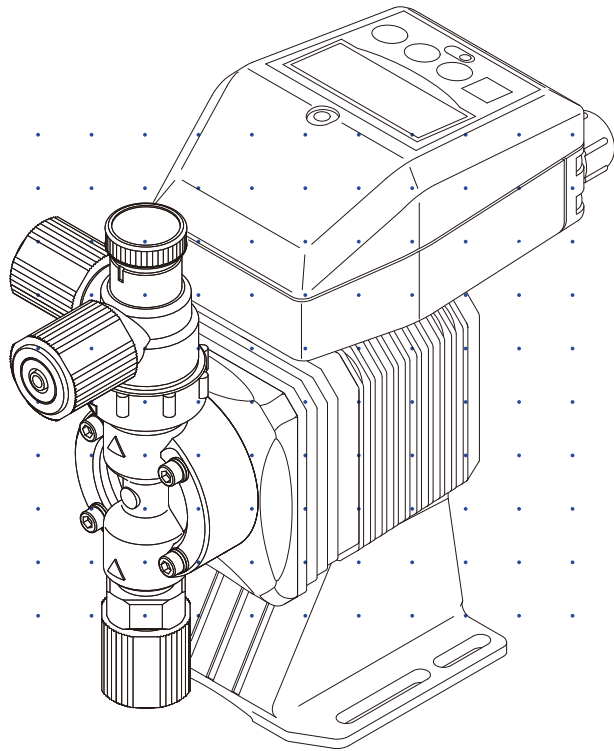


Iwaki


Electromagnetic Metering Pump

EHN-YN



Instruction manual

Thank you for choosing our product.

 Please read through this instruction manual before use.

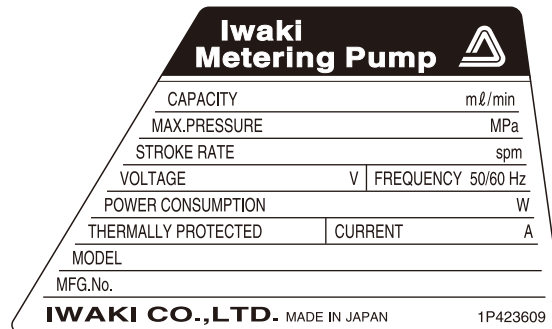
This instruction manual describes important precautions and instructions for the product. Always keep it on hand for quick reference.

Order confirmation

Open the package and check that the product conforms to your order. If any problem or inconsistency is found, immediately contact your distributor.

a. Check if the delivery is correct

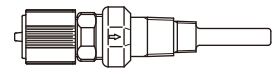
Check the nameplate to see if the information such as model codes, discharge capacity and discharge pressure are as ordered.



b. Check accessories are complete

- A check valve or a back pressure valve

*The applicable check valve and back pressure valve vary with pump models. See page 83 for applicable pumps and specs.



- Hose stoppers (ø4×ø6 or ø9×ø12)

*The EHN-BN_/-CN_ FC/SH models have fixed-tube sizes. So any hose stopper is not additionally provided to that pump configuration.

*Other pump configurations than above are equipped with the ø4×ø9 or ø8×ø13 hose stoppers when shipped from our factory. Use the additional ø4×ø6 or ø9×ø12 hose stoppers along with actual tube size to be used.

Model	EHN_MYN	EHN_MYN-NAE
# of hose stopper	4	5



ø4×ø6 tubing



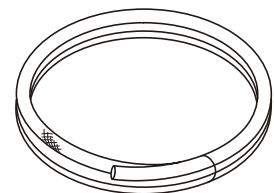
ø9×ø12 tubing

Note one out of the additional hose stoppers are packed with the check valve in a plastic bag.

- A 3m PVC braided tube (ø4×ø9 or ø8×ø13)

*To the EHN-BN_/-CN_ PP models, ø4×ø9 or ø8×ø13 EVA tubes are attached.

*No tube is attached for the EHN-BN_/-CN_ FC/SH models.



c. Check if the delivery is damaged or deformed

Check for transit damage and loose bolts.

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Safety instructions

Read through this section before use. This section describes important information for you to prevent personal injury or property damage.

■ Symbols

In this instruction manual, the degree of risk caused by incorrect use is noted with the following symbols. Please pay attention to the information associated with the symbols.



WARNING

Indicates mishandling could lead to a fatal or serious accident.



CAUTION

Indicates mishandling could lead to personal injury or property damage.

A symbol accompanies each precaution, suggesting the use of "Caution", "Prohibited actions" or specific "Requirement".

Caution marks



Caution



Electrical shock

Prohibition mark



Prohibited



Do not rework or alter

Requirement mark



Requirement



Wear protection



Grounding

Export Restrictions

Technical information contained in this instruction manual might be treated as controlled technology in your countries, due to agreements in international regime for export control.

Please be reminded that export license/permission could be required when this manual is provided, due to export control regulations of your country.

⚠ WARNINGS



Electrical
shock

Turn off power before service

Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed.



Requirement

Stop operation

If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems.



Prohibited

Do not use the pump in any condition other than its intended purpose

The use of the pump in any conditions other than those clearly specified may result in failure or injury. Use this product in specified conditions only.



Do not remodel

Do not modify the pump

Alterations to the pump carry a high degree of risk. It is not the manufacturer's responsibility for any failure or injury resulting from alterations to the pump.



Wear
protectors

Wear protective clothing

Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work. The specific solution will dictate the degree of protection. Refer to SDS precautions from the solution supplier.



Prohibited

Do not damage the power cable

Do not pull, knot or crush the power cable. Damage to the power cable could lead to a fire or electrical shock if cut or broken.



Prohibited

Do not operate the pump in a flammable atmosphere

Do not place explosive or flammable material near the pump.

⚠ CAUTIONS



Requirement

Qualified personnel only

The pump should be handled or operated by qualified personnel with a full understanding of the pump. Any person not familiar with the product should not take part in the operation or management of the pump.



Prohibited

Use specified power only

Do not apply power other than that specified on the nameplate. Otherwise, failure or fire may result. Ensure the pump is properly grounded.



Caution

Do not run pump dry

Do not run pump dry for more than 30 minutes (even when the pump runs for degassing). The pump head fixing screws may loosen and liquid may leak. Optimise your system. If the pump runs dry for a long period (for more than 30 minutes), the pump head and the valve guide may deform by friction heat and consequently leakage results.



Prohibited

Keep electric parts and wiring dry

Risk of fire or electric shock. Install the pump where it can be kept dry.



Caution

Ventilation

Fumes or vapours can be hazardous with certain solutions. Ensure proper ventilation at the operation site.



Prohibited

Do not install/store the pump:

- In a flammable atmosphere or a dusty/humid environment.
- Where ambient temperature can exceed 0-40°C.
- In direct sunlight or wind & rain.



Requirement

Spill precautions

Ensure protection and containment of solution in the event of plumbing or pump damage (secondary containment).



Prohibited

Do not use the pump in a wet location

The pump is not waterproof. Use of the pump in wet or extremely humid locations could lead to electric shock or short circuit.



Grounding

Grounding

Risk of electrical shock! Always properly ground the pump. Conform to local electric codes.



Electrical shock

Install a GFCI (earth leakage breaker)

An electrical failure of the pump may adversely affect other devices on the same line. Purchase and install an earth leakage breaker separately.



Requirement

Preventative maintenance

Follow instructions in this manual for replacement of wear parts. Do not disassemble the pump beyond the extent of the instructions.



Prohibited

Do not use a damaged pump

Use of a damaged pump could lead to an electric shock or death.



Requirement

Disposal of a used pump

Dispose of any used or damaged pump in accordance with local rules and regulations. If necessary, consult a licensed industrial waste disposal company.



Caution

Check the pump head bolts

Liquid may leak if any of the pump head bolts become loose. Tighten the bolts diagonally and evenly by the following torque before initial operation and at regular intervals.

Tightening torque

EHN-BN11/-BN16/-BN21, EHN-CN16/-CN21 : 2.16 N•m

EHN-BN31, EHN-CN31/-CN36 : 2.55 N•m



Requirement

Install a relief valve

Install a relief valve on a discharge line near the pump so as to automatically release the discharge pressure when it exceeds the maximum level.



Caution

Use a proven chemically-resistant tube

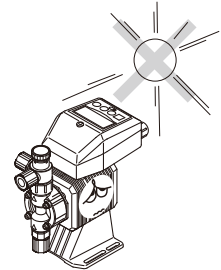
The 3m PVC braided tube attached, for example, may be chemically attacked especially with sodium hypochlorite. Use a proven chemical resistant tube if an aggressive chemical is used.

Precautions for use

- Electrical work should be performed by a qualified electrician. Otherwise, personal injury or property damage could result.

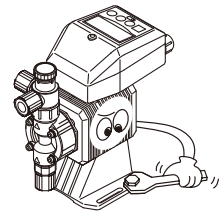


- Do not install the pump:
 - In a flammable atmosphere.
 - In a dusty/humid place.
 - In direct sunlight or wind & rain.
 - Where ambient temperature can exceed 0-40°C.
 - Where ambient humidity can exceed 85%RH.



Protect the pump with a cover when installing it out of doors.

- Select a level location, free from vibration, that won't hold liquid. Anchor the pump with four M5 bolts so it doesn't vibrate. If the pump is installed level, output may be affected.



- When two or more pumps are installed together, vibration may be significant, resulting in poor performance or failure. Select a solid foundation (concrete) and fasten anchor bolts securely to prevent vibration during operation.



- Allow sufficient space around the pump for easy access and maintenance.



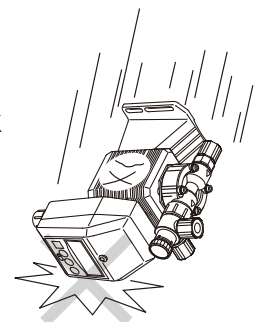
- Install the pump as close to the supply tank as possible.



- When handling liquids that generate gas bubbles (sodium hypochlorite or hydrazine solution), install the pump in a cool and dark place. Flooded suction installation is strongly recommended.



- Use care handling the pump. Do not drop. An impact may affect pump performance. Do not use a pump that has been damaged to avoid the risk of electrical damage or shock.



- The pump has a rating of IP66 equivalent, but is not waterproof. Do not operate the pump while wet with solution or water. Failure or injury may result. Immediately dry off the pump if it gets wet.



- Do not close discharge line during operation. Solution may leak or tubing may break. Install a relief valve to ensure safety and prevent damaged plumbing.



- Do not use the control unit to a different drive unit of other pumps. An electrical circuit or the drive unit may fail.



- Solution in the discharge line may be under pressure. Release the pressure from the discharge line before disconnecting plumbing or disassembly of the pump to avoid solution spray.



- Wear protective clothing when handling or working with pumps. Consult solution SDS for appropriate precautions. Do not come into contact with residual solution.



- Do not clean the pump or nameplate with a solvent such as benzine and thinner. This may discolour the pump or erase printing. Use a dry or a damp cloth or a neutral detergent.



Overview

Pump characteristics, features and part names are described in this section.

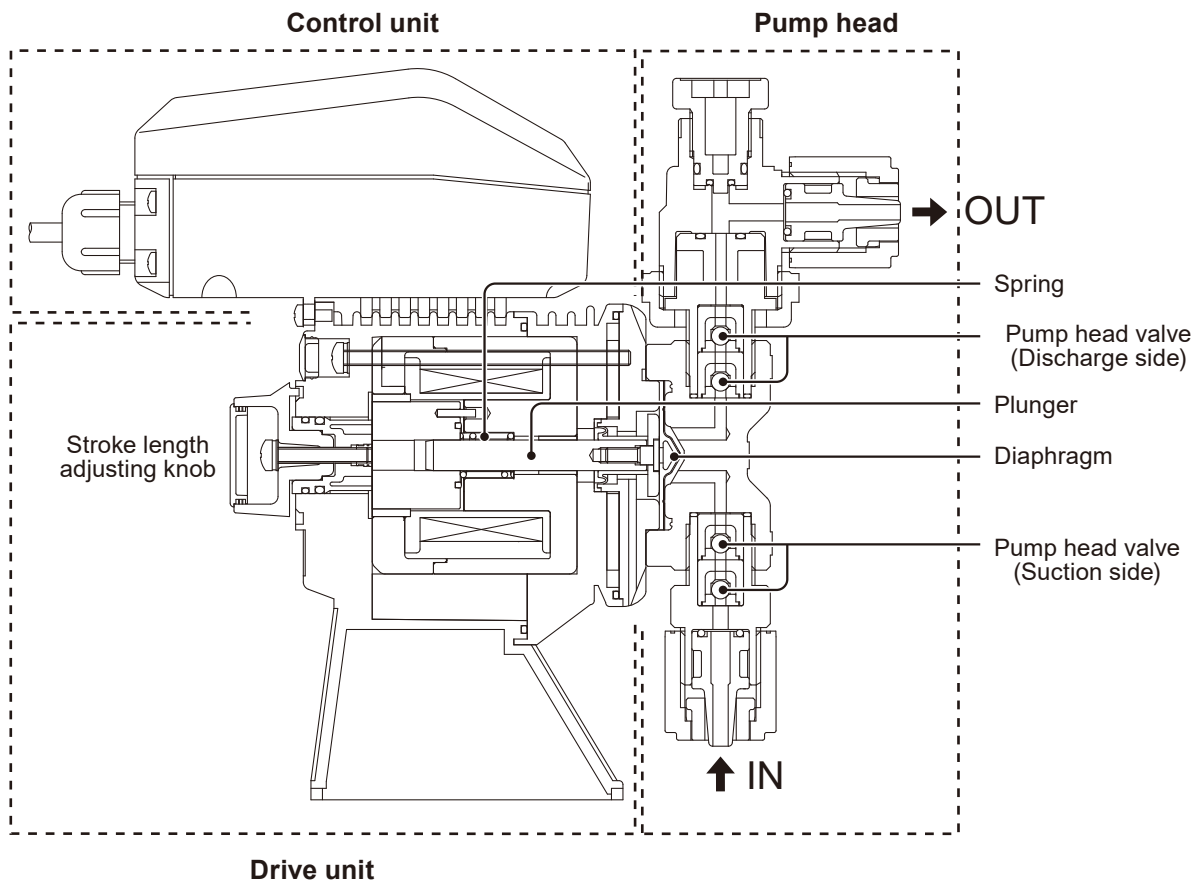
Introduction

Pump structure & Operating principle

The EHN series is a diaphragm metering pump which consists of a pump head, drive unit and control unit. A diaphragm is directly driven by electromagnetic force.

Principle of operation

The pulse signal via the control unit generates the electromagnetic force to make reciprocating motion with the assistance of the spring force. The reciprocating motion is transferred to a diaphragm through a plunger and then volumetric change occurs in the pump head. This mechanism transfers liquid along with pump head valve action.



Features

- **Multivoltage operation**

The EHN series is a multivoltage type (100-240VAC) and can be selected without local power limitations.

- **High turndown ratio**

A wide range, digitally-controlled, turndown ratio of 1-360spm with fine flow tuning (stroke length adjustment)

- **Waterproof and dustproof structure**

The sealed unit design assures a rating of IP66 equivalent.

*This pump is not water resistant. Protect the pump with a cover when installing it out of doors.

- **External control**

External signals through an analogue input and a digital input can control operation. Use the analogue input to make proportional control and the digital input to run the pump with a multiplier or a divisor.

- **Auto degassing system (Auto degassing type)**

Enables gaseous liquid delivery, expelling gas to open air to prevent gas lock in the pump head.

- **Auto restoration (with the FCM flow checker connected to the control unit)**

The pump starts to run at a full speed (360spm) once a flow checker detects gas lock in the pump head.

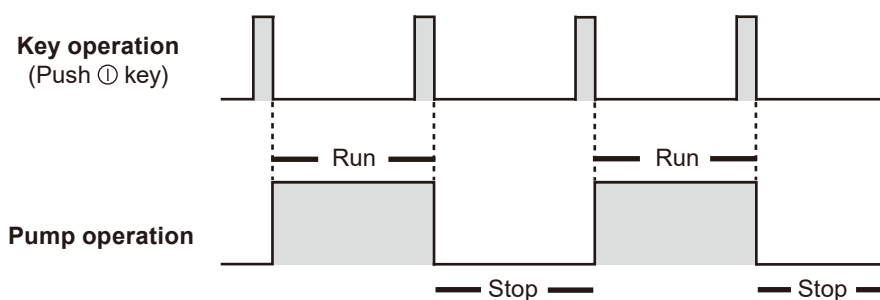
*The pump stops when having failed to resolve gas lock.

*For the pump with the XFCM flow checker code, electrically connect the FCM flow checker NOT to the control unit on top of the pump but an external controller.

Operational function

Manual mode

Run/stop the pump with the start/stop key. A stroke rate (MAN speed) can be changed in the range of 1-360spm with the UP and the DOWN keys at any time during operation or stop. See page 49 for detail.

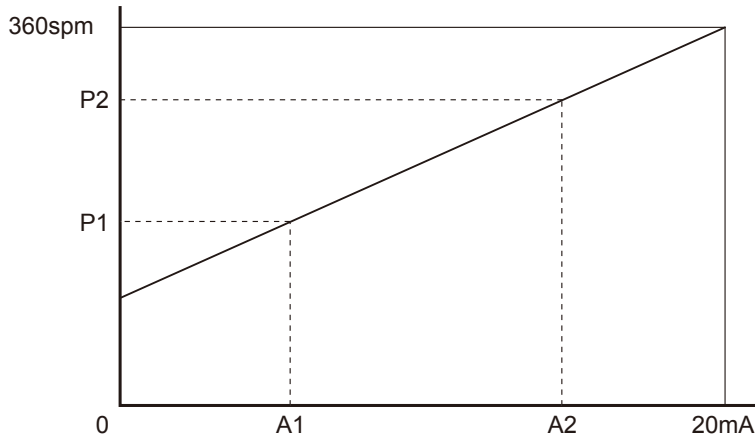


EXT mode

■ Proportional control (Analogue control: See page 49)

The pump increases/decreases a stroke rate in the range of 0-360spm in proportion to 0-20mA.

An optimal proportional line must be established beforehand based on two different operating points (P1-A1, P2-A2). Extra attention for unexpected pump behaviour may be needed for this type of control. In the following control line, for example, 0spm does not come at 0mA. In other cases, the pump speed may reach 360spm before 20mA (however, the pump does not run over 360spm at any mA-spm setting.).



Conditions

- A1 and A2 must be 20mA or below
- P1 and P2 must be 360spm or below
- A1 and A2 must be different mA
- P1 and P2 must be different spm

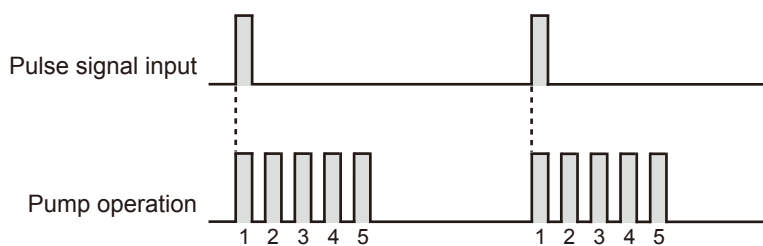
■ Multiplier setting (Digital control: See page 51)

The pump runs at the MAN speed for the preset multiplier (1-999 strokes) per incoming external signal.

*The pump makes one stroke per pulse when a multiplier is set to 1.

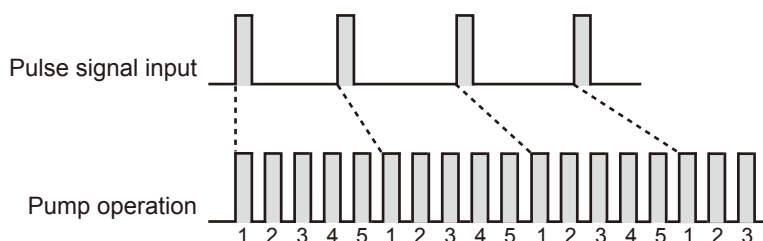
*The pump will pause the operation while the STOP signal is input and resume the operation when the STOP signal is released (if the pump is paused at the moment the first three strokes are completed, for example, the pump resumes to finish the remaining 4th and 5th strokes right after pausing is cancelled.).

Example) When the multiplier is set to 5, the pump makes five strokes per signal.



With the multiplier buffer ON ("X-ON"), the buffer stores excess pulse signals, which are entered before the scheduled strokes per signal are completed.

*The excess pulse signals are stored for up to 65535 strokes.



■ Divisor setting (Digital control: See page 53)

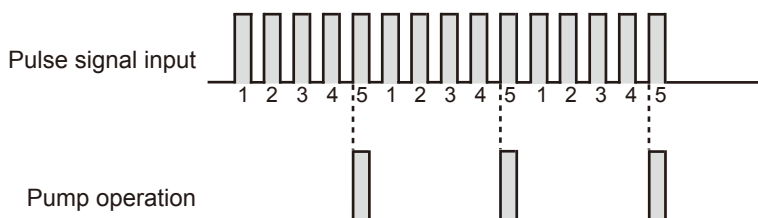
The pump runs for the preset divisor (1-999 pulse rates) at every incoming external signals.

*In the digital control with a preset divisor, the pump does not run over 360spm at any pulse rate.

*The pump makes one stroke per pulse when a divisor is set to 1.

*The pump will pause operation while the STOP signal is input and resume operation when the STOP signal is released (if the pump is paused at the moment the first three pulses are entered, for example, the pump resumes right after the remaining 4th and 5th pulses are entered.).

Example) When the divisor is set to 5, the pump makes one stroke every 5 signals.



With the divisor buffer ON ("/-ON"), the buffer stores excess pulse signals, which are entered to exceed the maximum speed of 360spm.

*The excess pulse signals are stored for up to 65535 strokes.

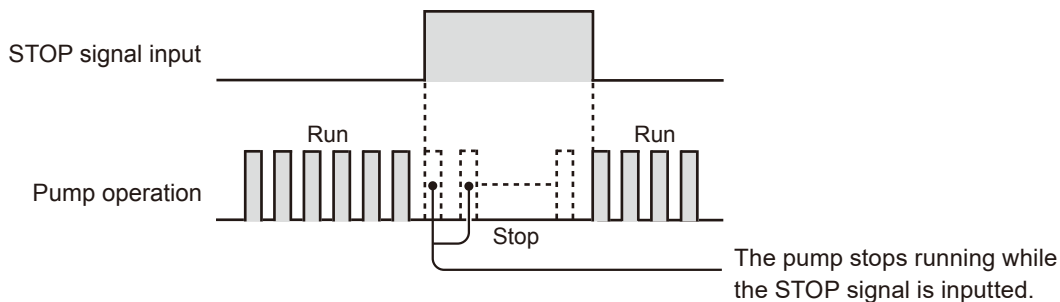
■ STOP function (See page 55)

The start/stop of the pump can be controlled by external devices such as a level sensor.

STOP signal input: "M-OFF"

The pump stops while receiving the external signal via the STOP terminal (closed circuit).

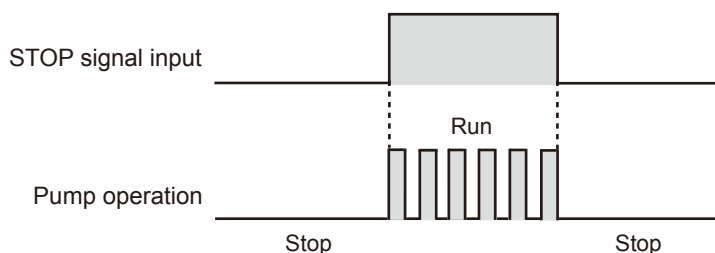
*The pump resumes operation when the STOP signal is released.



STOP signal input: "M-ON"

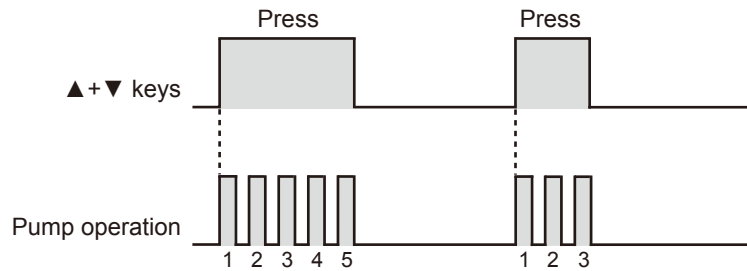
The pump runs while receiving the external signal via the STOP terminal (closed circuit).

*The pump stops operation when the STOP signal is released.



■ Priming function (See page 56)

The pump runs at the maximum stroke rate while both the UP and DOWN keys are pressed. Use this function for priming or degassing.



■ Auto restoration (with the FCM flow checker connected to the control unit: See page 57)

The pump starts to run at a full speed (360spm) once a flow checker detects gas lock in the pump head. Program the following time periods before operation.

Pre-Alarm time programming

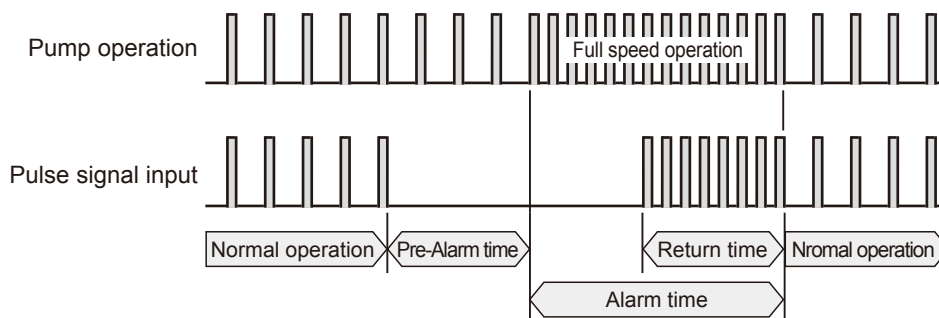
Set a time period from the detection of gas lock to the start of full speed operation. The pump keeps running along with setting during this period.

Alarm time programming

Set a time period of the full speed operation. The pump stops when having failed to resolve gas lock in this period.

Return time programming

Set a time period from the resolution of gas lock to the resumption of the normal operation. The pump keeps running at the full speed during this period.

