mode is established

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

Error code

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

Error code	Type	Cause of alarm	Action to take when an alarm occurs
E-02	Level error	The chemical liquid remaining in the tank has dropped to a low level.	Replenish the chemical liquid in the tank.
E-04	Pulse overflow	The buffer size has been exceeded in the pulse input-based proportional control. (Buffer size: 32)*	• Review the setting. • Review the pump model.
E-05	Analog error	This code is output when the analog input value has dropped below the lower limit (2 mA or less) or has risen above the upper limit (22 mA or more).	Check the wiring connections.
E-06	Abnormal pressure error (when the SAFE mode is disabled)	This code is output when the discharge pressure increases to an abnormally high level regardless of whether the safety function is enabled or disabled.	Return the piping pressure to the normal level.
E-07	Abnormal pressure error (when the SAFE mode is enabled)		

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

● Remedial action taken in the pulse modes

Mode	Cause	Remedial action
Common to both pulse modes	• Chattering in the pulse output • The output pulses and signal specifications do not match.	• Replace with a unit free from chattering. • Change the pump.
Frequency-division	• The frequency-division ratio is too high. • The stroke speed is too slow.	• Replace with a unit that meets the signal specifications. • Increase the stroke speed (example: 50 -> 300 strokes/min.)
Magnification	• The magnification is too high. • The stroke speed is too slow.	• Replace with a unit that meets the signal specifications. • Increase the stroke speed (example: 50 -> 300 strokes/min.)

● How to release the alarm

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

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

■ Model code

PW		-	30R	-	VTCE	-	4X9PVC	-	W	-	S	-	JPL
(1)	(2)		(3)		(4)		(5)		(6)		(7)		(8)

(1) Series name

PW	Standard
DCLPW	Used only to inject sodium hypochlorite In-line automatic air-release type with air block
CLPW	Used only to inject sodium hypochlorite In-line automatic air-release type

(2) Control type

Blank*1	Standard (pulse-input) type
M	Analog-input type
T	Timer type

(3) Model (Discharge-volume standard)*1

30R	30mL/min (w/ relief-valve)
60R	60mL/min (w/ relief-valve)
100R	100mL/min (w/ relief-valve)
30	30mL/min
60	60mL/min
100	100mL/min
200*2	220mL/min

*1 The discharge capacity differs for the 6TCT, VTCET and ATCF.
For details, refer to the specifications and capacity table.
*2 Only the VTCE and VTCF types are available as the 200 models.

(4) Liquid-end material

VTCE/VTCF/FTCE/FTCF/FTCT/6TCT/VTCET/ATCF

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

(5) Hose standard

Size	Material
4×9	PVC
6×11	PVC
12×18	PVC
4×6	PA
6×8	PE/FEP/PTFE
1/4×3/8	PE/FEP

(6) Joint specification

W	Standard
BW*1	Boiler
PW*2	High-pressure
V*3	High-viscosity

*1 PW-30R/30 only
*2 PW-30 only
*3 PW-60/100-VTCF only

(7) Applicable standard

S	Standard
CE	CE marking-compatible

(8) Power plug

EUP	Euro plug
ULP	UL plug
AUP	Australia plug
UKP	UK plug
JPL	Japan lead wire
NON	No cable

■ Performance Specifications

● General chemical injection type

Conditions: clean water, room temperature

Series		PW/PWM/PWT						
Liquid-end material		VTCE/VTCF						
Model		30R	30	60R	60	100R	100	200
Max. discharge volume	mL/min	30		60		100		220
	L/H	1.8		3.6		6		13.2
Max. discharge pressure	MPa	0.7	1.0	0.7	1.0	0.7		0.2
Stroke speed	strokes/min	1 ~ 300 (Enables setting in 1-stroke units)						
Stroke length	mm	0.5 ~ 1 (Enables adjustment using the dial)						
Connection	Discharge side	ϕ4×ϕ9		ϕ6×ϕ11				
	Suction side	ϕ4×ϕ9		ϕ6×ϕ11				
	Air release	ϕ4×ϕ6						-
Viscosity of transfer liquid	mPa·s	50 or less						
Temperature of transfer liquid	°C	0 ~ 40 (no freezing allowed)						
Ambient temperature	°C	0 ~ 40 (no freezing allowed)						
Environmental protection		IEC standard: IP65 or equivalent						
Insulation class		B						
Weight	kg	1.8		1.9				4.0

Conditions: clean water, room temperature

Series		PW/PWM/PWT								
Liquid-end material		FTCE/FTCF/FTCT						6TCT		
Model		30R	30	60R	60	100R	100	30	60	100
Max. discharge volume	mL/min	30		60		100		27	55	95
	L/H	1.8		3.6		6.0		1.62	3.3	5.7
Max. discharge pressure	MPa	0.7	1.0	0.7	1.0	0.7		0.5		
Stroke speed	strokes/min	1 ~ 300 (Enables setting in 1-stroke units)								
Stroke length	mm	0.5 ~ 1 (Enables adjustment using the dial)								
Connection	Discharge side	ϕ6×ϕ8								
	Suction side	ϕ6×ϕ8								
	Air release	ϕ4×ϕ6						-		
Viscosity of transfer liquid	mPa·s	50 or less								
Temperature of transfer liquid	°C	0 ~ 40 (no freezing allowed)								
Ambient temperature	°C	0 ~ 40 (no freezing allowed)								
Environmental protection		IEC standard: IP65 or equivalent								
Insulation class		B								
Weight	kg	1.8		1.9				3.2	3.3	

■ Performance Specifications

● High-viscosity type

Conditions: clean water, room temperature

Series		PW/PWM/PWT	
Liquid-end material		VTCF	
Model		60	100
Max. discharge volume	mL/min	60	100
	L/H	3.6	6.0
Max. discharge pressure	MPa	1.0	0.7
Stroke speed	strokes/min	1 ~ 300 (Enables setting in 1-stroke units)	
Stroke length	mm	0.5 ~ 1 (Enables adjustment using the dial)	
Connection	Discharge side	ϕ12×ϕ18	
	Suction side	ϕ12×ϕ18	
	Air release	-	
Viscosity of transfer liquid	mPa·s	3000 or less	
Temperature of transfer liquid	°C	0 ~ 40 (no freezing allowed)	
Ambient temperature	°C	0 ~ 40 (no freezing allowed)	
Environmental protection		IEC standard: IP65 or equivalent	
Insulation class		B	
Weight	kg	1.9	

● Boiler type

Conditions: clean water, room temperature

Series		PW/PWM/PWT	
Liquid-end material		VTCET	
Model		30R	30
Max. discharge volume	mL/min	28	
	L/H	1.68	
Max. discharge pressure	MPa	1.5	
Stroke speed	strokes/min	1 ~ 300 (Enables setting in 1-stroke units)	
Stroke length	mm	0.5 ~ 1 (Enables adjustment using the dial)	
Connection	Discharge side	ϕ4×ϕ6	
	Suction side	ϕ4×ϕ9	
	Air release	ϕ4×ϕ6	
Viscosity of transfer liquid	mPa·s	50 or less	
Temperature of transfer liquid	°C	0 ~ 40 (no freezing allowed)	
Ambient temperature	°C	0 ~ 40 (no freezing allowed)	
Environmental protection		IEC standard: IP65 or equivalent	
Insulation class		B	
Weight	kg	1.9	

