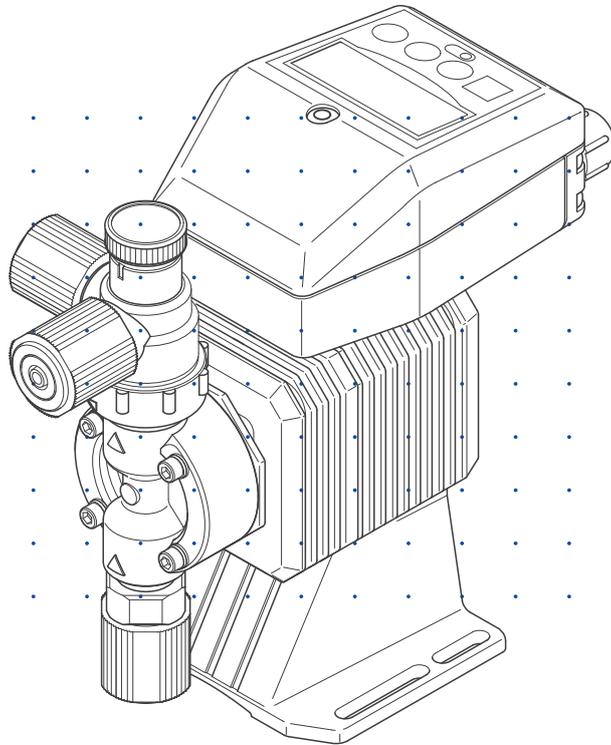


Iwaki

Electromagnetic Metering Pump

EHN-YN (multi-tube connection)



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.

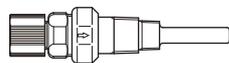
Check the nameplate to see if the information such as model codes, discharge capacity, discharge pressure and power voltage are as ordered.

Iwaki Metering Pump			
CAPACITY	mL/min		
MAX.PRESSURE	MPa		
STROKE RATE	spm		
VOLTAGE	V	FREQUENCY	50/60 Hz
POWER CONSUMPTION	W		
THERMALLY PROTECTED	CURRENT	A	
MODEL			
MFG.No.			
IWAKI CO.,LTD. MADE IN JAPAN		1P423609	

b. Check accessories are complete.

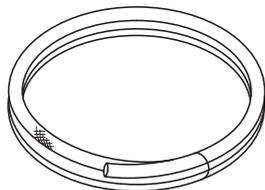
- A check valve

*The applicable check valve varies with pump models.
See page 62 for applicable pumps.



- A 3m PVC braided tube ($\varnothing 4 \times \varnothing 9$ or $\varnothing 8 \times \varnothing 13$)

* $\varnothing 4 \times \varnothing 9$ or $\varnothing 8 \times \varnothing 13$ EVA tube is attached to the PP type.



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.



Indicates mishandling could lead to a fatal or serious injury accident.



Indicates mishandling could lead to personal injury or property damage.

A symbol accompanies each precaution, suggesting the use of "Caution", "Prohibited actions" and 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 carries 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 MSDS 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). Otherwise, the pump head fixing screws may loosen and liquid may leak. Optimise your system in order for the pump not to run dry. If the pump runs dry for a long period (for more than 30 minutes), the pump head and the valve cases 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.
- in 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

Using a damaged pump could lead to an electric leak or shock.



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 pump head bolts become loose. Tighten the bolts evenly to the specified torque below in diagonal order before initial operation and at regular intervals.

Tightening torque

EHN-B11/-B16/-B21/-C16/-C21 : 2.16 N•m

EHN-B31/-C31/-C36 : 2.55 N•m



Requirement

Install a relief valve

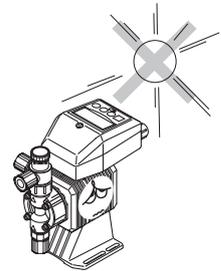
Install a relief valve on a discharge line near the pump so as to automatically release the discharge pressure when it exceeds the maximum level.

Precautions for use

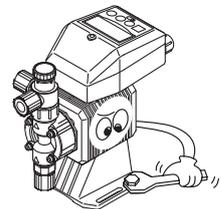
- Electrical work should be performed by a qualified electrician. Otherwise, personal injury or property damage may result.



- 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 40°C or falls below 0°C.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.



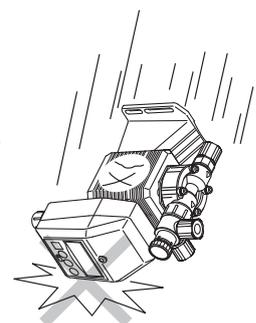
- Install the pump as close to the supply tank as possible.



- 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 IP65, 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 remove the control unit. Note that an applicable control unit differs with each drive unit. Do not attach a control unit to a different drive unit. Otherwise, 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 MSDS 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.



Caution



Caution



Caution



Requirement



Caution



Overview

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

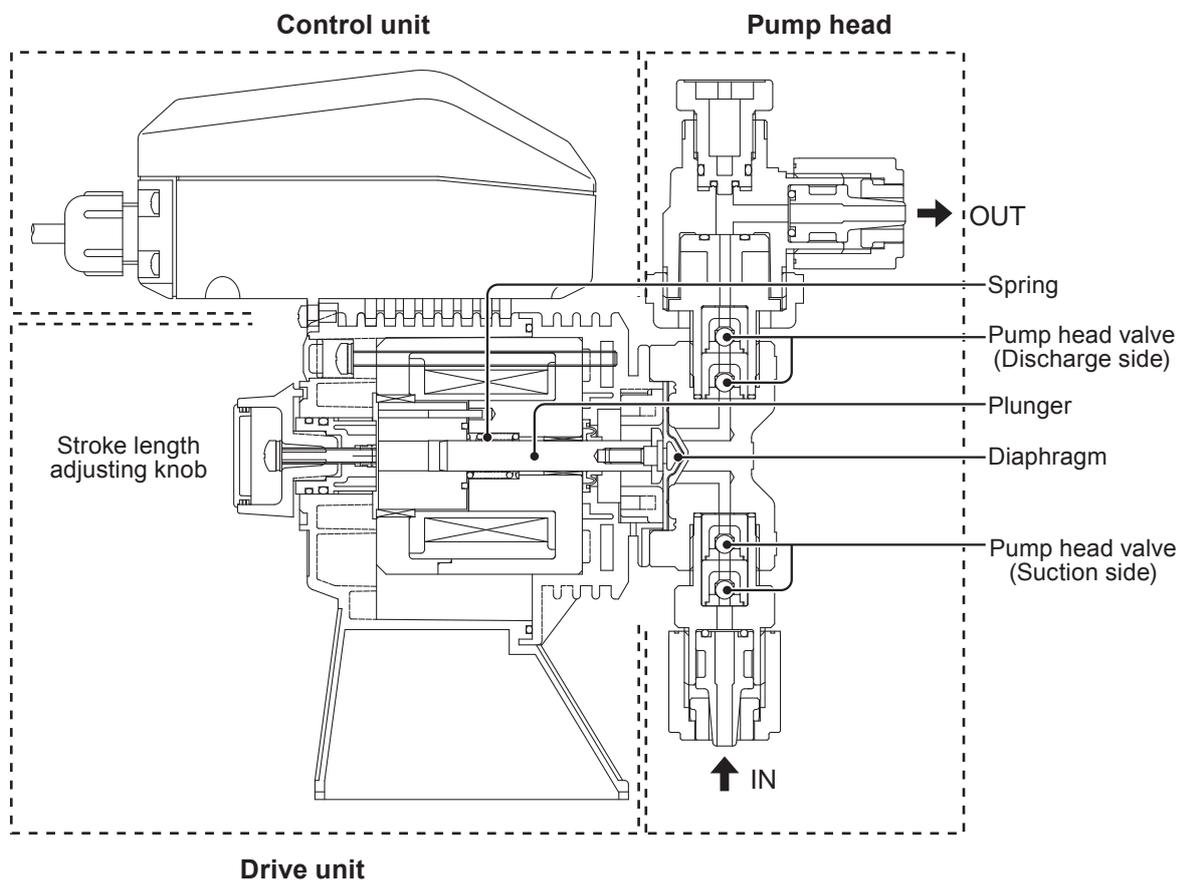
Introduction

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

Electromagnetic force and spring force make reciprocating motion. The reciprocating motion is transferred to a diaphragm through a plunger and then volumetric change occurs in the pump head. This action 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 concern for local power voltage.

- **High turndown ratio**

Offers a digitally-controlled range of 1-360 (1spm resolution).

- **IP rating of 66**

The sealed drive unit and control unit assure IP66.

*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 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.

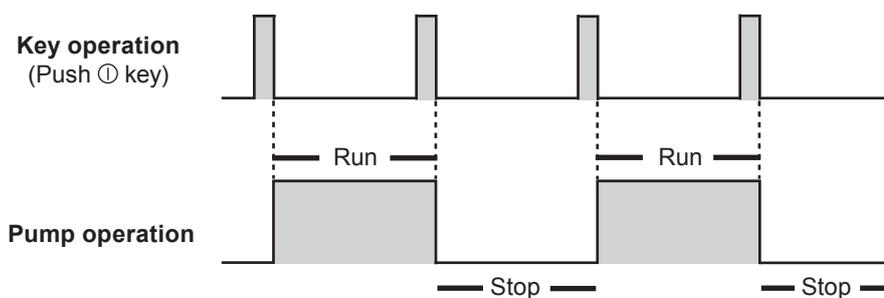
- **Auto degassing system (Auto degassing type)**

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

Operational function

Manual mode

Run/stop the pump by the start/stop key. A stroke rate (MAN speed) can be changed in the range of 1-360spm by the UP and the DOWN keys at any time during operation or stop. See page 39 for detail.

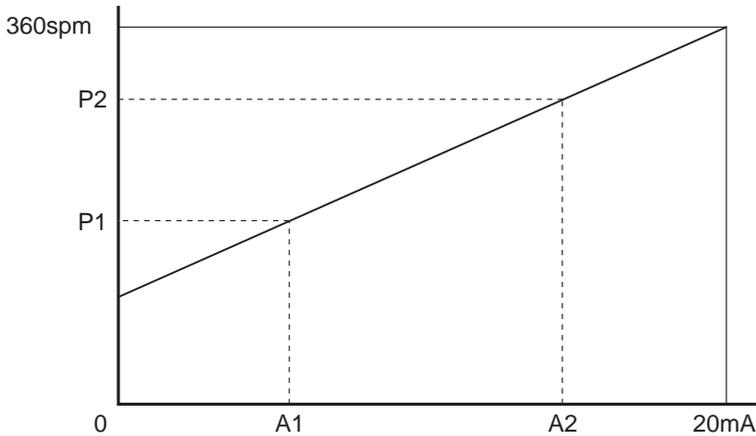


EXT mode

■ Proportional control (Analogue control : See page 39)

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

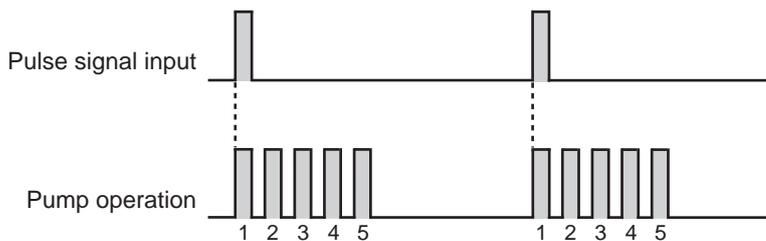
■ Multiplier setting (Digital control : See page 41)

The pump increases/decreases a stroke rate by the external signal and the multiplier. Set a multiplier (1-999 shots) per pulse in advance of operation.

*In the digital control with a preset multiplier, the pump does not run over the MAN speed at any pulse rate.

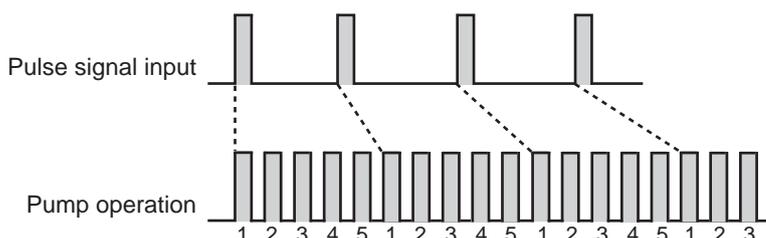
*The pump makes one shot per pulse when a multiplier is set to 1.

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



The buffer stores extra pulse signals which are entered before the scheduled shots per signal are completed.

*Extra pulses are stored up to 255 pulses.

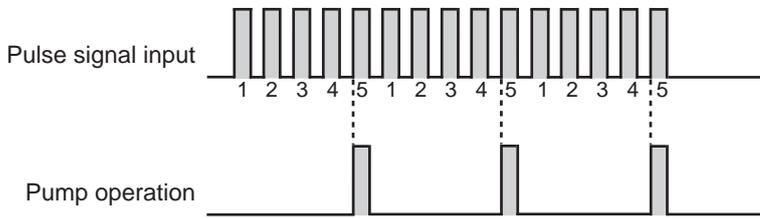


■ **Divisor setting (Digital control : See page 43)**

The pump increases/decreases a stroke rate by the external signal and the divisor. Set a divisor (1-999 pulse rates) per shot in advance of operation.

- *In the digital control with a preset divisor, the pump does not run over 360 spm at any pulse rate.
- *The pump makes one shot per pulse when a divisor is set to 1.

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



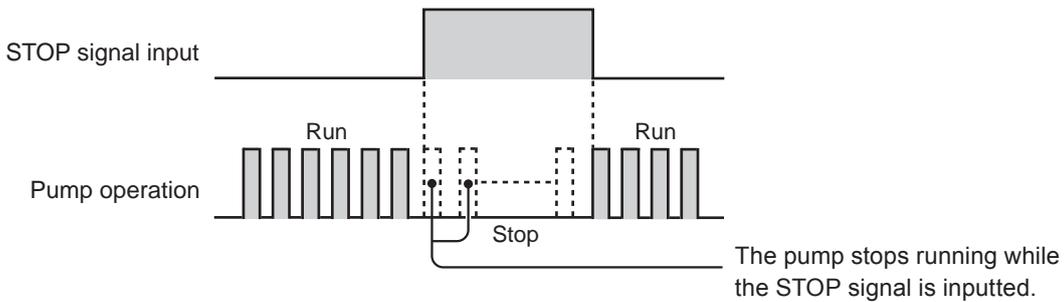
■ **STOP function (See 45 page)**

The start/stop of the pump can be controlled by the external STOP signal.