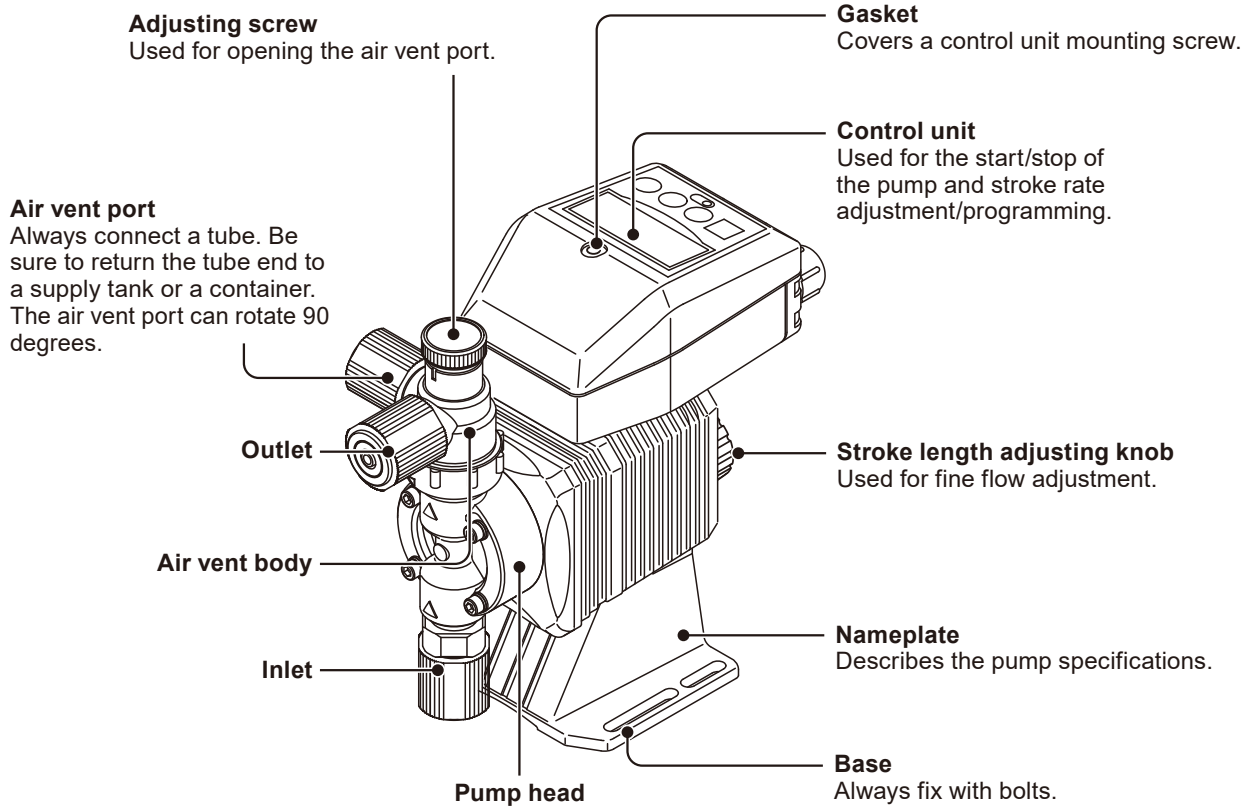


■ Synchronous output (See page 57)

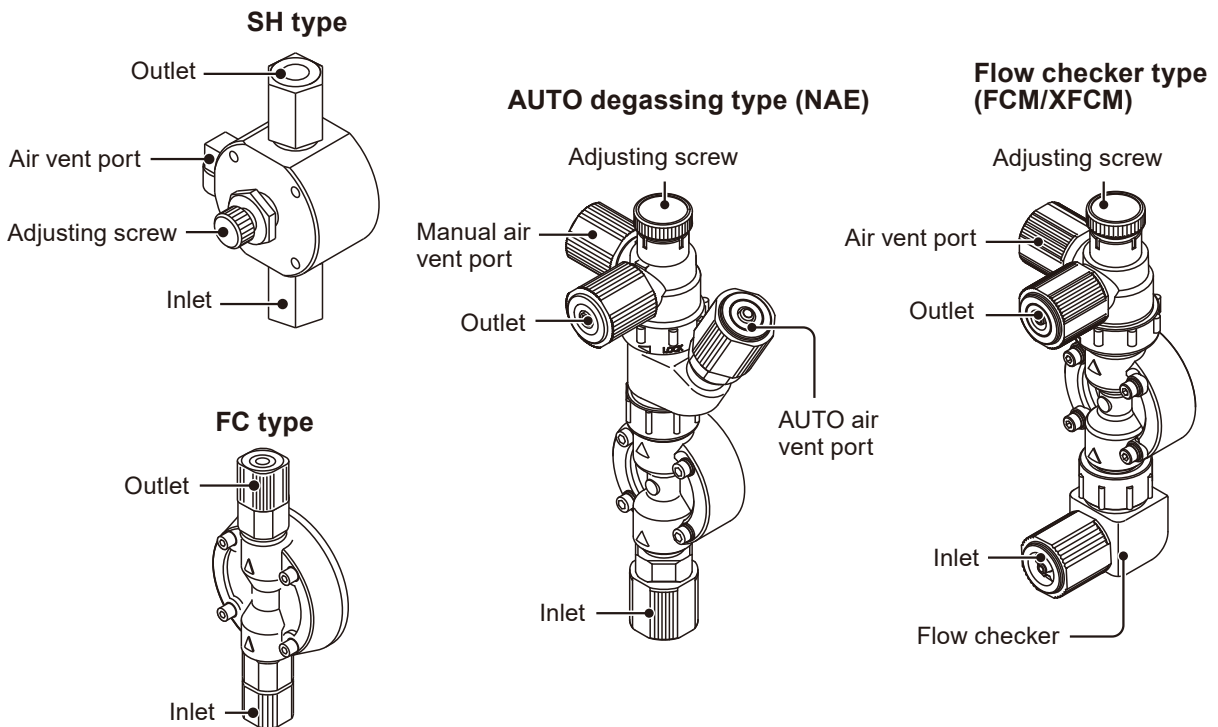
The pump outputs the pulse signal in sync with the pump stroke (spm) via the out terminal.

Part names

Pump

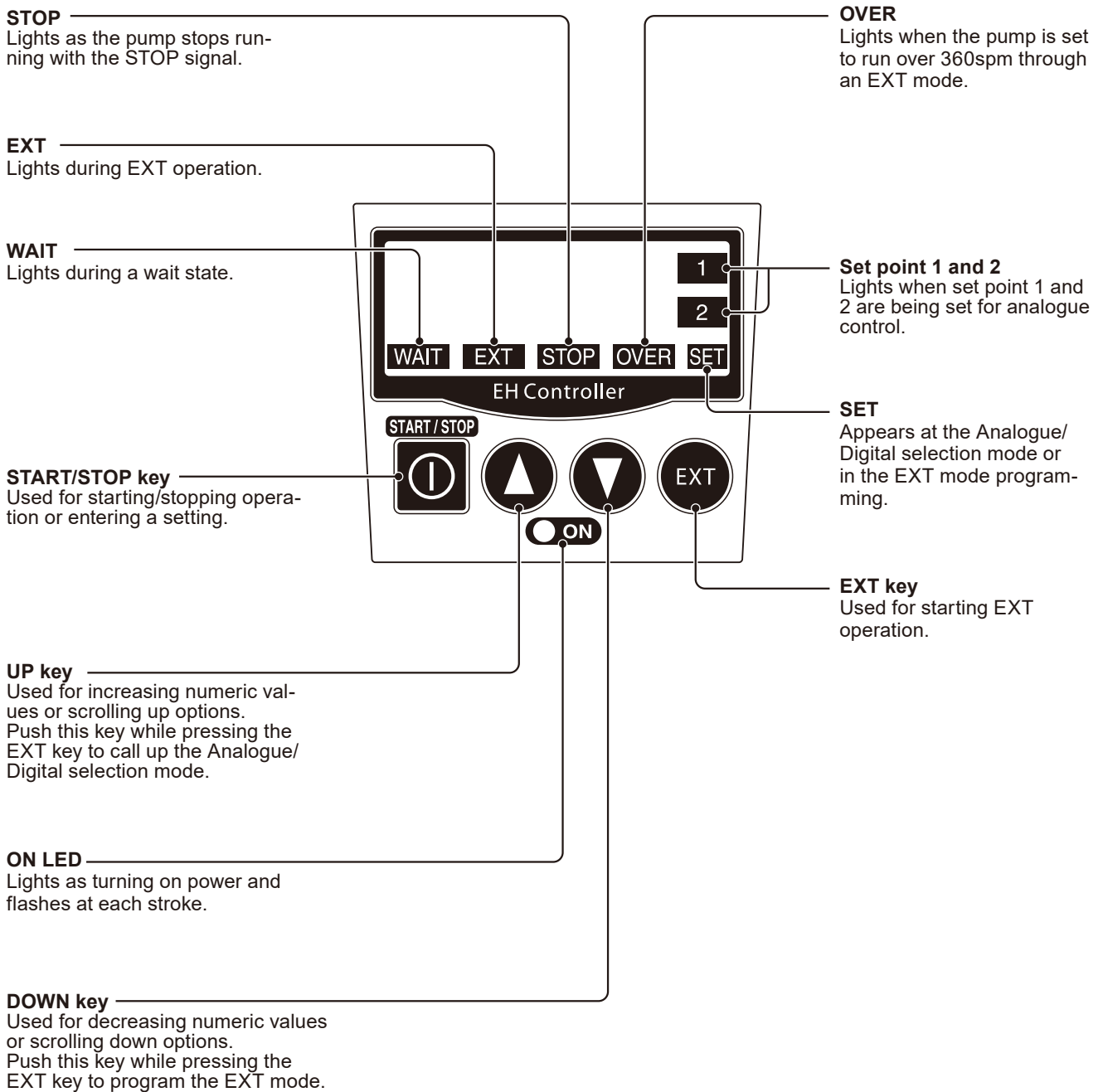


Pump heads













*The FC type does not have an air vent port.




Operation panel







■ Basic displays

Display	States
	Manual mode. The pump is running at 360spm.
	A waiting state. "WAIT" indication appears. Numerical value shows the MAN speed.
	EXT mode with a multiplier 5. The pump is making five strokes per signal.
	EXT mode with a divisor 5. The pump is making one stroke per 5-signal.
	EXT mode with analogue signals. Numeric value shows the pump speed.
	Analogue control is selected to EXT mode.
	Digital control is selected to EXT mode.
	Analogue control is being set.
	Digital control is being set.
	M-OF or M-ON is being set for STOP function. An input of the STOP signal suspends operation with the left choice (M-OF).

■ Alarm displays

Display	States
	"EXT" and "OVER" indications appear when the pump under analogue control is set to run over 360spm with the external current signal, however, the pump speed does not exceed that maximum rate at any current value.
	"EXT" and "OVER" indications appear when the pump under digital control (with multiplier) receives an excess pulse which exceeds the MAN speed pulse rate. Such a pulse is stored for up to 65535 strokes if the multiplier buffer is turned on ("X-ON").
	"EXT" and "OVER" indications appear when the pump under digital control (with divisor) receives an excess pulse which exceeds the maximum design speed of 360spm. Such a pulse is stored for up to 65535 strokes if the divisor buffer is turned on ("/-ON").

■ Other displays

Display	States
	The pump is running at 360spm by the priming function.
	Keypad is locked. Any key operation is cancelled. See page 56 to release this state.
	
	

■ Auto restoration displays

Display	States
PAOF	Pre-Alarm time is being set.
PA I	
ALOF	Alarm time is being set.
AL I	
REOF	Return time is being set.
RE I	
RE.O I	
PAAL	Alarm out or pump out is being set.
PA	
AL	
SAM	
PE r r	The pump is running at full speed after the detection of air lock.
FLOW	The pump has stopped after failing to remove air lock.

*Set the auto restoration function only when the FCM flow checker is connected to the controller.

Identification codes

Each code represents the following information.

Pump

EHN - BN 11 VC _ M YN - _ - _
a b c d e f g h i

a. Series name

EHN : Multivoltage electromagnetic metering pump

b. Drive unit (Average power consumption)

BN : 20W

CN : 24W

c. Diaphragm effective diameter

11 : 10mm 16 : 15mm 21 : 20mm

31 : 30mm 36 : 35mm

d. Wet end materials

Pump

Code	Pump head	Fitting	Valve	O ring	Valve seat	Gasket	Diaphragm
VC	PVC	PVC	Alumina ceramic	FKM	FKM	PTFE	PTFE (bonded to EPDM)
VS			SUS316 equivalent	EPDM	EPDM		
PC	GFRPP	GFRPP	Alumina ceramic	FKM	FKM		
PS			SUS316 equivalent	EPDM	EPDM		
PP			Alumina ceramic	FKM	PCTFE		
FC	PVDF	PVDF	Alumina ceramic	-	SUS316		
SH	SUS316	SUS316			HC		

Flow checker (FCM/XFCM flow checker type)

Code	Body	Float	Control sheet	O ring
VC	PVC	PVC	PVC	FKM
VS				EPDM

Automatic air vent (NAE Auto degassing type)

Code	Air vent valve guide A	Air vent valve guide B	Valve	Separate pin	Valve seat	O ring
VC	PVC	PVC	Zirconia ceramic	Titanium	FKM	FKM
VS			SUS316 equivalent	SUS316 equivalent	EPDM	EPDM

Material code

PVC : Polyvinyl chloride

GFRPP : Glassfiber-reinforced polypropylene

EPDM : Ethylene-propylene rubber

FKM : Fluorine-contained rubber

PTFE : Polytetrafluoroethylene

PCTFE : Polychlorotrifluoroethylene

HC : Hastelloy C276 equivalent

SUS316 : Austenitic stainless steel

PVDF : Polyvinylidene difluoride

e. Connection

Code	Tube I.D. × O.D.
No code	ø4×ø9/ø4×ø6*
	ø8×ø13/ø9×ø12*
2	ø4×ø6
6	ø10×ø12
9	Rc¼" female thread

*When the ø4×ø6 or ø9×ø12 tube is used, use the attached hoes stopper accordingly.

f. Fitting

No code : Fixed-tube connection

M : Multi-tube connection

g. Control unit function

YN : High functional

h. Special version

No code : Standard type

55 : High compression type

NAE : Auto degassing type

i. Flow checker

No code : No flow checker installed

FCM : Flow checker pre-installed and connected to the control unit

XFCM : Flow checker pre-installed and NOT connected to the control unit

Control unit

EHNC - B YN - _____
 a b c d

a. Model

EHNC : Multivoltage control unit

b. Drive unit

B : 20W

C : 24W

c. Control unit function

YN : High functional

d. Special version

No code : Standard type

01-99 : Customized model

Installation

This section describes the installation of the pump, piping and wiring. Read through this section before work.

! Points to be observed

- Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed.
- If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems.
- Do not place explosive or flammable material near the pump.
- Do not use a damaged pump. Use of a damaged pump could lead to an electric shock or death.

Pump mounting

Select an installation location and mount the pump.

Necessary tools

- Four M5 bolts (pump mounting)
- An adjustable wrench or spanner

1 Select a suitable place.

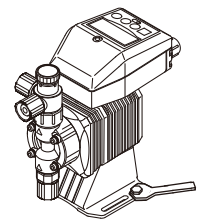
Select a level location, free from vibration, that won't hold liquid. See page 10 for detail. Flooded suction installation is strongly recommended when handling liquids that generate gas bubbles (sodium hypochlorite or hydrazine solution).

2 Anchor the pump with four M5 bolts.

Be sure to fix the pump at four points.

NOTE

If the pump is not installed level, output may be affected.



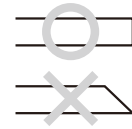
Plumbing

Connect tubes to the pump and install a check valve.

Before operation

- Cut the tube ends flat.

Tube end (side view)



Necessary tools

- An adjustable wrench or a spanner.

Tube connection

When the tube is removed and then reconnected

- If the fitting nut, stopper, adaptor, fitting, or tube surface is wet with a chemical liquid, flush with tap water and then dry off. Wet parts won't bite into the tube successfully, and the tube may slip out of the connection with a chemical spill.
- When removing the connection, if the adaptor has become stuck in the crushed tube and stopper and those parts can not be separated, contact us for a new adaptor/stopper set.
- Do not reuse the same crushed tube end to reseal the tubing. Cut off the end and start with new tubing to ensure a new seal is established.
- Use a new tube if the old tube is hardened, swollen, discoloured, cracked, worn, or sticky.

■ Multi-tube connection for the EHN-BN_/-CN_ VC/VS/PC/PS/PP models

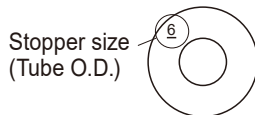
When the tube is first connected

- a. Pass the tube through the fitting nut and stopper, and then slide it down onto the adaptor to the following depth or farther.

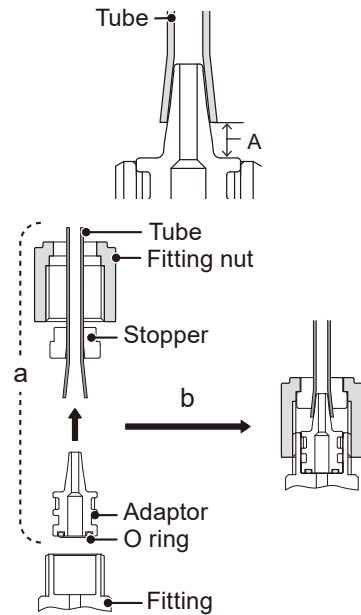
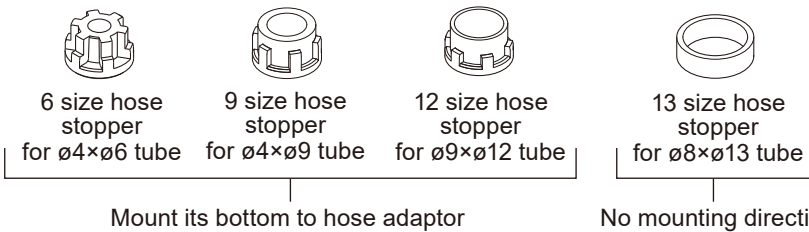
Tube size (I.D.×O.D.)	Depth (A)
ø4×ø6	6 mm
ø4×ø9	4 mm
ø9×ø12	7 mm
ø8×ø13	5 mm

*If you are to use a ø4×ø6 or ø9×ø12 tube size, change the hose stopper accordingly.

*See the back side of the stopper for the stopper size (tube O.D.).



*The shapes of the hose stoppers differ according to the size.



- b. Put the tube end (adaptor) onto the fitting. Then hand tighten the fitting nut.

*Make sure the O ring is in place (beneath the adaptor), or leakage of the solution may result.

- c. Retighten the fitting nut by turning it further 180 degrees with an adjustable wrench or a 27mm spanner so it crushes into the tube a little.

*Do not use excessive force when tightening the plastic fitting nut. Overtightening may crush tube too thin and weaken connection.

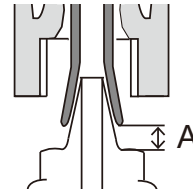
*Some tubing may be too firm to be pushed onto the adaptor to the designated depth shown above. If so, wet the tapered area of the adaptor to give it some lubricity, or immerse the tube end into warm water (40°C or below) to give it more flexibility.

■ Fixed-tube connection for the EHN-BN_/-CN_FC models

When the tube is first connected

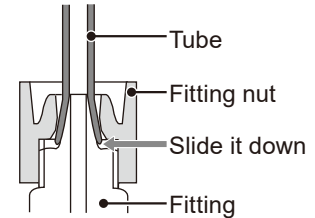
- a. Pass the tube through the fitting nut and slide it down onto the fitting to the following depth or farther.

Tube size (I.D.×O.D.)	Depth (A)
ø4×ø6	1mm
ø10×ø12	1mm



- b. Then hand tighten the fitting nut.
 c. Retighten the fitting nut by turning it 180 degrees with an adjustable wrench or a following spanner.

Model	Spanner size
EHN-11/21 FC	22mm
EHN-31/36 FC	24mm

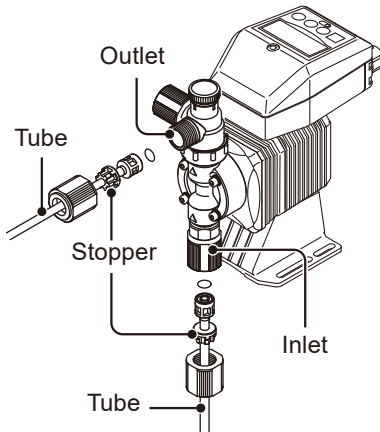


*Do not use excessive force when tightening the plastic fitting nut. Overtightening may crush tube too thin and weaken connection.

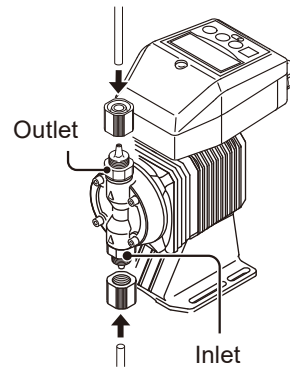
*Some tubing may be too firm to be pushed onto the fitting to the designated depth shown above. If so, wet the tapered area of the fitting to give it some lubricity, or immerse the tube end into warm water (40°C or below) to give it more flexibility.

1 Connect tubes into the pump inlet and outlet.

Multi-tube connection



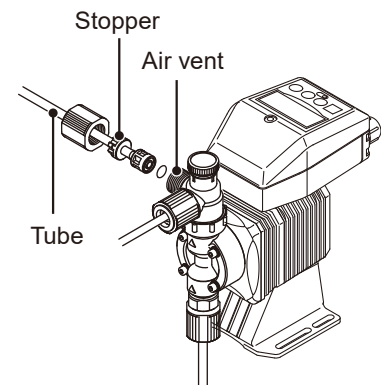
Fixed-tube connection (with the FC wet ends)



*The FC type does not have an air vent port. Tubing has now been completed.

2 Connect a tube to establish the air vent line.

Route back the other tube end to a supply tank or a container.



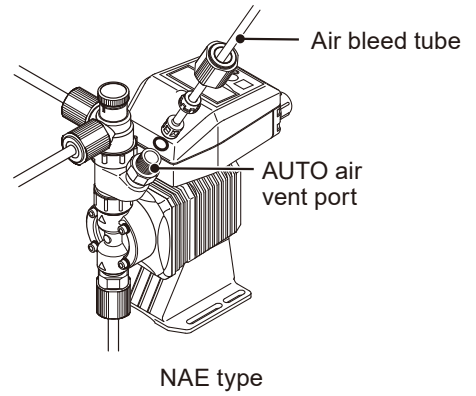
Multi-tube connection

3 For the NAE type, connect an air bleed tube to establish the AUTO air vent line.

Route back the end of the auto air vent line to a supply tank or a container.

Even after gas is eliminated from the pump, a small amount of liquid is continuously expelled through the air vent path as long as the pump is running (you will see more liquid in siphoning).

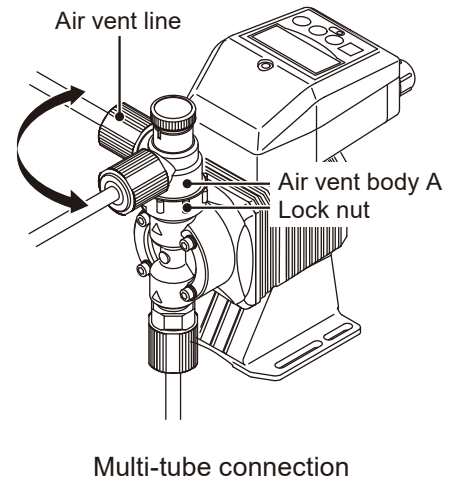
*If you are to use a $\varnothing 4 \times \varnothing 6$ tube, change the stopper size accordingly.



4 Determine the air vent body A direction.

The air vent body A can rotate 90 degrees.

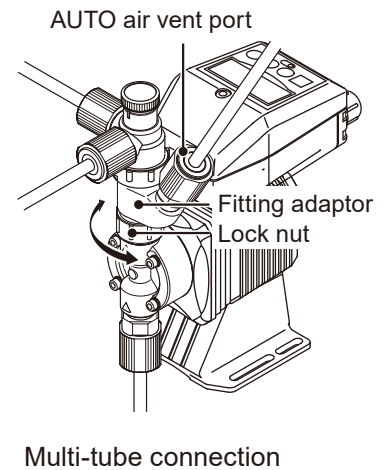
- Loosen the lock nut.
- Turn the air vent body A to the optimal direction.
- Hand-tighten the lock nut, holding the air vent body A.
- Use an adjustable wrench or a 38mm spanner to turn the lock nut further 90 degrees.



5 For the NAE type, determine the AUTO air vent port direction.

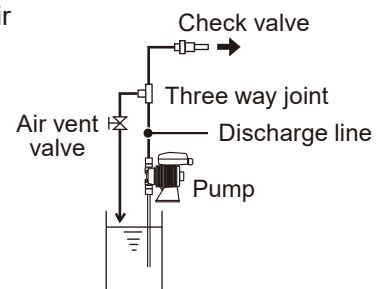
The fitting adaptor can rotate 90 degrees.

- Loosen the lower lock nut.
- Turn the fitting adaptor to the optimal direction.
- Hand-tighten the lower lock nut, holding the fitting adaptor.
- Use an adjustable wrench or a 32mm spanner to turn the lock nut further 90 degrees.



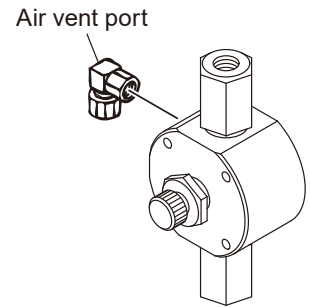
NOTE

The air vent port is not provided to the pump with the FC wet ends. Install an air vent valve as the right diagram shows.

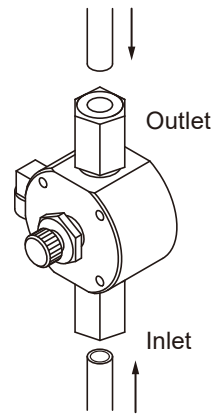


Thread connection for the EHN-SH models

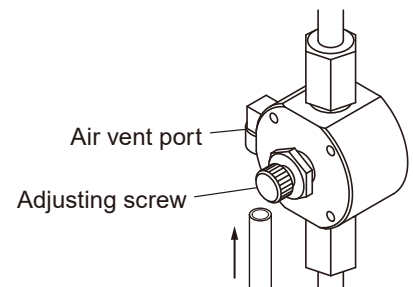
- 1 Wrap a sealing tape around the threads of the air vent port and screw it into the pump head.



- 2 Connect pipes into the pump inlet and outlet (Rc1/4 female thread).
Use a proper pipe size to prevent a leakage or entrained air.
*Establish the shortest pipe line length and the minimum number of bends so the pipe resistance is minimized.

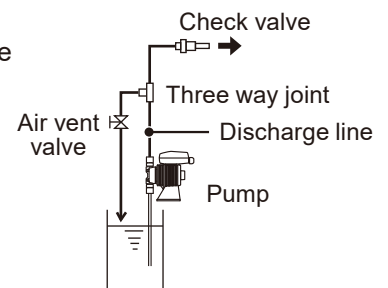


- 3 Connect a pipe to establish the air vent line.
Route back the other tube end to a supply tank or a container.



NOTE

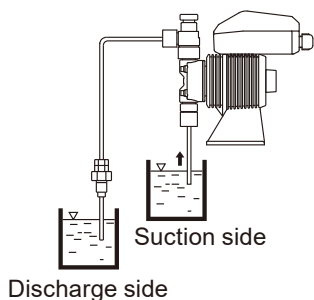
Even if the adjusting screw of the pump with the SH wet ends is loosened, the discharge line may be under pressure. Install an air vent valve on the discharge line as well.



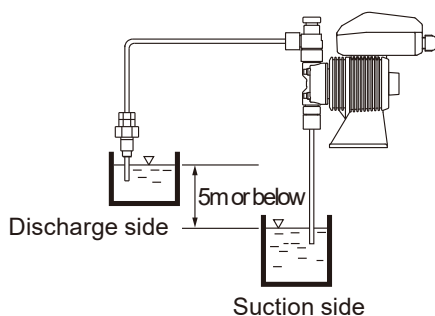
Check valve/Back pressure valve mounting

Install a provided check valve or a back pressure valve to the pump for the prevention of a back flow, siphon and overfeeding. In the following cases, be sure to install the check valve or a back pressure valve.

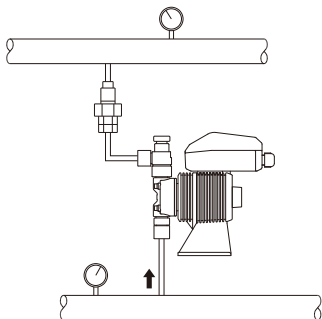
- A suction side liquid level is higher than a discharge side or an injection point at atmospheric pressure.



- A discharge side liquid level is higher than a suction side but the distance is 5m or below.



- A suction side pressure is higher than a discharge side pressure.



- A discharge pressure (including pipe resistance and discharge head) is below 0.13MPa (0.049MPa for the EHN-BN31/-CN36).

■ **Tube connection for the EHN-BN_/-CN_ VC/VS/PC/PS/PP/FC models**

1 Mount a check valve or a back pressure valve at the discharge tube end.

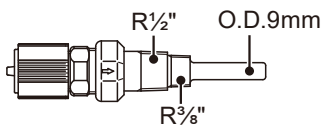
*The CAN check valve has the R $\frac{1}{2}$ " and R $\frac{3}{8}$ " thread connections as well as an O.D. 9mm tube connection. The BVC back pressure valve has the R $\frac{1}{2}$ " and R $\frac{3}{8}$ " thread connections as well as an O.D.12mm tube connection. If required, trim off an amount of the extension tip until it fits your fitting or tee.

*If you are to use a different tube size ($\phi 4 \times \phi 6$ or $\phi 9 \times \phi 12$) with a multi-tube connection, change stopper size accordingly.

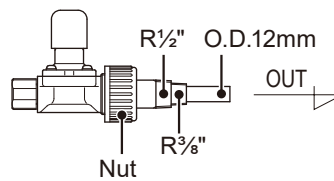
NOTE

The maximum allowable tightening torque of the R $\frac{1}{2}$ " and R $\frac{3}{8}$ " thread connections are 10 N·m. Do not use excessive force when tightening into a pipe.

CAN check valve

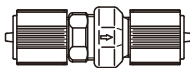


BVC back pressure valve



*The CBN check valve (both ends tube connections) is optionally available. Contact us or your nearest distributor.

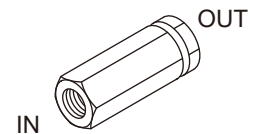
CBN check valve



■ **Thread connection for the EHN-BN_/-CN_ SH models**

1 Mount a check valve at the discharge pipe end.

The discharge line must be 1 m or longer.