● High-pressure type

Conditions: clean water, room temperature

Series		PW/PWM/PWT
Liquid-end material		VTCET
Model		30
Max. discharge volume	mL/min	25
	L/H	1.50
Max. discharge pressure	MPa	2.0
Stroke speed	strokes/min	1 ~ 300 (Enables setting in 1-stroke units)
Stroke length	mm	0.5 ~ 1 (Enables adjustment using the dial)
Connection	Discharge side	ϕ4×ϕ6
	Suction side	ϕ4×ϕ9
	Air release	ϕ4×ϕ6
Viscosity of transfer liquid	mPa·s	50 or less
Temperature of transfer liquid	°C	0 ~ 40 (no freezing allowed)
Ambient temperature	°C	0 ~ 40 (no freezing allowed)
Environmental protection		IEC standard: IP65 or equivalent
Insulation class		B
Weight	kg	1.9

■ Performance Specifications

● Sodium hypochlorite injection type w/ air block

Conditions: clean water, room temperature

Series		DCLPW/DCLPWM/DCLPWT					
Liquid-end material		ATCF					
Model		30R	30	60R	60	100R	100
Max. discharge volume	mL/min	30		60		90	
	L/H	1.8		3.6		5.4	
Max. discharge pressure	MPa	0.7	1.0	0.7	1.0	0.7	
Stroke speed	strokes/min	1 ~ 300 (Enables setting in 1-stroke units)					
Stroke length	mm	0.5 ~ 1 (Enables adjustment using the dial)					
Connection	Discharge side	ϕ4×ϕ9		ϕ6×ϕ11			
	Suction side	ϕ4×ϕ9		ϕ6×ϕ11			
	Air release	ϕ4×ϕ6					
	Degassing joint	1/4"×3/8"					
Viscosity of transfer liquid	mPa·s	50 or less					
Temperature of transfer liquid	°C	0 ~ 40 (no freezing allowed)					
Ambient temperature	°C	0 ~ 40 (no freezing allowed)					
Environmental protection		IEC standard: IP65 or equivalent					
Insulation class		B					
Weight	kg	2.0		2.1			

● Sodium hypochlorite injection type

Conditions: clean water, room temperature

Series		CLPW/CLPWM/CLPWT					
Liquid-end material		ATCF					
Model		30R	30	60R	60	100R	100
Max. discharge volume	mL/min	30		60		90	
	L/H	1.8		3.6		5.4	
Max. discharge pressure	MPa	0.7	1.0	0.7	1.0	0.7	
Stroke speed	strokes/min	1 ~ 300 (Enables setting in 1-stroke units)					
Stroke length	mm	0.5 ~ 1 (Enables adjustment using the dial)					
Connection	Discharge side	ϕ4×ϕ9		ϕ6×ϕ11			
	Suction side	ϕ4×ϕ9		ϕ6×ϕ11			
	Air release	ϕ4×ϕ6					
Viscosity of transfer liquid	mPa·s	50 or less					
Temperature of transfer liquid	°C	0 ~ 40 (no freezing allowed)					
Ambient temperature	°C	0 ~ 40 (no freezing allowed)					
Environmental protection		IEC standard: IP65 or equivalent					
Insulation class		B					
Weight	kg	1.8		1.9			

■ Liquid-end material

● General chemical injection type

Series	PW/PWM/PWT					
Model	VTCE	VTCF	FTCE	FTCF	FTCT	6TCT
Pump head	PVC	PVC	PVDF	PVDF	PVDF	SUS316
Diaphragm	PTFE	PTFE	PTFE	PTFE	PTFE	PTFE
Check ball	Ceramic	Ceramic	Ceramic	Ceramic	Ceramic	Ceramic
O-ring	EPDM	Fluoro rubber	EPDM	Fluoro rubber	Special fluoro rubber	PTFE
Valve seat	EPDM	Special fluoro rubber	EPDM	Special fluoro rubber	PTFE	-
Packing	-	-	-	-	PTFE	-
Joint	PVC	PVC	PVDF, PP	PVDF, PP	PVDF	SUS316
Ball stopper	PVC	PVC	PVDF	PVDF	PTFE	PTFE

● High-viscosity type

Series	PW/PWM/PWT
Model	VTCF
Pump head	PVC
Diaphragm	PTFE
Check ball	Ceramic
O-ring	Fluoro rubber
Joint	PVC
Valve stopper	PE
Compressed coil spring	SUS304

● Boiler type

Series	PW/PWM/PWT
Model	VTCET
Pump head	PVC
Diaphragm	PTFE
Check ball	Ceramic
O-ring	EPDM
Valve seat	PTFE
Joint	PVC, SUS304
Ball stopper	PVC

● High-pressure type

Series	PW/PWM/PWT
Model	VTCET
Pump head	PVC
Diaphragm	PTFE
Check ball	Ceramic
O-ring	EPDM
Valve seat	PTFE
Joint	PVC, SUS304
Ball stopper	PVC

● Sodium hypochlorite injection type

Series	DCLPW/DCLPWM/DCLPWT	CLPW/CLPWM/CLPWT
Model	ATCF	
Pump head	Acrylic (PMMA)	
Diaphragm	PTFE	
Check ball	Ceramic	
O-ring	Fluoro rubber	
Valve seat	Special fluoro rubber	
Packing	PTFE	
Joint	PVC	
Ball stopper	PVC	
Degassing joint	PVC	-

■ Power Supply Specifications

	30R/30	30R/30 (Boiler/ High-pressure type)	60R/60	100R/100	200
Rated voltage	AC100~240V(±10%)				
No. of phases	1-phases				
No. of frequency	50/60Hz				
Maximum current	2.0A	2.5A			
Max. power consumption	200VA	250VA			
Ave. power consumption	15W	18W			

• Use the maximum current in calculating the required power capacity.
• Be absolutely sure to use a commercial power source (the power supplied by an electric power company) for supplying the power.

■ Power sources that cannot be used
1. Power sources in which an AC power regulator is installed
2. Power sources on the output side of an inverter

■ I/O Signal Specifications

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

■ Operation mode

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

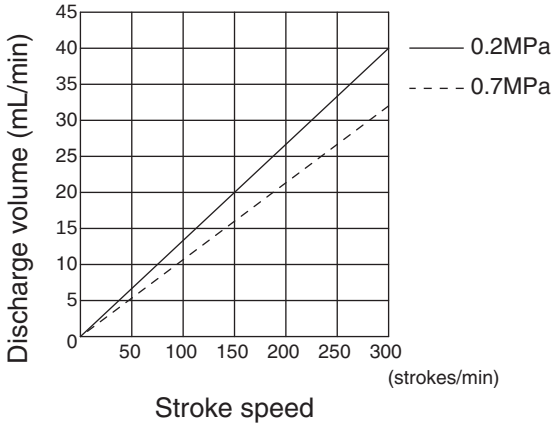
■ Performance curve

- The performance curves below represent the measurements taken under the conditions prevailing at TACMINA'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.