Operation stop at the STOP signal input: "M-OFF"

The pump stops while receiving the STOP signal.

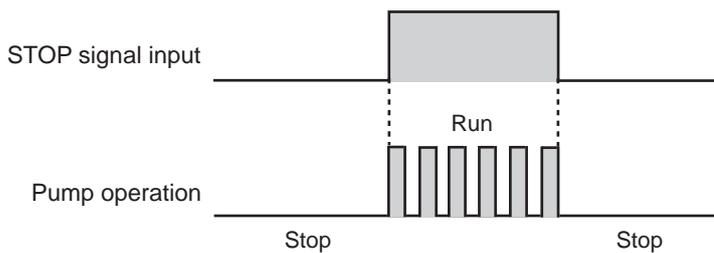
- *The pump resumes operation when the stop signal is released.



Operation resumption at the STOP signal input: "M-ON"

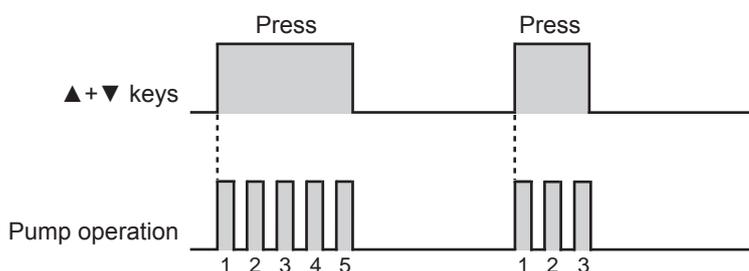
The pump runs while receiving the STOP signal.

- *The pump stops operation when the stop signal is released.



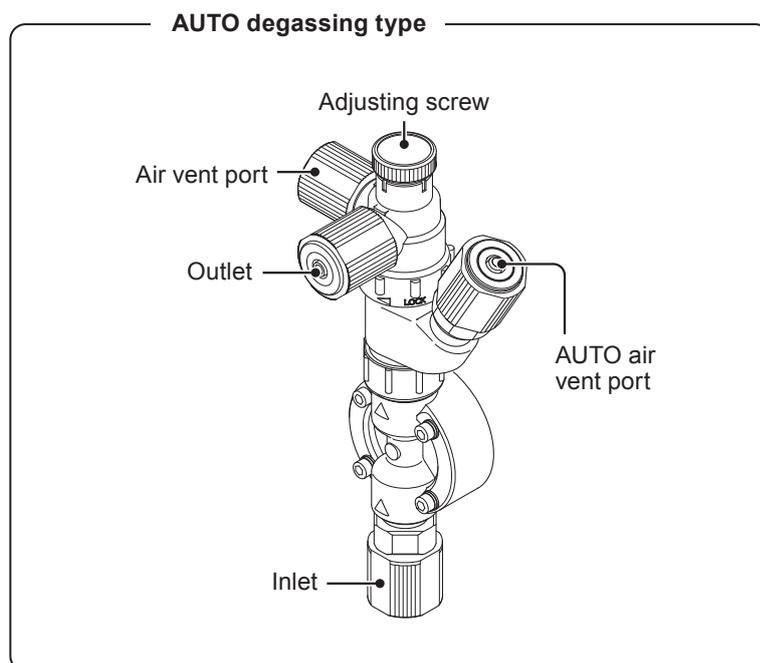
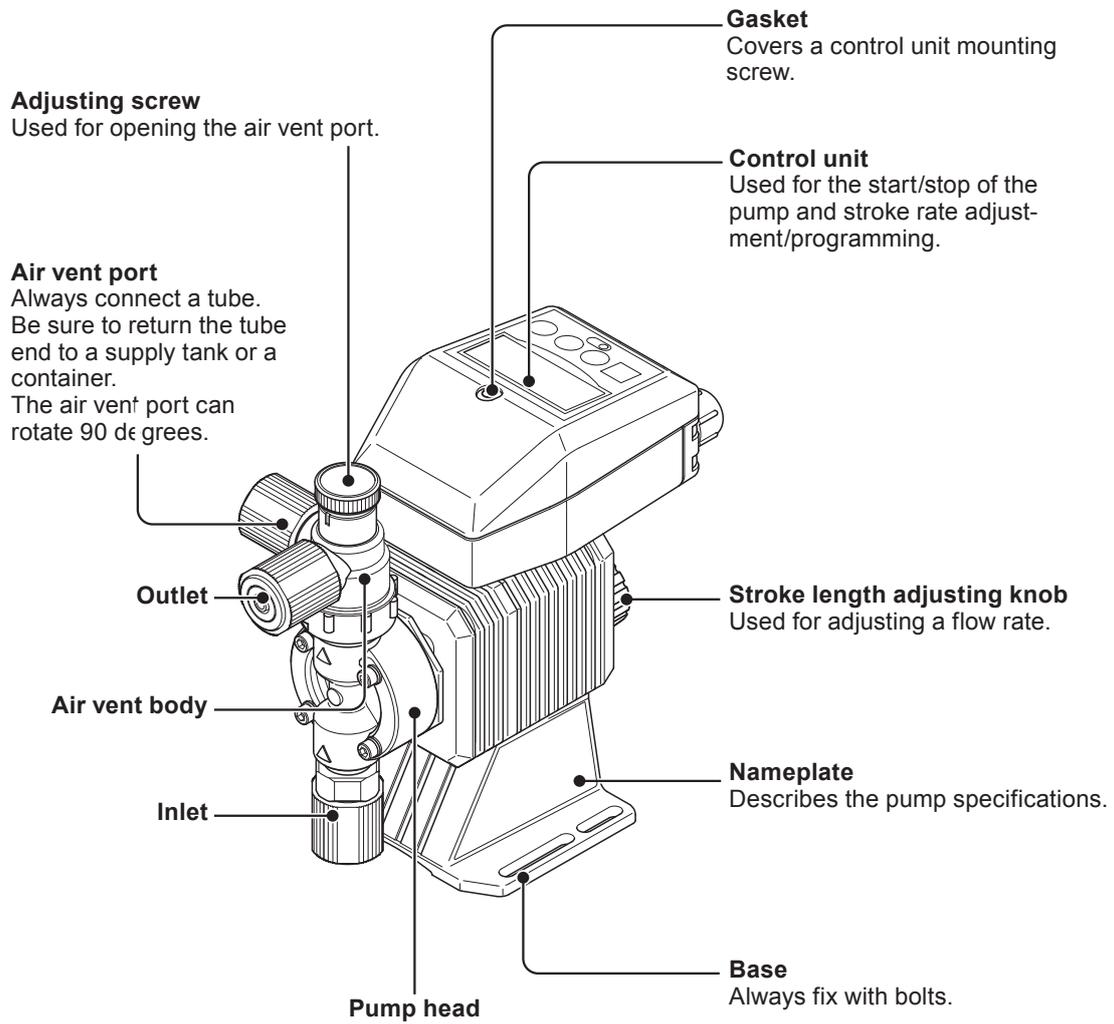
■ **Priming function (See page 46)**

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

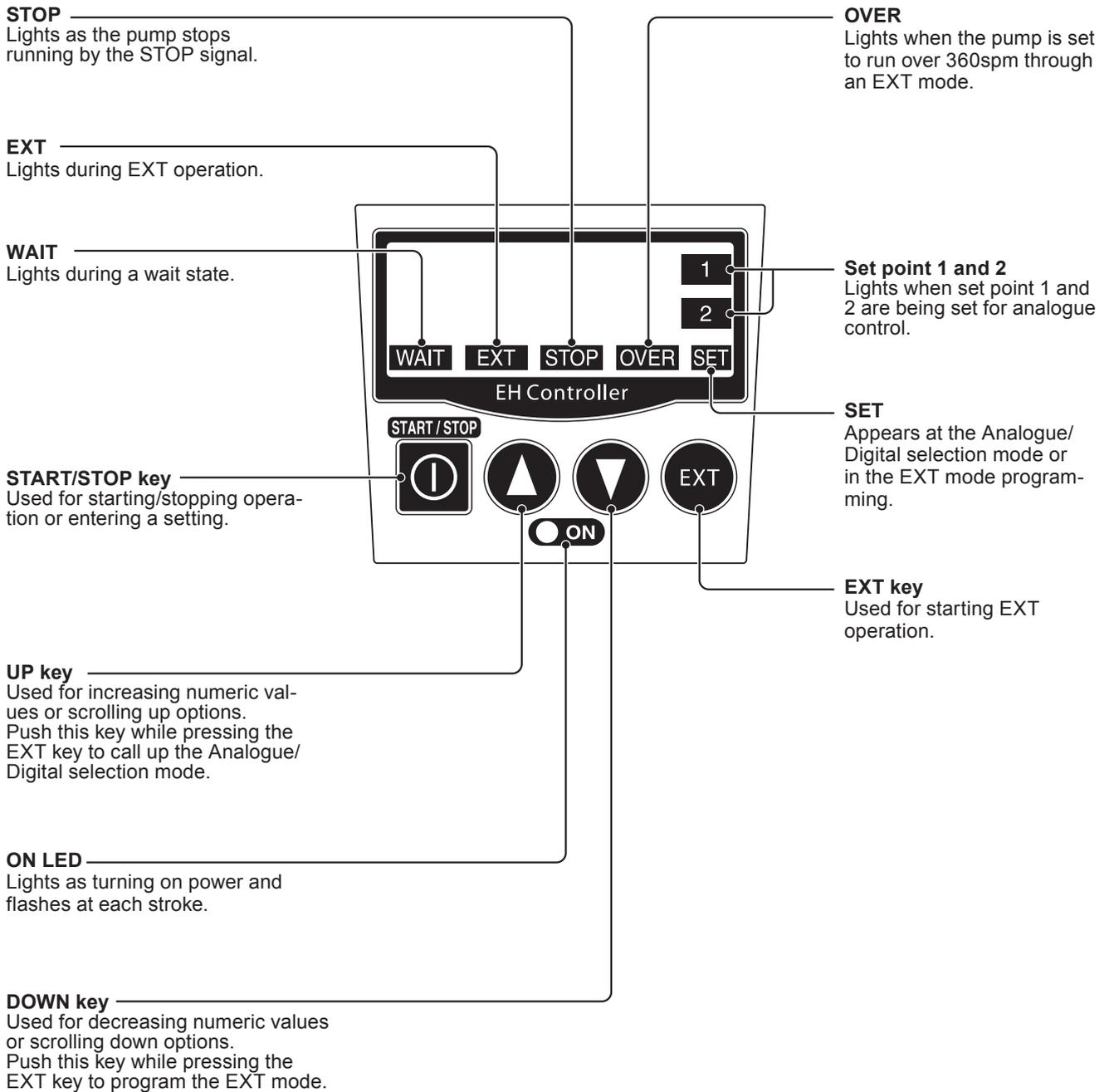


Part names

Pump



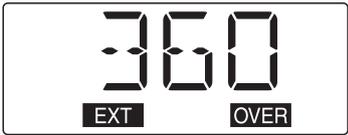
Operation panel



■ 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 shots per signal.
	EXT mode with a divisor 5. The pump is making one shot per 5-signal.
	EXT mode with analogue signals. The pump is running at 120spm.
	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
	<p>"EXT" and "OVER" indications appear when the pump under analogue control is set to run over 360spm by the external current signal, however, the pump speed does not exceed that maximum rate at any current value.</p>
	<p>"EXT" and "OVER" indications appear when the pump under digital control (with multiplier) receives an extra pulse which exceeds the MAN speed pulse rate. An unprocessed signal is stored up to 255 signals if the multiplier buffer is turned on.</p>
	<p>"EXT" and "OVER" indications appear when the pump under digital control (with divisor) is set to run over 360spm by the external pulse signal, however, the pump speed does not exceed the maximum rate at any pulse rate. An unprocessed signal is stored up to 255 signals if the divisor buffer is turned on.</p>

■ Other displays

Display	States
	<p>The pump is running at the priming speed (360spm).</p>
	<p>Keypad is locked. Any key operation is cancelled. See page 46 to release this state.</p>
	<p>Keypad is locked. Any key operation is cancelled. See page 46 to release this state.</p>
	<p>Keypad is locked. Any key operation is cancelled. See page 46 to release this state.</p>

Identification codes

Each code represents the following information.

Pump

EHN - B 11 VC _ M YN - ____
 a b c d e f g h

a. Series name

EHN : Multivoltage electromagnetic metering pump

b. Drive unit (Average power consumption)

B : 20W
 C : 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 +EPDM (dry end)
VH			HC276	EPDM	EPDM		
PC	GFRPP	GFRPP	Alumina ceramic	FKM	FKM		
PH			HC276	EPDM	EPDM		
PP			Alumina ceramic	FKM	PCTFE		

Automatic air vent (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
VH			HC276	HC276	EPDM	EPDM

Material code

PVC : Transparent polyvinyl chloride GFRPP : Glassfiber-reinforced polypropylene
 EPDM : Ethylene-propylene rubber FKM : Fluorine-contained rubber
 PTFE : Polytetrafluoroethylene PCTFE: Polymonochlorotrifluoroethyle
 HC276: HASTELLOY C276

e. Tube size

Code	Tube I.D. × O.D.	Applicable pumps
No code*	ø4×ø9/ø4×ø6	EHN-11/-16/-21
	ø8×ø13/ø9×ø12	EHN-31/-36

*A numeric code in this field represents a custom tube size.

f. Fitting

M : Multi-tube connection

g. Control unit function

YN : High functional

h. Special version

55 : High compression type

NAE : Auto degassing type

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

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

Observe the following points when installing the pump.

- 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.
- 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.

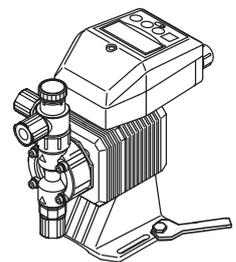
Select a level location, free from vibration, that won't hold liquid. See page 10 for detail. Flooded suction installation is strongly recommended when handling liquids that generate gas bubbles (sodium hypochlorite or hydrazine solution).

2 Anchor the pump by four M5 bolts.

Be sure to fix the pump at four points.

NOTE

Install the pump horizontally. If the pump is installed at a tilt, the flow may reduce.