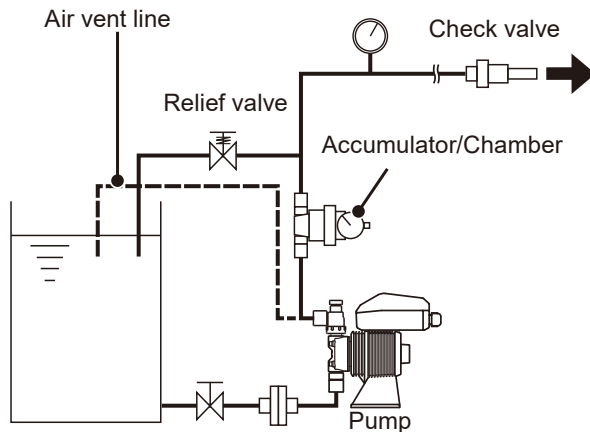


NOTE

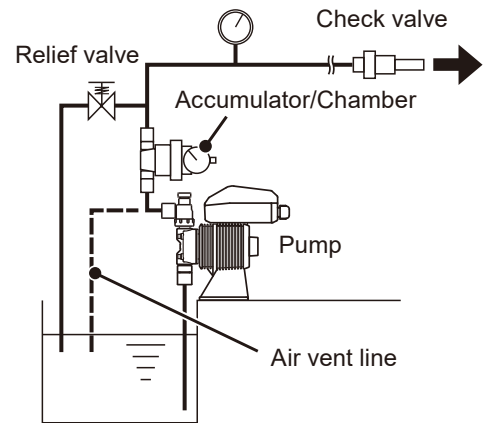
- Periodically clean or replace a check valve with new one for the prevention of crystal clogging, especially when using sodium hypochlorite.
- If the set pressure of the check valve plus the injection point pressure to your system is lower than the maximum discharge pressure of the pump, the pump output can exceed the specified point. See page 44 and adjust the output capacity.

Tubing layout

Flooded suction application

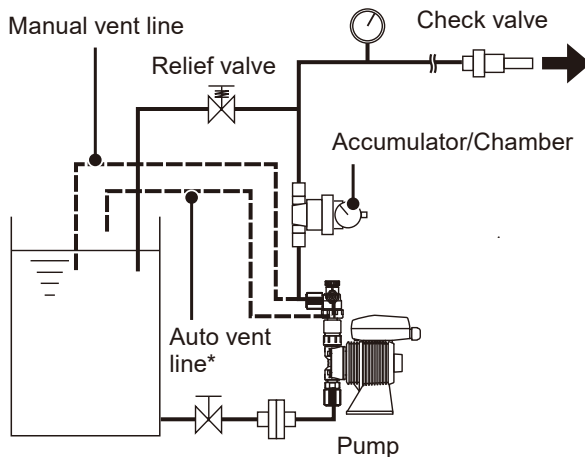


Suction lift application

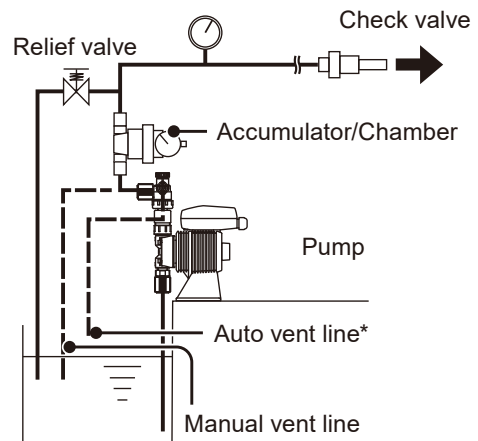


Tubing layout of the EHN_NAE models

Flooded suction application



Suction lift application



NOTE

- Flooded suction installation is strongly recommended when handling liquids that generate gas bubbles (sodium hypochlorite or hydrazine solution).
 - Install a branched pipe and a relief valve on the discharge line for the prevention of excessive pressure that might be caused by a clogged injection point.
 - When flooded suction installation is established, keep the suction line length shorter than 1m for ensuring the auto degassing system works properly. Any longer length may contain too much gas inside which exceeds the degassing capability of the pump, however, use of an optional Iwaki DG degassing joint to the pump inlet can help enhance the degassing capability.
 - When the pump and system are restarted after a long interval, be sure to expel gas from the pump and the suction line manually through the degassing step on page 39.
 - Even after gas is eliminated from the pump, a small amount of liquid is continuously expelled through the air vent path as long as the pump is running (you will see more liquid in siphoning). Be sure to route back the end of the auto air vent line to a supply tank or a container.
 - The auto air vent line to a supply tank or a container must be established in the possible shortest distance without any arched line.
- *Keep the auto vent line open ended to atmosphere. Do not immerse the tube end in solution in a supply tank.

When the BVC back pressure valve is used:

- Mount the BVC valve on the vertical discharge line ensuring the BVC outlet directs upwards.
*If you mount the BVC valve in a horizontal discharge line or upside down, it does not work properly.
- If plumbing is extended further beyond the mounting location of the BVC valve, do not install a shut-off valve on the extended line. This product will be damaged if the shut-off valve is fully closed while the pump is running.
- If plumbing is extended further beyond the mounting location of the BVC valve, always keep the pressure in the extended plumbing half or lower than the set pressure of the BVC valve.
- Replace gaskets with new ones every time when the nut is loosened or the BVC valve is taken apart. Fasten the nut by 9.0N•m after putting them together so the gasket is crushed properly to ensure the new sealing.
*If gaskets are reused or if the nut is not tightened by the rated torque, the sealing may be imperfect.

■ BVC pressure setting

The set pressure of the BVC valve is adjusted with tap water and then shipped from our factory. If you need to adjust the set pressure according to your environment, follow the steps as shown below.

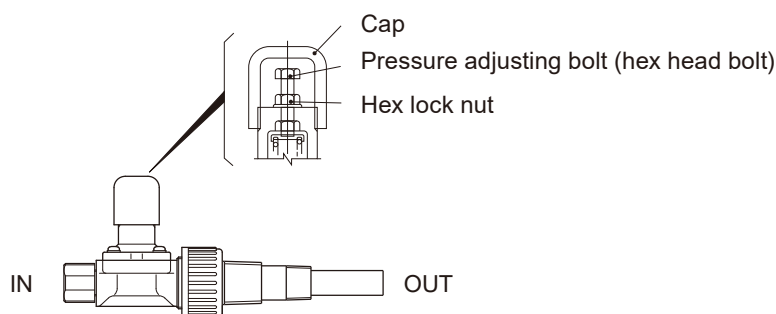
1 Open the cap and loosen the M5 hexagon lock nut.

2 Turn the pressure adjusting bolt to the set pressure.

Always check the pressure gauge while it is adjusted.

NOTE

The pressure increases as the adjusting bolt is tightened clockwise and decreases as loosened. Rotate the bolt clockwise by two to three turns to raise pressure and then start to reduce pressure to a specified level.



3 Fasten the hexagon lock nut to "lock" the pressure adjusting bolt.

Get the cap back afterwards.

Wiring

Wiring for power voltage, earthing and external signals.

! Points to be observed

Observe the following points during wiring work.

- Electrical work should be performed by a qualified electrician. Always observe local electric codes.
- Observe the rated voltage range, or the electrical circuit in the control unit may fail.
- Do not perform wiring work while electric power is ON. Otherwise, an electrical shock or a short circuit may result. Be sure to turn off the power before wiring work.
- Be careful for electric power not to be turned on during work.

Necessary tools

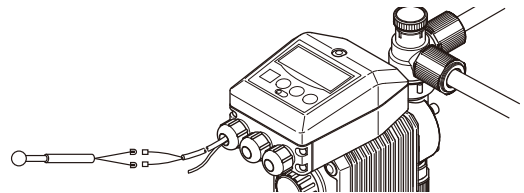
- Adjustable wrench or a 20mm spanner
- Phillips screw driver
- Precision screw driver

Power voltage/Earthing

Points to be checked

- Check that power voltage is turned off.

- 1 Connect power cable via crimp contacts.

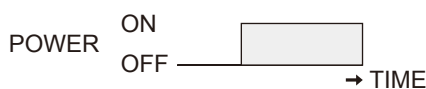


- 2 Earth the pump.

NOTE

- Do not share a power source with a high power device which may generate a surge voltage. Otherwise an electronic circuit may fail. The conductive noise caused by an inverter also affects the circuit.
- Energize the pump with a power voltage via a mechanical relay or switch. Do not fluctuate the voltage, or CPU may malfunction. See page 35 for the precautions for ON-OFF control by cycling power.

Apply power sharply



Do not apply gradually

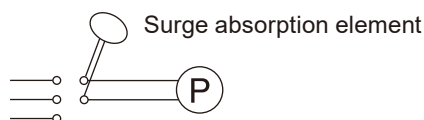


- Use a circuit protector (250VAC, 3A Medium speed) as necessary.
- Do not use a motor thermal relay.

Surge voltage

The electronic circuit in the control unit may fail due to a surge voltage. Do not place the pump close to a high power device of 200V or more which may generate a large surge voltage. Otherwise, take any of the following measures.

- Install a surge absorption element (such as a varistor with capacity of 2000A or more) via power cable or,

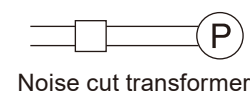


Recommended varistors:

Panasonic ERZV14D431

See manufacturer's catalogues for detail.

- A noise cut transformer via the power cable.



Precautions for ON-OFF control by cycling power

The control unit is equipped with a CPU. To ensure the CPU to work properly, always start/stop the pump with the STOP signal for ON-OFF control. Try not to turn on and off the main power. Otherwise, observe the following points:

- Ensure the minimum OFF time of 10 minutes.
- When using a mechanical relay for ON-OFF operation, its contact capacity should be 5A or more. Or a contact point may break.
- If a mechanical relay with the contact capacity of 5A is used, the maximum allowable number of power cycles is limited to 150,000 times. Use the contact capacity of 10A or more when the power cycles exceed that number or when a power source is shared with a large capacity equipment which may cause a surge voltage and damage a contact point.
- Even the large mechanical relay may not last forever. If further longer life is desirable, use a SSR (Solid State Relay) such as the OMRON G3F that does not have a mechanical contact point. Note this product is not designed to be operated with a zero-crossing SSR. See manufacturer's catalogs and make sure a non zero-crossing SSR is selected.

Signal wire connection

Check that power voltage is turned off. The pump is still charged right after turning off power. Wait for one minute before wiring is performed.

Applicable cables

Cable outer diameter: 7.6-7.8mm

Cable type: 4-conductor cable: VCTF-4 0.75mm²

3-conductor cable: VCTF-3 1.25mm²

2-conductor cable: UL/CSA SJT 18AWG/2

*A cable with the larger O.D. than 7.8mm can not be fitted to the controller. A smaller O.D. cable than 7.6mm may impair water-/dust-tightness of the controller.

NOTE

- Do not lay on these signal cables in parallel with a power cable. Otherwise the electromagnetic induction noise is generated and malfunction or failure may result.
- When using an external SSR for signal input, such a semiconductor relay must be capable of handling the maximum applied voltage from the pump (12V with 5mA). Also, its leak current must be 0.1mA or below. See specs of the selected SSR. The OMRON G3TA-IDZR02S-US SSR or the G3TA-IDZR02SM-US SSR at least meets the requirement.
- When using an external mechanical relay for signal input, such a relay must be capable of handling the maximum applied voltage from the pump (12V with 5mA).

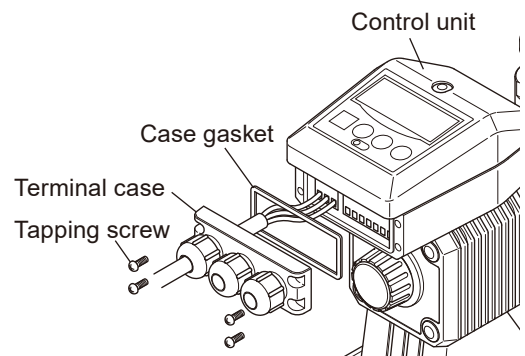
*Use either an external no-voltage contact or an external open collector for the signal line wiring.

*Set pulse duration to 10-100ms and the number of pulses at or below 360 pulses per minute.

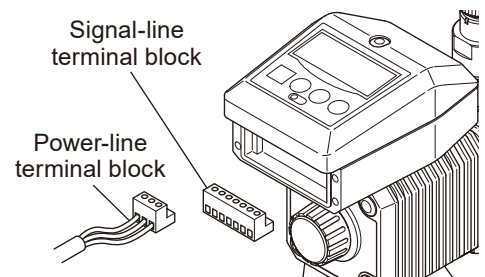
1 Detach the terminal case.

Remove four screws and take out the terminal case.

*The gasket is provided to keep water-/dust-tightness between the parts. Make sure it's always in place.



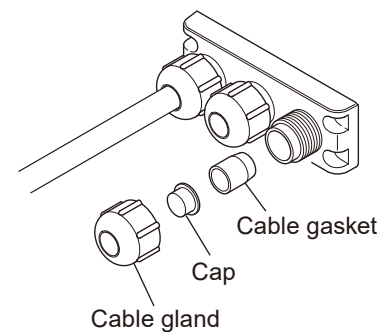
2 Remove the power line block and the signal line terminal block from the PCB in the control unit.



3 Remove a cable gland and a cap to pull out a cable gasket.

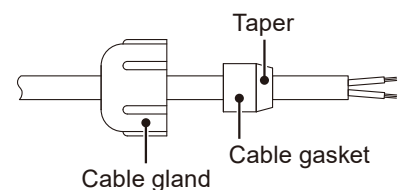
*The cap is not used as long as a cable is connected.

*Use a 20mm spanner as necessary if the cable nut is stuck to the control unit.



4 Pass an external signal cable into the terminal case via the cable gland and the cable gasket.

*Be careful not to oppositely orient the cable gasket.



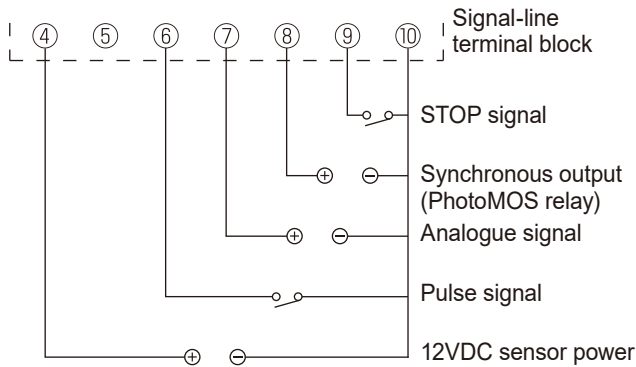
5 Connect the external signal cable.

- Use a precision screwdriver to connect signal wires to the signal-line terminal block.
- Attach the power-line block and the signal-line terminal block to the PCB.
- Adjust the slackness of the signal cable, pulling it out.
- Hand-tighten the cable nut.

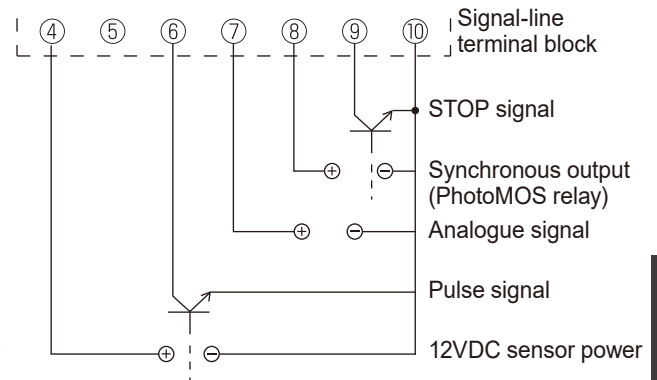
*The external signal cable must be properly sealed with the cable gasket.

Wiring diagram

When a no-voltage contact is used.



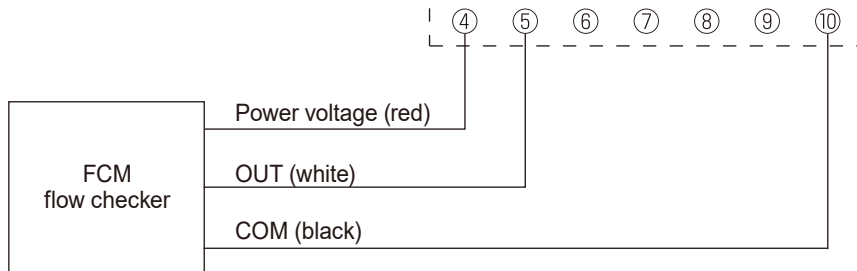
When an open collector signal is used.



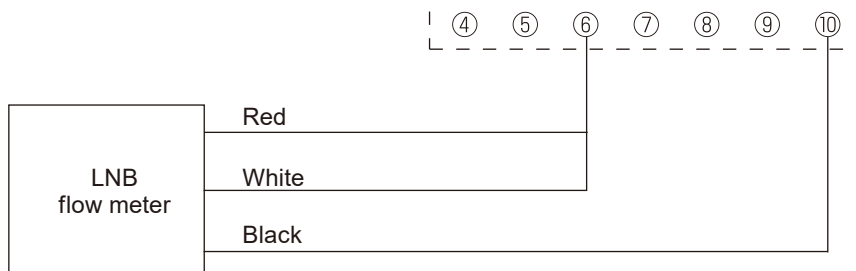
*Reverse polarity of the analogue signal input upsets the proportional control or may break the PCB.

*Reverse polarity of the open collector stop and pulse signal inputs must be avoided. Terminals 6 and 9 are plus (+), and Terminal 10 is minus (-). The maximum applied voltage from these terminals to an external device is 12V with 5mA.

*When the synchronous output (PhotoMOS relay) is used, an external device must apply voltage to Terminals 8 and 10. The maximum applied voltage to that output terminal is 24VAC/DC with 0.1A.



*When the FCM flow checker is purchased separately and retrofitted to the pump, connect the power voltage (red) to Terminal 4, OUT (white) to Terminal 5, and COM (black) to Terminal 10 as shown above.



*When an Iwaki LNB series flow meter (pulse output type) is used, connect both the red line and white line together to Terminal 6, and the black line to Terminal 10 as shown above.

6 Mount the terminal case to the control unit.

Fasten fixing screws evenly to 0.3N•m.

NOTE

Always check that the case gasket are fitted. Or the liquid may enter the control unit and failure may result.

Operation

This section describes pump operation and programming. Run the pump after pipework and wiring are completed.

Before operation

First check tubing and wiring are correct. And then perform degassing and flow rate adjustment before starting operation.

Points to be checked

Before operation, check if:

- Liquid level in a supply tank is enough.
- Tubing is securely connected and is free from leakage and clogging.
- Discharge/suction valves are opened.
- Power voltage range is correct.
- Electrical wiring is correct and is free from the risk of short circuit and electrical leakage.

Retightening of pump head fixing bolts

Important

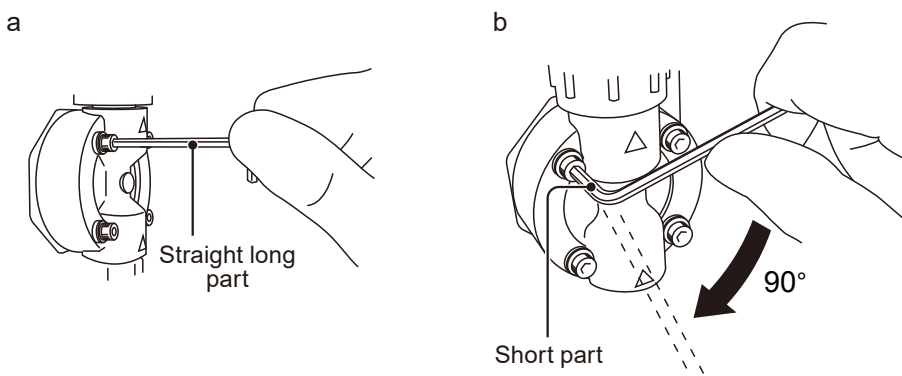
The pump head fixing bolts may loosen when plastic parts creep due to temperature change in storage or in transit. This could lead to a chemical leak. Tighten the bolts diagonally and evenly by the rated torque at each model before initial operation and at regular intervals (every three months).

Tightening torque

Model code	Torque	Bolts
EHN-BN11/-BN16/-BN21	2.16 N•m	M4 Hex. socket head bolt
EHN-BN31	2.55 N•m	M4 Hex. socket head bolt
EHN-CN16/-CN21	2.16 N•m	M4 Hex. socket head bolt
EHN-CN31	2.55 N•m	M4 Hex. socket head bolt
EHN-CN36	2.55 N•m	M5 Hex. socket head bolt

■ Use of a hexagon wrench instead of a torque wrench

Fasten the fixing bolts as tight as can be with the straight long part of a hexagon wrench (a) and further turn the bolts clockwise 90 degrees with the short part (b).



Degassing

The gas in the pump and tubing is the obstacle to liquid delivery and needs to be expelled before the pump is started. Especially:

- When the pump starts to run for the first time.
- When a flow rate is too low.
- After liquid is replaced in a supply tank.
- After a long period of stoppage.
- After maintenance and inspection are performed.

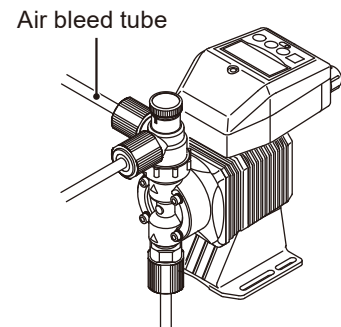
NOTE

- Both gas and chemical come out together through an air bleed tube. Make sure the end of the tube is located in a supply tank or a container.
- Some chemicals are harmful or even attack dry end parts. Wash/wipe chemicals off immediately if getting wet.

■ EHN-BN_/-CN_ MYN

Points to be checked

- An air bleed tube is connected to the pump.



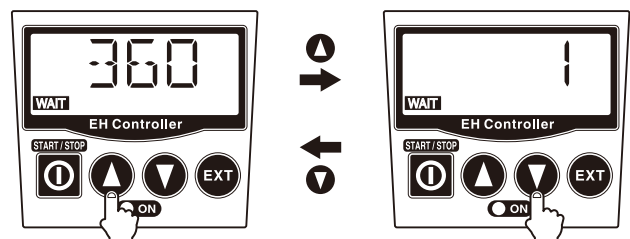
1 Turn on power.

The ON LED and the display are turned ON.

*The pump waits in the MAN mode when turning on power with a default setting or calls up a previous mode at the last shutoff.

2 Set stroke rate to 360spm.

- spm increases/decreases every time the UP/DOWN key is pushed.
- Press and hold either key for more than three seconds for quick change. Quick change stops at 1 or 360spm. 1 or 360rpm skips to 360 or 1spm when the key is released and pushed once.

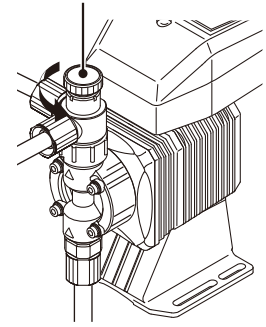


- 3** Rotate the adjusting screw two revolutions anticlockwise to open the air vent port.

NOTE

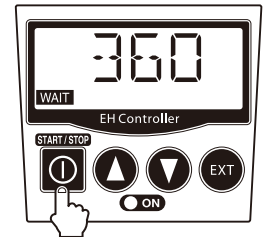
Do not rotate the screw three revolutions. The adjusting screw may come off with solution spray.

Adjusting screw



- 4** Push the start/stop key and run the pump for more than ten minutes for degassing.

The ON LED blinks at each stroke.



- 5** Push the start/stop key and stop the pump.

- 6** Rotate the adjusting screw clockwise to close the air vent port.

- 7** Check liquid is delivered to the discharge line.

Degassing must be repeated until liquid is outputted from the pump outlet.

- 8** Check connections for leakage.

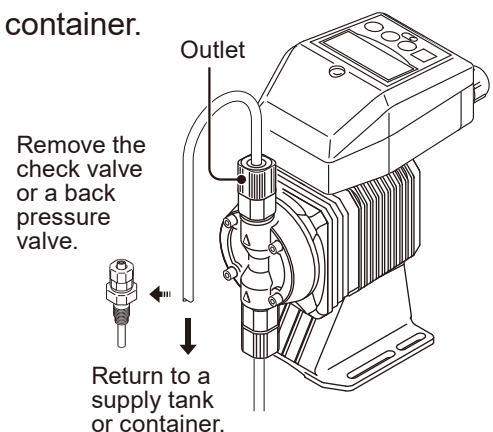
Degassing has now been completed.

■ EHN-BN_-/-CN_FC

No air vent port is provided to these pumps; however, you can expel air, taking steps below. Otherwise, you can branch the main flow line (discharge side) for establishing an open-ended air vent line.

- 1** Reroute the discharge tube back to the supply tank or container.

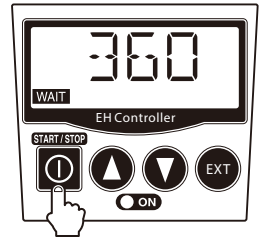
*If the check valve or the back pressure valve is already installed, solution in the discharge line may be under pressure. This is not totally recommended; however, you have no choice but to remove the check valve or the back pressure valve while solution is pressurised. Use a cloth around the outlet fitting nut many turns until it can be a protection against solution spray and the check valve is safely removed.



2 Turn on power.

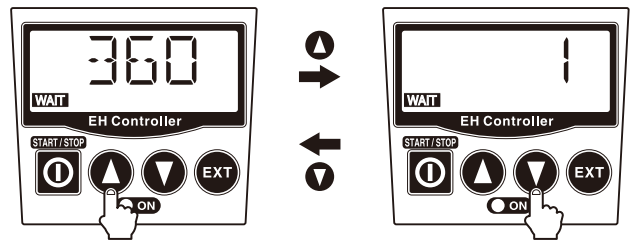
The ON LED and the display are turned ON.

*The pump waits in the MAN mode when turning on power with a default setting or calls up a previous mode at the last shutoff.



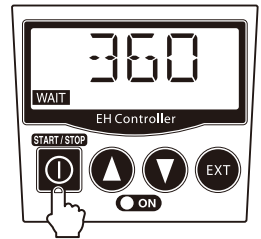
3 Set stroke rate to 360spm.

- spm increases/decreases every time the UP/DOWN key is pushed.
- Press and hold either key for more than three seconds for quick change. Quick change stops at 1 or 360spm. 1 or 360rpm skips to 360 or 1spm when the key is released and pushed once.



4 Push the start/stop key and run the pump for more than ten minutes for degassing.

The ON LED blinks at each stroke.



5 Push the start/stop key and stop the pump.

6 Check liquid is delivered to the discharge line.

Degassing must be repeated until liquid is outputted from the pump outlet.

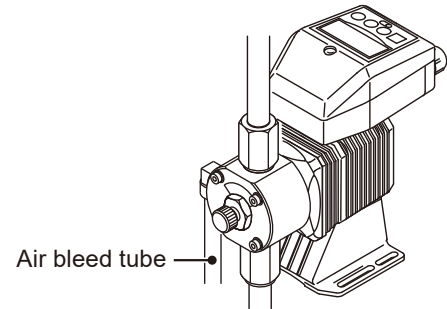
7 Check connections for leakage.

Degassing has now been completed.

■ EHN-BN_/-CN_SH

Points to be checked

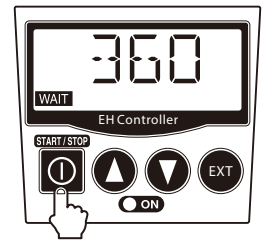
- An air bleed tube is connected to the pump.



1 Turn on power.

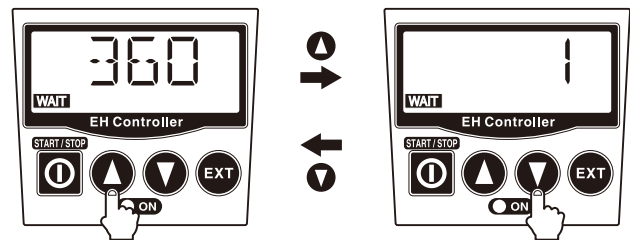
The ON LED and the display are turned ON.

*The pump waits in the MAN mode when turning on power with a default setting or calls up a previous mode at the last shutoff.



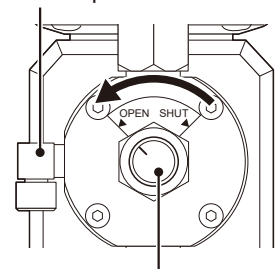
2 Set stroke rate to 360spm.

- spm increases/decreases every time the UP/DOWN key is pushed.
- Press and hold either key for more than three seconds for quick change. Quick change stops at 1 or 360spm. 1 or 360rpm skips to 360 or 1spm when the key is released and pushed once.



3 Rotate the adjusting screw anticlockwise to set to OPEN so that the air vent port opens.

Air vent port



Adjusting screw

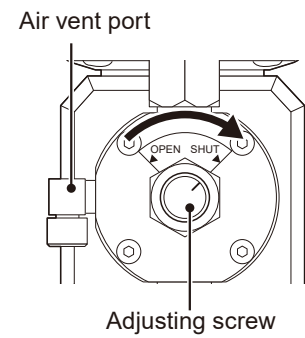
4 Push the start/stop key and run the pump for more than ten minutes for degassing.

The ON LED blinks at each stroke.



5 Push the start/stop key and stop the pump.

6 Rotate the adjusting screw clockwise to set to SHUT so that the air vent port closes.



7 Check liquid is delivered to the discharge line.
Degassing must be repeated until liquid is outputted from the pump outlet.