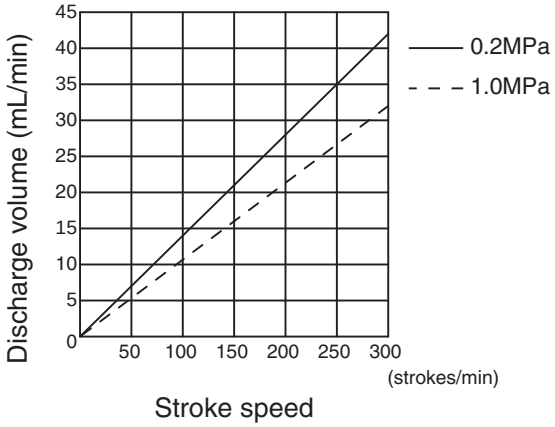
● General chemical injection type · High-viscosity type

Conditions: clean water, room temperature

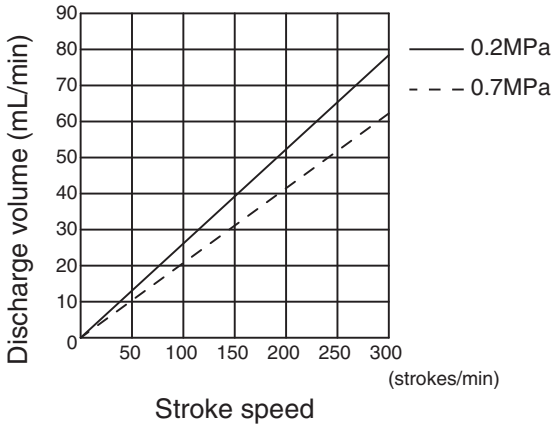
PW/PWM/PWT-30R-VTCE/VTCF/FTCE/FTCF/FTCT



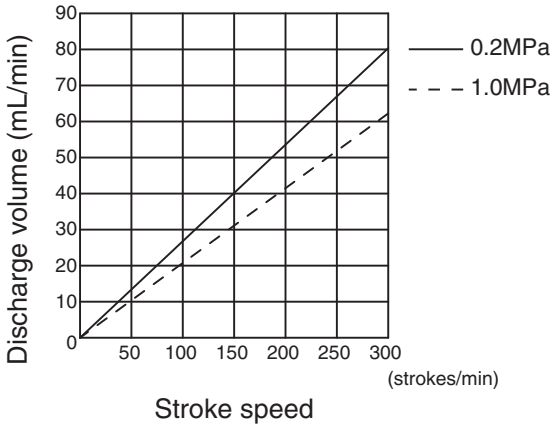
PW/PWM/PWT-30-VTCE/VTCF/FTCE/FTCF/FTCT



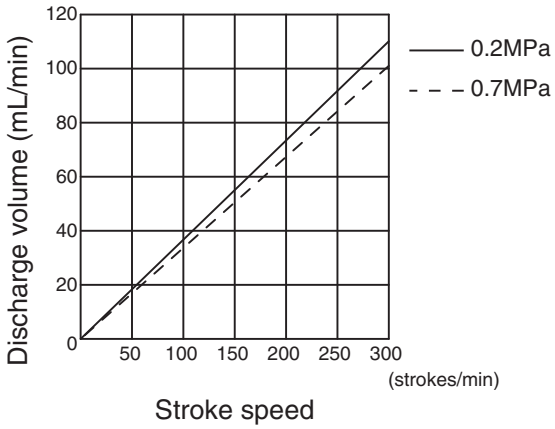
PW/PWM/PWT-60R-VTCE/VTCF/FTCE/FTCF/FTCT



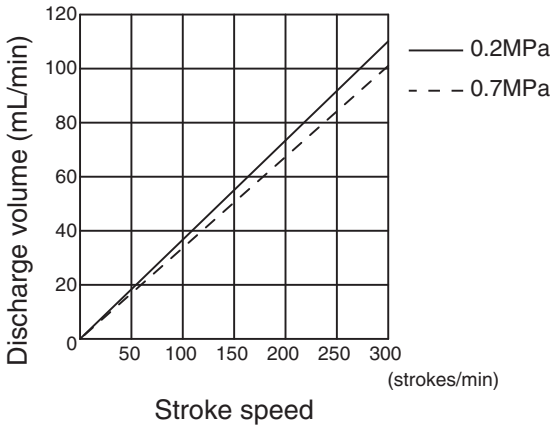
PW/PWM/PWT-60-VTCE/VTCF/FTCE/FTCF/FTCT



PW/PWM/PWT-100R-VTCE/VTCF/FTCE/FTCF/FTCT



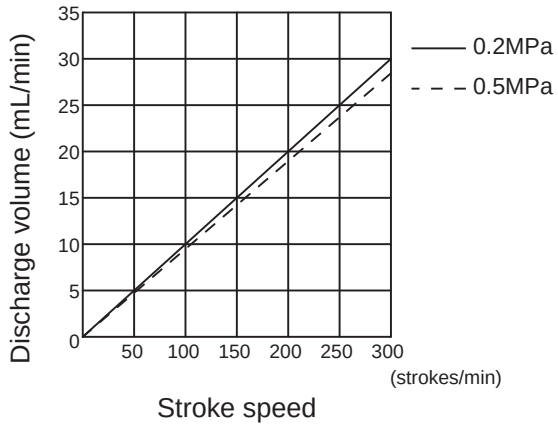
PW/PWM/PWT-100-VTCE/VTCF/FTCE/FTCF/FTCT



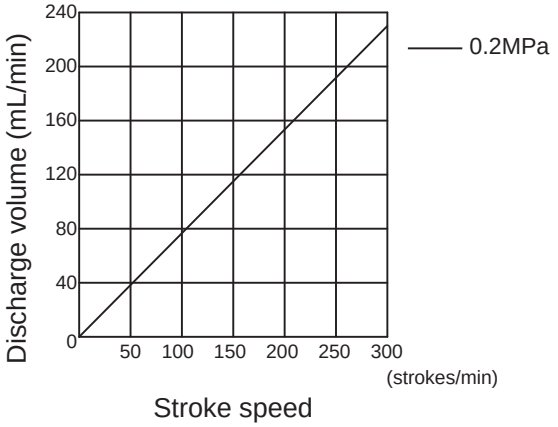
Specifications

Conditions: clean water, room temperature

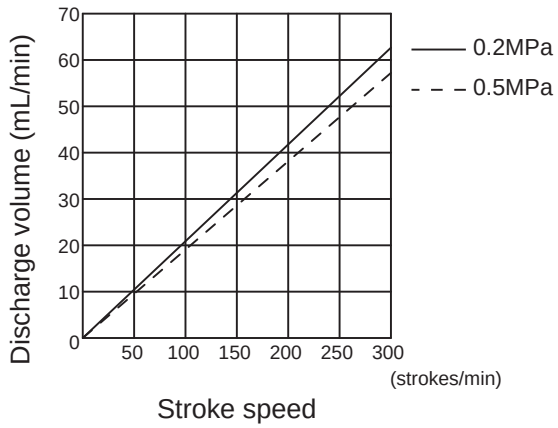
PW/PWM/PWT-30-6TCT