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 spanner.

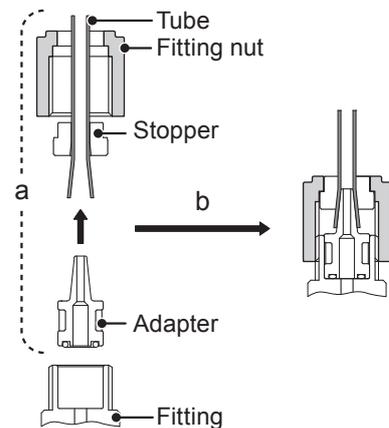
Tube connection

- Pass a tube into the fitting nut and stopper and then slide it down to the adapter as far as it will go.
- Put the tube end (adapter) in the fitting. Then hand tighten the fitting nut.
- Retighten the fitting nut by turning it further 180 degrees with an adjustable wrench or spanner (crush tube mount).

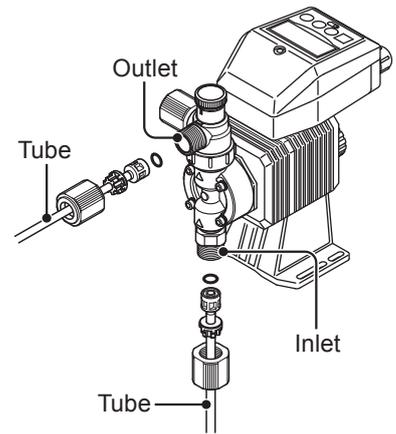
*Do not use excessive force to the plastic fitting nut.

*In your try to remove the connection, the adapter may be stuck in the crushed tube and the stopper. Try not to damage the taper of the adapter that is crushing the tube against the stopper. If it has been damaged, contact us for the new adapter/stopper.

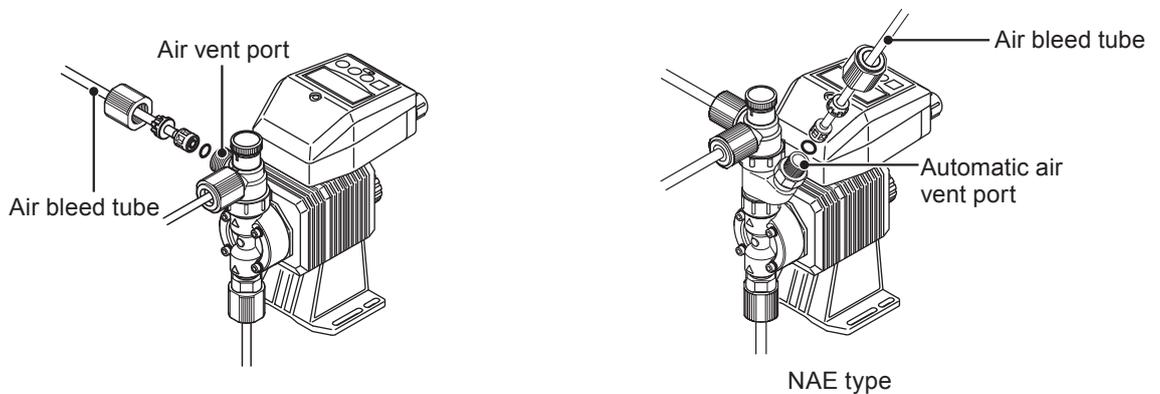
*Do not reuse the same tube end for the crush sealing. Cut it off for ensuring the new seal is established.



1 Connect tubes into the inlet and outlet.



2 Connect an air bleed tube into the air vent port (or automatic air vent port for the NAE type). Route back the other tube end to a supply tank or a container.

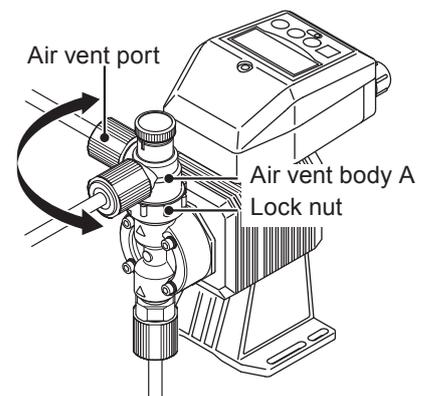


3 Determine the optimal direction of the air vent port.

The air vent body A can rotate 90 degrees.

*Note the port direction is not adjustable for the auto degassing type (NAE).

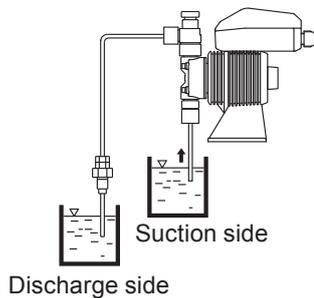
- Loosen the lock nut.
- Turn the air vent port to the optimal direction.
- Hand-tighten the lock nut, holding the air vent body A.
- Use an adjustable wrench or spanner to turn the lock nut further 90 degrees.



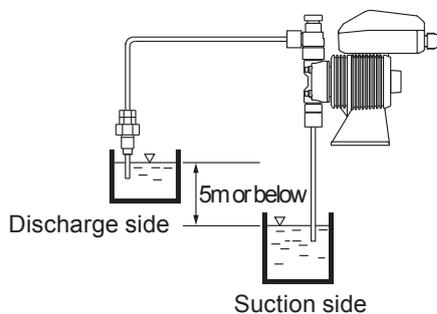
Check valve mounting

Install an optional check valve to the EHN-YN for the prevention of a back flow, siphon and overfeeding. In the following cases be sure to install the check valve.

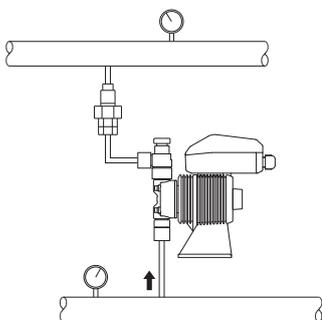
- A suction side liquid level is higher than a discharge side or an injection point at atmospheric pressure.



- 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.

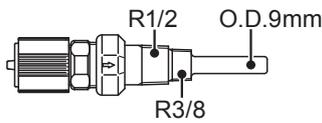


- A discharge pressure (including pipe resistance and discharge head) is below 0.13MPa (0.049MPa for B31 and C36).

1 Mount a check valve at the discharge tube end.

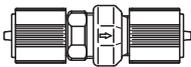
*The CAN check valve has the R1/2 and R3/8 thread connections as well as an O.D. 9mm tube connection. Cut off an unused part and adjust the connection length as necessary.

CA check valve

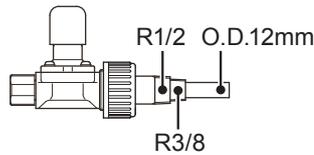


*The CBN check valve (both ends tube connections) and the BVC back pressure valve are optionally available. Contact us or your nearest distributor.

CBN check valve



BVC back pressure valve

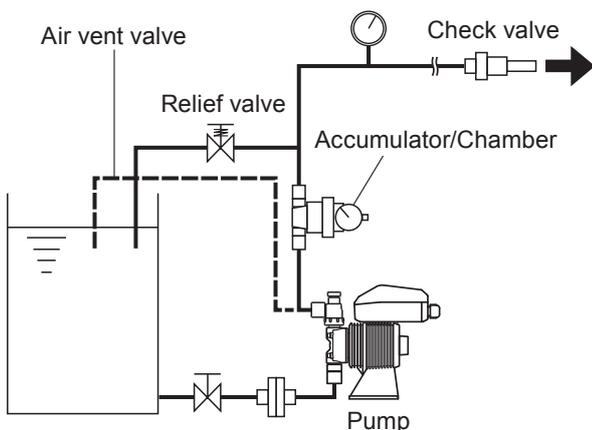


NOTE

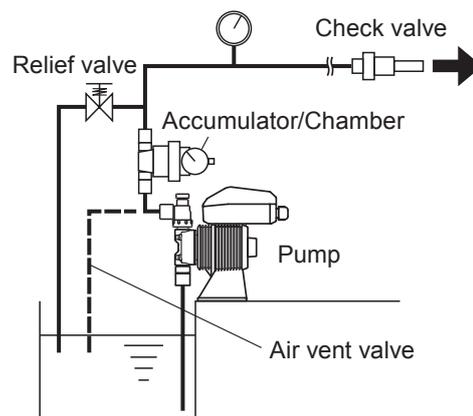
- Periodically clean or replace a check valve with new one for the prevention of crystal clogging, especially when using sodium hypochlorite.
- In the nature of the pump, the lower discharge pressure, the higher discharge capacity (and vice versa). If you want to observe the max discharge capacity at any low level of system (/discharge) pressure, use the check/back pressure valve to give the additional pressure of $0.17\text{MPa} \pm 0.04$ to the discharge line or reduce the pump speed/stroke length.

Tubing layout

Flooded suction application



Suction lift application



*Flooded suction installation is strongly recommended when handling liquids that generate gas bubbles (sodium hypochlorite or hydrazine solution).

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

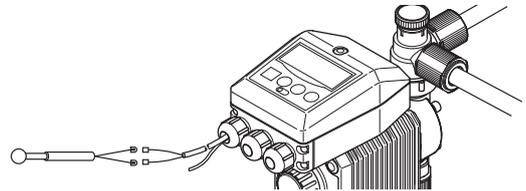
- Adjustable wrench or spanner
- Phillips screw driver
- Precision screw driver

Power voltage/Earthing

Points to be checked

- Check that power voltage is turned off.

- 1 Connect power cable via crimp contacts.

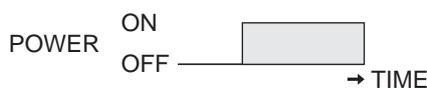


- 2 Earth the pump.

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 28 for the precautions for ON-OFF control by a mechanical relay.

Apply power sharply



Do not apply gradually

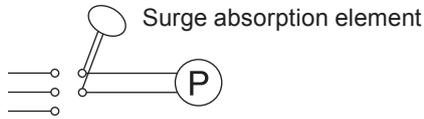


- Use a circuit protector (250VAC, 3A Medium speed) as necessary.
- Do not use a motor thermal relay.

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.

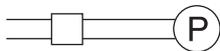
- Install a surge absorption element (such as a varistor with capacity of 2000A or more) via power cable or,



Recommended varistors. See manufacturer's catalogues for detail.

Panasonic ERZV14D431
KOA NVD14UCD430

- A noise cut transformer via the power cable.



Noise cut transformer

Precautions for ON-OFF control by a mechanical relay

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

- Do not turn ON/OFF power voltage more than six times per hour.
- When using a mechanical relay for ON-OFF operation, its contact capacity should be 5A or more. Contact point may fail if it is less than 5A.
- If a mechanical relay with the contact capacity of 5A is used, the maximum allowable ON/OFF operation is about 150,000 times. The contact capacity should be 10A or more when making ON-OFF operation over 150,000 times or sharing a power source with a large capacity equipment. Otherwise a contact point may fail by surge voltage.
- Use a solid state relay (SSR) as necessary (such as the OMRON G3F). See manufacturer's catalogues for detail.

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.

Applicable cables

Cable outer diameter: 7.6-7.8mm.

Cable type: VCTF-4 0.75mm² four-core cable

VCTF-3 1.25mm² triplex cable

UL/CSA SJT 18AWG/2 duplex cable

*The use of a cable with a smaller O.D. can break a connection point of the cable or impair water-/dust-tightness of the pump.

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.
- The following products are the recommended SSRs (Solid State Relays) for signal input. Any other SSRs might cause malfunction. See manufacturer's information for details on these SSRs.
 - OMRON G3FD-102S or G3FD-102SN
 - OMRON G3TA-IDZR02S or G3TA-IDZR02SM
- When using a mechanical relay for signal input, its minimum application load should be 5mA or below.
- Insert the DIN 4- or 5-pin female connector as far as it will go and then tighten the skirt to make a secure connection.

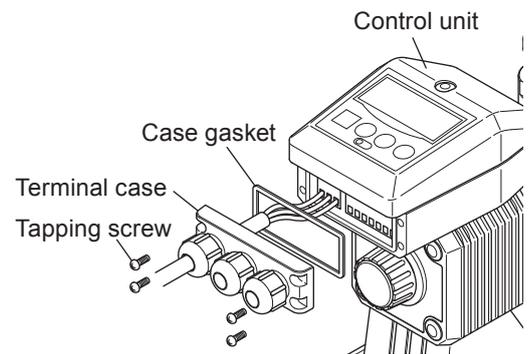
*Use either a no-voltage contact or an open collector for the input, STOP, and AUX signals.

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

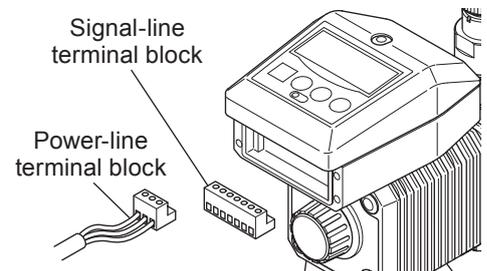
1 Detach the terminal case.

Remove four screws and take out the terminal case.

*The gasket is provided to keep water-/dust-tightness between the parts. Be sure to replace once it has removed.

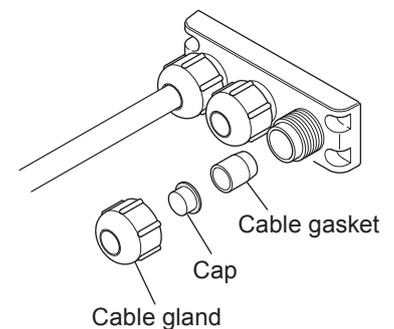


2 Remove the power line and signal line terminal blocks from the PCB in the control unit.



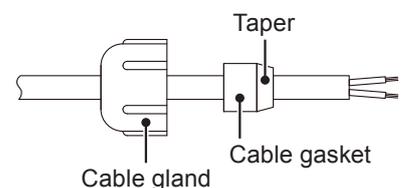
3 Remove a cable gland and a cap to pull out a cable gasket.

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



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.