8 Check connections for leakage.
Degassing has now been completed.

Flow rate adjustment

The flow rate can be changed by adjusting a stroke rate and a stroke length.

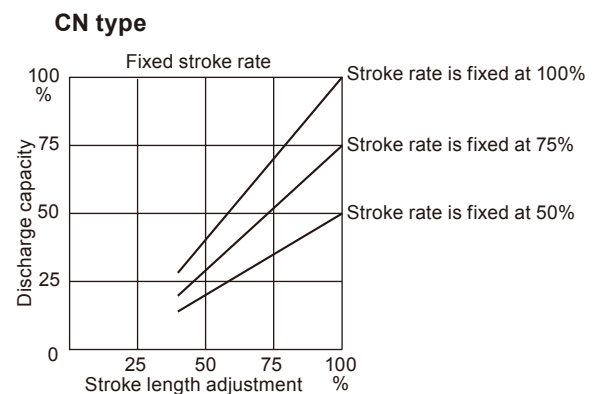
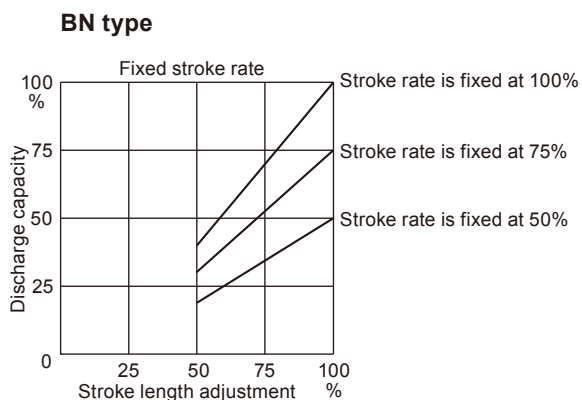
The stroke rate represents the pump speed in spm (stroke per minute). The stroke rate adjustment is the main way to adjust the flow rate from the pump.

The stroke length represents the moving distance of the plunger. The widest moving distance is defined as 100% stroke length. The stroke length adjustment is used for determining the optimal flow volume per stroke (fine adjustment of the pump flow).

First adjust a flow rate by means of stroke rate adjustment. Use stroke length adjustment for the range where stroke rate adjustment can not reach. Note the optimal stroke length change with operating conditions and liquid characteristics.

- 1** Change the stroke rate with the stroke length 100% to the specified level.
See the "Stroke rate adjustment" section on page 45 and the "Stroke length adjustment" section on page 46 for detail.
- 2** Measure the flow rate.
- 3** If the flow rate is lower/higher than the specified level, increase/decrease the stroke rate and measure the pump flow again.
- 4** Change the stroke length for fine adjustment.
- 5** Measure the pump flow again to see the specified level is obtained.

■ Flow rate, stroke rate and stroke length

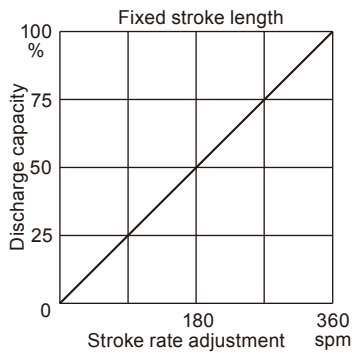


■ Precautions of flow rate adjustment

- **When back pressure is high**, set stroke length to 100% and adjust the pump flow by changing the stroke rate.
- **When each dose greatly affects a chemical reaction in neutralization or titration application**, shorten the stroke length to reduce the flow rate per stroke. And then adjust the pump flow by changing the stroke rate.
- **When handling liquids that generate gas bubbles (sodium hypochlorite or hydrazine solution)**, set the stroke length to 100% and adjust the pump flow by changing the stroke rate. Note gas lock may occur when the stroke length is set too short.

■ Stroke rate adjustment

The stroke rate can be set by keypad operation from 1 to 360spm. The relation between the flow rate* and the stroke rate is shown as below.

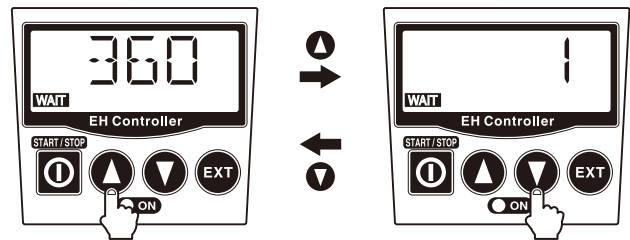


*The nameplate shows the maximum (100%) output with the full stroke rate and length.

1 Turn on power and call up manual mode.

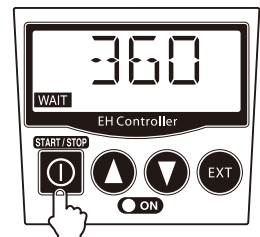
2 Use the UP or DOWN key to adjust a stroke rate.

- spm increases/decreases every time the UP/DOWN key is pushed.
- Press and hold either key for three seconds for quick change. Quick change stops at 1 or 360spm. 1 or 360rpm skips to 360 or 1spm when the key is released and pushed once.



3 Push the start/stop key.

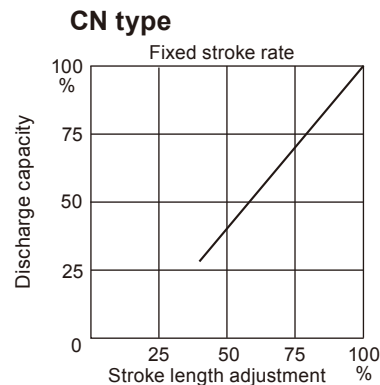
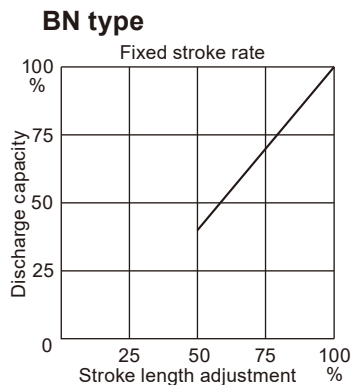
The ON LED blinks at each stroke during operation.



■ Stroke length adjustment

The stroke length can be adjusted when the moving distance of the plunger is changed with the stroke length adjusting knob.

The stroke length adjustment range is 50-100% for the BN type, 40-100% for the CN type. The relation between the flow rate* and the stroke length is shown as below.



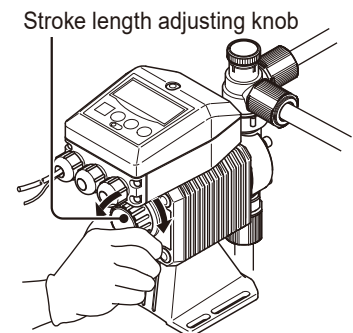
*The nameplate shows the maximum (100%) output with the full stroke rate and length.

NOTE

Do not rotate the stroke length adjusting knob when the pump is not running.

- 1 Turn on power and push the start/stop key to run the pump.
The ON LED blinks during operation.

- 2 Rotate the stroke length adjusting knob and adjust the liquid volume per stroke.



Before a long period of stoppage (One month or more)

Clean wet ends and the inside of piping:

- Run the pump with clean water for about 30 minutes to rinse chemicals off from the pump head and piping.

Before unplugging the pump:

- Always stop the pump by key operation and wait for three seconds before unplugging the pump. Otherwise, the last key operation may not be put in memory. In this case the pump unintentionally starts to run as powered on, discharging liquid.

When the pump does not transfer liquid:

- Clean the valve sets and remove foreign matters.
- If gas is in the pump head, expel gas and readjust a flow rate. See the "Degassing" section on page 39 and the "Flow rate adjustment" section on page 44 for detail.

Operation programming

Operation at each mode is individually set and controlled by keypad operation. Select a proper mode to make optimal operation.

Default setting and Setting range

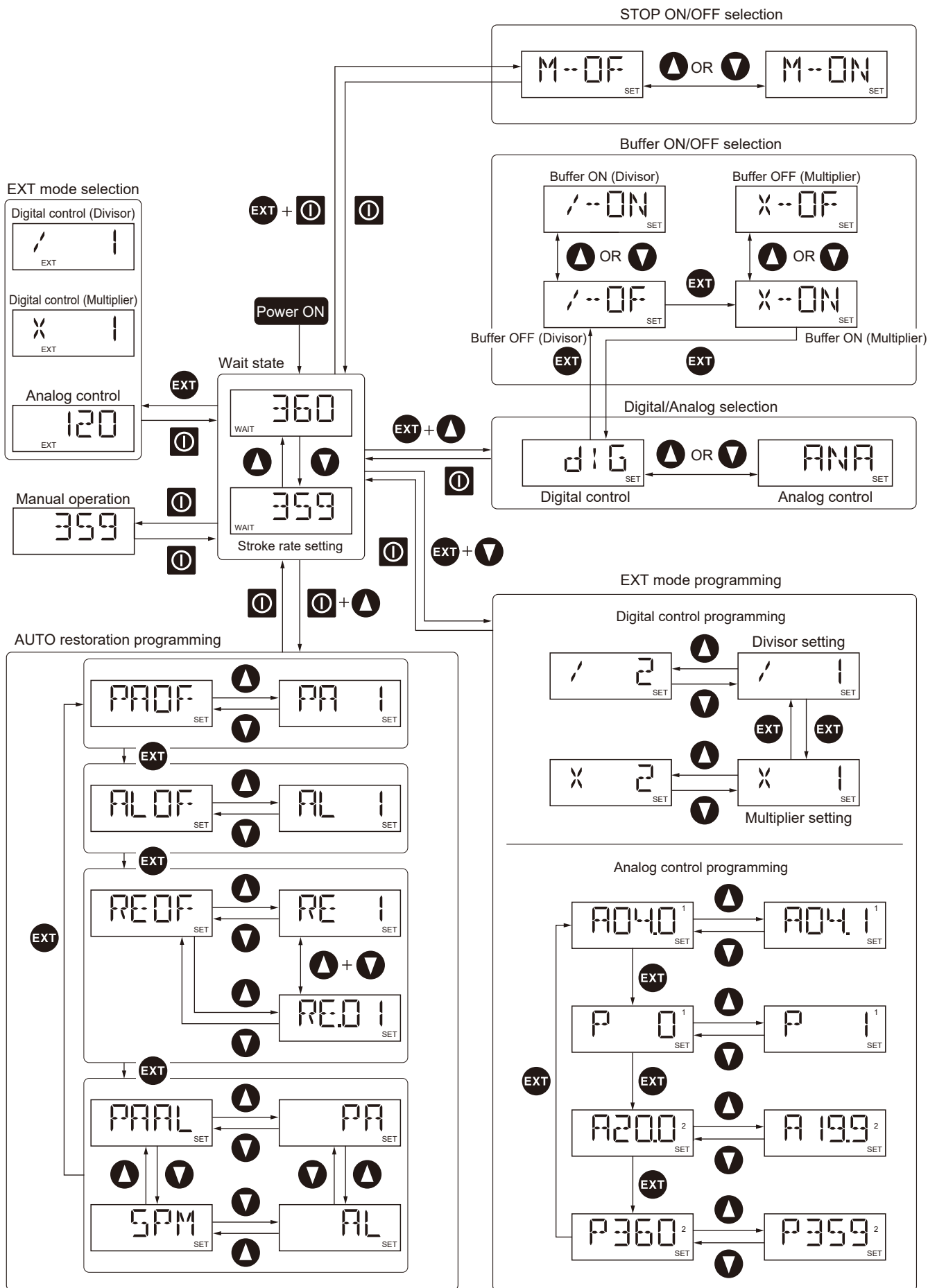
Mode	Parameters	Default settings	Setting ranges	Step* ²
Manual	Stroke rate* ¹	360	1-360	1
Dig/Ana selection	Digital/ Analog	dIG (Digital)	dIG (Digital)/ ANA(Analog)	-
EXT mode	Multiplier (Digital)	X1	1-999	1
	Divisor (Digital)	/1	1-999	1
	Analog	4.0mA at Set point 1	0.0-20.0	0.1
		0spm at Set point 1	0-360	1
		20.0mA at Set point 2	0.0-20.0	0.1
360spm at Set point 2		0-360	1	
Buffer ON/OFF	Multiplier	X-ON	X-OF or X-ON	-
	Divisor	/-OF	/-OF or /-ON	-
STOP function	M-ON/M-OF	M-OF	M-ON/ M-OF	-
Auto restoration	Pre-Alarm time* ³	PAOF	PAOF/ 1-60min	1
	Alarm time* ³	ALOF	ALOF/ 1-60min	1
	Return time* ³	REOF	REOF/ 1-60min/ 1-60sec	1
	Alarm out	PAAL	PAAL/ PA/ AL/ SPM	-

*¹ The MAN speed is used as the upper limit spm in the digital control mode with a multiplier.

*² The stroke rate increases/decreases by the minimum value (1spm/0.1mA/1min/1sec) every time the up or down key is pushed. Press and hold either key 3 seconds for quick change.

*³ Turn ON and set them up only when the optional FCM flow checker is used.

Programming flow



Operation

Read this section before operation.

Manual operation

Run or stop the pump by keypad operation.

1 Turn on power.

The ON LED and the display are turned ON.

*The pump waits in the MAN mode when turning on power with a default setting or calls up a previous mode at the last shutoff

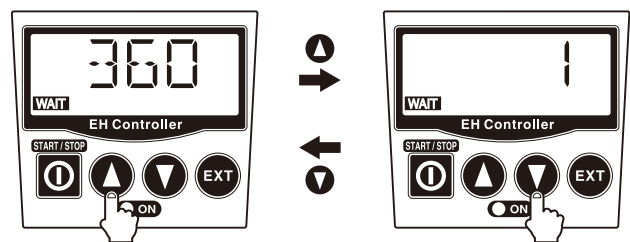
2 Push the start/stop key to return to the wait state.

"WAIT" indication appears.



3 Use the UP or DOWN key to adjust the stroke rate (MAN speed).

- The stroke rate increases or decreases every time the UP or DOWN key is pushed.
- Press and hold either key for three seconds for quick change. Quick change stops at 1 or 360spm. 1 or 360spm skips to 360 or 1spm when the key is released and pushed once.



4 Push the start/stop key to start operation.

The ON LED blinks at each stroke during operation.

EXT operation

The pump operation is controlled with the external signal.

■ Analog control programming

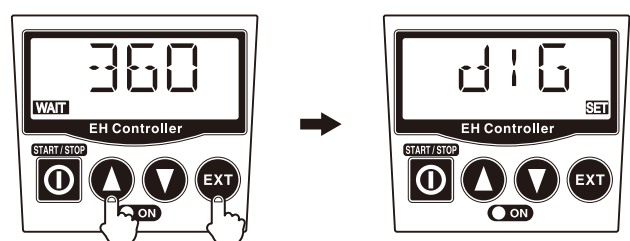
Set the pump to run in between 0-360spm in proportion to 0-20mA.

1 Push the start/stop key to return to the wait state.

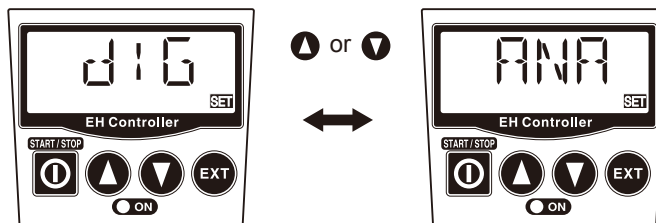
"WAIT" indication appears.

2 Push the UP key while pressing the EXT key to call up the Digital/Analog selection.

"DIG"(digital) or "ANA"(analog) will appear.

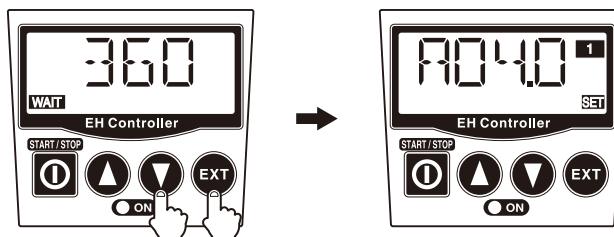


- 3** Select "ANA".
Scroll through "dIG" and "ANA" selection with the UP and DOWN keys.

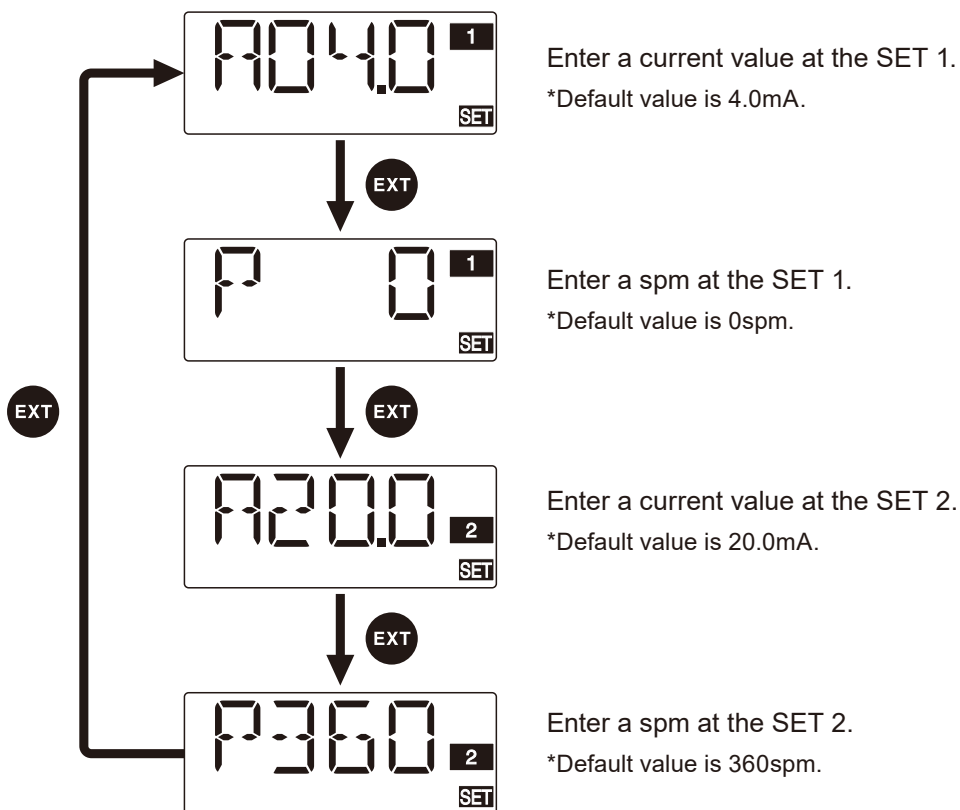


- 4** Push the start/stop key to return to the wait state.

- 5** Push the DOWN key while pressing the EXT key to call up the analog control setting mode.



- 6** Use the UP and DOWN keys to set the SET1 & 2 parameters.



- 7** Push the start/stop key to return to the wait state.

- 8** Push the EXT key to start the analog control.

■ Digital control programming

The pump operation is controlled with the external (pulse) signal. Set a multiplier or a divisor as necessary for its intended purpose before operation.

Multiplier setting

The pump runs at the MAN speed for the preset multiplier (1-999 strokes) per incoming external signal. Set a multiplier per pulse in advance of operation.

*The pump makes one stroke per pulse when a multiplier is set to 1.

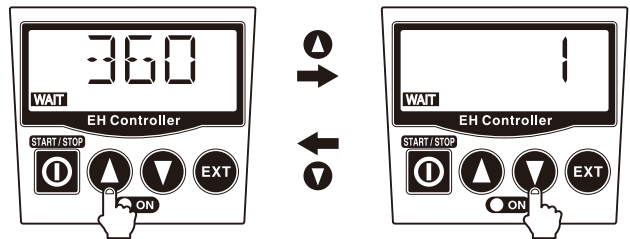
NOTE

- The pump does not run over the manual stroke rate (MAN speed). If the MAN speed is set to 200spm, for example, the pump does not run over the speed with any multiplier or pulse rate.
- The MAN speed skips from 360spm (/1spm) to 1spm (/360spm) when the up (/down) key is pushed once.
- Do not enter the external signal to the pump while the digital control setting is changed.

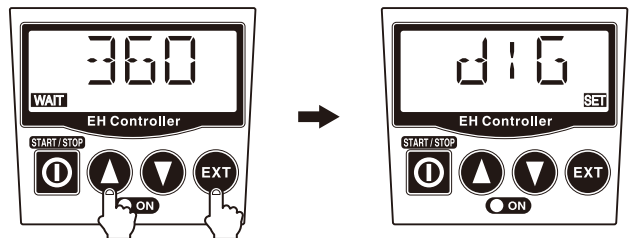
- 1** Push the start/stop key to return to the wait state.
"WAIT" indication appears.

- 2** Use the UP or DOWN key to adjust the stroke rate (MAN speed).

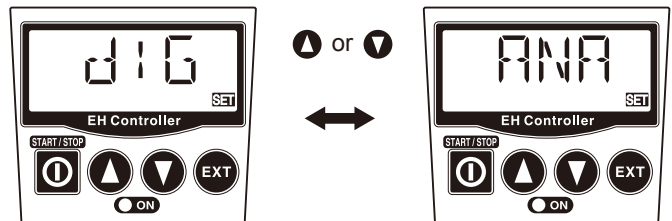
- The stroke rate increases/decreases every time the UP or DOWN key is pushed.
- Press and hold either key for three seconds for quick change. Quick change stops at 1 or 360spm. 1 or 360spm skips to 360 or 1spm when the key is released and pushed once.



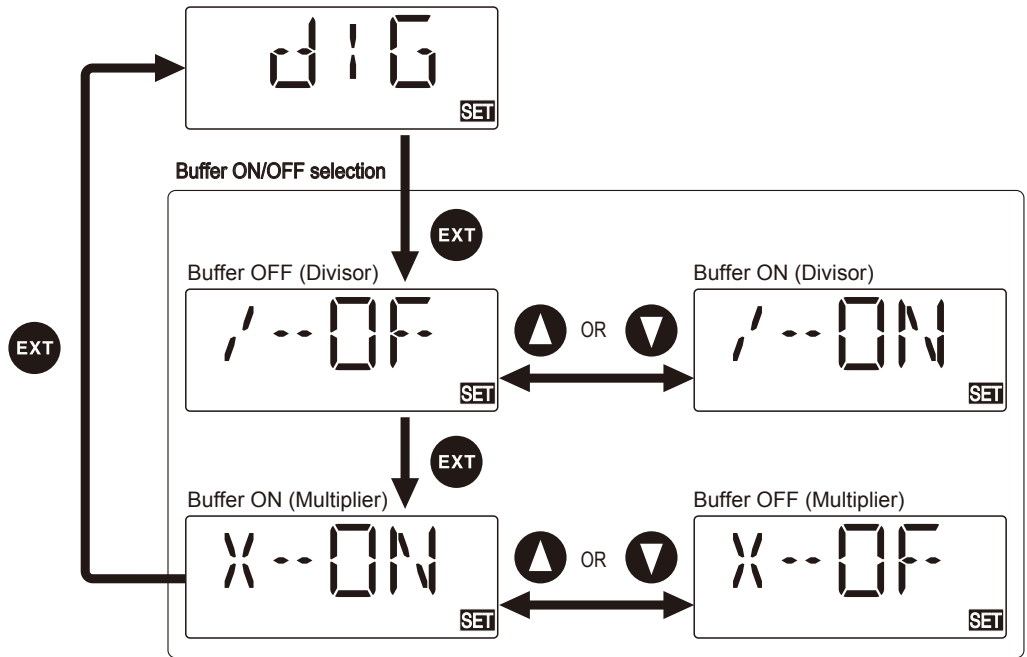
- 3** Push the UP key while pressing the EXT key to call up the Digital/Analog selection.
"dIG"(digital) or "ANA"(analog) will appear.



- 4** Select "dIG".
Scroll through "dIG" and "ANA" with the UP and DOWN keys.



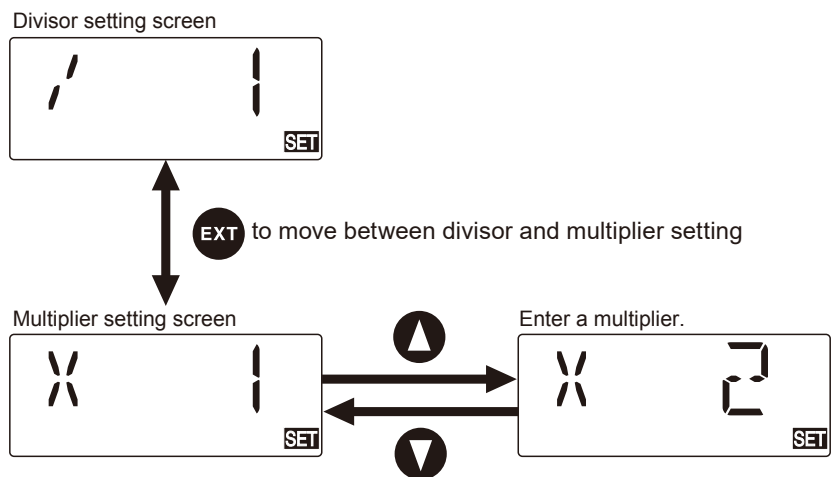
- 5** Push the EXT key to call up the buffer ON/OFF selection.
 Scroll through "X-ON" and "X-OFF" with the UP and DOWN keys and push the EXT key to decide.



- 6** Push the start/stop key to return to the wait state.

- 7** Push the DOWN key while pressing the EXT.

- 8** Set a multiplier.



- 9** Push the start/stop key to return to the wait state.

NOTE

Do not forget to push the start/stop key. Otherwise, setting is not entered.

- 10** Push the EXT key to start the digital control.

Divisor setting

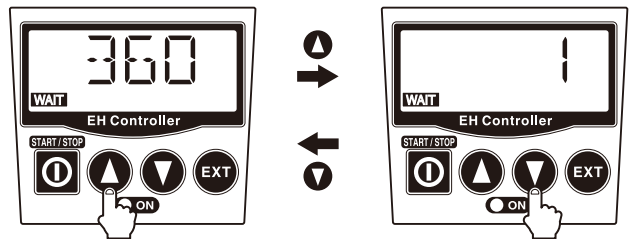
The pump runs for the preset divisor (1-999 pulse rates) at every incoming external signals. Set a divisor per stroke in advance of operation.

NOTE

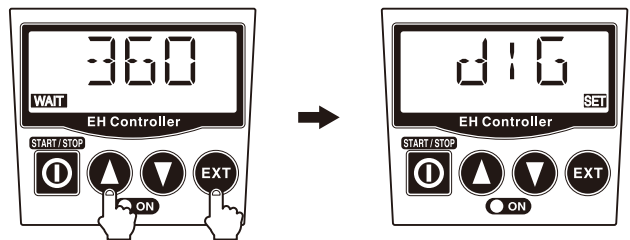
If a divisor is set to 1, the pump speed equals to the external pulse rate (1:1 operation). This operation, however, may be upset when the pulse rate has exceeded 360spm and the extra signals are cancelled. Although this is not malfunction, set the buffer to "/-ON" or use the multiplier to ensure steady 1:1 operation.

- 1 Push the start/stop key to return to the wait state.
"WAIT" indication appears.

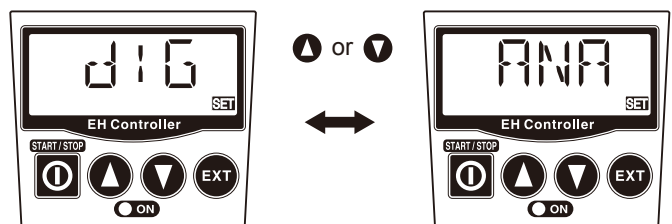
- 2 Use the UP or DOWN key to adjust stroke rate (MAN speed).
 - The stroke rate increases/decreases every time the UP or DOWN key is pushed.
 - Press and hold either key for three seconds for quick change. Quick change stops at 1 or 360spm. 1 or 360spm skips to 360 or 1spm when the key is released and pushed once.