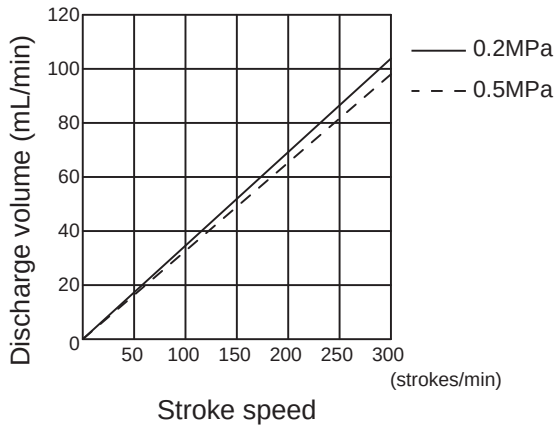
PW/PWM/PWT-200-VTCE/VTCF



PW/PWM/PWT-60-6TCT



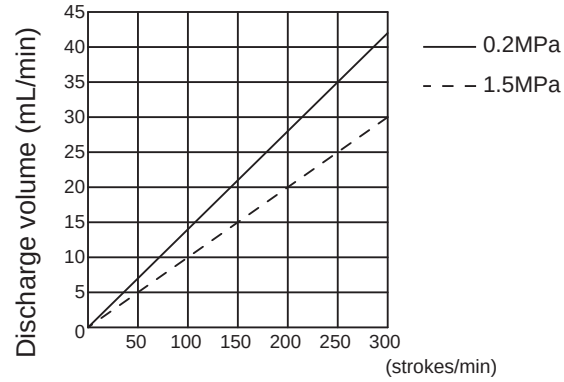
PW/PWM/PWT-100-6TCT



● Boiler type

Conditions: clean water, room temperature

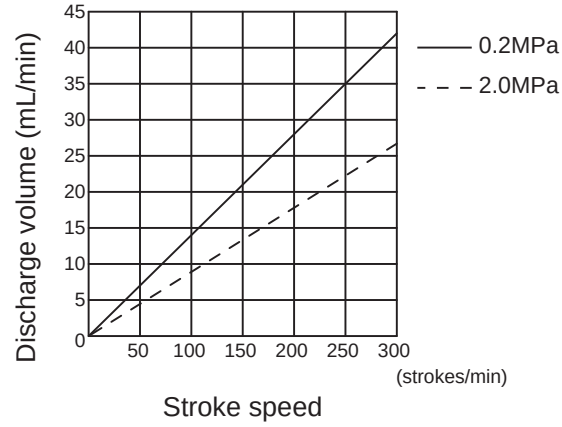
PW/PWM/PWT-30R/30-VTCET



● High-pressure type

Conditions: clean water, room temperature

PW/PWM/PWT-30-VTCET

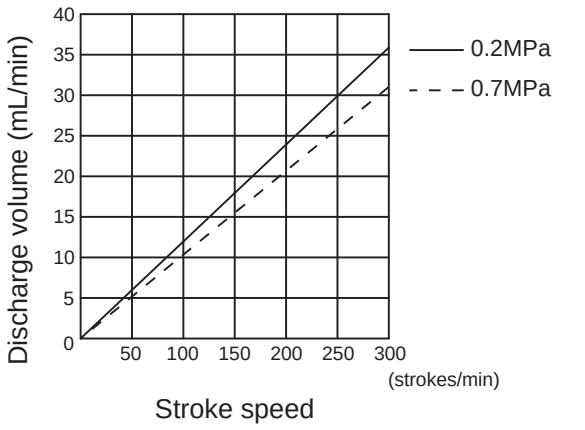


Specifications

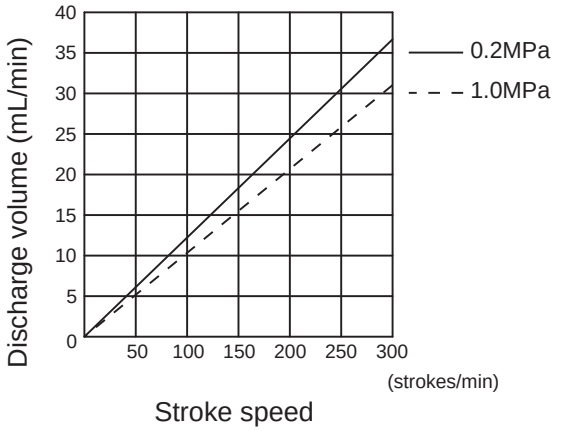
● **Sodium hypochlorite injection type w/ air block**
● **Sodium hypochlorite injection type**

Conditions: clean water, room temperature

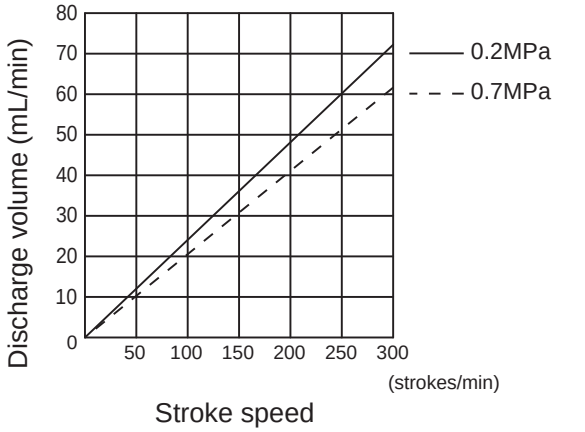
DCLPW/DCLPWM/DCLPWT-30R-ATCF
CLPW/CLPWM/CLPWT-30R-ATCF



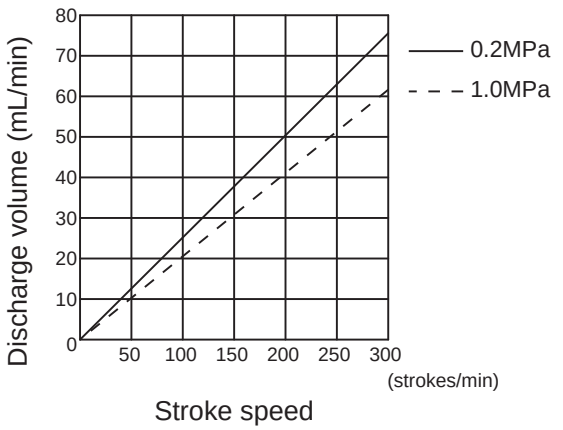
DCLPW/DCLPWM/DCLPWT-30-ATCF
CLPW/CLPWM/CLPWT-30-ATCF