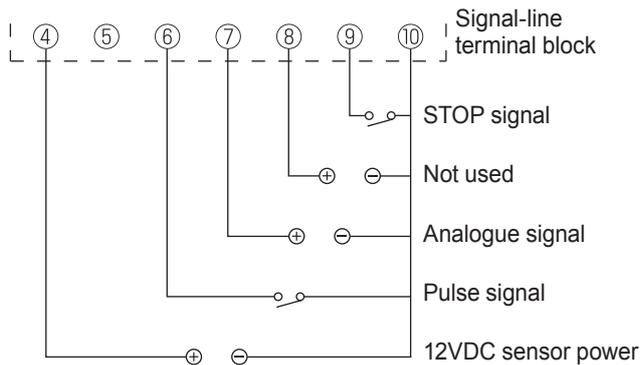
5 Connect the external signal cable.

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

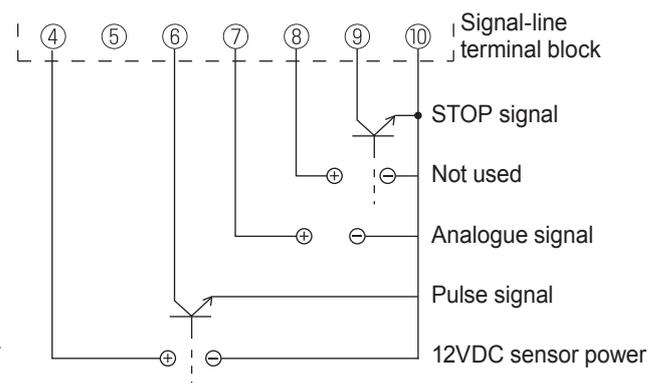
*The external signal cable should be sealed by the cable gasket.

Wiring diagram

When a no-voltage contact is used



When an open collector 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. The terminal 6 and 9 are plus (+), and terminal 10 is minus (-). The maximum applied voltage from these terminals is 12V at 5mA.

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 can lead to leakage. Be sure to retighten the bolts evenly to the specified tightening torque below in diagonal order before starting operation.

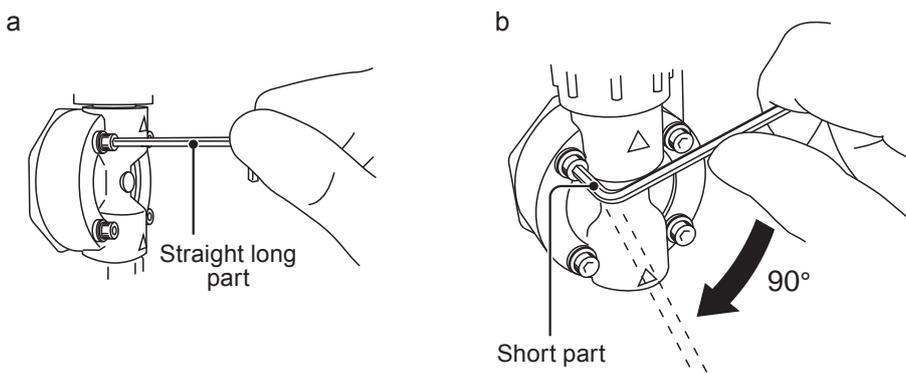
Tightening torque

Model code	Torque	Bolts
EHN-B11/-B16/-B21	2.16 N•m	M4 Hex. socket head bolt
EHN-B31	2.55 N•m	M4 Hex. socket head bolt
EHN-C16/-C21	2.16 N•m	M4 Hex. socket head bolt
EHN-C31	2.55 N•m	M4 Hex. socket head bolt
EHN-C36	2.55 N•m	M5 Hex. socket head bolt

*Tighten fixing bolts once every three months.

■ Use of a hexagon wrench instead of a torque wrench

Fasten the fixing bolts as tight as can be by the hand 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:

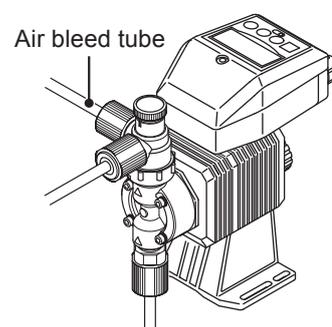
- When the pump starts to run for the first time.
- When a flow rate is too low.
- After liquid is replaced in a supply tank.
- After a long period of stoppage
- After maintenance and inspection are performed

NOTE

- Both gas and chemical come out together through an air bleed tube. Place the end of the tube in a supply tank or a container.
- Some chemicals may damage skin and dry end parts. Wash/wipe chemicals off immediately if they got wet.

Points to be checked

- An air bleed tube is connected to the pump.



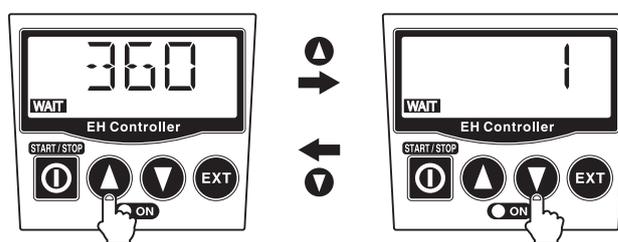
1 Turn on power.

The ON LED and the display are turned on.

*The pump waits in the manual mode when turned on with the factory default setting.

2 Set stroke rate to 360spm.

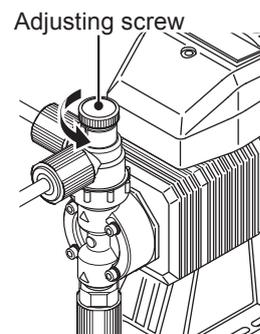
- spm increases/decreases every time the UP/DOWN key is pushed.
- Press and hold either key for more than three seconds for quick change. Quick change stops at 1 or 360spm. 1 or 360rpm skips to 360 or 1spm when the key is released and pushed once.



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

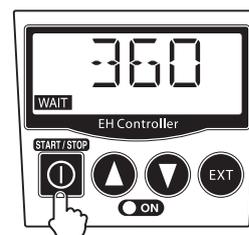
NOTE

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



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

The ON LED blinks at each shot.



- 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.

Flow rate adjustment

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

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.

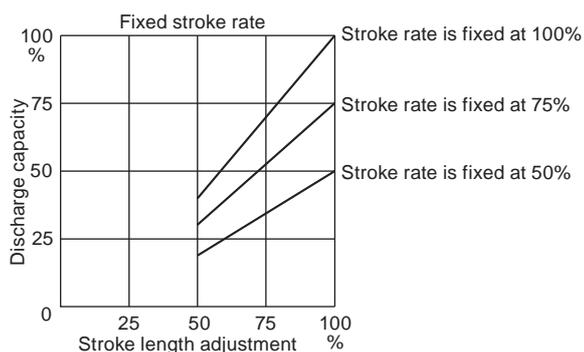
The stroke length represents the moving distance of the plunger. The widest moving distance is defined as 100% stroke length. The stroke length adjustment is used for determining the optimal flow volume per shot (fine adjustment of the pump flow).

First adjust a flow rate by 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.

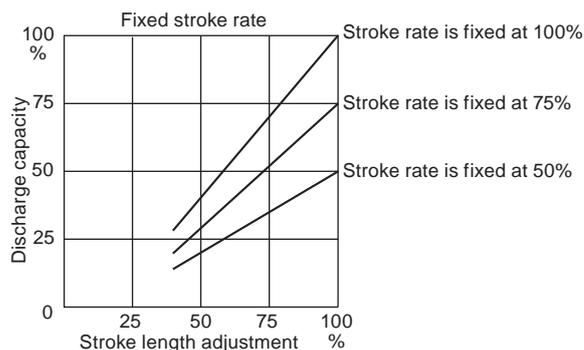
- 1 Change the stroke rate with the stroke length 100% to the specified level.
See "Stroke rate adjustment" on page 35 and "Stroke length adjustment" on page 36 for detail.
- 2 Measure the flow rate.
- 3 If the flow rate is lower/higher than the specified level, increase/decrease the stroke rate and 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

B type



C type

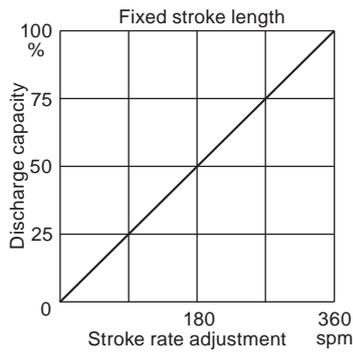


■ Precautions of flow rate adjustment

- **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 shot. 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.

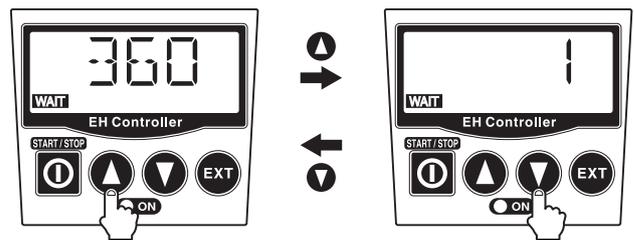


*100% discharge capacity equals to the flow rate described on the nameplate.

1 Turn on power and call up manual mode.

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

- spm increases/decreases as pushing the UP/DOWN keys.
- 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.

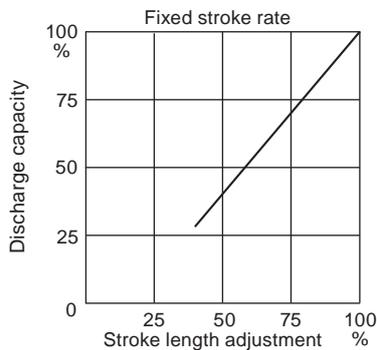
The ON LED blinks at each shot during operation.



■ Stroke length adjustment

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

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



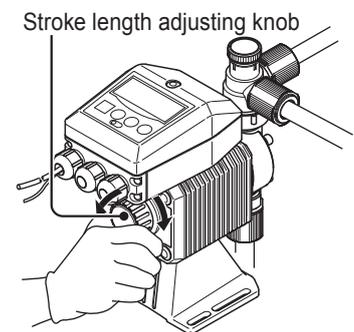
*The flow rate described on the nameplate falls on 100% discharge capacity and stroke length.

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 shot.



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 at resuming operation.

- Clean the valve sets and remove foreign matters.
- If gas is in the pump head, expel gas and readjust a flow rate. See "Degassing" on page 32 and "Flow rate adjustment" on page 34 for detail.

Operation programming

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

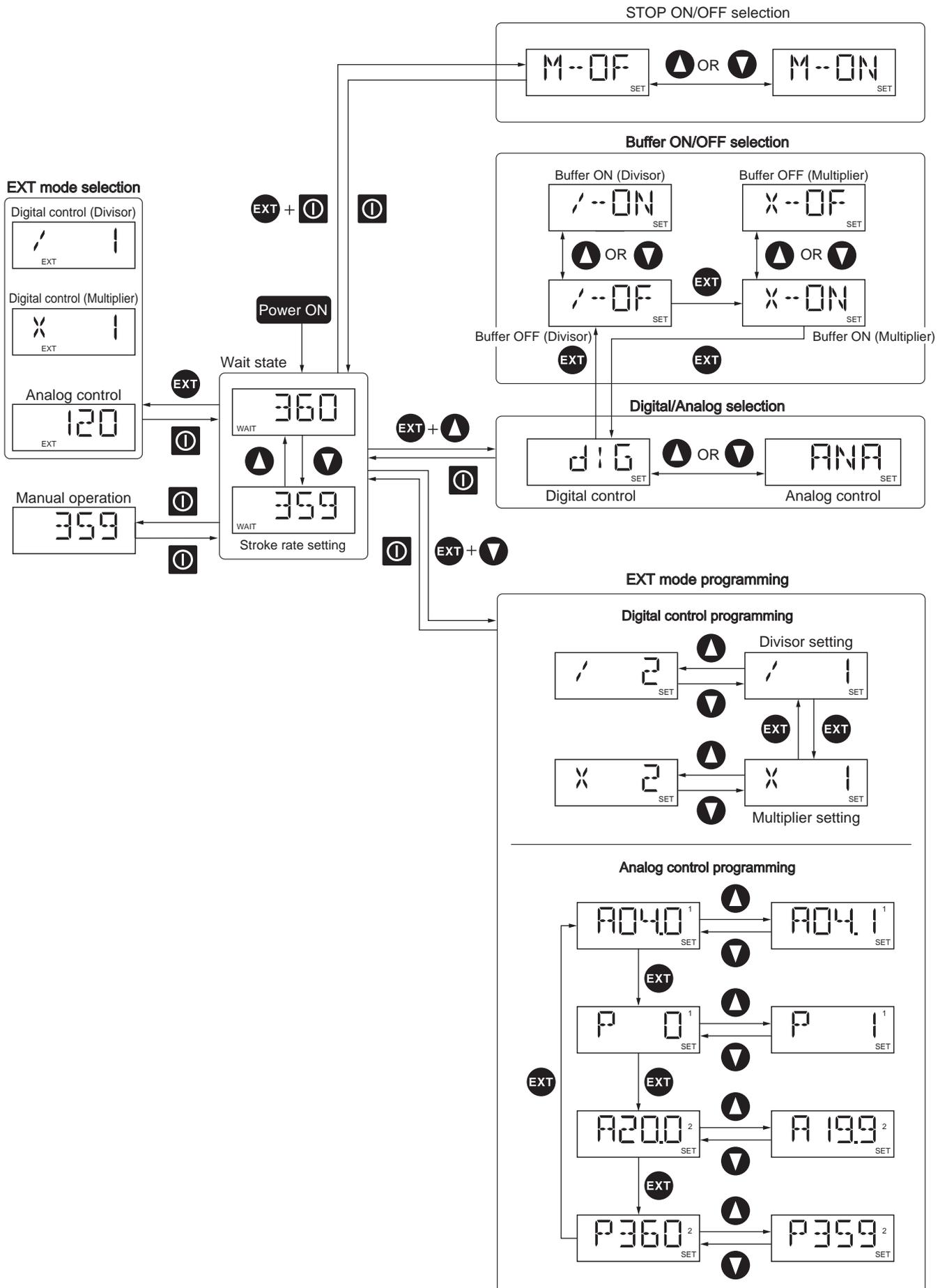
Default setting and Setting range

Mode	Parameters	Default	Setting ranges	Minimum increment/decrement
Manual	Stroke rate (MAN speed)* ¹	360	1-360	1* ²
Dig/Ana selection	Digital/Analog	dIG (Digital)	dIG (digital)/ANA(Analog)	-
EXT mode	Multiplier (Digital)	X1	1-999	1* ²
	Divisor (Digital)	/1	1-999	1* ²
	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	XON	XOF XON	-
	Divisor	/OF	/OF /ON	-
STOP function	M-ON/M-OFF	M-OFF	M-ON/M-OFF	-

*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 1spm every time the up or down key is pushed. Press and hold either key 3 seconds for quick change.