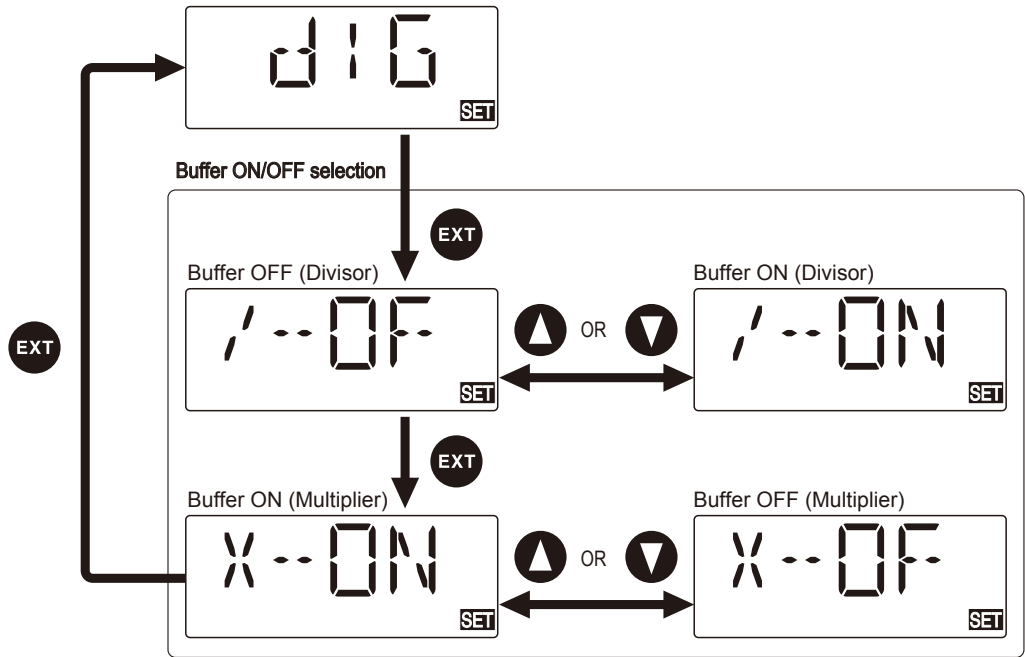
- 3 Push the UP key while pressing the EXT key to call up the Digital/Analog selection.
"dIG"(digital) or "ANA"(analog) will appear.



- 4 Select "dIG".
Scroll through "dIG" and "ANA" with the UP and DOWN keys.



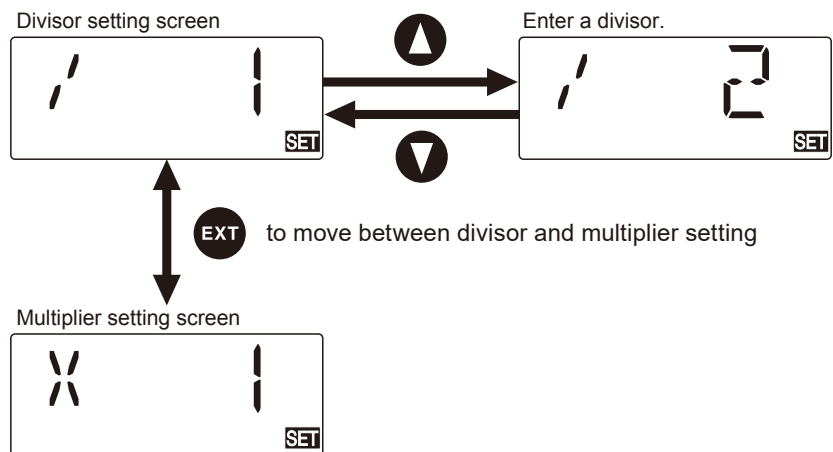
- 5** Push the EXT key to call up the buffer ON/OFF selection.
 Scroll through "/-ON" and "/-OFF" with the UP and DOWN keys and push the EXT key to decide.



- 6** Push the start/stop key to return to the wait state.

- 7** Push the DOWN key while pressing the EXT key.

- 8** Set a divisor.



- 9** Push the start/stop key to return to the wait state.

NOTE

Do not forget to push the start/stop key. Otherwise, setting is not entered.

- 10** Push the EXT key to start the digital control.

STOP function

The start/stop of the pump operation can be controlled with the external stop signal.

Stop signal input: "M-OFF"

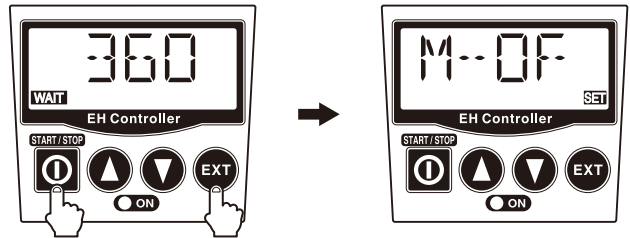
The pump stops while receiving the stop signal.

Stop signal input: "M-ON"

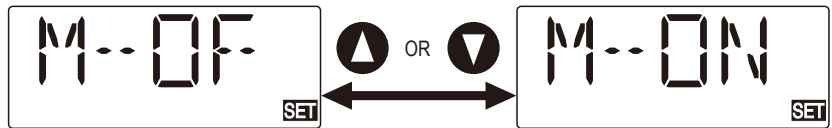
The pump runs while receiving the stop signal.

- 1 Push the start/stop key to return to the wait state.
"WAIT" indication appears.

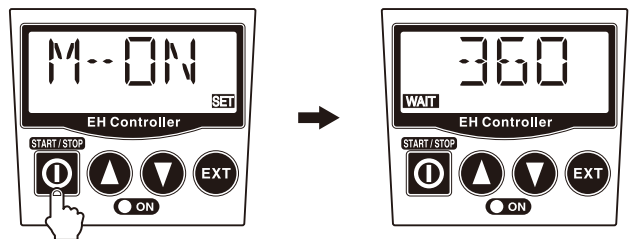
- 2 Push the start/stop key while pressing the EXT key to call up the STOP ON/OFF selection.
"M-OFF" or "M-ON" will appear.



- 3 Select "M-OFF" or "M-ON".
Scroll through "M-OFF" and "M-ON" with the UP and DOWN keys.



- 4 Push the start/stop key to return to the wait state.
The "STOP" indication appears when the pump is stopped with the STOP signal ON (M-OFF) or OFF (M-ON).



- 5 Push the start/stop key to start the Manual operation or the EXT key to start the EXT operation.

Keypad lock

Keypad lock can be active for the prevention of erroneous key operation.

NOTE

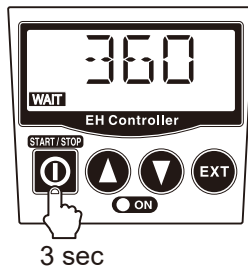
Any key operation is not effective when keypads are locked. In an emergency, turn off the main power to stop operation. Keypads are locked again when the pump is powered.

■ Keypad lock activation

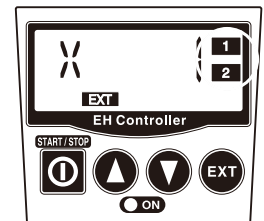
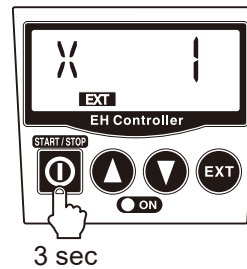
- 1 Press and hold the start/stop key for 3 seconds.

The following displays will appear.

Manual operation



Digital control



■ Keypad lock release

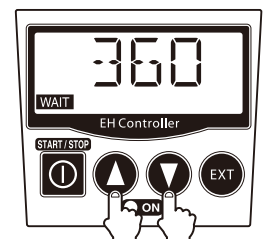
- 1 Press and hold the start/stop key for 3 seconds to release a keypad lock.

Priming function

This key operation runs the pump at the maximum stroke rate in operation.

- 1 Press and hold both the UP and DOWN keys.

The pump runs at the maximum stroke rate while both the keys are pressed.



Auto restoration/ Synchronous output

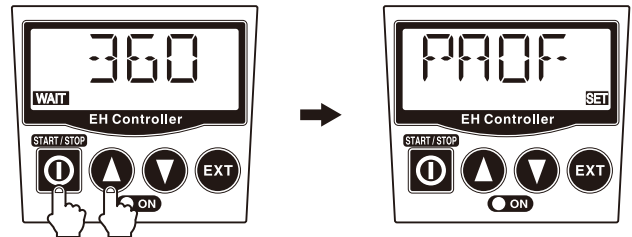
NOTE

This setting will be needed only when the FCM flow checker is used.

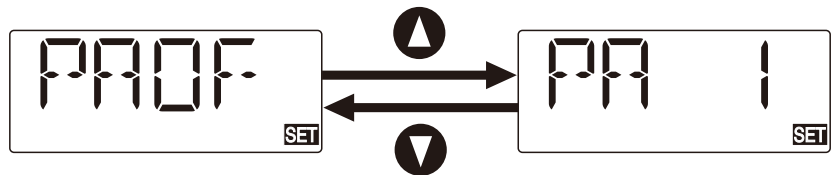
■ Auto restoration programming

- 1 Push the start/stop key to return to the wait state.
"WAIT" indication appears.

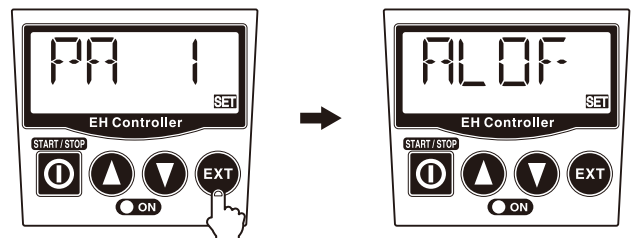
- 2 Push the UP key while pressing the start/stop key.
Pre-Alarm time programming screen will appear.



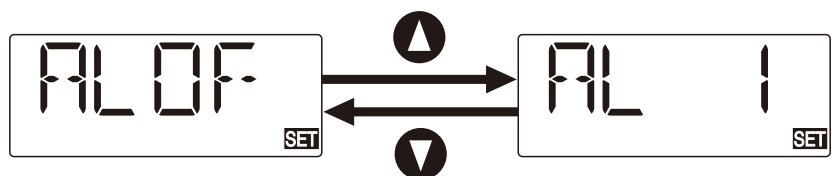
- 3 Use the UP or DOWN key to adjust Pre-Alarm time.
 - The time increases/decreases in the range of 1-60 minutes every time the UP/DOWN key is pushed.
 - Press and hold either key for three seconds for quick change. Quick change stops at 60min or "PAOF". 60min or "PAOF" skips to "PAOF" or 60min when the key is released and pushed once.



- 4 Push the EXT key.



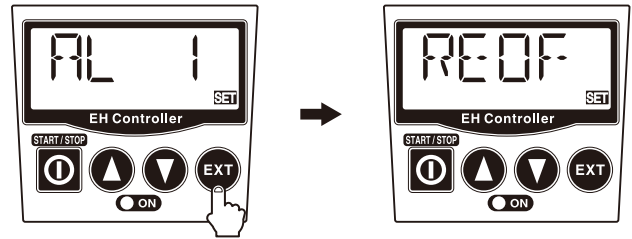
- 5 Use the UP or DOWN key to adjust Alarm time.
 - The time increases/decreases in the range of 1-60 minutes every time the UP/DOWN key is pushed.
 - Press and hold either key for three seconds for quick change. Quick change stops at 60min or "ALOF". 60min or "ALOF" skips to "ALOF" or 60min when the key is released and pushed once.



NOTE

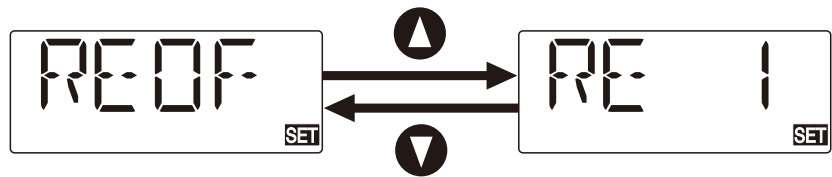
Do not set the Alarm time over 30 minutes for the pump not to continue to run dry for a long time. During the Alarm time, the pump runs at the max spm. The full speed operation may dry up the chemical tank and result in a long period of dry running which damages the pump internally.

6 Push the EXT key.

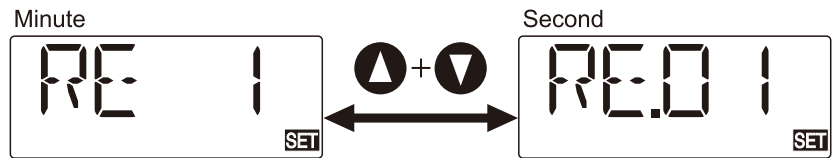


7 Use the UP or DOWN key to adjust Return time.

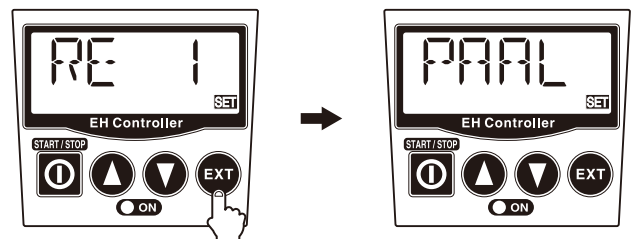
- The time increases/decreases in the range of 1-60 minutes/seconds every time the UP/DOWN key is pushed.
- Press and hold either key for three seconds for quick change. Quick change stops at 60 min/sec or "REOF". 60min/sec or "REOF" skips to "REOF" or 60min/sec when the key is released and pushed once.



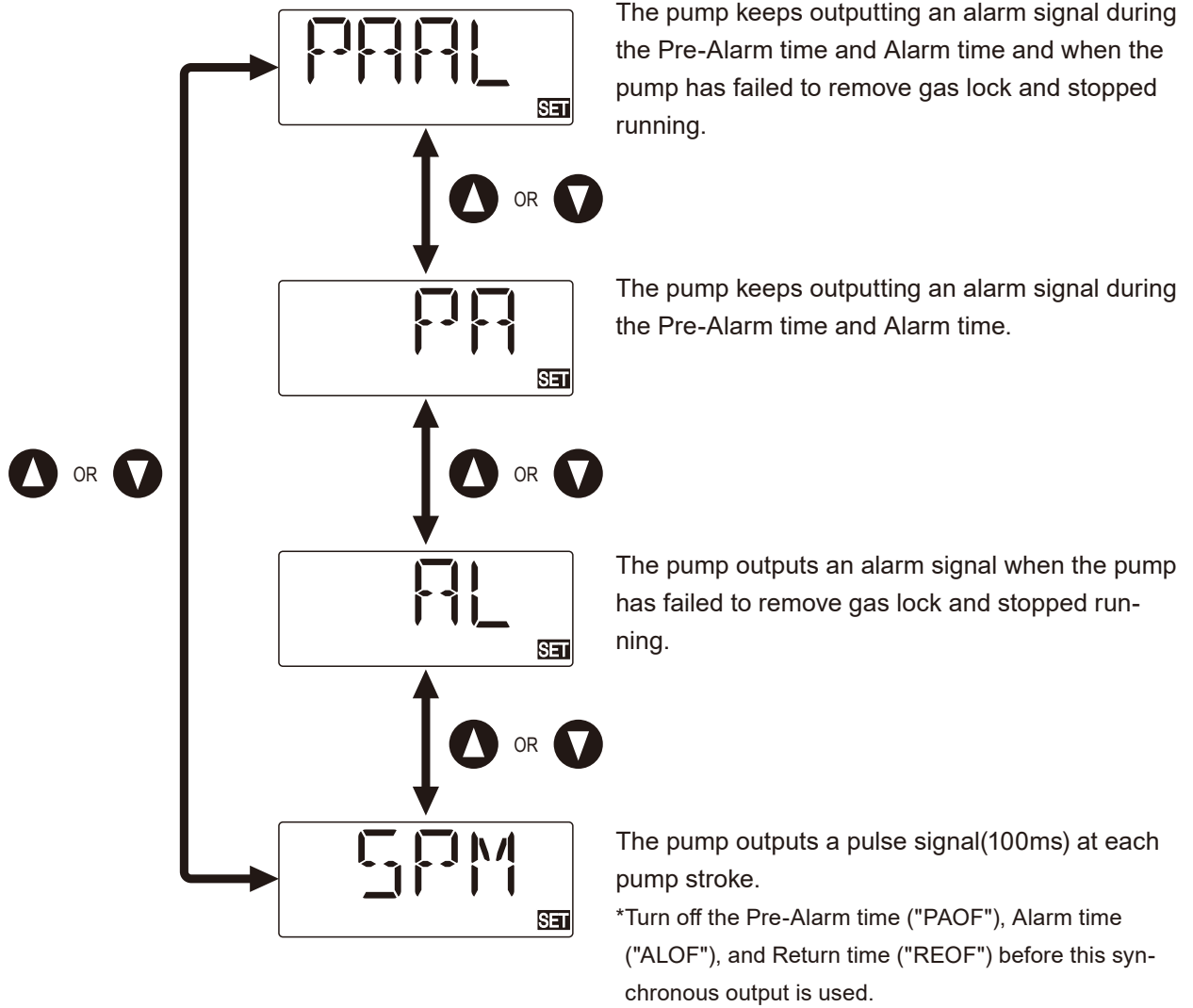
Push the UP and DOWN keys together to change a time unit in between min and sec.



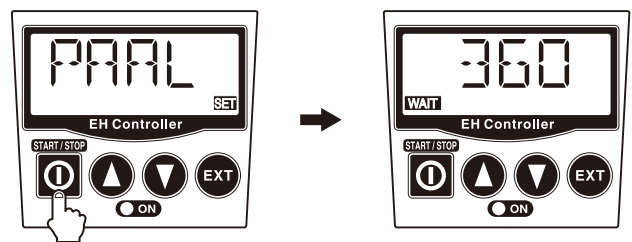
8 Push the EXT key to program the Alarm output behaviour.



9 Use the UP or DOWN key to set behaviour at each item.



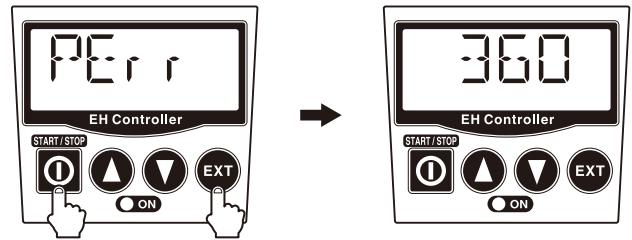
10 Push the start/stop key to return to the wait state.



Error codes

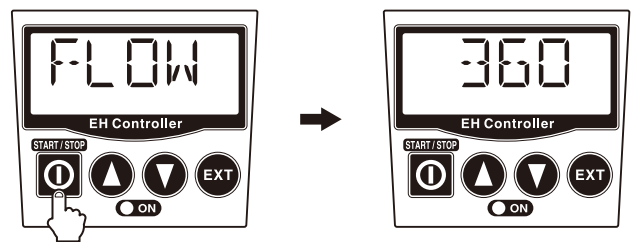
■ Reset of "PErr" (Full speed operation to resolve air lock)

- 1 Push the start/stop key while pressing the EXT key.
The pump resumes normal operation.



■ Reset of "FLOW" (Suspended operation after failing to resolve gas lock)

- 1 Push the start/stop key.
The pump waits in the manual mode.



Maintenance

This section describes troubleshooting, maintenance, wear part replacement, exploded views and specifications.

! Points to be observed

Observe the following points during maintenance work.

- Follow instructions in this manual for replacement of wear parts. Do not disassemble the pump beyond the extent of the instructions.
- Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work. The specific solution will dictate the degree of protection. Refer to SDS precautions from the solution supplier.
- Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed.

Before unplugging the pump

Always stop the pump by key operation. And wait for three seconds before unplugging the pump. Otherwise, the last key operation to stop the pump may not be put in memory. In this case the pump unintentionally starts to run as powered on, discharging liquid.

NOTE

- It's not the manufacturer's responsibility for any failure due to corrosion or erosion occurred in your operating condition.
- For the need of repair, contact your distributor of Iwaki or the manufacturer of equipment in which our product is built.
- Be sure to drain chemicals and flush the inside of the pump before return so that a harmful chemical does not spill out in transit.

Troubleshooting

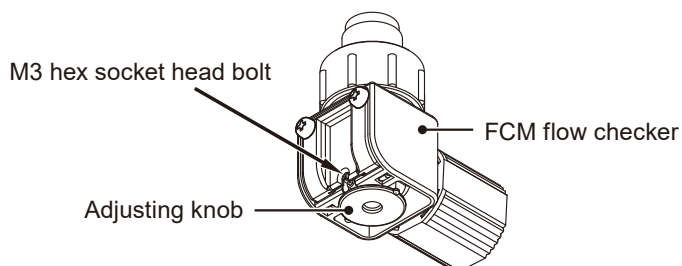
First check the following points. If the following measures do not help remove problems, contact your nearest distributor.

States	Possible causes	Solutions
The pump does not run (The LED does not light. Blank screen.)	Power voltage is too low.	• Observe the allowable voltage range of 90-264VAC
	The pump is not powered.	• Check the switch if it is installed. • Correct wiring. • Replace a breaking wire to new one.
	An electronic circuit in the control unit is failed.	• Replace the control unit.
Liquid can not be pumped up.	Air lock in the pump	• Expel air. See page 39.
	Stroke length is too short.	• Run the pump with full stroke length and then with adjusted length.
	Air ingress through a suction line	• Correct tubing.
	A valve set is installed upside down.	• Reinstall the valve set.

States	Possible causes	Solutions
Liquid can not be pumped up.	Valve gaskets are not installed.	• Install valve gaskets.
	Foreign matters are stuck in the pump head valves.	• Take apart, inspect and clean the valves. Replace as necessary.
	A ball valve is stuck on a valve seat.	• Take apart, inspect and clean the valve. Replace as necessary.
A flow rate fluctuates.	Air stays in the pump head.	• Expel air. See page 39.
	Overfeeding occurs.	• Mount a check valve. See page 30.
	Foreign matters are stuck in the pump head valves.	• Take apart, inspect and clean the valves. Replace as necessary.
	Diaphragm is broken.	• Replace the diaphragm.
	Pressure fluctuates at an injection point.	• Maintain a pressure constant at an injection point by optimising tubing or by relocating the point.
Liquid leaks.	The fitting or the air vent body is loose.	• Retighten them.
	The pump head is loose.	• Retighten the pump head. See page 38.
	O rings or valve gaskets are not installed.	• Install O rings and valve gaskets.
	Diaphragm is broken.	• Replace the diaphragm.
	Excessive discharge pressure	• Check that a discharge line is not closed. • Check if tubing is not clogged.
"PErr" or "FLOW" code appears even in operation at an intended flow rate. Or Auto restoration does not work properly.	Sensor cable connection is loose or disconnected.	• Secure the connection.
	A float is stuck in the flow checker.	• Clean the flow path of the flow checker. • Change a float position with the adjusting knob.
	Air ingress through a suction line	• Reroute tubing. • Secure tube joints.
	A strong magnetic field affects the float motion.	• Keep the operation site free from a magnetic field.
	AUTO restoration setting error	• Check PA, AL and RE time setting.

NOTE

Shift a float position along with liquid characteristics to optimise float motion. This adjustment is important for the flow checker to transmit pulse signals correctly. The adjusting knob is located beneath the flow checker. First loosen the M3 hex socket head bolt and then rotate the adjusting knob.



Inspection

Perform daily and periodic inspection to keep the best pump performance and safety.

Daily inspection

Check the following points. If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems. See the "Troubleshooting" section as necessary.

When wear parts come to the life limit, replace them with new ones. Contact your distributor for detail.

No.	States	Points to be checked	How to check
1	Pumping	• If liquid is pumped.	Flow meter or visual inspection
		• If the suction and discharge pressure are normal.	Pressure gauge
		• If liquid has deteriorated, crystallized or settled.	Visual or audio inspection
2	Noise and vibration	• If abnormal noise or vibration occurs. They are signs of abnormal operation.	Visual or audio inspection
3	Air ingress from the pump head joints and the suction line	• If pumped liquid includes air bubbles, check the line for leakage/loose connection and retighten as necessary.	Visual or audio inspection

Periodic inspection

Retighten the pump head mounting bolts evenly to the following torque in diagonal order.

*Mounting bolts may loosen in operation. How fast the bolts start to loosen is depending on operating conditions.

Tightening torque

Model code	Torque	Bolts
EHN-BN11/-BN16/-BN21	2.16 N•m	M4 Hex. socket head bolt
EHN-BN31	2.55 N•m	M4 Hex. socket head bolt
EHN-CN16/-CN21	2.16 N•m	M4 Hex. socket head bolt
EHN-CN31	2.55 N•m	M4 Hex. socket head bolt
EHN-CN36	2.55 N•m	M5 Hex. socket head bolt

*A hexagon wrench can be used for a torque wrench. See page 38.

Wear part replacement

To run the pump for a long period, wear parts need to be replaced periodically.

It is recommended that the following parts are always stocked for immediate replacement.

Contact your nearest distributor for detail.

! Precautions

- Solution in the discharge line may be under pressure. Release the pressure from the discharge line before disconnecting plumbing or disassembly of the pump to avoid solution spray.
- Rinse wet ends thoroughly with tap water.
- Each time the pump head is taken apart, replace the diaphragm, the O ring and the valve sets with new ones.

Wear part list

		Parts				# of parts	Estimated life
		VC/VS/PC/PS	PP	FC	SH	2 sets	
		Valve set					
Pump	Diaphragm					1	8000 hours
	O ring	 #42 O ring is used for the NAE, FCM or XFCM type		-		See page 77 or later.	
	Bolt gasket					1	
	AUTO air vent assembly (NAE type)					1 set	
Flow checker	O ring					1 set	
CAN check valve	Check valve poppet (with an O ring)					1 set	
	Check valve spring					1	
	CS check valve	EHN-SH only				1	
	BVC back pressure valve	EHN-FC only				1	

*Wear part duration varies with the pressure, temperature and characteristics of liquid.

*The estimated life is calculated based on the continuous operation with clean water at ambient temperature.

Before replacement

First release pressure from the pump head and the discharge line.

1 Stop the pump operation.

2 Rotate the adjusting screw two revolutions anticlockwise to open the air vent port.

NOTE

Do not rotate it three revolutions from the closed position. Or liquid may come out from the adjusting screw.

*The air vent adjusting screw is NOT provided or NOT capable to release discharge line pressure to the pump with the FC/SH wet end codes. Establish an air vent line with an air vent valve and adjust the valve manually to expel gas from the pump and system before operation (see the sketch on page 28 and 29 as well.). In the case the air vent line is unable to be built, you have no choice but to remove the discharge line while it is under pressure. This is not totally recommended; however, use a cloth around the outlet fitting nut many turns until it can be a protection against solution spray and the discharge tube is safely removed.

3 Check the pump head and the discharge line are depressurized.

Liquid pressure is released from the air vent line in the form of solution spray.

NOTE

If pressurized liquid is not expelled, run the pump with an opened air vent line until pressure is removed.

■ Necessary tools (Width across flat)

Model		Spanner			
		Fitting nut	Fitting	Lock nut	Air vent body B
EHN_MYN		27 mm	24 mm	38 mm	21 mm
EHN_NAE					
EHN_FCM/XFCM			-	32 mm	*
EHN-BN/-CN 11/21	FC	22 mm	22 mm	-	-
EHN-BN/-CN 31/36		24 mm	24 mm	-	-
EHN-BN/-CN 11/21	SH	-	21 mm	-	-
EHN-BN/-CN 31/36		-	27 mm	-	-

*Use 17 mm socket wrench instead of a spanner.

Valve set replacement

■ Discharge valve set disassembly/assembly

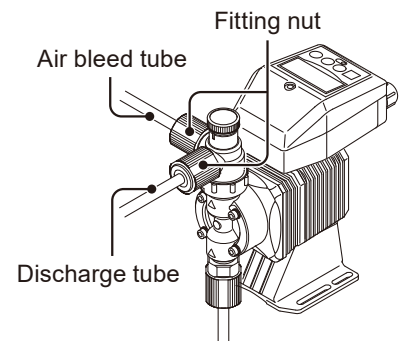
Necessary tools

- An adjustable wrench or a spanner
- A pair of tweezers
- 17mm socket wrench for the EHN-BN09 models

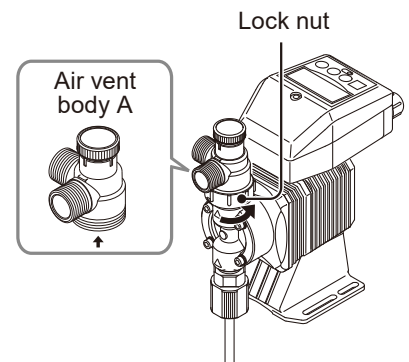
*Unfix the pump base before disassembly.

EHN-BN_/-CN_ MYN

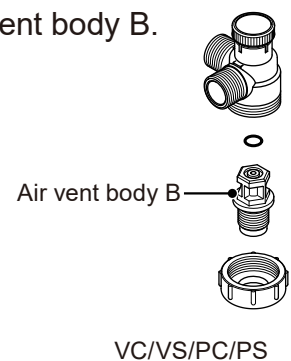
- 1** Use an adjustable wrench or a 27mm spanner to remove the fitting nut, the discharge tube, and the air bleed tube.



- 2** Turn the lock nut anticlockwise with an adjustable wrench or a 38mm spanner and remove the air vent body A.



- 3** Use an adjustable wrench or a 21mm spanner to remove the air vent body B.



- 4** Pull out the valve set with a pair of tweezers.

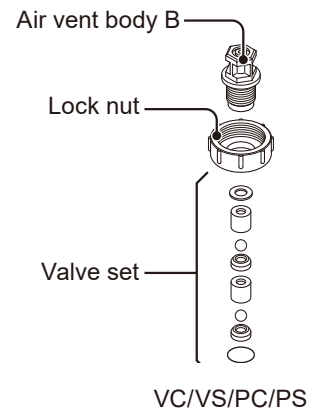
5 Build up the new valve set into the pump head and hand-tighten the air vent body B through the lock nut as far as it will go.