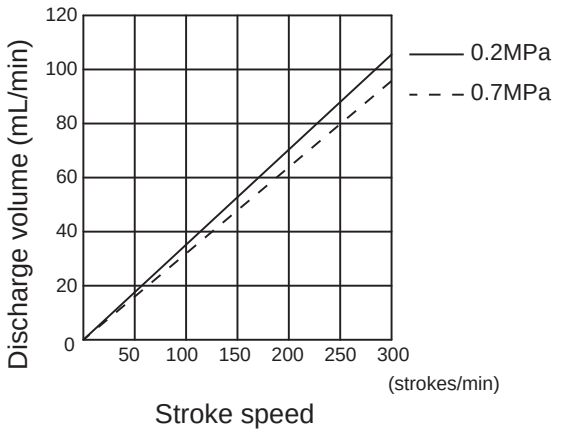
DCLPW/DCLPWM/DCLPWT-60R-ATCF
CLPW/CLPWM/CLPWT-60R-ATCF



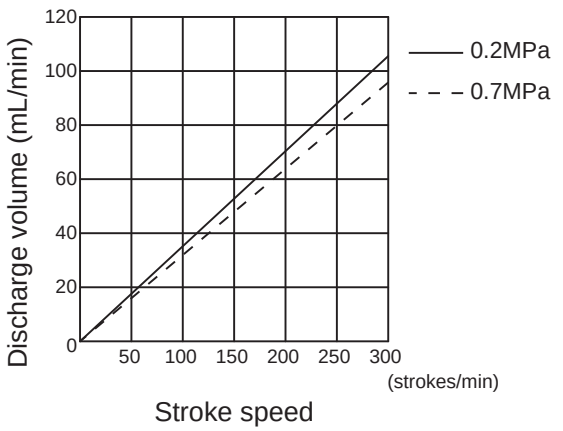
DCLPW/DCLPWM/DCLPWT-60-ATCF
CLPW/CLPWM/CLPWT-60-ATCF



DCLPW/DCLPWM/DCLPWT-100R-ATCF
CLPW/CLPWM/CLPWT-100R-ATCF



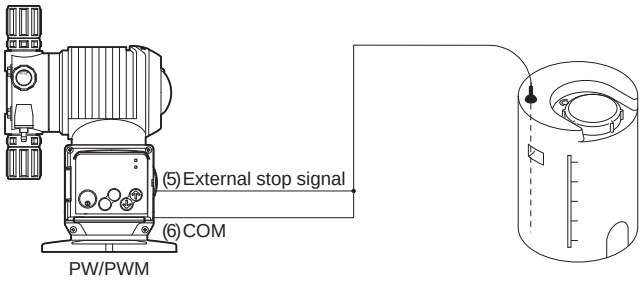
DCLPW/DCLPWM/DCLPWT-100-ATCF
CLPW/CLPWM/CLPWT-100-ATCF



Application examples

TACMINA float switch

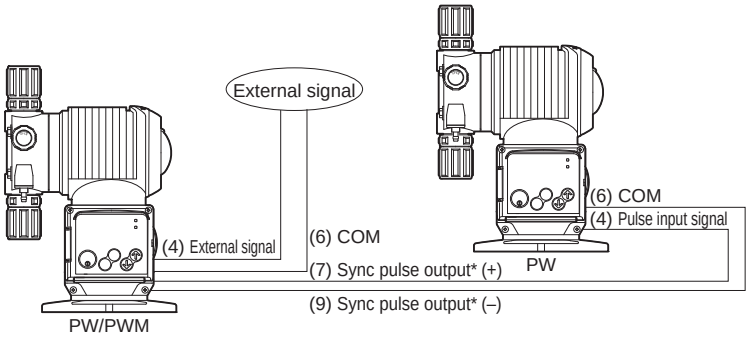
■ Stopping the pump when the tank has become empty



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

■ Continuously operating more than one pump

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



First pump (controlled by external signals)
Second pump (operation linked)

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

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

● Operating the pumps at the same speed

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

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

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

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

Set the second pump, which is a pulse signal-input type, to the pulse magnification mode, and set the magnification to 2x.
(The control precision is reduced with this kind of setting so it is recommended that the pumps be installed in such a way that the first pump operates for a greater number of times.)

Consumables

■ Consumables

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

⚠ CAUTION

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

NOTE

- **TACMINA will continue to supply consumables 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 consumables are available (except for some models).**

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

(1) PW/PWM/PWT-30R/60R/100R/30/60/100-VTCE/VTCF

Part	Quantity per pump		Recommended replacement timeframe
	30R/60R/100R	30/60/100	
Valve seat assembly	2		Every 10,000 hours
Diaphragm assembly (diaphragm, protective diaphragm)	1		Every 10,000 hours
Relief valve	1	–	Every 10,000 hours*
Air-release knob	–	1	Every 10,000 hours
Air-release nozzle assembly	1		Every 10,000 hours
O-ring (S60)	1		Every 10,000 hours

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

(2) PW/PWM/PWT-200-VTCE/VTCF

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

(3) PW/PWM/PWT-30R/60R/100R/30/60/100-FTCE/FTCF/FTCT

Part	Quantity per pump		Recommended replacement timeframe
	30R/60R/100R	30/60/100	
Valve seat assembly	2		Every 10,000 hours
Diaphragm assembly (diaphragm, protective diaphragm)	1		Every 10,000 hours
Relief valve	1	–	Every 10,000 hours*
Air-release knob	–	1	Every 10,000 hours
Air-release nozzle assembly	1		Every 10,000 hours
O-ring (S60)	1		Every 10,000 hours

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

Consumables

(4) PW/PWM/PWT-30/60/100-6TCT

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

(5) PW/PWM/PWT-60/100-VTCF-V (High-viscosity type)

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

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

(6) PW/PWM/PWT-30R/30-VTCET-BW (Boiler type)

Part	Quantity per pump		Recommended replacement timeframe
	30R	30	
Valve seat assembly	2		Every 10,000 hours
Diaphragm assembly (diaphragm, protective diaphragm)	1		Every 10,000 hours
Relief valve	1	–	Every 10,000 hours*
Air-release knob	–	1	Every 10,000 hours
Air-release nozzle assembly	1		Every 10,000 hours
O-ring (S60)	1		Every 10,000 hours

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

(7) PW/PWM/PWT-30-VTCET-PW (High-pressure type)

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

Consumables

(8) DCLPW/DCLPWM/DCLPWT-30R/60R/100R/30/60/100-ATCF

Part	Quantity per pump		Recommended replacement timeframe
	30R/60R/100R	30/60/100	
Valve seat assembly (Discharge-side)	1		Every 10,000 hours
Valve seat assembly (Suction-side)	1		Every 10,000 hours
Diaphragm assembly (diaphragm, protective diaphragm)	1		Every 10,000 hours
Relief valve	1	–	Every 10,000 hours*
Air-release knob	–	1	Every 10,000 hours
Air-release nozzle assembly	1		Every 10,000 hours
O-ring (S60)	1		Every 10,000 hours
O-ring (P10)	1		Every 10,000 hours