Programming flow



Operation

Read this section before operation.

Manual operation

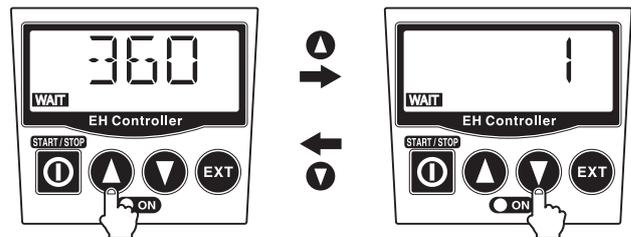
Run or stop the pump by keypad operation.

- 1 Supply the rated power voltage to the pump.
The ON LED lights and a previous mode at the last shutoff returns.
*The pump waits in the manual mode when turning on power with a default setting.

- 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 shot during operation.

EXT operation

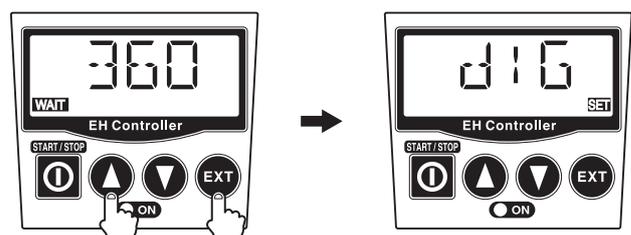
The pump operation is controlled by the external signal.

■ Analog control programming

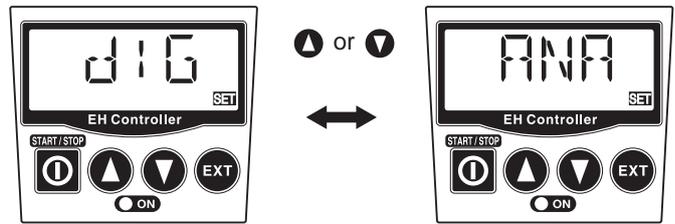
Set the pump to run in between 0-360spm in proportion to 0-20mA.

- 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.

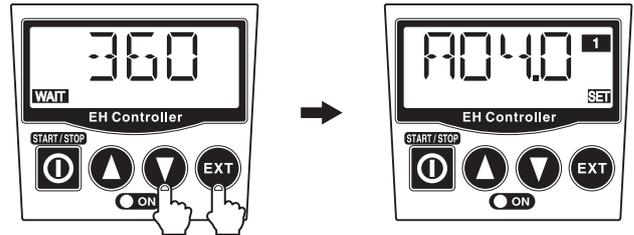


- 3 Select "ANA".
Scroll through "dIG" and "ANA" selection by the UP and DOWN keys.

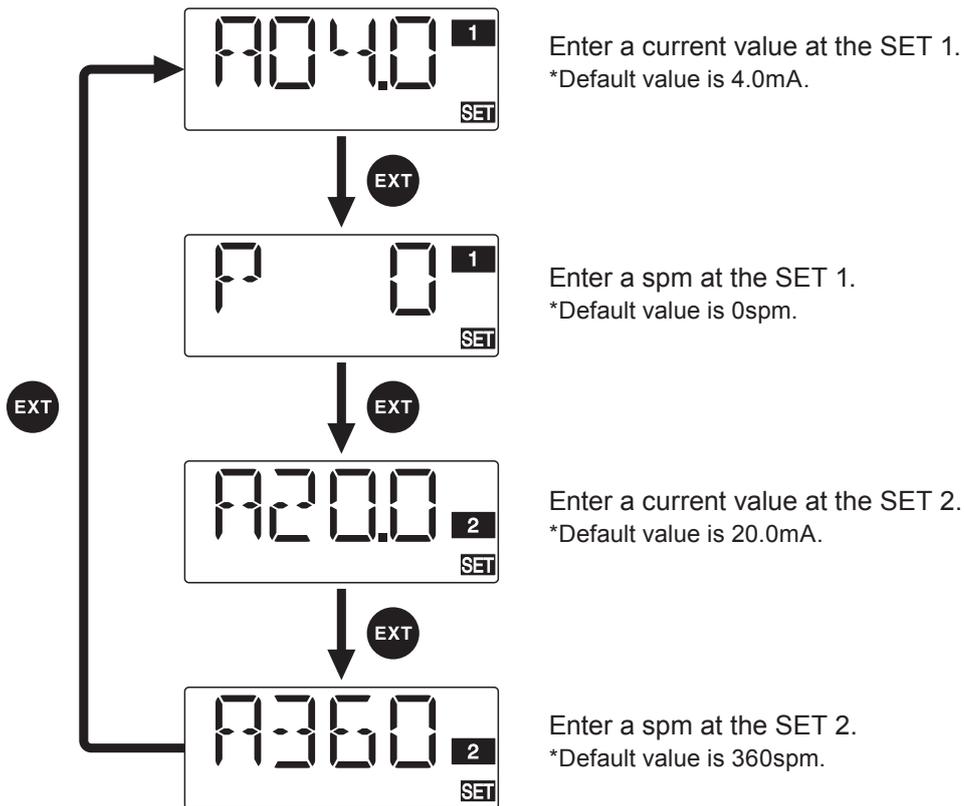


- 4 Push the start/stop key to return to the wait state.

- 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 by the external (pulse) signal. Set a multiplier or a divisor as necessary for its intended purpose before operation.

Multiplier setting

The pump increases/decreases a stroke rate by the external signal and the multiplier. Set a multiplier (1-999 shots) per pulse in advance of operation.

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

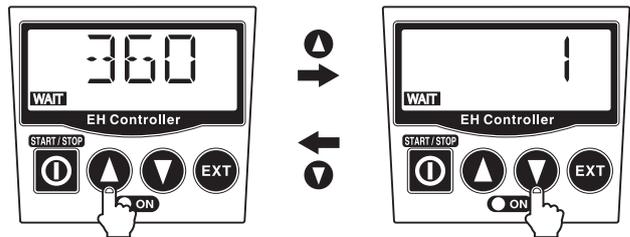
NOTE

- 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 behaviour is changed.

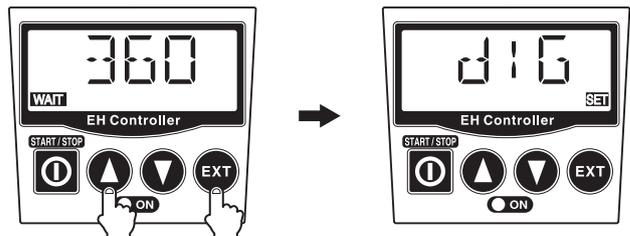
- 1 Push the start/stop key to return to the wait state.
"WAIT" indication appears.

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

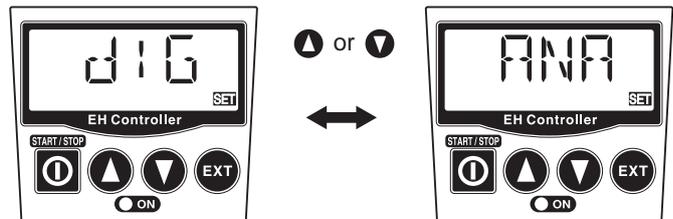
- The stroke rate increases/decreases every time the UP or DOWN key is pushed.
- Press and hold either key for three seconds for quick change. Quick change stops at 1 or 360spm. 1 or 360spm skips to 360 or 1spm when the key is released and pushed once.



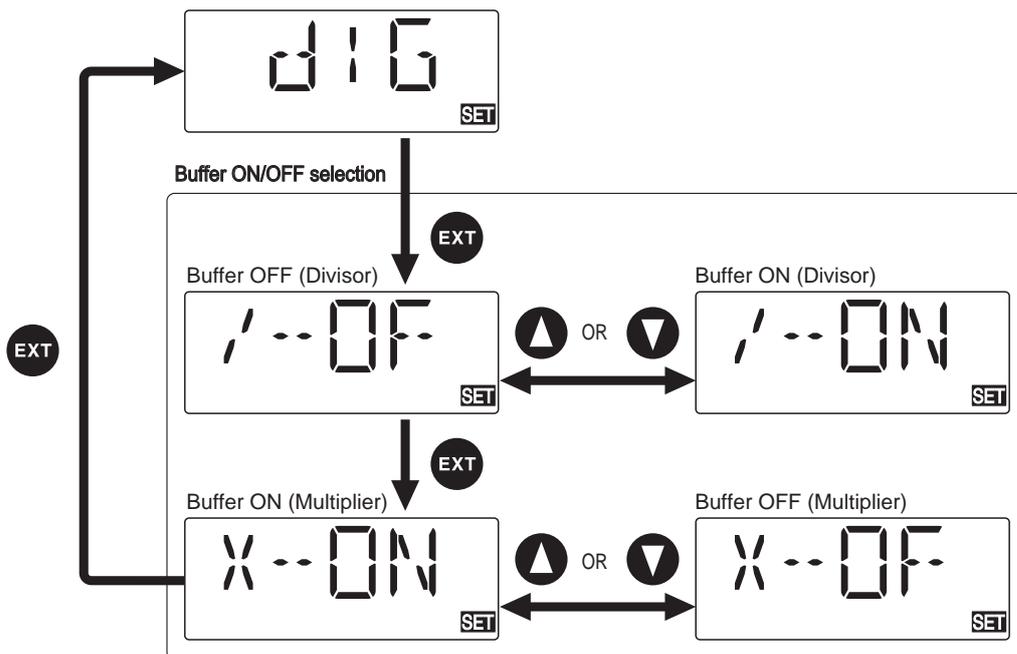
- 3 Push the UP key while pressing the EXT key to call up the Digital/Analog selection.
"dIG"(digital) or "ANA"(analog) will appear.



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



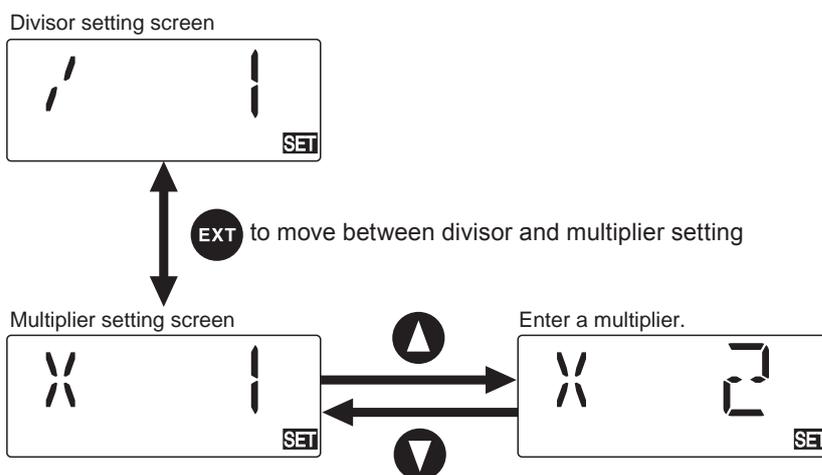
- 5 Push the EXT key to call up the buffer ON/OFF selection.
 Scroll through "X-ON" and "X-OFF" by the UP and DOWN keys.



- 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 programming

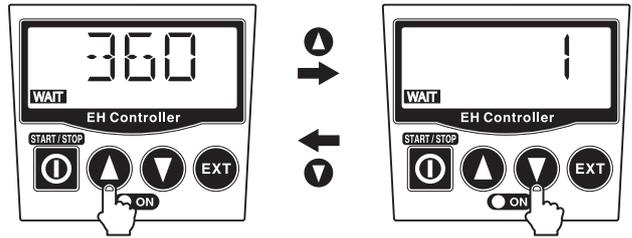
The pump increases/decreases a stroke rate by the external signal and the divisor. Set a divisor (1-999 pulse rates) per shot in advance of operation.

NOTE

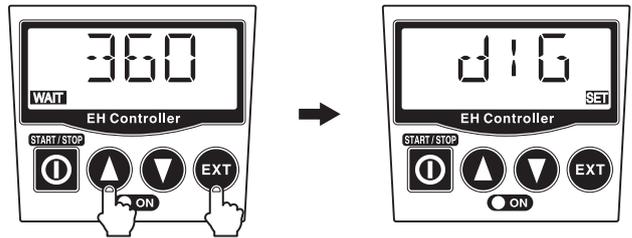
If a divisor is set to 1, the pump speed equals to the external pulse rate (1:1 operation). This operation, however, may be upset when the pulse rate has exceeded 360spm and the extra signals are cancelled. Although this is not malfunction, use of the multiplier is recommended to ensure correct 1:1 operation.