Retighten it by a further ¼ turn with an adjustable wrench or a 21mm spanner.

*Arrange the valve set in the correct parts order and direction. A leak or an insufficient flow may result.

*Be sure to fit O rings and gaskets in place.

*Keep the valve set clean.



6 Remount the air vent body A and connect tubes.

Tighten the lock nut, air vent body A, and fitting nut with an adjustable wrench or a following spanner.

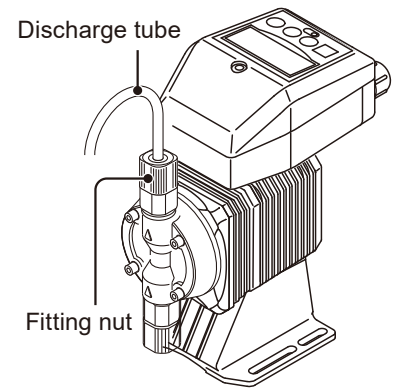
Fitting nut	Lock nut
27 mm	38 mm

*See the tube connection section on page 25 for detail.

EHN-BN_-/CN_FC

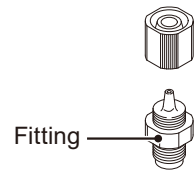
- 1** Use an adjustable wrench or following spanner to remove the fitting nut and the discharge tube.

Model	Width across flat
EHN-11/21	22 mm
EHN-31/36	24 mm



- 2** Use an adjustable wrench or following spanner to remove the fitting.

Model	Width across flat
EHN-11/21	22 mm
EHN-31/36	24 mm



- 3** Pull out the valve set with a pair of tweezers.

- 4** Build up the new valve set into the pump head and hand-tighten the fitting as far as it will go.

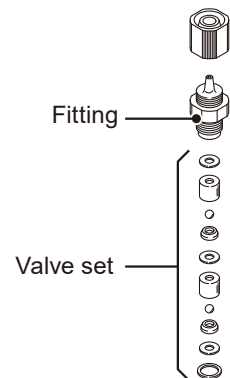
Retighten it by a further $\frac{1}{4}$ turn with an adjustable wrench or following a spanner.

Model	Width across flat
EHN-11/21	22 mm
EHN-31/36	24 mm

*Arrange the valve set in the correct parts order and direction. A leak or an insufficient flow may result.

*Be sure to fit O rings and gaskets in place.

*Keep the valve set clean.



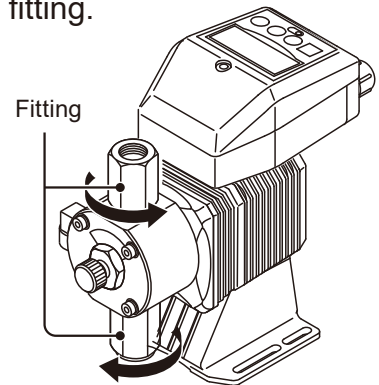
- 5** Reconnect the discharge tube.

*See the tube connection section on page 25 for detail.

1 Remove the suction, discharge and air bleed pipe.

2 Use an adjustable wrench or following spanner to remove the fitting.

Model	Width across flat
EHN-11/21	21 mm
EHN-31/36	27 mm



3 Pull out the valve set with a pair of tweezers.

4 Build up the new valve set into the fitting and hand-tighten it to the pump head as far as it will go.

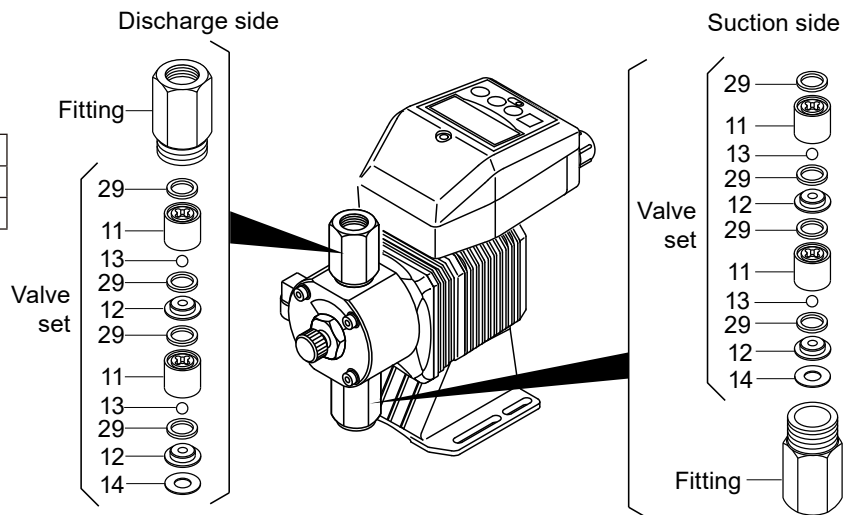
Retighten it by a further ¼ turn with an adjustable wrench or a spanner.

Model	Width across flat
EHN-11/21	21 mm
EHN-31/36	27 mm

*Arrange the valve set in the correct parts order and direction. A leak or an insufficient flow may result.

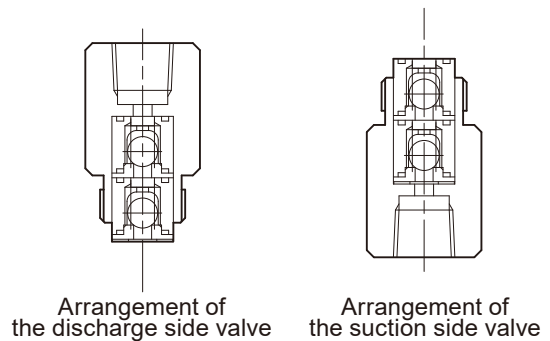
*Be sure to fit O rings and gaskets in place.

*Keep the valve set clean.



NOTE

Do not drop the valve set.



Arrangement of the discharge side valve

Arrangement of the suction side valve

5 Reconnect the suction, discharge and air bleed pipe.

*See the thread connection section on page 29 for detail.

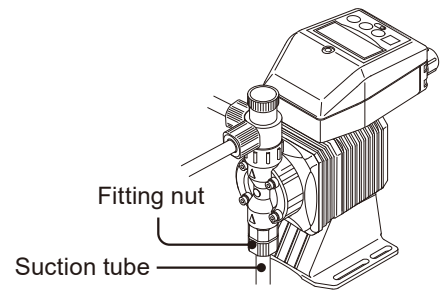
■ Suction valve set disassembly/assembly

NOTE

Be careful not to drop the valve set.

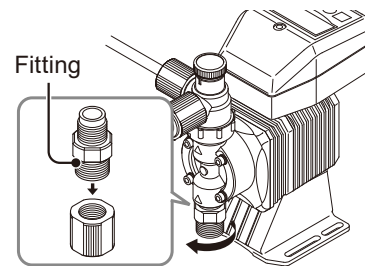
- 1 Use an adjustable wrench or following spanner to remove the fitting nut and the suction tube.

Model	Width across flat
EHN-BN/-CN 11/21 FC	22 mm
EHN-BN/-CN 31/36 FC	24 mm
Any other models	27 mm



- 2 Use an adjustable wrench or following spanner to remove the fitting.

Model	Width across flat
EHN-BN/-CN 11/21 FC	22 mm
EHN-BN/-CN 11/21 SH	21 mm
EHN-BN/-CN 31/36 SH	27 mm
Any other models	24 mm

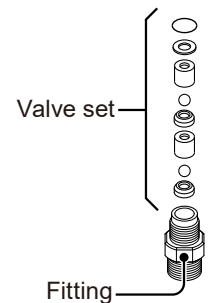


- 3 Pull out the valve set with a pair of tweezers.

- 4 Build up the new valve set into the fitting and hand-tighten it into the pump head as far as it will go.

Retighten it by a further 1/4 turn with an adjustable wrench or a spanner.

Model	Width across flat
EHN-BN/-CN 11/21 FC	22 mm
EHN-BN/-CN 11/21 SH	21 mm
EHN-BN/-CN 31/36 SH	27 mm
Any other models	24 mm



VC/VS/PC/PS

*Arrange the valve set in the correct parts order and direction. A leak or an insufficient flow may result.

*Be sure to fit O rings and gaskets in place.

*Keep the valve set clean.

- 5 Reconnect the suction tube.

*See the tube connection section on page 25 for detail.

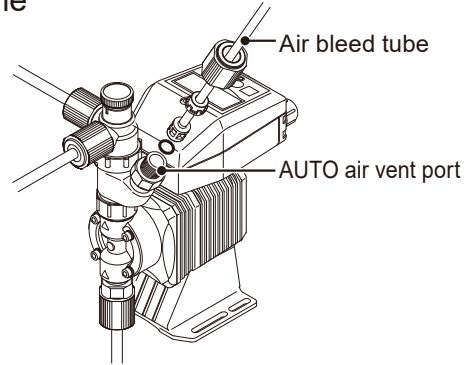
Air vent assembly replacement for the EHN_NAE models

Necessary tools

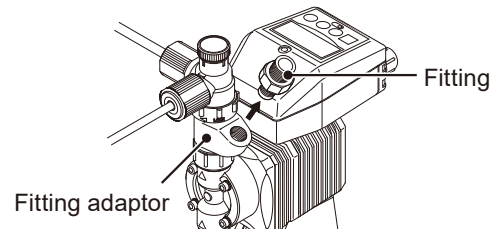
- An adjustable wrench or a spanner
- A pair of tweezers

- 1** Use an adjustable wrench or 27mm spanner to loosen the fitting nut and remove the air bleed tube.

*Be careful not to get wet with a residual chemical.



- 2** Use an adjustable wrench or 24mm spanner to remove the fitting from the fitting adaptor.



- 3** Pull out the auto air vent valve with a pair of tweezers from the fitting adaptor.

- 4** Remove the tape from the new auto air vent assy.

*Do not drop the auto air vent valve from the fitting.

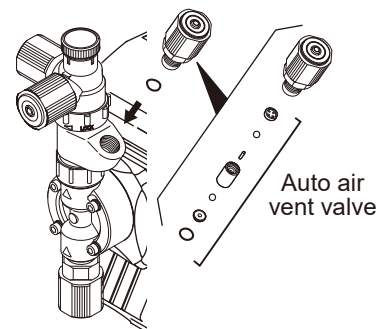
- 5** Hand-tighten the new auto air vent assembly into the fitting adaptor as far as it will go.

Retighten it by a further 1/4 turn with an adjustable wrench or a 24mm spanner.

*Arrange the valve set in the correct parts order and direction. A leak or an insufficient flow may result.

*Be sure to fit O rings in place.

*Keep the valve set clean.



- 6** Reconnect the air bleed tube.

*See the tube connection section on page 25 for detail.

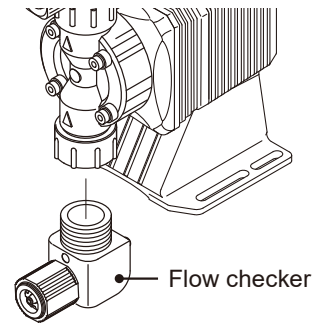
Flow checker replacement (FCM/XFCM type)

Necessary tools

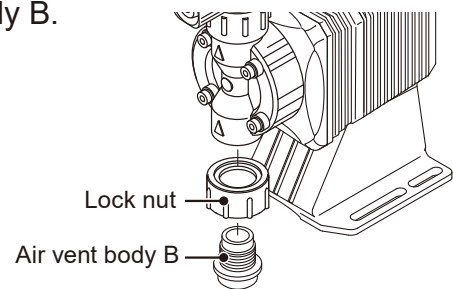
- An adjustable wrench or a 27, or 31mm spanner
- A 17mm socket wrench
- A pair of tweezers

1 Use an adjustable wrench or 27mm spanner to loosen the fitting nut and remove the suction tube.

2 Use an adjustable wrench or 31mm spanner to remove the lock nut and the flow checker.



3 Use a 17mm socket wrench to remove the air vent body B.



4 Pull out the valve set with a pair of tweezers.

5 Place a new valve set into the fitting.

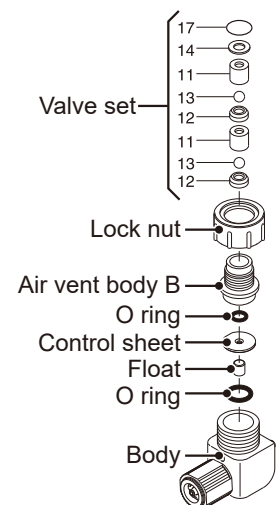
Hand-tighten the fitting into the pump head as far as it will go.

Retighten it by a further $\frac{1}{4}$ turn with a 17mm socket wrench.

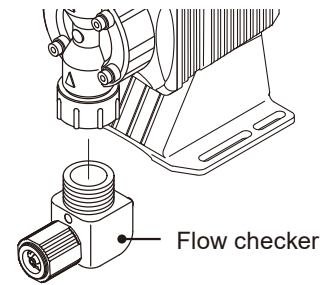
*Arrange the valve set in the correct parts order and direction. A leak or an insufficient flow may result.

*Be sure to fit O rings and gaskets in place.

*Keep the valve set clean.

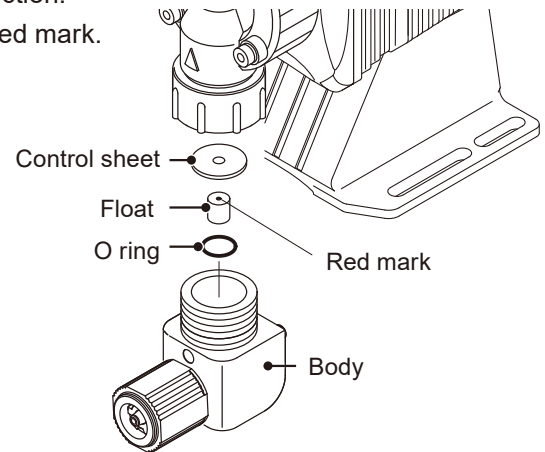


6 Mount the new flow checker.



NOTE

- Arrange the valve set in the correct parts order and direction.
- The float has a mounting direction. The top side has a red mark.



7 Reconnect the suction tube.

*See the tube connection section on page 25 for detail.

Diaphragm/Bolt gasket replacement

Necessary tools

- An adjustable wrench or a spanner
- A hexagon wrench
- A torque wrench
- A pair of tweezers

NOTE

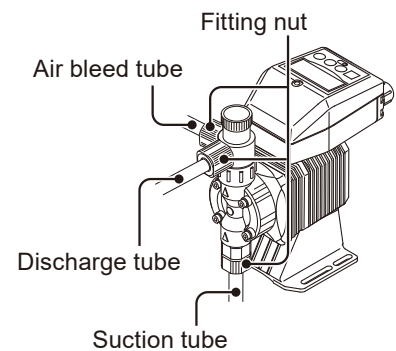
Pay attention not to lose diaphragm spacers. A few diaphragm spacers may be inserted between the retainer and plunger for the adjustment of a diaphragm location. Note that the number of diaphragm spacers provided varies at different pumps.

1 Run the pump and set the stroke length to 0%. Then stop the pump.

*Shorten the stroke length to 0% or just to the length that the diaphragm can be removed.

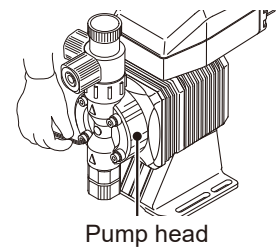
2 Use an adjustable wrench or following spanner to loosen the fitting nuts and remove the suction tube, discharge tube, and air bleed tube.

Model	Width across flat
EHN-BN/-CN 11/21 FC	22 mm
EHN-BN/-CN 31/36 FC	24 mm
Any other models	27 mm



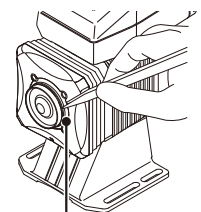
3 Remove the pump head with a hexagon wrench.

*Solution in the pump head may be under pressure. Loose the lower bolts first.



Pump head

4 Pull out the bolt gasket with a pair of tweezers.



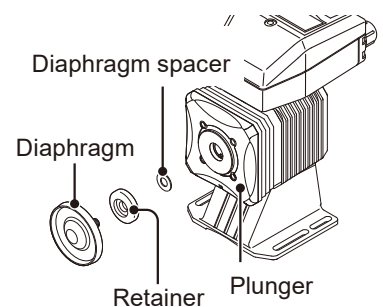
Bolt gasket

5 Unscrew the diaphragm from the plunger (pump shaft).

*The retainer and the diaphragm spacer are inserted behind the diaphragm. Try not to lose them.

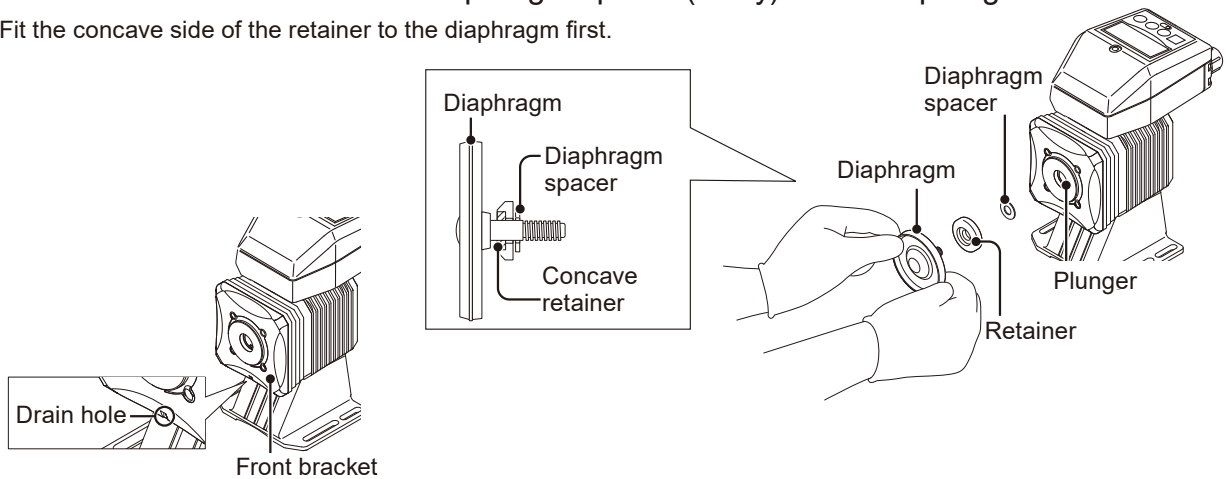
*The diaphragm spacer adjusts the diaphragm to be seated properly. Some models may not include the spacer.

*After removing the diaphragm, you can take out the front bracket. Try not to drop it.



6 Install the retainer and then the diaphragm spacer (if any) to the diaphragm shaft.

*Fit the concave side of the retainer to the diaphragm first.



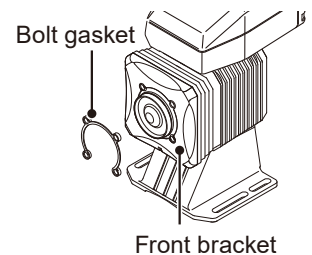
*If the front bracket is removed, fit it as the drain hole directs downward and then install the diaphragm.

7 Screw the new diaphragm into the plunger as far as it will go.

8 Run the pump and set the stroke length to 100%. Then stop the pump.

9 Fit a new bolt gasket into the front bracket groove.

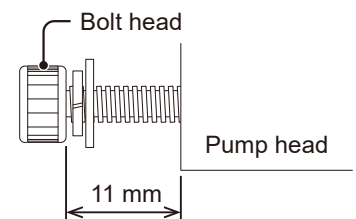
*Ensure the open end of the bolt gasket directs downward. The raised bumps of the gasket mate with the front bracket.



10 Mount the pump head.

Make sure the bolts seat against the bolt gasket or the bolt head is 11mm away from the pump head before tightening them. Tighten the bolts diagonally and evenly by the specified torque at each model.

*Do not use excessive force when tightening the bolts. A damaged bolt gasket and insufficient sealing may result.



Tightening torque

Model code	Torque	Bolts
EHN-BN11/-BN16/-BN21	2.16 N•m	M4 Hex. socket head bolt
EHN-BN31	2.55 N•m	M4 Hex. socket head bolt
EHN-CN16/-CN21	2.16 N•m	M4 Hex. socket head bolt
EHN-CN31	2.55 N•m	M4 Hex. socket head bolt
EHN-CN36	2.55 N•m	M5 Hex. socket head bolt

*A hexagon wrench can be used for a torque wrench. See page 38.

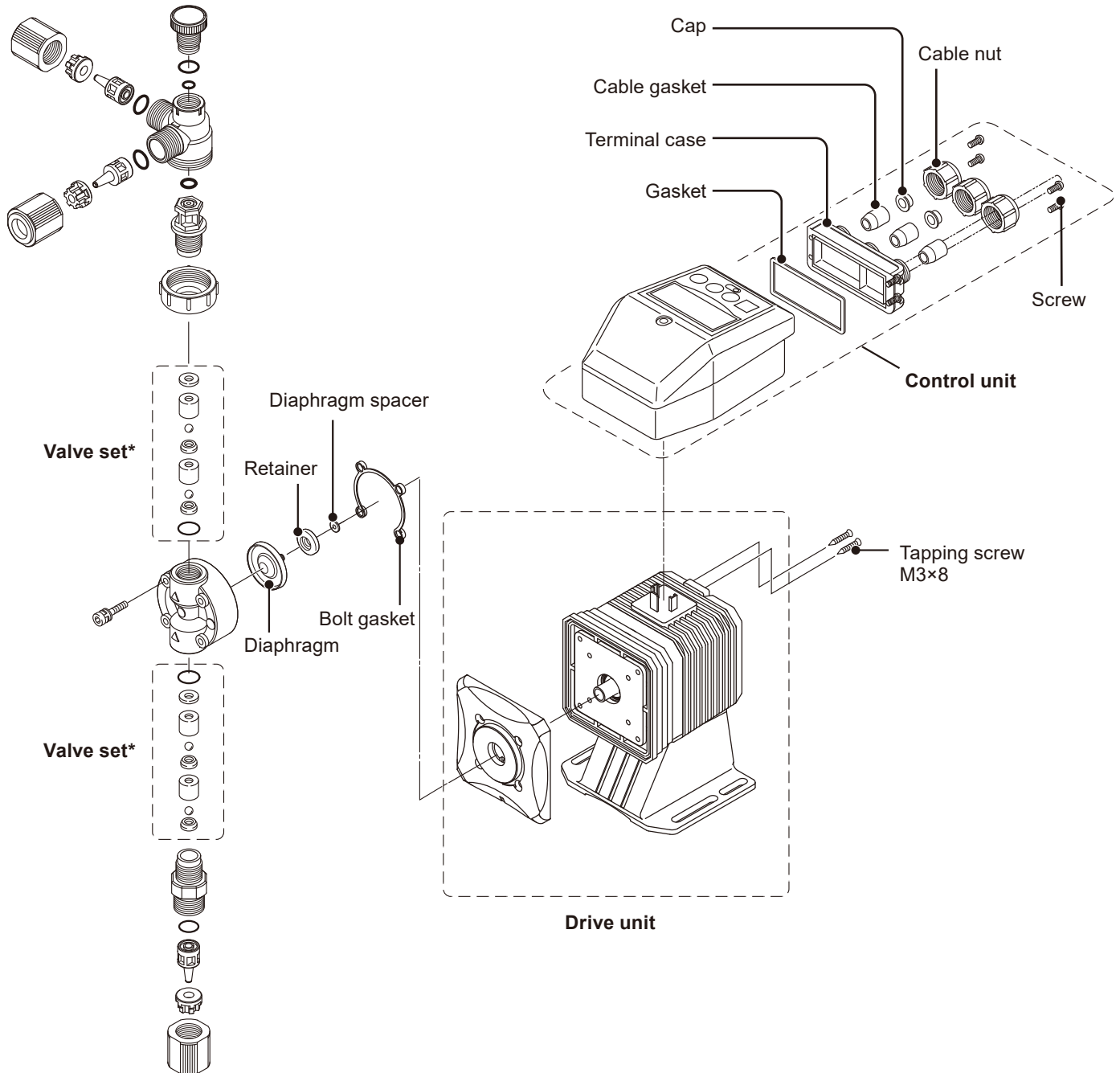
11 Reconnect the air bleed tube.

*See the tube connection section on page 25 for detail.

Exploded view

Pump head, Drive unit & Control unit

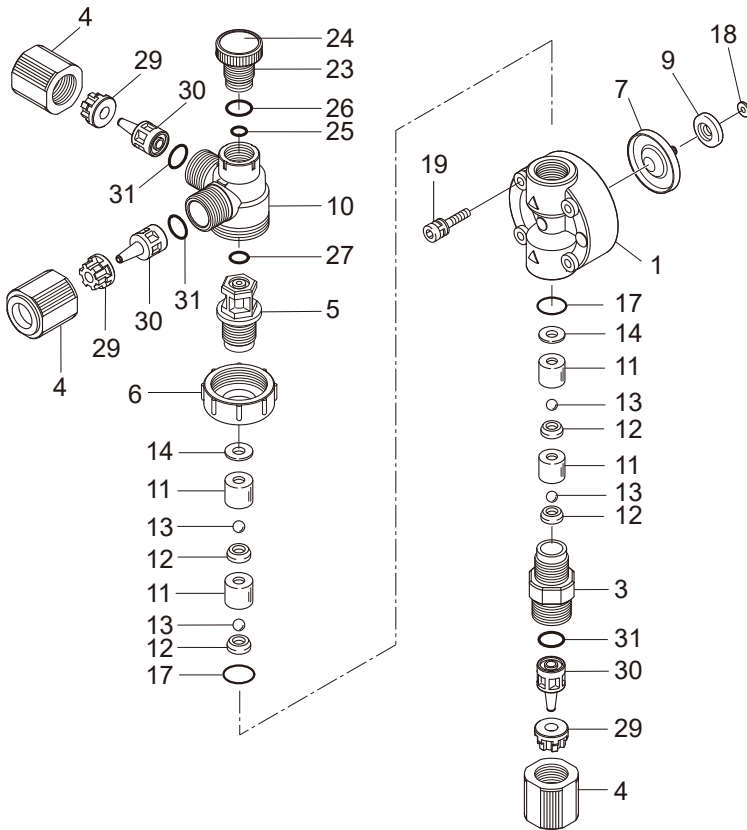
Do not take apart the pump beyond the extent shown in the diagram below.



*Wet end materials and their sizes differ with models. See the "Valve set replacement" section on page 66 for detail.

Pump head

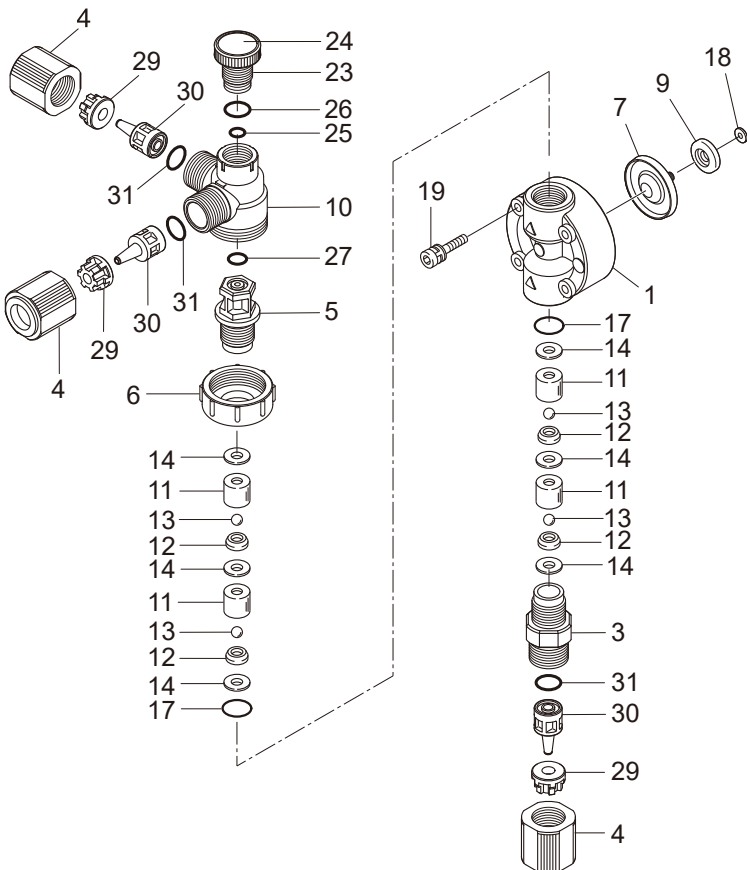
■ EHN-BN_/-CN_VC/VS/PC/PS



No.	Part names	# of parts
1	Pump head	1
3	Fitting	1
4	Fitting nut	3
5	Air vent body B	1
6	Lock nut	1
7	Diaphragm	1
9	Retainer	1
10	Air vent body A	1
11	Valve guide	4
12	Valve seat	4
13	Valve	4
14	Valve gasket	2
17	O ring	2
18	Diaphragm spacer	*
19	Hex socket cap bolt [PW•SW]	4
23	Adjusting screw	1
24	Name plate	1
25	O ring	1
26	O ring	1
27	O ring	1
29	Hose stopper	3
30	Hose adaptor	3
31	O ring	3

*The number of diaphragm spacers varies with pump model.