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

(9) CLPW/CLPWM/CLPWT-30R/60R/100R/30/60/100-ATCF

Part	Quantity per pump		Recommended replacement timeframe
	30R/60R/100R	30/60/100	
Valve seat assembly (Discharge-side)	1		Every 10,000 hours
Valve seat assembly (Suction-side)	1		Every 10,000 hours
Diaphragm assembly (diaphragm, protective diaphragm)	1		Every 10,000 hours
Relief valve	1	–	Every 10,000 hours*
Air-release knob	–	1	Every 10,000 hours
Air-release nozzle assembly	1		Every 10,000 hours
O-ring (S60)	1		Every 10,000 hours

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

Spare parts & options

■Spare parts (sold separately)

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

• Nuts • Retaining rings • Joints

■Options

- **Back pressure valve**
  This valve prevents overfeeding*1 and siphoning*2 phenomena by sealing the chemical outlet with a diaphragm and applying just the right amount of pressure (back pressure) to suppress the in-ertia 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 and tightening of the valve, to prevent accidents or possible damage to the pump and piping.
- **Air chamber**
  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 is to be installed, be absolutely sure to provide the relief valve mentioned above.
- **Accumulator**
  The accumulator is provided to reduce pulsation, and the principle behind its operation is the same as that of the air chamber. 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 up the tank. Two models, a 1-point (single-sensor) and a 2-point (double-sensor) model, are available.
- **Flow checker**
  This highly acid- and alkali-resistant, low-cost flow meter allows you to monitor injection operation of the pump. It can be directly attached on the discharge side of the pump.
- **Degassing joint**
  Installed on the suction side of the pump, this joint separates air bubbles and fluid to prevent air bubbles from entering the pump head.
- **PTS-30/50/120**
  These are chemical injection units consisting of a metering pump and PE tank (with a capacity of 30, 50 or 120 liters).
- **Chemical tank**
  Tanks made of PE (with a capacity ranging from 25 to 100 liters) or of PVC (with a capacity ranging from 100 to 1,000 liters)
- **Solution tank**
  These tanks (made of PE with a capacity ranging from 50 to 500 liters) can have a metering pump or agitator mounted on top.
- **Parts kit**
  This kit contains a complete set of all required consumables.It is economical, and an easy way to store and managethe parts you need.

Explanation of terms

- **Overfeeding**
  A phenomenon that liquid continues to discharge from the piping for a few seconds due to the momentum of discharge (inertia) after stop operating a pump. In case of pulsation flow, the actual discharge volume might be larger than rated one because of this phenomenon.
- **Siphoning**
  The phenomenon that chemicals continue to be sucked out naturally and continue flowing when the tip of the pump's discharge-side piping is lower than the level of liquid in the suction-side tank.
- **Cavitation**
  This phenomenon that the negative pressure inside the pump head causes air bubbles to form, diminishing the discharge volume and causing abnormal noises and vibration.

✻ For more detailed information, ask for “How to use metering pumps properly,” a technical document provided by TACMINA.

After-sales services

If any aspects of the terms and conditions of the after-sales service applying to the repairs to be provided during the warranty period and other such matters are not clear, consult your vender or a TACMINA representative.

Warranty

(1) The warranty period is two (2) year from the date of purchase. However, consumable parts are not covered under this warranty.

(2) If, during the warranty period, the product sustains malfunctions or damages despite normal use and proper maintenance as a result of design or manufacturing defect, TACMINA will arrange for repair of the product at no charge to the customer.
However, the customer will be charged for the following expenses:
- Malfunctions or damages of the warranted product occurring after the warranty period has expired
- Malfunctions or damages of the warranted product caused by incorrect use, maintenance, storage, or carelessness in handling such as dropping or water immersion
- Malfunctions or damages of the warranted product resulting from the use of parts other than the ones designated by TACMINA
- Malfunctions or damages of the warranted product resulting from the repair or remodeling undertaken by individuals other than TACMINA employees or personnel of businesses authorized by TACMINA
- Malfunctions or damages of the warranted product stemming from changes in the specifications or remodeling of the warranted product instituted at the wishes of individuals (such as the user) other than TACMINA employees
- Malfunctions or damages of the warranted product resulting from fires, natural disasters, geological calamities and forces majeures
- Malfunctions or damages of the warranted product resulting from the failure to perform regular maintenance
- Malfunctions or damages of the warranted product itself resulting from damages or deterioration of consumable parts
- Malfunctions or damages of the warranted product resulting from loose bolts, nuts and hoses
- Color change, deterioration, malfunctions, or damages of the warranted product caused by exposure to water, corrosive gas, or ultraviolet light from the sunlight
- Malfunctions or damages of the warranted product resulting from equipment or piping other than the warranted product
- Costs incurred by on-site service calls to remote areas

(3) Decisions on the causes of the malfunctions or damages of the warranted product shall be made in accordance with the outcome of the discussions held between the user and TACMINA's maintenance engineers.

(4) TACMINA accepts no liability whatsoever for any damage caused by malfunctions of the warranted product or for any damage incurred by use of the warranted product.

Repairs

Before requesting repairs, read this instruction manual carefully, and check again. If you then decide that there is trouble in your pump, ask your vender to take care of the repairs.

(1) During the warranty period
Ask your vender to take care of the repairs. Your vender will undertake the repairs in accordance with the terms and conditions set forth in the warranty.