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

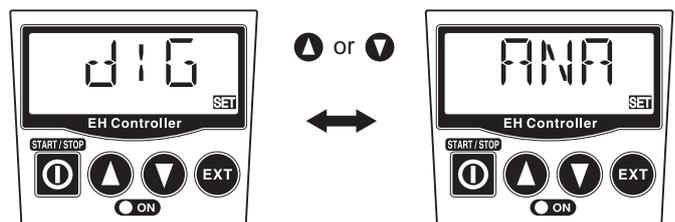
- 2 Use the UP or DOWN key to adjust stroke rate (MAN speed).
 - The stroke rate increases/decreases every time the UP or DOWN key is pushed.
 - Press and hold either key for three seconds for quick change. Quick change stops at 1 or 360spm. 1 or 360spm skips to 360 or 1spm when the key is released and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



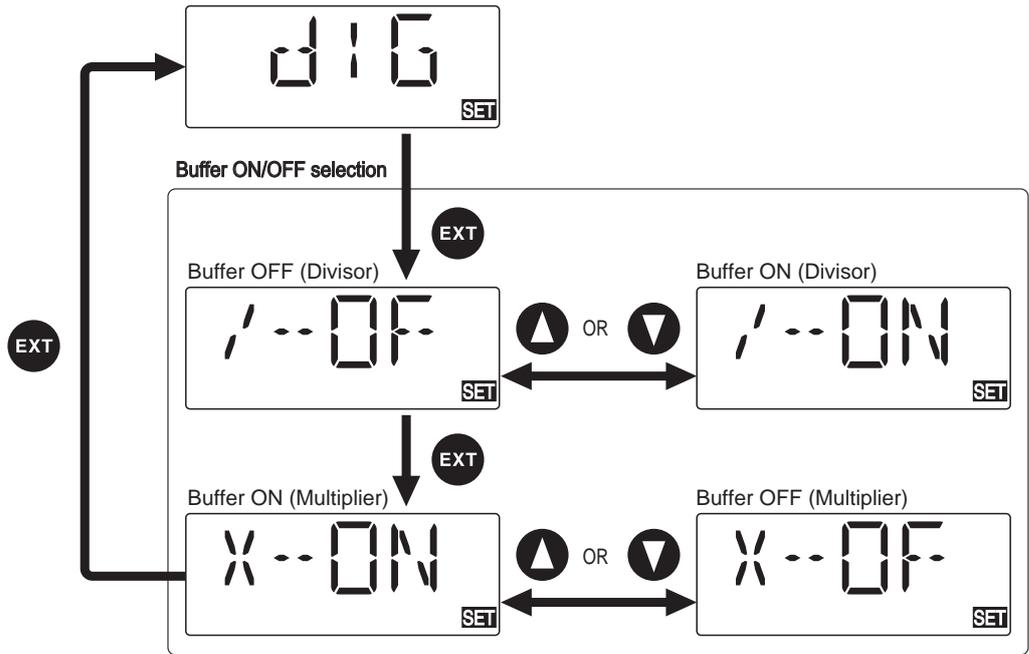
- 3 Push the UP key while pressing the EXT key to call up the Digital/Analog selection.
"dIG"(digital) or "ANA"(analog) will appear.



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



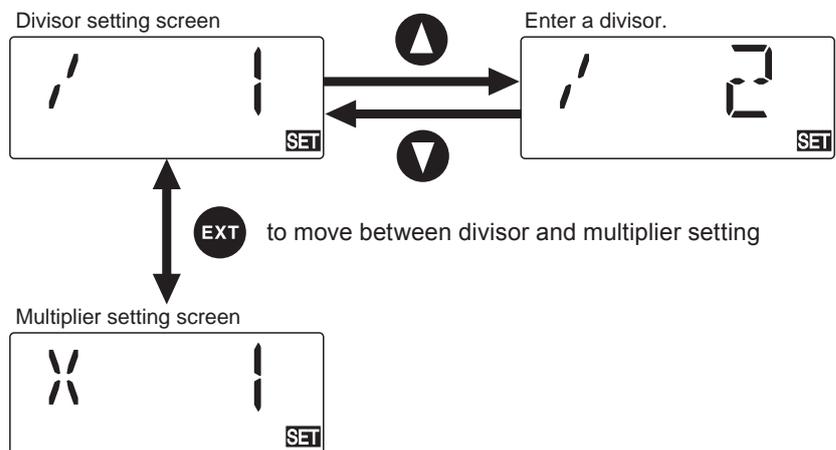
- 5 Push the EXT key to call up the buffer ON/OFF selection.
 Scroll through "/-ON" and "/-OFF" by the UP and DOWN keys.



- 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 by the external stop signal.

- **Operation stop at the stop signal input: "M-OFF"**

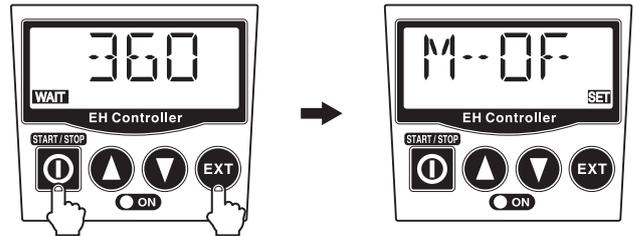
The pump stops while receiving the stop signal.

- **Operation resumption at the stop signal input: "M-ON"**

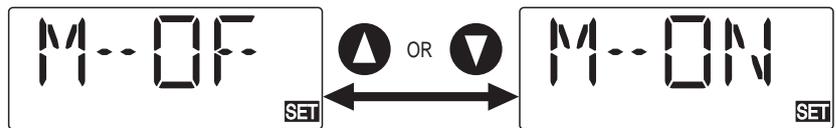
The pump runs while receiving the stop signal.

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

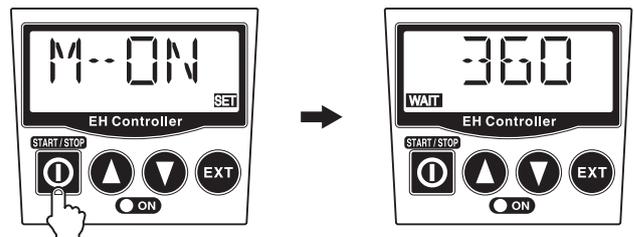
- 2 Push the start/stop key while pressing the EXT key to call up the STOP ON/OFF selection.
"M-OFF" or "M-ON" will appear.



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



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



Keypad lock

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

NOTE

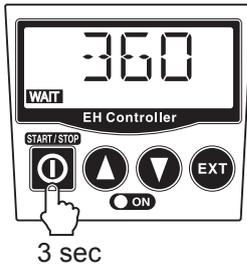
Any key operation is not effective when keypads are locked. In an emergency, turn off the main power to stop operation. Keypads are locked again when the pump is powered.

■ Keypad lock activation

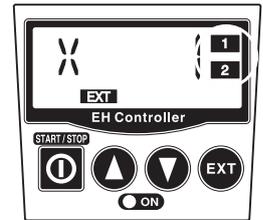
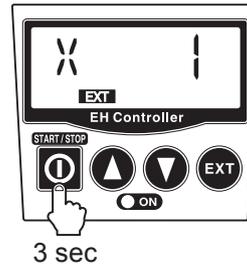
- 1 Press and hold the start/stop key for 3 seconds.

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.



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 MSDS 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, especially when disconnecting the pump from a piping system. Otherwise, the stop command may not be saved, and the pump may unintentionally start to run and deliver fluid into an imperfect piping system as it is powered on once again.

NOTE

- It's not the manufacture's responsibility for any failure due to corrosion or erosion occurred in your operating condition.
- When repair is needed to our pumps, contact us or the manufacturer of the machine in which our product is built.
- Be sure to drain chemicals and flush the inside of the pump before return. Or harmful chemicals may spill out in transit.

Troubleshooting

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

■ Pump

States	Possible causes	Solutions
The pump does not run. (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 pump is switched on if any. • 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.	Gas lock in the pump	• Expel air. See page 32.
	Stroke length is too short.	• Run the pump with full stroke length and then with proper length.
	Air ingress through a suction line	• Reroute tubing.
	A valve set is installed upside down.	• Reinstall the valve set.
	Valve gaskets are not installed.	• Install valve gaskets.
	Foreign matters are stuck in the pump head valves.	• Dismantle, inspect and clean the valves. Replace as necessary.
	A ball valve is stuck on a valve seat.	• Dismantle, inspect and clean the valve. Replace as necessary.
A flow rate fluctuates.	Air trapped in the pump head.	• Expel air. See page 32.
	Overfeeding occurs.	• Mount a check valve. See page 25.
	Foreign matters are stuck in the pump head valves.	• Dismantle, inspect and clean the valves. Replace as necessary.
	Diaphragm is broken.	• Replace the diaphragm.
	Pressure fluctuates at an injection point.	• Maintain the pressure constant by optimizing tubing or by relocating the injection point.
Liquid leaks.	The fitting or the air vent body is mounted loose.	• Retighten them.
	The pump head is mounted loose.	• Retighten the pump head. See page 31.
	O rings or valve gaskets are not installed in place.	• 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.

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 leakage occurs. • If pumped liquid includes air bubbles, check lines for leakage 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-B11/-B16/-B21	2.16 N•m	M4 Hex. socket head bolt
EHN-B31	2.55 N•m	M4 Hex. socket head bolt
EHN-C16/-C21	2.16 N•m	M4 Hex. socket head bolt
EHN-C31	2.55 N•m	M4 Hex. socket head bolt
EHN-C36	2.55 N•m	M5 Hex. socket head bolt

*A hexagon wrench can be used for a torque wrench. See page 31.

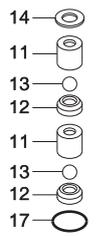
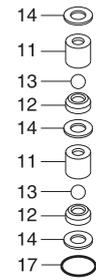
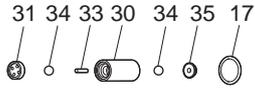
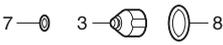
Wear part replacement

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 dismantled, replace the diaphragm and the valve sets with new ones.

Wear part list

		Parts		# of parts	Estimated life
		VC/VH/PC/PH	PP		
Pump	Valve set			2 sets	8000 hours
	Diaphragm			1	
	O ring	 <p>#42 O ring is used for the NAE type</p>		See page 58-59	
	AUTO air vent valve set (NAE type)			1 set	
Check valve	Check valve poppet (with an O ring)			1 set	
	Check valve spring			1	

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

*The estimated life is calculated based on pumping clean water at ambient temperature.

Before replacement

First release pressure from the pump head and discharge line.

1 Stop the pump operation.

2 Rotate the adjusting screw two revolutions anticlockwise or open an air vent line to release pressure.

NOTE

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

3 Check the air vent line and the pump head 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.

Valve set replacement

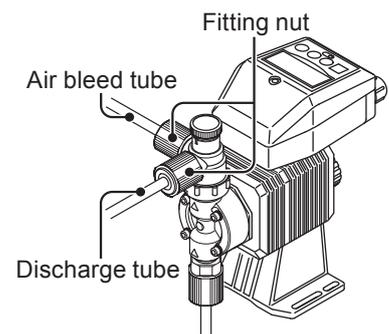
■ Discharge valve set disassembly/assembly

Necessary tools

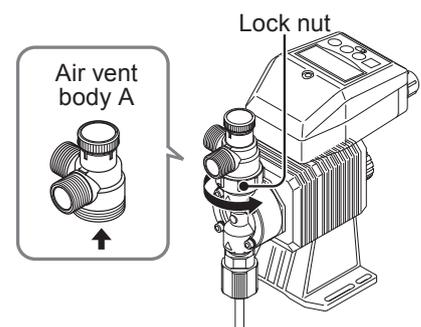
- An adjustable wrench or spanner
- A 21mm box wrench
- A pair of tweezers

*Unfix the pump base before disassembly.

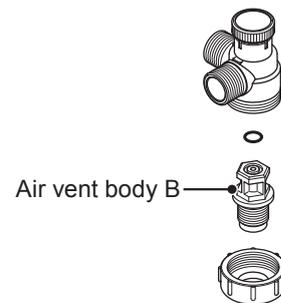
1 Loosen the fitting nut and remove the discharge tube and air bleed tube.



2 Turn the lock nut anticlockwise by an adjustable wrench and remove the air vent body A.



3 Remove the air vent body B by the 21mm box wrench.



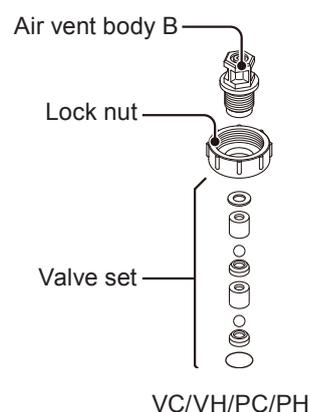
4 Pull out the valve set by a pair of tweezers.

5 Build up the new valve set into the pump head and fasten the air vent body B via the lock nut.

*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.



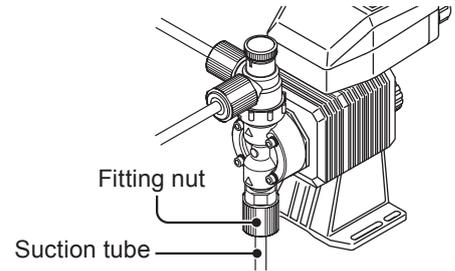
6 Remount the air vent body A and connect tubes.

■ Suction valve set disassembly/assembly

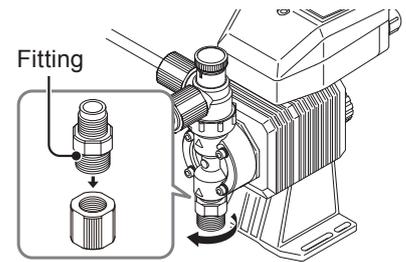
NOTE

Be careful not to drop the valve set.

- 1 Remove the fitting nut and remove the suction tube.



- 2 Remove the fitting by an adjustable wrench or a spanner.



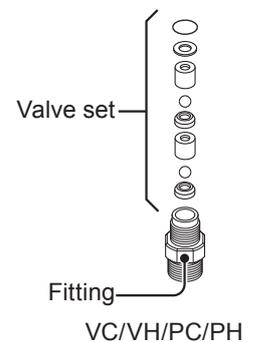
- 3 Pull out the valve set by a pair of tweezers.

- 4 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 1/4 turn with an adjustable wrench or a 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.

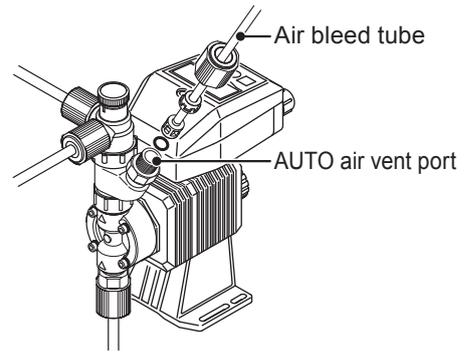


- 5 Reconnect the suction tube.

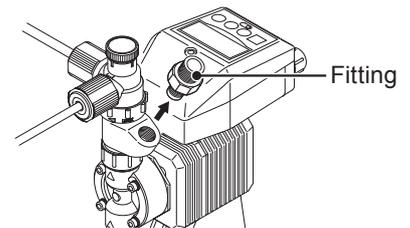
Air vent valve set replacement (NAE type)

- 1 Loosen the fitting nut and remove the air bleed tube.

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



- 2 Remove the fitting by an adjustable wrench or a spanner.



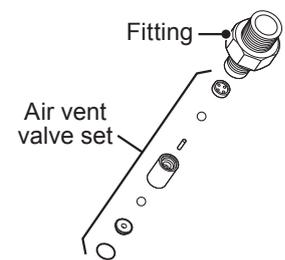
- 3 Pull out the valve set by a pair of tweezers.