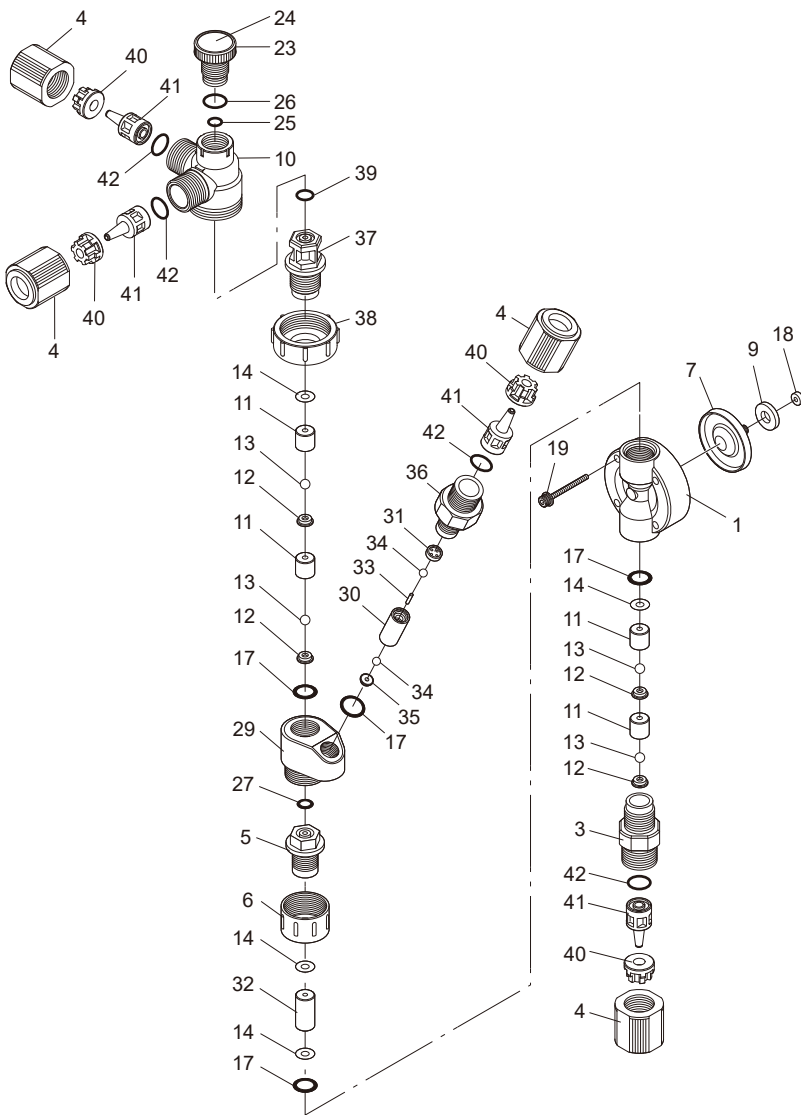
■ EHN-BN_/-CN_PP



No.	Part names	# of parts
1	Pump head	1
3	Fitting	1
4	Fitting nut	3
5	Air vent body B	1
6	Lock nut	1
7	Diaphragm	1
9	Retainer	1
10	Air vent body A	1
11	Valve guide	4
12	Valve seat	4
13	Valve	4
14	Valve gasket	6
17	O ring	2
18	Diaphragm spacer	*
19	Hex socket cap bolt [PW•SW]	4
23	Adjusting screw	1
24	Name plate	1
25	O ring	1
26	O ring	1
27	O ring	1
29	Hose stopper	3
30	Hose adaptor	3
31	O ring	3

*The number of diaphragm spacers varies with pump model.

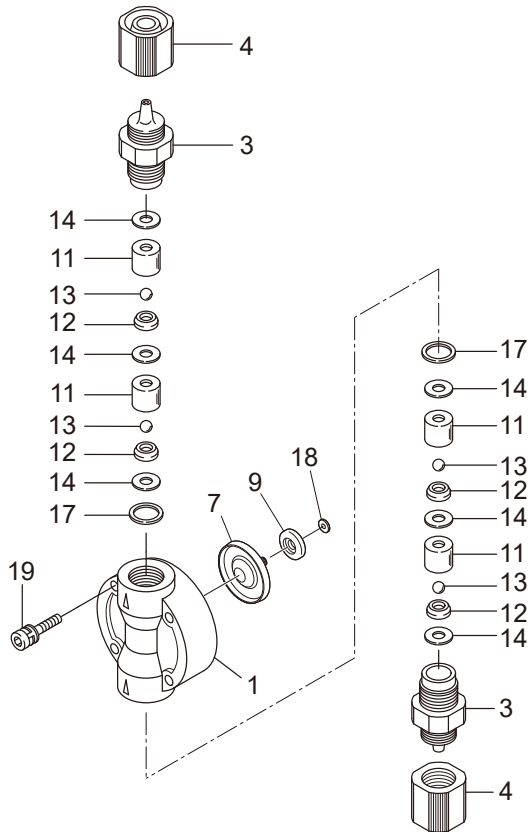
■ EHN-BN_-/CN_-NAE



No.	Part names	# of parts
1	Pump head	1
3	Fitting	2
4	Fitting nut	4
5	Air vent body B	1
6	Lock nut	1
7	Diaphragm	1
9	Retainer	1
10	Air vent body A	1
11	Valve guide	4
12	Valve seat	4
13	Valve	4
14	Valve gasket	4
17	O ring (S14)	4
18	Diaphragm spacer	*
19	Hex socket cap bolt [PW•SW]	4
23	Adjusting screw	1
24	Name plate	1
25	O ring (P4)	1
26	O ring (P10A)	1
27	O ring (P7)	1
29	Fitting adaptor	1
30	Air vent valve guide A	1
31	Air vent valve guide B	1
32	Spacer	1
33	Separate pin	1
34	Valve	2
35	Valve seat	1
36	Fitting	1
37	Air vent body B	1
38	Lock nut	1
39	O ring	1
40	Hose stopper	4
41	Hose adaptor	4
42	O ring	4

*The number of diaphragm spacers varies with pump model.

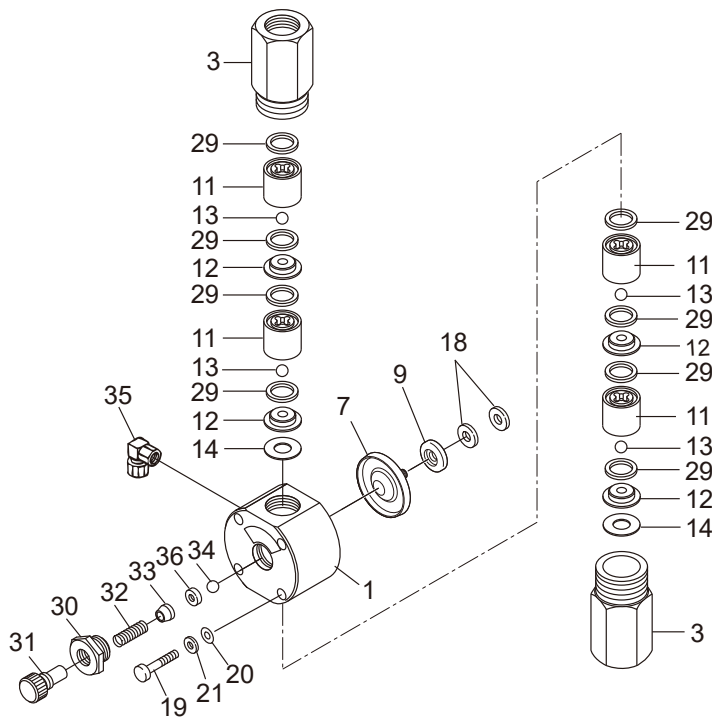
■ EHN-BN_-/-CN_FC



No.	Part names	# of parts
1	Pump head	1
3	Fitting	2
4	Fitting nut	2
7	Diaphragm	1
9	Retainer	1
11	Valve guide	4
12	Valve seat	4
13	Valve	4
14	Valve gasket	6
17	Gasket	2
18	Diaphragm spacer	*
19	Hex socket cap bolt [PW•SW]	4

*The number of diaphragm spacers varies with pump model.

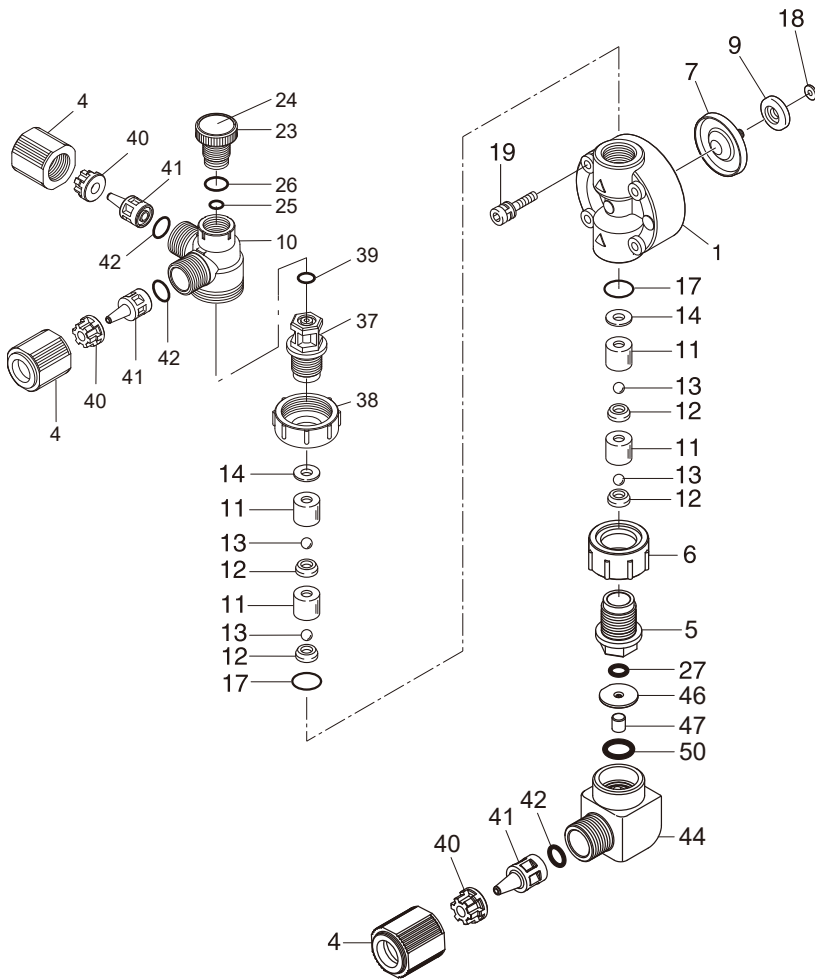
■ EHN-BN_-/-CN_SH



No.	Part names	# of parts
1	Pump head	1
3	Fitting	2
7	Diaphragm	1
9	Retainer	1
11	Valve guide	4
12	Valve seat	4
13	Valve	4
14	Valve gasket B	2
18	Diaphragm spacer	*
19	Hex socket cap bolt [PW•SW]	4
29	Valve gasket A	8
30	Seal nut	1
31	O ring	1
32	Spring	1
33	Seal ring	1
34	Valve	1
35	Tube connector	1
36	Spacer	1

*The number of diaphragm spacers varies with pump model.

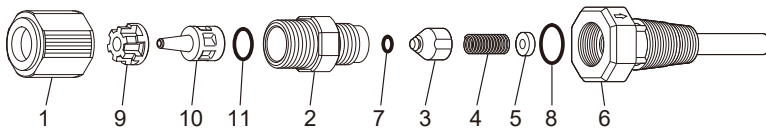
■ EHN-BN_/CN_-FCM/XFCM



No.	Part names	# of parts
1	Pump head	1
4	Fitting nut	3
5	Air vent body B	1
6	Lock nut	1
7	Diaphragm	1
9	Retainer	1
10	Air vent body A	1
11	Valve guide	4
12	Valve seat	4
13	Valve	4
14	Valve gasket	2
17	O ring	2
18	Diaphragm spacer	*
19	Hex socket cap bolt [PW•SW]	4
23	Adjusting screw	1
24	Name plate	1
25	O ring	1
26	O ring	1
27	O ring	2
37	Air vend body B	1
38	Lock nut	1
40	Hose stopper	3
41	Hose adaptor	3
42	O ring	3
44	Body	1
46	Control sheet	1
47	Float	1
50	O ring	1

*The number of diaphragm spacers varies with pump model.

Check valve (VC/VS/PC/PS/PP)



No.	Part names	# of parts
1	Fitting nut	1
2*1	Valve case	1
3	Poppet	1
4	Spring	1
5*2	Spacer	1 (0)
6	Valve fitting A	1
7	O ring	1
8	O ring	1
9*3	Hose stopper	1
10	Hose adaptor	1
11	O ring	1

*1 Tighten the valve case to the valve fitting A by 2.94N·m.

*2 No spacer is provided to the CAN-2VCL-M/-2VEL-M/-2VL-M/-2EL-M.

*3 The shape of the hose stopper changes with the tube size. See page 26 for detail.

Specifications/Outer dimensions

Specifications

Information in this section is subject to change without notice.

■ Pump

VC/VS/PC/PS/PP (-55/-FCM/-XFCM)

Model code	Max. output capacity mL/min	Max. rated discharge pressure MPa	Stroke length mm (%)	Stroke rate spm	Tube size mm	Average current A	Average power cons. W	Weight kg
EHN-BN11	38	1.0	0.5-1.0 (50-100)	1-360	ø4×ø9 ø4×ø6	0.8	20	1.8
EHN-BN16	65	0.7						
EHN-BN21	100	0.4						
EHN-BN31	230	0.2			ø8×ø13 ø9×ø12			
EHN-CN16	80	1.0	0.5-1.25 (40-100)		ø4×ø9 ø4×ø6	1.2	24	2.9
EHN-CN21	130	0.7						
EHN-CN31	270	0.35						
EHN-CN36	450	0.2			ø8×ø13 ø9×ø12			

FC

Model code	Max. output capacity mL/min	Max. rated discharge pressure MPa	Stroke length mm (%)	Stroke rate spm	Tube size mm	Average current A	Average power cons. W	Weight kg
EHN-BN11	38	1.0	0.5 - 1.0 (50 - 100)	1-360	ø4×ø6	0.8	20	1.8
EHN-BN21	100	0.4						
EHN-CN21	130	0.7	0.5 - 1.25 (40 - 100)		ø10×ø12	1.2	24	2.9
EHN-CN31	270	0.35						
EHN-CN36	410	0.2						

SH

Model code	Max. output capacity mL/min	Max. rated discharge pressure MPa	Stroke length mm (%)	Stroke rate spm	Tube size mm	Average current A	Average power cons. W	Weight kg
EHN-BN11	38	1.0	0.5 - 1.0 (50 - 100)	1-360	ø4×ø6	0.8	20	2.4
EHN-BN21	100	0.4						
EHN-CN21	130	0.7	0.5 - 1.25 (40 - 100)		ø10×ø12	1.2	24	4.1
EHN-CN31	270	0.35						
EHN-CN36	410	0.2						

NAE

Model code	Max. output capacity mL/min	Max. rated discharge pressure MPa	Stroke length mm (%)	Stroke rate spm	Tube size mm	Average current A	Average power cons. W	Weight kg
EHN-BN11	30	1.0	0.5-1.0 (50-100)	1-360	ø4×ø9 ø4×ø6	0.8	20	1.8
EHN-BN16	55	0.7						
EHN-CN16	65	1.0	0.5-1.25 (40-100)		1.2	24	2.9	
EHN-CN21	110	0.7						

*Maximum output capacity is rated with clean water at ambient temperature at maximum discharge pressure (also, stroke length 100%, at 360spm and rated voltage). Output may increase as pressure decreases.

*Allowable room temperature: 0-40°C

*Allowable liquid temperature: 0-40°C for the pumps with the VC/VS wet ends (0-60°C for the PC/PS/PP wet ends)

*The EHN-B21/-C16 with PP wet ends are not available.

*Allowable power voltage deviation: ±10% of the rated range

*If you are to use a different tube size (ø4×ø6 or ø9×ø12) with a multi-tube connection, change stopper size accordingly.

■ Control unit

Operation mode	Mode	Manual EXT (multiplier or divisor)
	Mode selection	Key operation
Stroke rate	Setting range	1-360spm
	spm programming	UP and DOWN keys
STOP function	M-OFF	The pump stops during contact input.
	M-ON	The pump runs during contact input.
	Input signal	Dry contact or open collector* ¹
EXT mode	Digital control	n (1-999) strokes per signal (multiplier)* ² n (1-999) signals per stroke (divisor)* ³ 1:1 operation with n=1
	Analog control	Set point 1 0-20mA, 0-360spm Set point 2 0-20mA, 0-360spm
	Input signal	Dry contact or open collector* ¹
Control function	PRIME	Max spm operation while the UP and DOWN keys are pressed.
	Keypad lock	Keypad lock and release
AUTO restoration* ⁵	Pre-Alarm time	Off/ 1-60min
	Alarm time	Off/ 1-60min
	Return time	Off/ 1-60min/ 1-60sec
Output	Dry contact (photoMOS relay) 24VAC/DC 0.1A PAAL* ⁵ /PA* ⁵ /AL* ⁵ /SPM are settable.	
Indicator	Numeric indication	4-digit LCD
	Operation	Green LED (blinks at each stroke)
Buffer	Non-volatile memory	
Power voltage* ⁴	100-240VAC 50/60Hz	

*¹ The maximum applied voltage from the EHN-YN to an external contact is 12V with 5mA. The minimum application load of the relay or switch should be 5mA or below.

*² In the digital control with a preset multiplier, the pump does not run over the MAN speed at any pulse rate. An unprocessed pulse signal which exceeds the MAN speed pulse rate is stored for up to 65535 strokes if the multiplier buffer is turned on ("X-ON").

*³ In the digital control with a preset divisor, the pump does not run over 360 spm at any pulse rate. An unprocessed pulse signal which exceeds the max 360 spm is stored for up to 65535 strokes if the divisor buffer is turned on ("I-ON").

*⁴ Observe the specified power voltage range. Otherwise failure may result. The allowable voltage range is 90-264VAC.

*⁵ Turn ON and set them up only when the optional FCM flow checker is used.

■ Power cable

Conduction section area	0.75 [mm ²] (duplex cable)
Length	1500 [mm]
Cable type/standard	VCTFK
Terminal end	Spade terminal (V1.25-YS4A or equivalent)

■ Pump colour

Blue	Munsell colour system 7.5PB 3/8
Red	Munsell colour system 5R 3/10

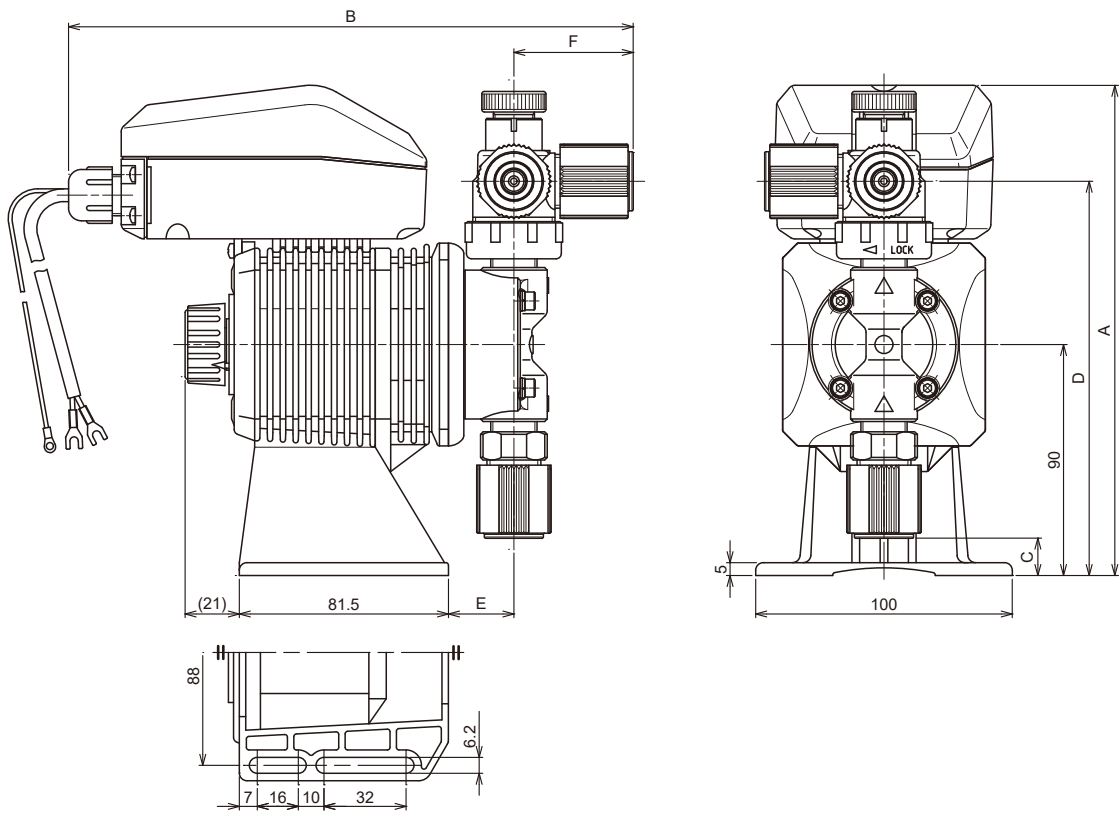
■ Check valve

Model code	Set pressure MPa	Tube sizes mm	Wet ends	Applicable pumps	Wet end codes	
CAN-1VC-M	0.17	ø4×ø9/ ø4×ø6	PVC	EHN-BN11/-BN16/-BN21 EHN-CN16/-CN21	VC	
CAN-1VE-M					VS	
CAN-2VC-M		ø8×ø13/ ø9×ø12		EHN-CN31	VC	
CAN-2VE-M				VS		
CAN-2VCL-M	0.05			EHN-BN31 EHN-CN36	VC	
CAN-2VEL-M				VS		
CAN-1V-M	0.17	ø4×ø9/ ø4×ø6		GFRPP	EHN-BN11/-BN16/-BN21 EHN-CN16/-CN21	PC/PP
CAN-1E-M						PS
CAN-2V-M		ø8×ø13/ ø9×ø12	EHN-CN31		PC/PP	
CAN-2E-M			PS			
CAN-2VL-M	0.05		EHN-BN31 EHN-CN36		PC/PP	
CAN-2EL-M			PS			
CS-1S	0.2	Rc1/4	SUS304		EHN-BN11/-BN21 EHN-CN21/-CN31	SH
CS-1SL	0.05					
BVC-1TV-4H	0.2	ø4×ø6	PVDF	EHN-BN11/-BN21 EHN-CN21	FC	
BVC-1TV-10H		0.1				ø10×ø12
	EHN-CN36					

*If you are to use a different tube size (ø4×ø6 or ø9×ø12) with a multi-tube connection, change stopper size accordingly.

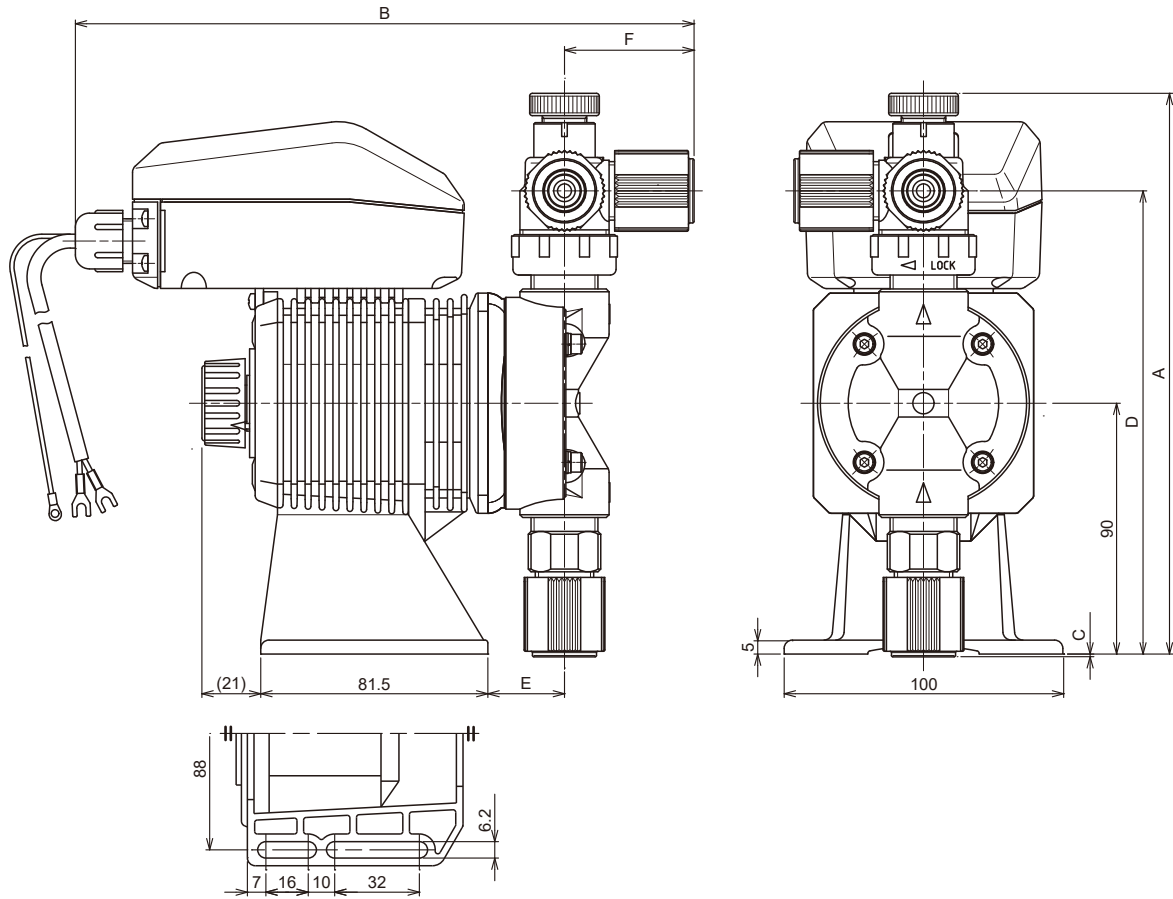
Outer dimensions

■ EHN-BN11/-BN16/-BN21 VC/VS/PC/PS/PP M



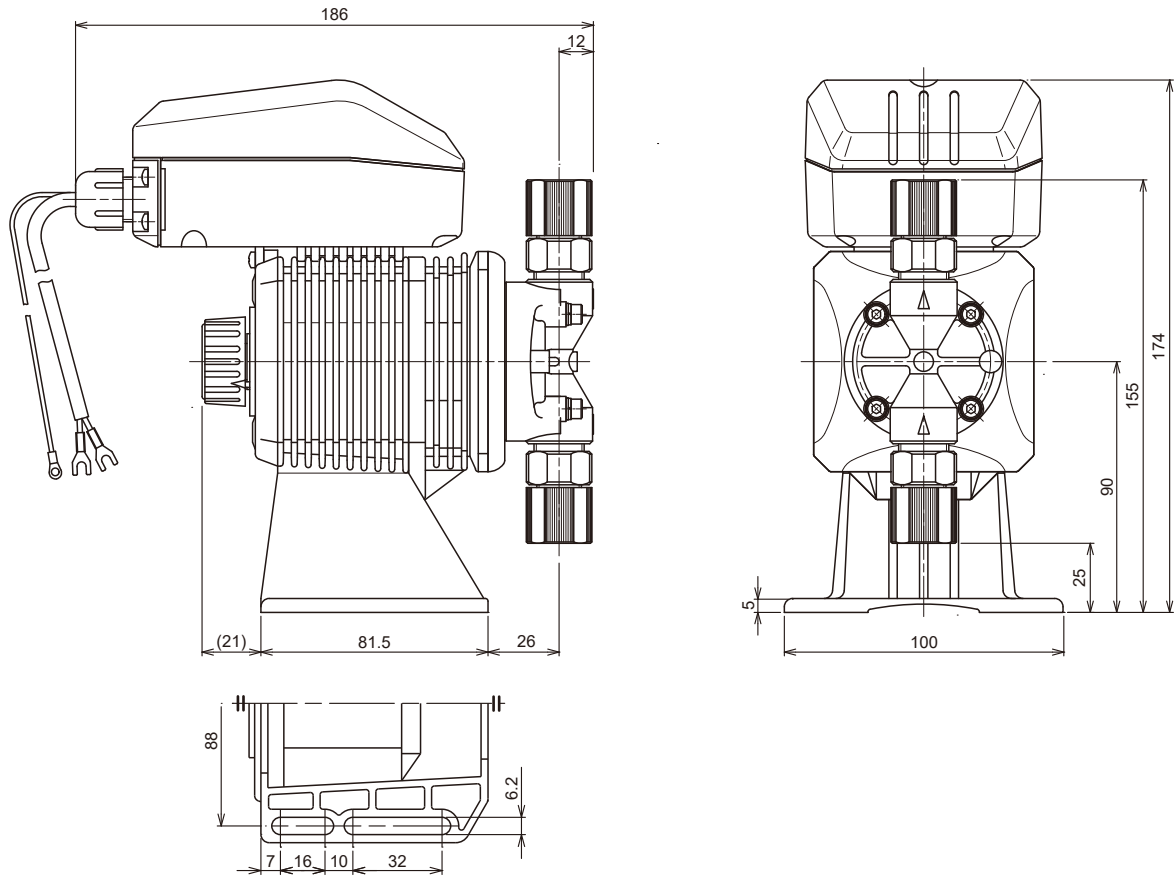
Model		A	B	C	D	E	F
EHN-BN11/-BN16/-BN21	VC/VS/PC/PS	189	220	14	154	26	47
	PP	190			155		