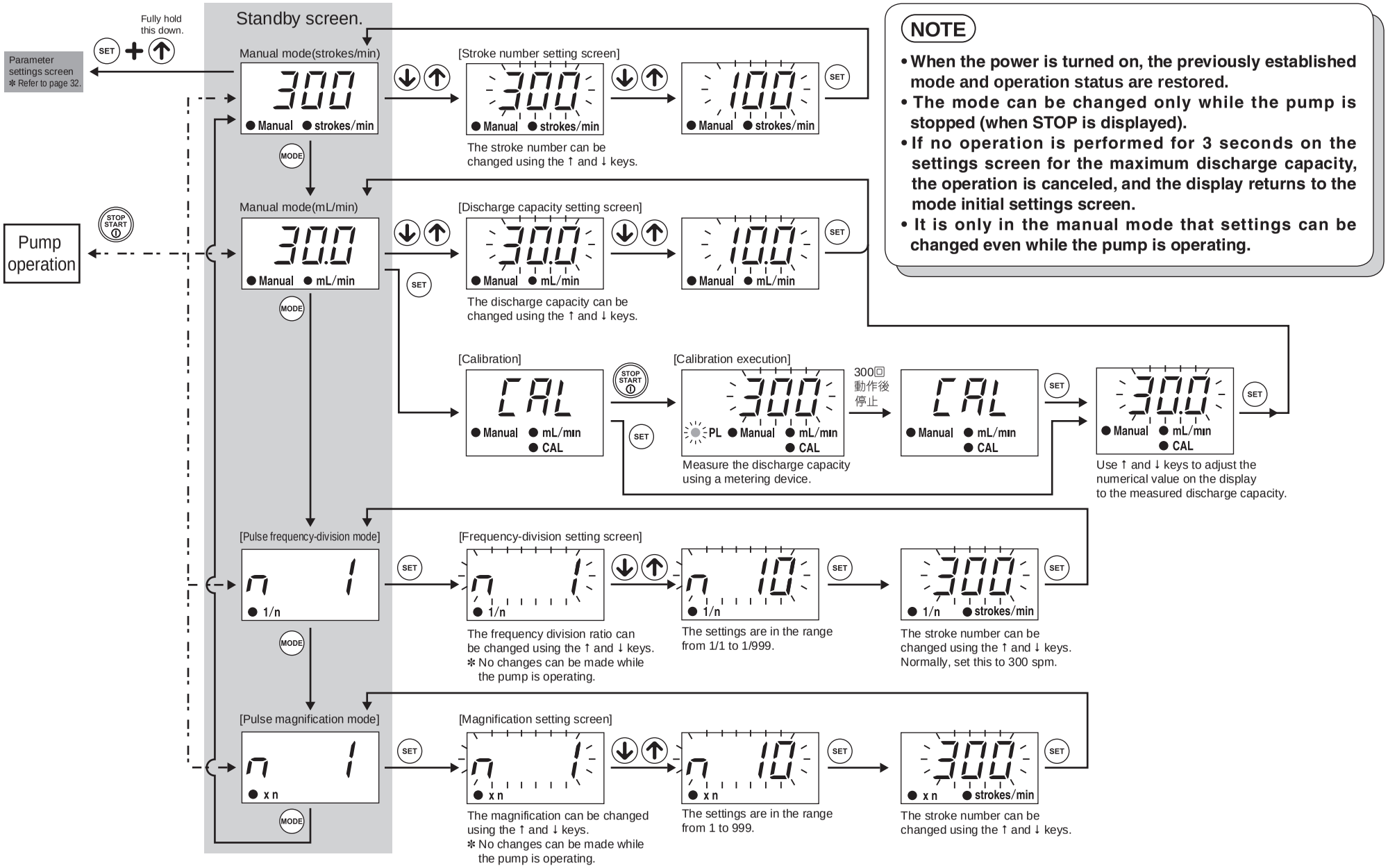
(2) After the warranty period
Consult with your vender. If repairs will make it possible for the product to maintain its functions, repairs will be undertaken if the user requests them, and the user will be charged for those repairs.

(3) Precautions when returning products for repair
In order to ensure the safety of repair personnel and protect the environment, the user must wash the pump thoroughly, and return it with the safety data sheet (MSDS) attached.
- ✻ The product may not be repaired if the safety data sheet (MSDS) is not attached.
- ✻ Even when the safety data sheet (MSDS) is attached, TACMINA may send the pump back if it determines that repairing it will constitute risks or dangers.

■Minimum retention period for consumables

TACMINA will continue to supply consumables for its pumps for a period of eight (8) years after the manufacture of the pumps has been discontinued.

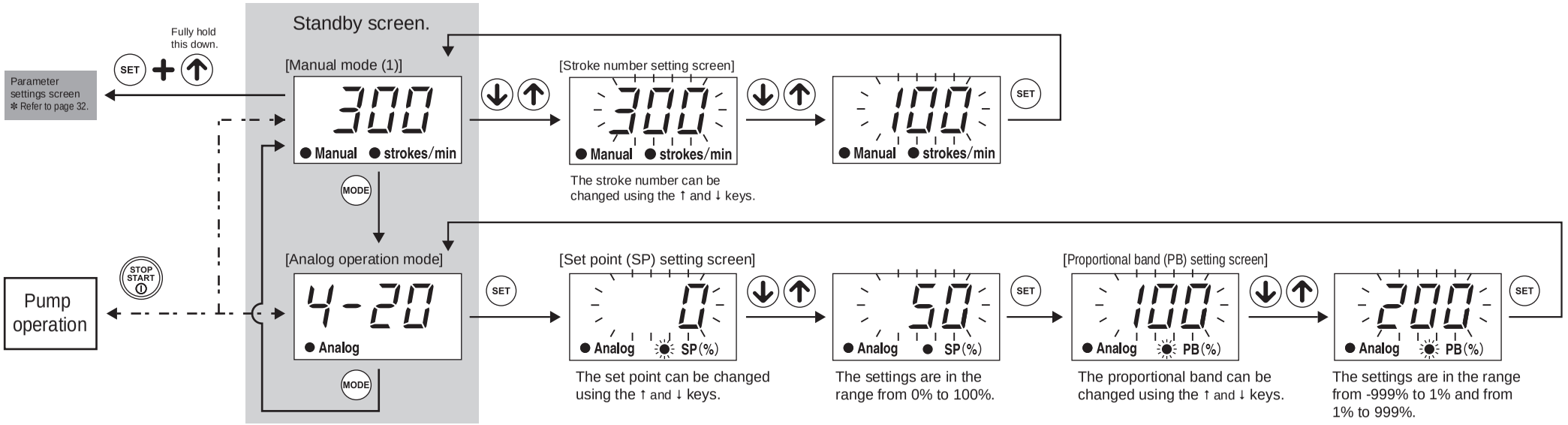
PW series: Standard (pulse) type setting flow