- 4 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 1/4 turn with an adjustable wrench or a 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.



- 5 Reconnect the air bleed tube.

Diaphragm replacement

Necessary tools

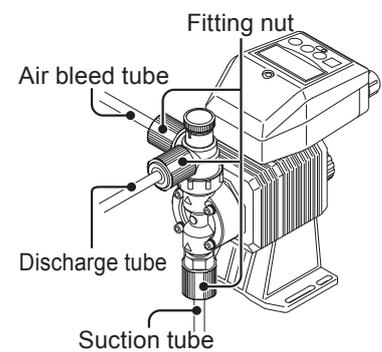
- An adjustable wrench or spanner
- A hexagon wrench
- A torque wrench

NOTE

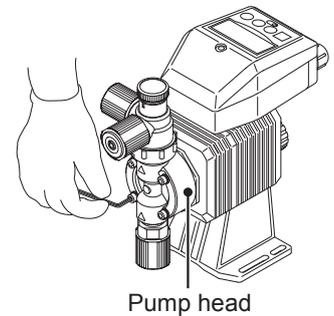
Pay attention not to lose diaphragm spacers. A few diaphragm spacers may be inserted between the retainer and plunger for the adjustment of a diaphragm location. Note that the number of diaphragm spacers provided varies at different pumps.

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

2 Loosen the fitting nuts and remove the suction tube, discharge tube, and air bleed tube.

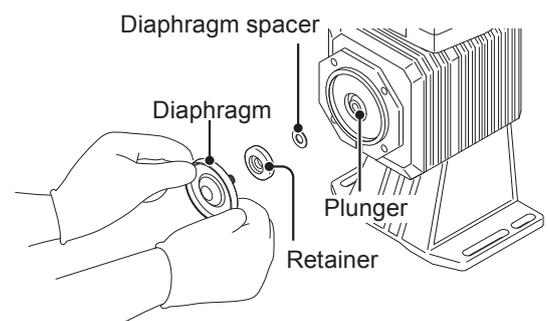


3 Remove the pump head with a hexagon wrench.



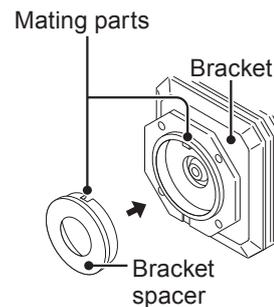
4 Unscrew the diaphragm from the plunger (pump shaft).

5 Slide the retainer and diaphragm spacer(s) onto the screw of the new diaphragm.



NOTE

- Fit the retainer with its round edge to the diaphragm.
- Do not remove the bracket spacer. If removed, replace it as shown to the right.



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

7 Run the pump and set the stroke length to 100%.
Stop the pump afterwards.

8 Mount the pump head.
Tighten the pump head fixing bolts diagonally and evenly by the following torque at each model.

Tightening torque

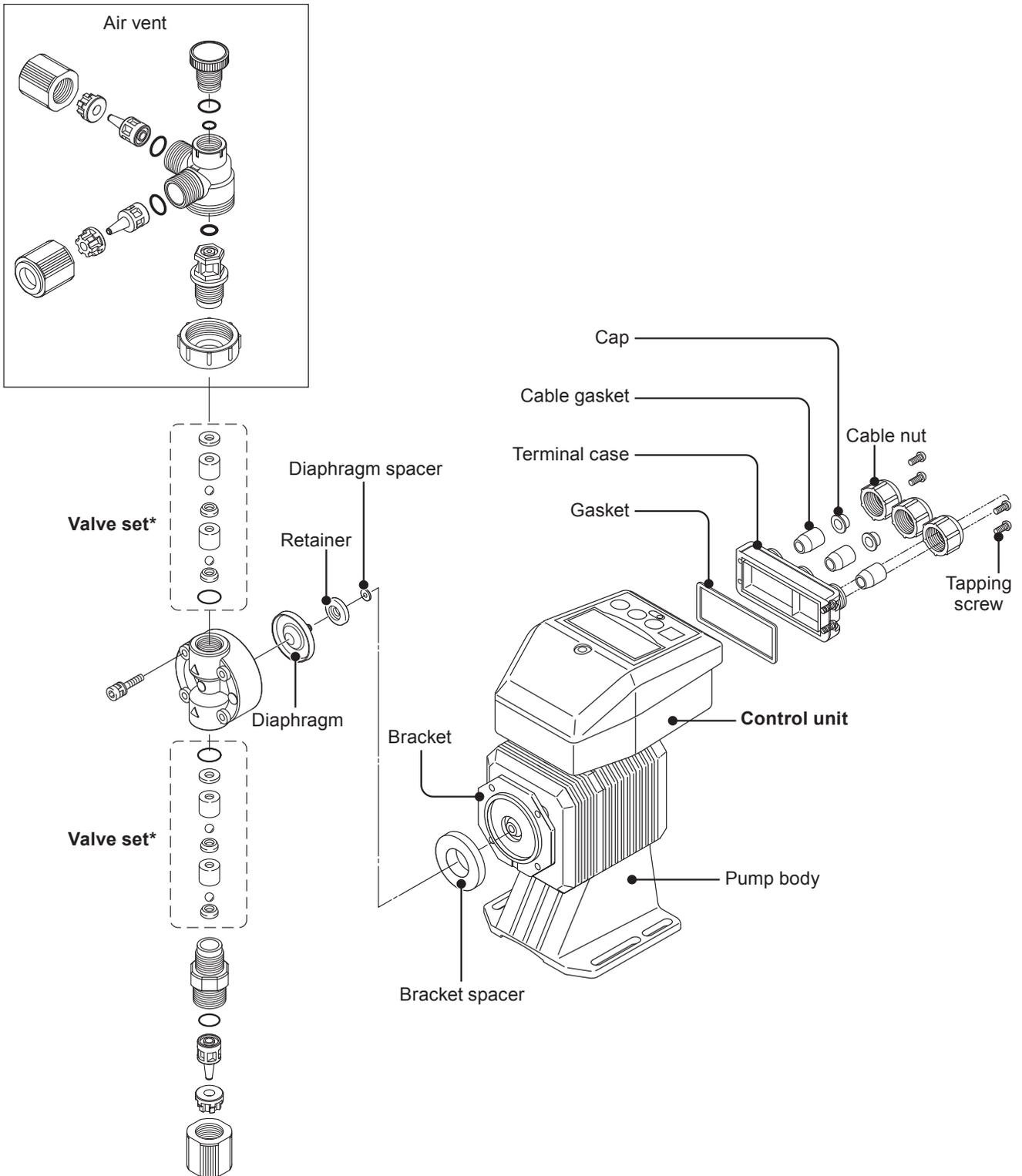
Model code	Torque	Bolts
EHN-B11/-B16/-B21	2.16 N•m	M4 Hex. socket head bolt
EHN-B31	2.55 N•m	M4 Hex. socket head bolt
EHN-C16/-C21	2.16 N•m	M4 Hex. socket head bolt
EHN-C31	2.55 N•m	M4 Hex. socket head bolt
EHN-C36	2.55 N•m	M5 Hex. socket head bolt

*A hexagon wrench can be used for a torque wrench. See page 31.

Exploded view

Pump head, Drive unit & Control unit

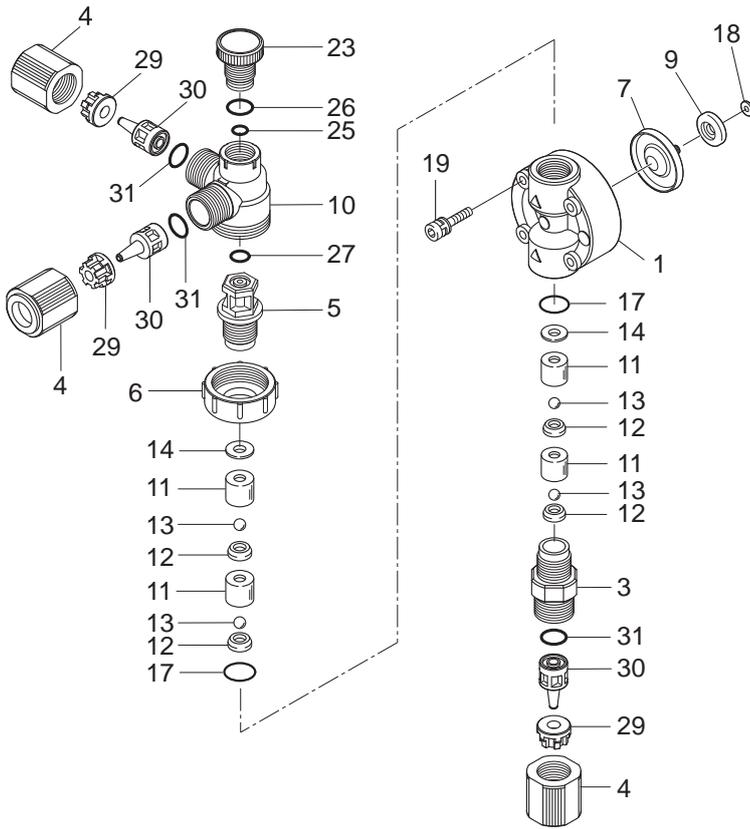
Do not dismantle the pump beyond the extent shown in the diagram below.



*Pump head material and size differ with models.

Pump head

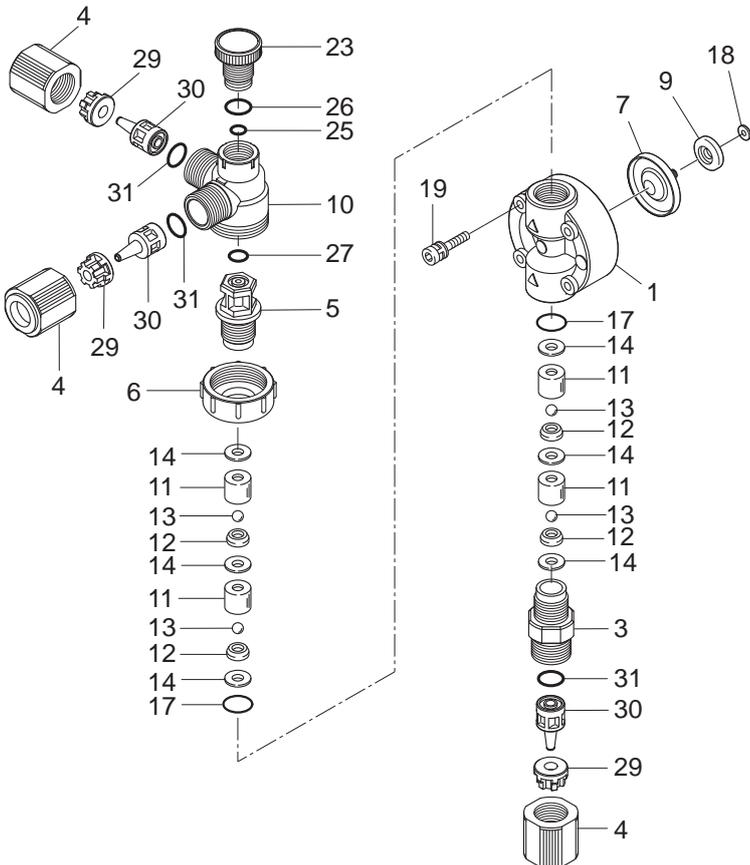
■ EHN-B11/-B16/-B21/-B31/-C16/-C21/-C31/-C36 VC/VH/PC/PH



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
25	O ring	1
26	O ring	1
27	O ring	1
29	Hose stopper	3
30	Hose adapter	3
31	O ring	3

*The number of diaphragm spacers varies with pump model.

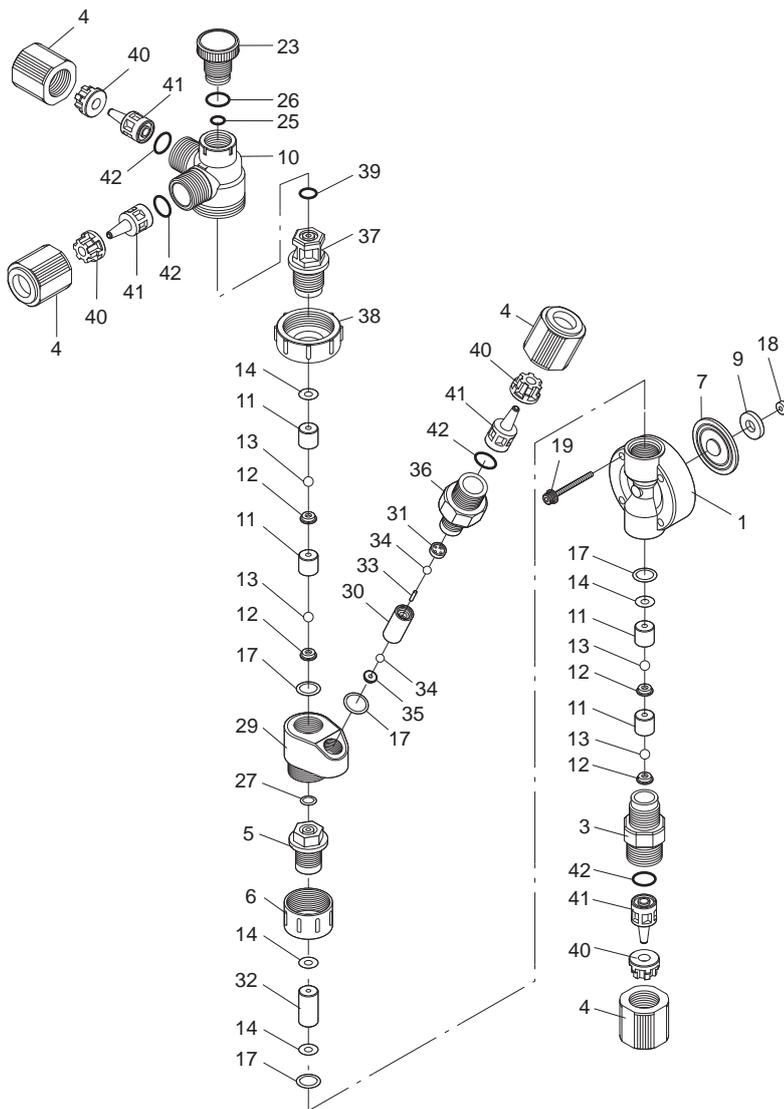
■ EHN-B11/-B16/-B21/-B31/-C16/-C21/-C31/-C36 PP



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
25	O ring	1
26	O ring	1
27	O ring	1
29	Hose stopper	3
30	Hose adapter	3
31	O ring	3

*The number of diaphragm spacers varies with pump model.