■ EHN-BN31 VC/VS/PC/PS/PP M

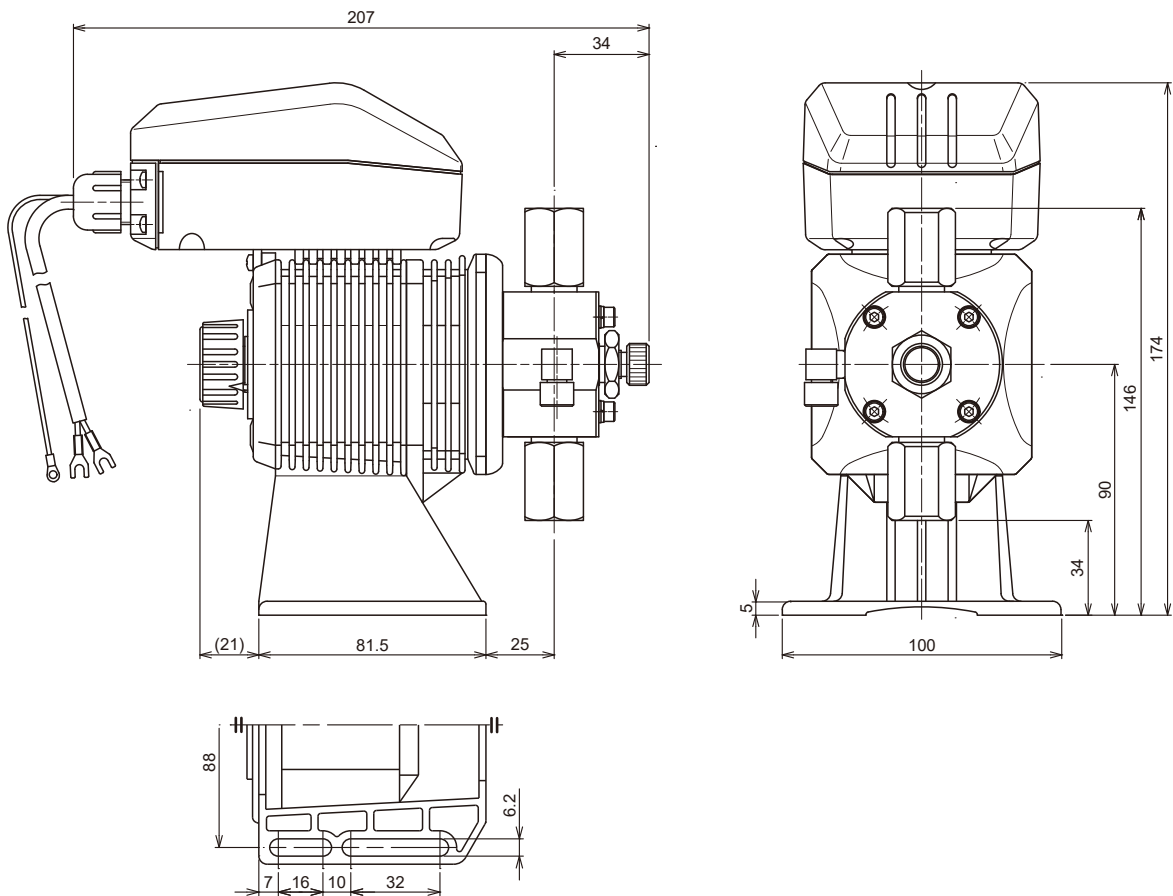


Model		A	B	C	D	E	F
EHN-BN31	VC/VS/PC/PS	201	222	1	166	28	47
	PP	202			167		

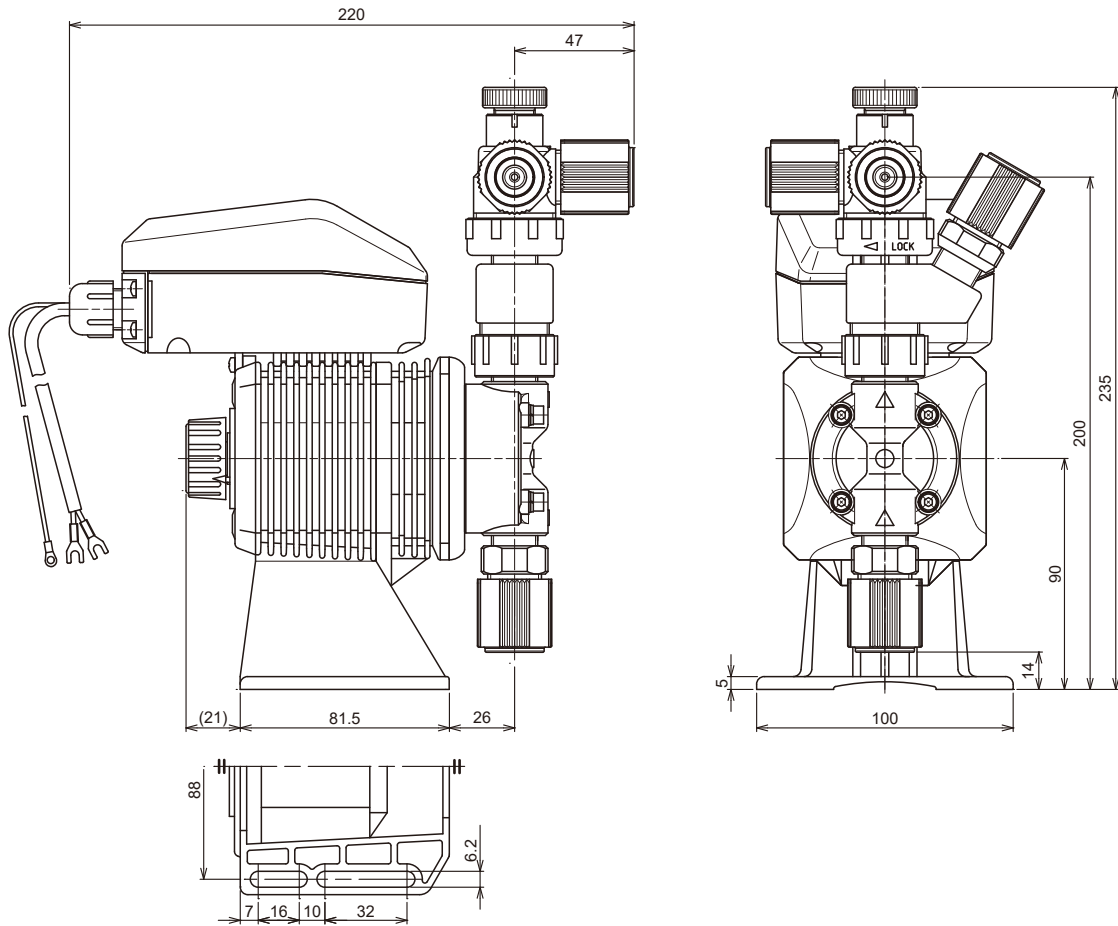
■ EHN-BN11/-BN21 FC



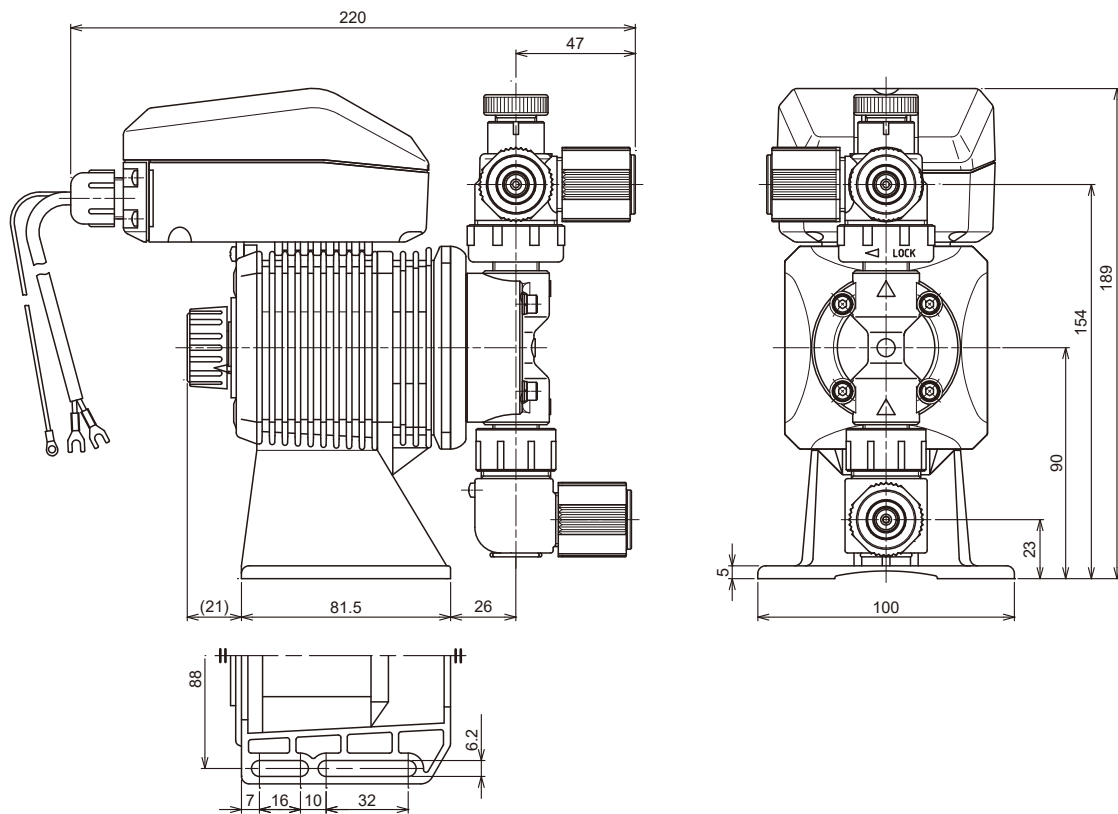
■ EHN-BN11/-BN21 SH



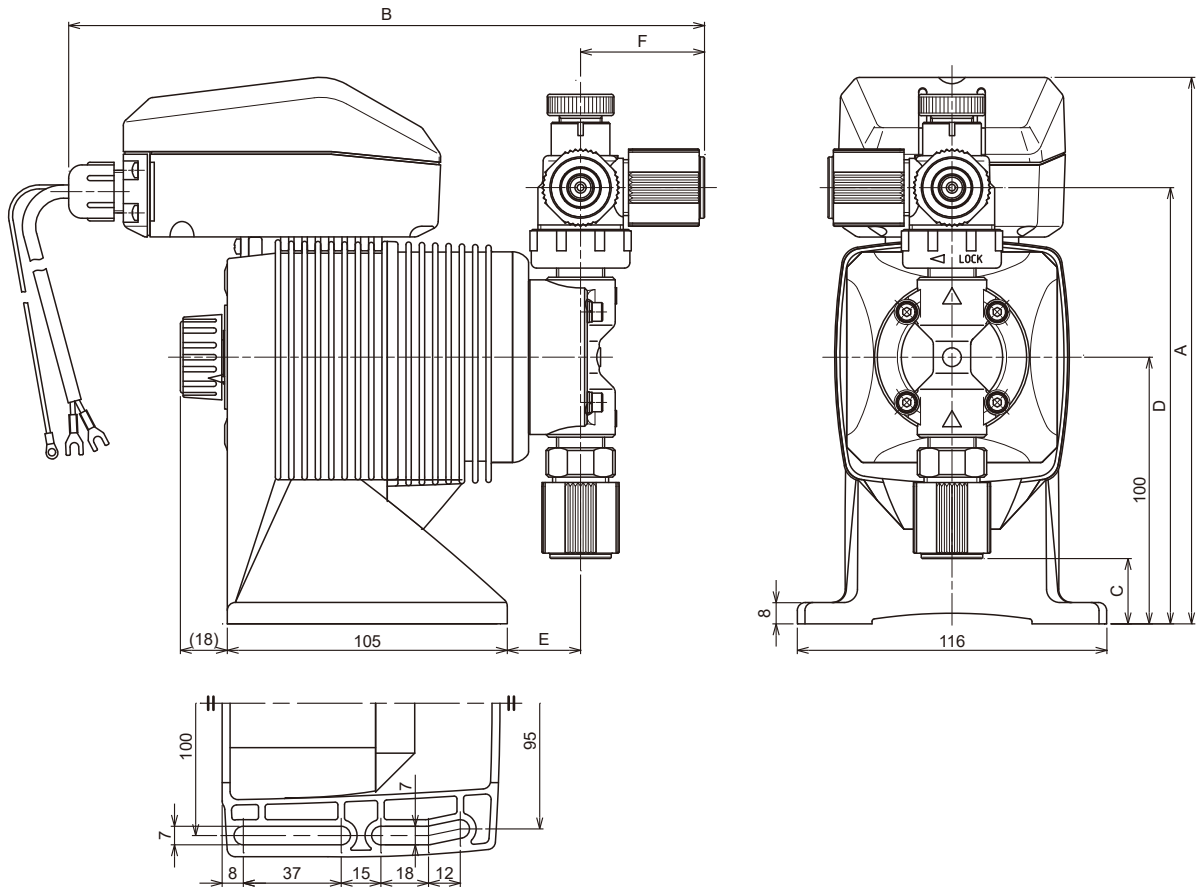
■ EHN-BN11/-BN16/-BN21 VC/VS M-NAE



■ EHN-BN11/-BN16/-BN21 VC/VS M FCM/XFCM

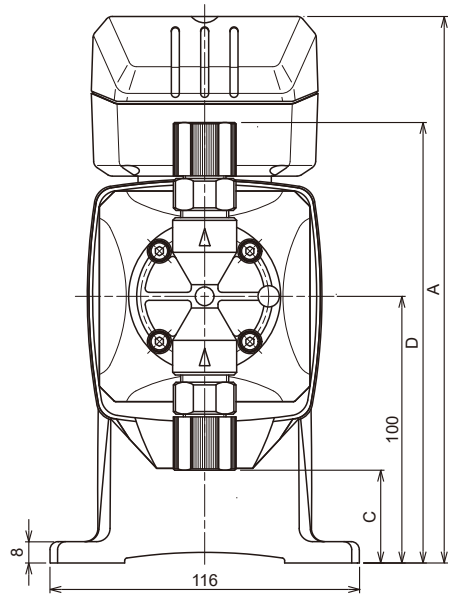
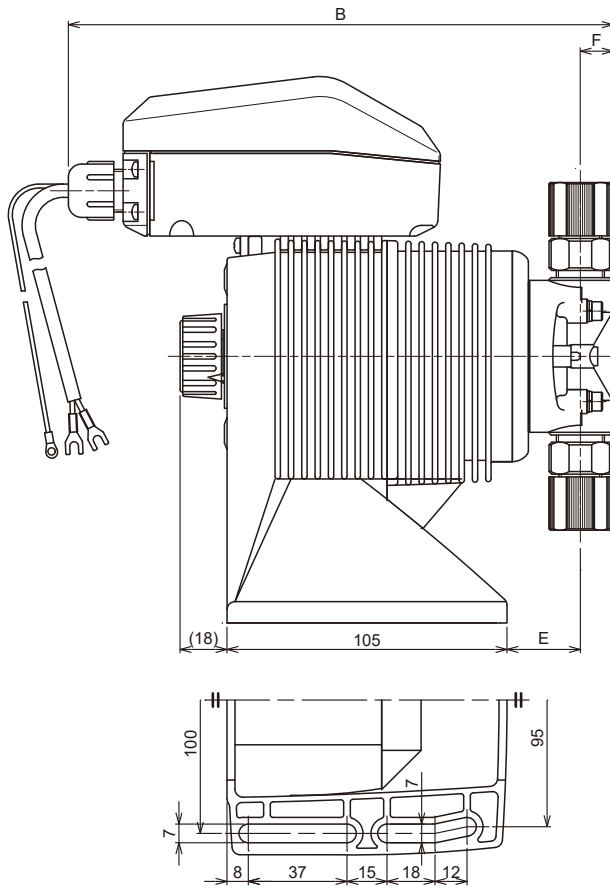


■ EHN-CN16/-CN21/-CN31/-CN36 VC/VS/PC/PS/PP M



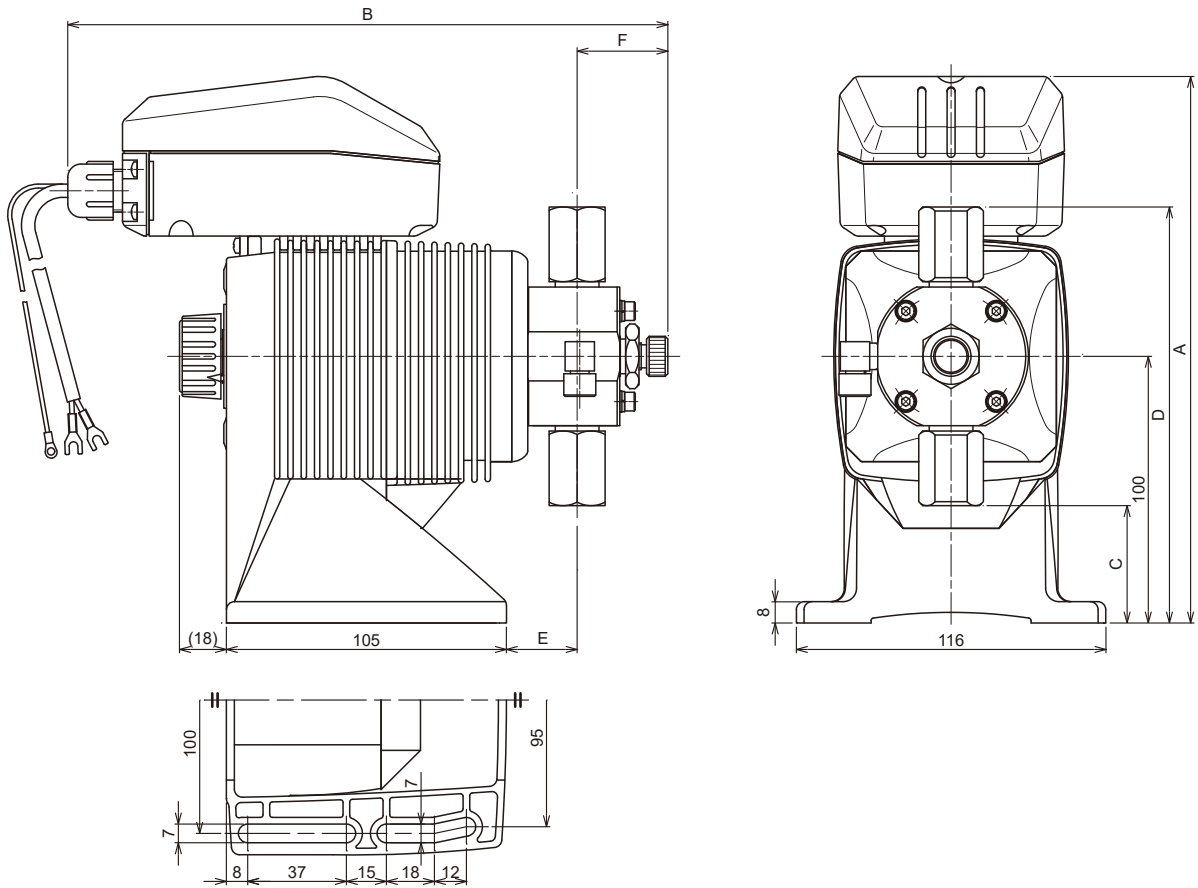
Model		A	B	C	D	E	F
EHN-CN16/-CN21	VC/VS/PC/PS	199	239	24	164	27	47
EHN-CN21	PP	200	238				
EHN-CN31/-CN36	VC/VS/PC/PS	211	240	10	176	29	
	PP	212		8	177		

■ EHN-CN21/-CN31/-CN36 FC



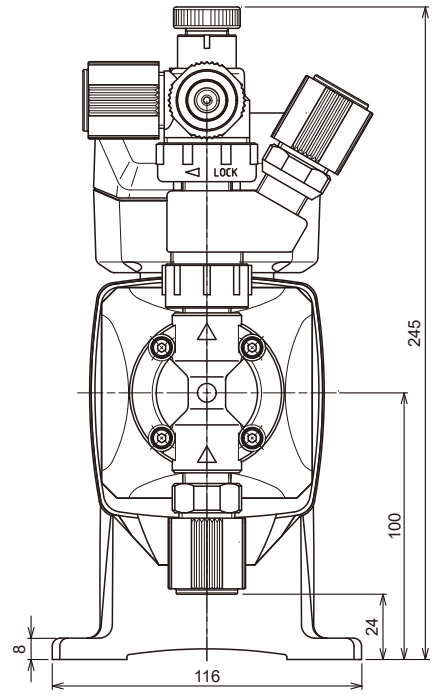
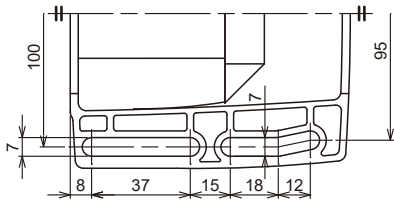
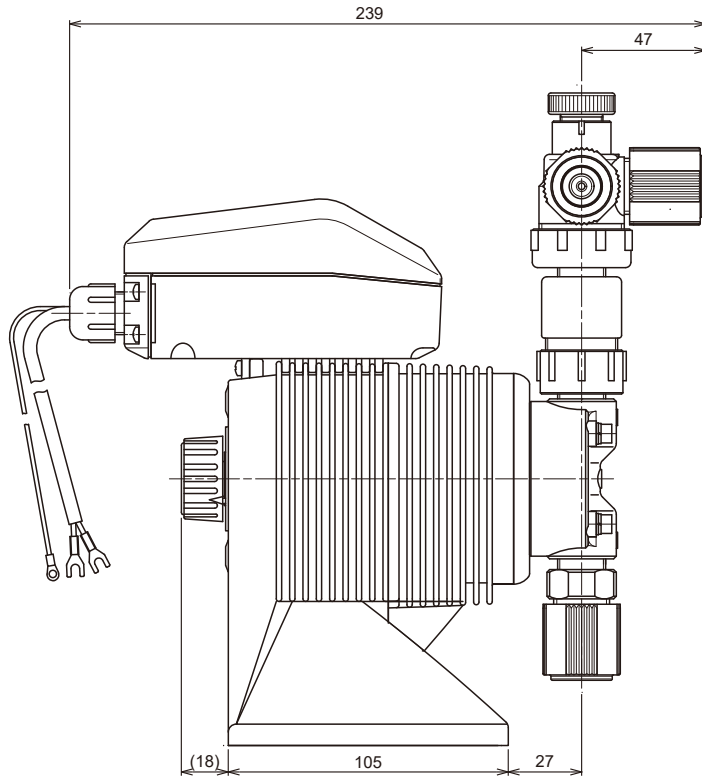
Model		A	B	C	D	E	F
EHN-CN21	FC	189	204	35	165	27	12
EHN-CN31			210	18.5			
EHN-CN36			208	18			

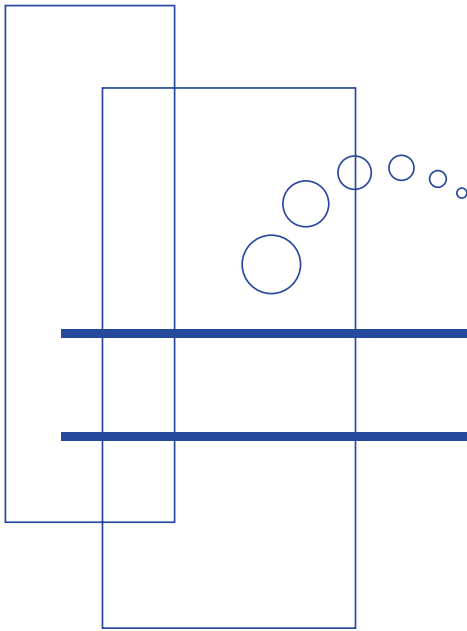
■ EHN-CN21/-CN31/-CN36 SH



Model		A	B	C	D	E	F
EHN-CN21	SH	189	225	44	156	26	34
EHN-CN31			228	34	166	28	35
EHN-CN36			227	31	169	28	34

■ EHN-CN16/-CN21 VC/VS M NAE





<https://www.iwakupumps.jp>

IWAKI CO.,LTD. 6-6 Kanda-Sudacho 2-chome Chiyoda-ku Tokyo 101-8558 Japan
TEL: +81 3 3254 2935 FAX: +81 3 3252 8892

European Headquarter / IWAKI Europe GmbH
TEL: +49 2154 9254 0 FAX: +49 2154 9254 48

Germany / IWAKI Europe GmbH
TEL: +49 2154 9254 50 FAX: +49 2154 9254 55

The Netherlands / IWAKI Europe GmbH (Netherlands Branch)
TEL: +31 74 2420011 FAX: +49 2154 9254 48

Italy / IWAKI Europe GmbH (Italy Branch)
TEL: +39 0445 561219 FAX: +39 0445 569088

Spain / IWAKI Europe GmbH (Spain Branch)
TEL/FAX: +34 934 741 638

Poland / IWAKI Europe GmbH (East Europe Branch)
TEL: +48 12 347 0755 FAX: +48 12 347 0900

Denmark / IWAKI Nordic A/S
TEL: +45 48 242345

Finland / IWAKI Suomi Oy
TEL: +358 10 201 0490

Norway / IWAKI Norge AS
TEL: +47 23 38 49 00

Sweden / IWAKI Sverige AB
TEL: +46 8 511 72900

Belgium / IWAKI Belgium N.V.
TEL: +32 13 670200 FAX: +32 13 672030

France / IWAKI France S.A.
TEL: +33 1 69 63 33 70 FAX: +33 1 64 49 92 73

U.S.A. / IWAKI America Inc.
TEL: +1 508 429 1440 FAX: +1 508 429 1386

Brazil / IWAKI Do Brasil Comercio De Bombas Hidraulicas LTDA.
TEL/FAX: +55 19 3244 5900

China (Shanghai) / IWAKI Pumps (Shanghai) Co., Ltd.
TEL: +86 21 6272 7502 FAX: +86 21 6272 6929

China (Hong Kong) / IWAKI Pumps Co., Ltd.
TEL: +852 2607 1168 FAX: +852 2607 1000

China (Guangzhou) / GFTZ IWAKI Engineering & Trading Co., Ltd.
TEL: +86 20 84350603 FAX: +86 20 84359181

China (Shenzhen) / IWAKI Pumps (Shenzhen) Co., Ltd.
TEL: +86 0755 8656 3696

Singapore / IWAKI Singapore Pte Ltd.

TEL: +65 6316 2028 FAX: +65 6316 3221

Indonesia / IWAKI Singapore (Indonesia Office)
TEL: +62 21 6906606 FAX: +62 21 6906612

Malaysia / IWAKIm SDN. BHD.
TEL: +60 3 7803 8807 FAX: +60 3 7803 4800

Korea / IWAKI Korea Co., Ltd.
TEL: +82 2 6238 4800 FAX: +82 2 6238 4801

Taiwan / IWAKI Pumps Taiwan Co., Ltd.
TEL: +886 2 8227 6900 FAX: +886 2 8227 6818

Thailand / IWAKI (Thailand) Co., Ltd.
TEL: +66 2 322 2471 FAX: +66 2 322 2477

Australia / IWAKI Pumps Australia Pty Ltd.
TEL: +61 2 9899 2411 FAX: +61 2 9899 2421