NOTE

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

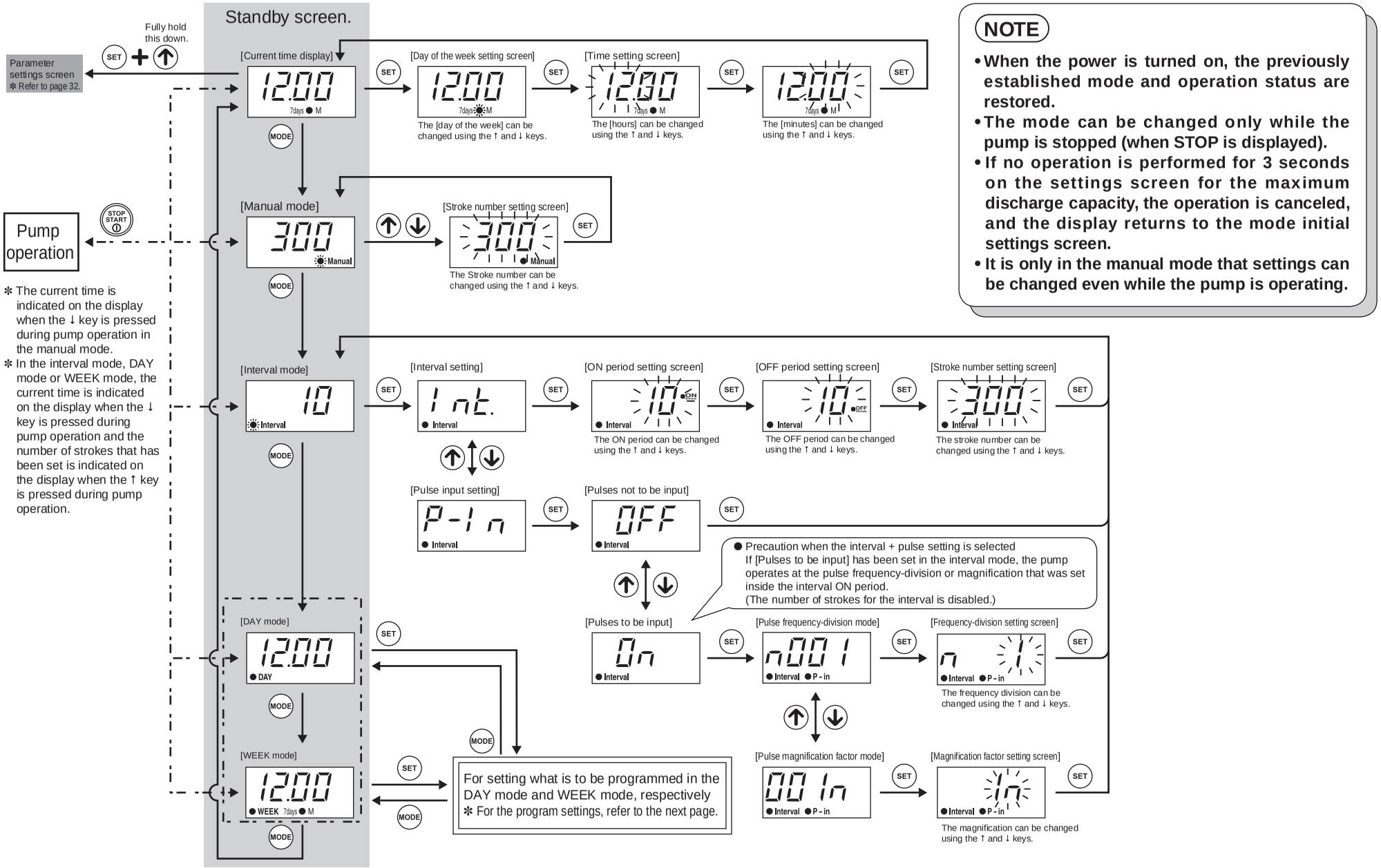
PWM series: Analog type setting flow



NOTE

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

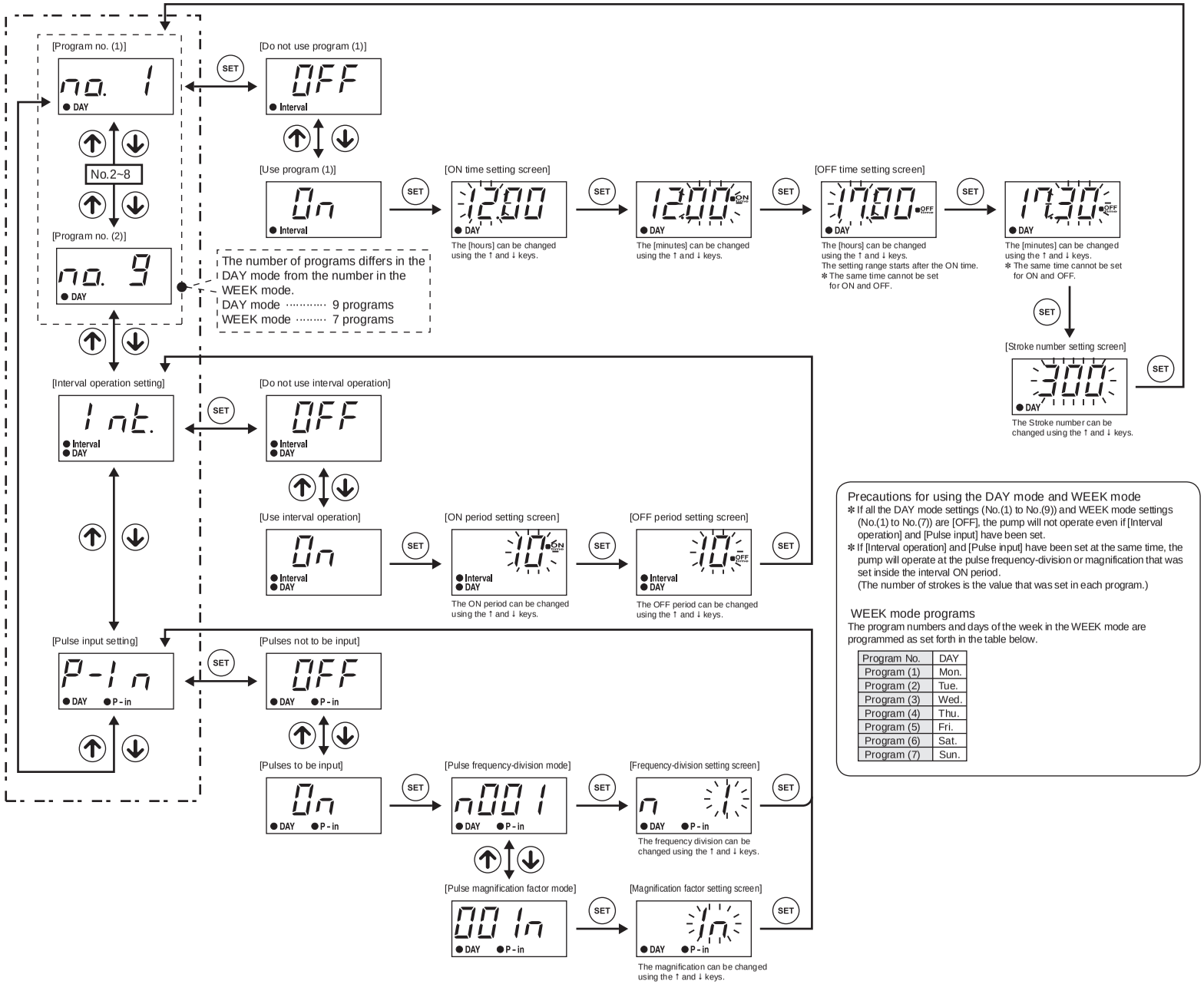
PWT series: Timer type setting flow



NOTE

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

● Details of DAY mode & WEEK mode setting flow



Precautions for using the DAY mode and WEEK mode

✻ If all the DAY mode settings (No.(1) to No.(9)) and WEEK mode settings (No.(1) to No.(7)) are [OFF], the pump will not operate even if [Interval operation] and [Pulse input] have been set.

✻ If [Interval operation] and [Pulse input] have been set at the same time, the pump will operate at the pulse frequency-division or magnification that was set inside the interval ON period.
(The number of strokes is the value that was set in each program.)

WEEK mode programs

The program numbers and days of the week in the WEEK mode are programmed as set forth in the table below.

Program No.	DAY
Program (1)	Mon.
Program (2)	Tue.
Program (3)	Wed.
Program (4)	Thu.
Program (5)	Fri.
Program (6)	Sat.
Program (7)	Sun.

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

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