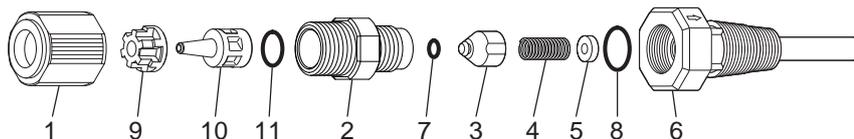
■ EHN-B11/-B16/-B21/-B31/-C16/-C21/-C31/-C36 -NAE



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
25	O ring (P4)	1
26	O ring (P10A)	1
27	O ring (P7)	2
29	Fitting adapter	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 adapter	4
42	O ring	4

*The number of diaphragm spacers varies with pump model.

Check valve (VC/VH/PC/PH/PP)



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

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

Specifications/Outer dimensions

Specifications

Information in this section is subject to change without notice.

■ Pump

VC/VH/PC/PH/PP

Model code	Flow rate ml/min	Discharge pressure MPa	Stroke length mm (%)	Stroke rate spm	Connection mm	Current value A	Power con. W	Weight kg
EHN-B11	38	1.0	0.5-1.0 (50-100)	1-360	ø4×ø9 ø4×ø6	0.8	20	1.8
EHN-B16	65	0.7						
EHN-B21	100	0.4						
EHN-B31	230	0.2			ø8×ø13 ø9×ø12			
EHN-C16	80	1.0	0.5-1.25 (40-100)	1-360	ø4×ø9 ø4×ø6	1.2	24	2.9
EHN-C21	130	0.7						
EHN-C31	270	0.35						
EHN-C36	450	0.2			ø8×ø13 ø9×ø12			

NAE

Model code	Flow rate ml/min	Discharge pressure MPa	Stroke length mm (%)	Stroke rate spm	Connection mm	Current value A	Power con. W	Weight kg
EHN-B11	30	1.0	0.5-1.0 (50-100)	1-360	ø4×ø9 ø4×ø6	0.8	20	1.8
EHN-B16	55	0.7						
EHN-C16	65	1.0	0.5-1.25 (40-100)			1.2	24	2.9
EHN-C21	110	0.7						

*The above information is based on pumping clean water at ambient temperature and the rated voltage.

*Flow rates were collected at the maximum discharge pressure, 100% stroke length, and 360spm. A flow rate increases as a discharge pressure decreases.

*Allowable room temperature: 0-40°C

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

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

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

■ 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	No-voltage contact or open collector* ¹
EXT mode	Digital control	n (1-999) shots per signal (multiplier)* ² n (1-999) signals per shot (divisor)* ³ 1:1 operation with n=1
	Analog control	Set point 1 0-20mA, 0-360spm Set point 1 0-20mA, 0-360spm
	Input signal	No-voltage 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
Output	No voltage contact (photoMOS relay) 24VAC/DC 0.1A PA AL/PA/AL/SPM are settable.	
Indicator	Numeric indication	4-digit LCD
	Operation	Green LED (blinks at each shot)
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 at 5mA. When using a mechanical relay, the minimum application load 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 extra pulse which exceeds the MAN speed pulse rate is stored up to 255 signals if the multiplier buffer is turned on.

*³ In the digital control with a preset divisor, the pump does not run over 360 spm at any pulse rate. An extra pulse which exceeds the max spm is stored up to 255 signals if the divisor buffer is turned on.

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

■ Power cable

Conduction section area	0.75 [mm ²] (Duplex cable)
Length	1500 [mm]
Standard	VCTFK
Terminal treatment	Spade terminal (V1.25-YS4A or equivalent)

■ Pump colour

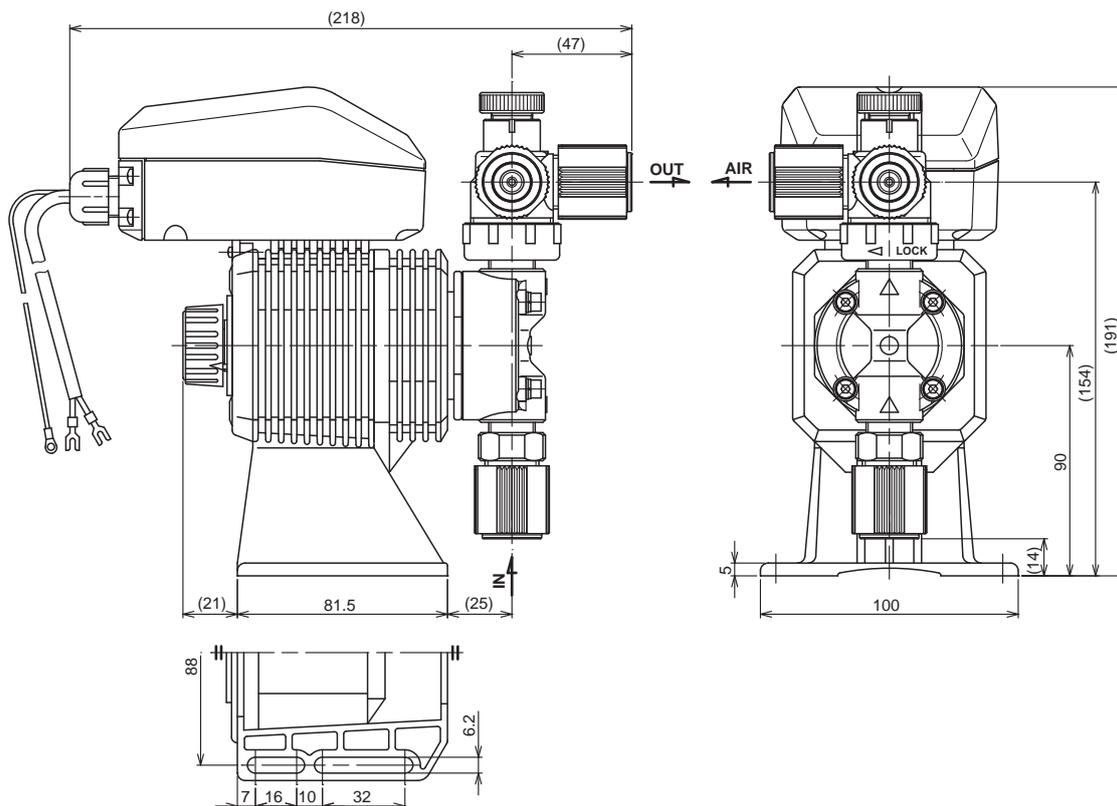
Blue	Munsell colour system 7.5PB 3/8
Red	Munsell colour system 5R 3/10

■ Check valve

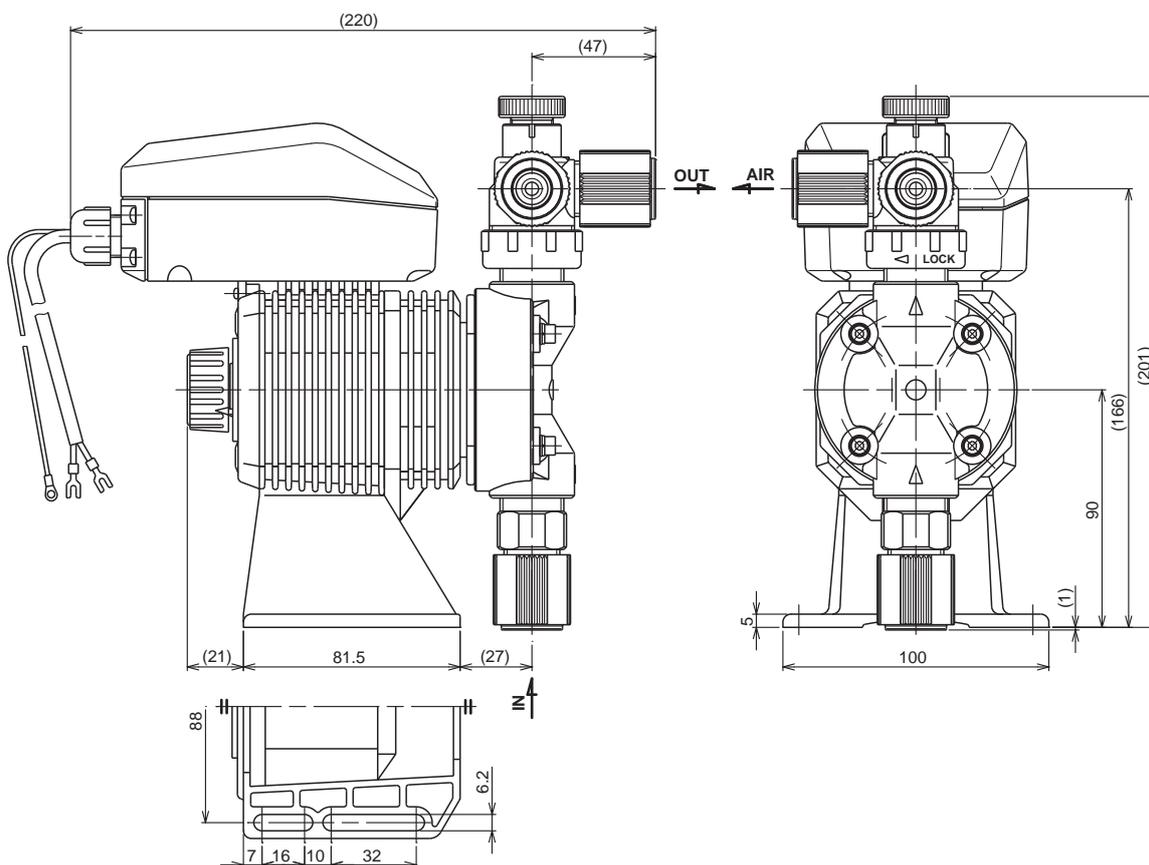
Model code	Set pressure MPa	Tube size mm	Wet ends	Applicable pump models	Wet end codes	
CA-1VC-M	0.17	ø4×ø9/ ø4×ø6	PVC	EHN-B11/-B16/-B21 EHN-C16/-C21	VC	
CA-1VE-M					VH	
CA-2VC-M		ø8×ø13/ ø9×ø12		EHN-C31	VC	
CA-2VE-M					VH	
CA-2VCL-M	0.05			EHN-B31 EHN-C36	VC	
CA-2VEL-M					VH	
CA-1V-M	0.17	ø4×ø9/ ø4×ø6		GFRPP	EHN-B11/-B16/-B21 EHN-C16/-C21	PC/PP
CA-1E-M						PH
CA-2V-M		ø8×ø13/ ø9×ø12	EHN-C31		PC/PP	
CA-2E-M					PH	
CA-2VL-M	0.05		EHN-B31 EHN-C36		PC/PP	
CA-2EL-M					PH	

Outer dimensions

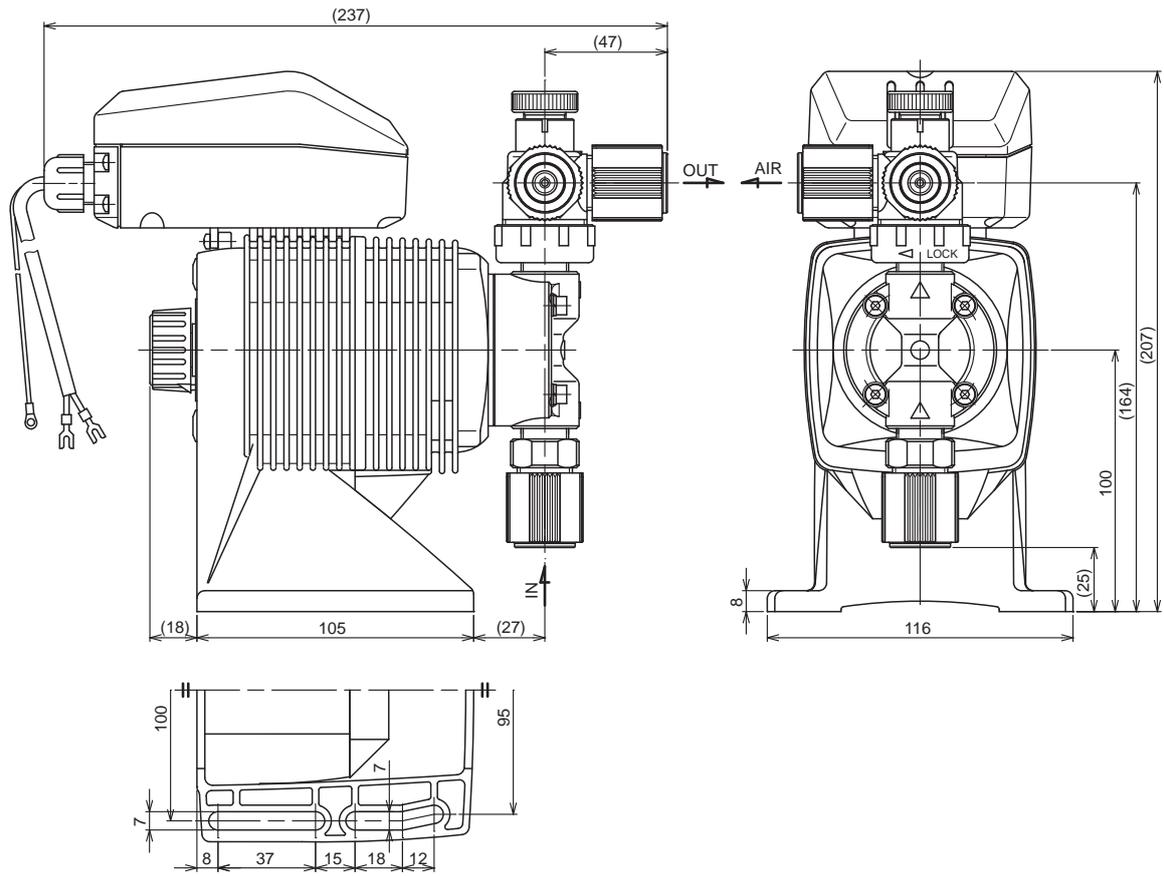
■ EHN-B11/-B16/-B21 VC/VH/PC/PH/PP



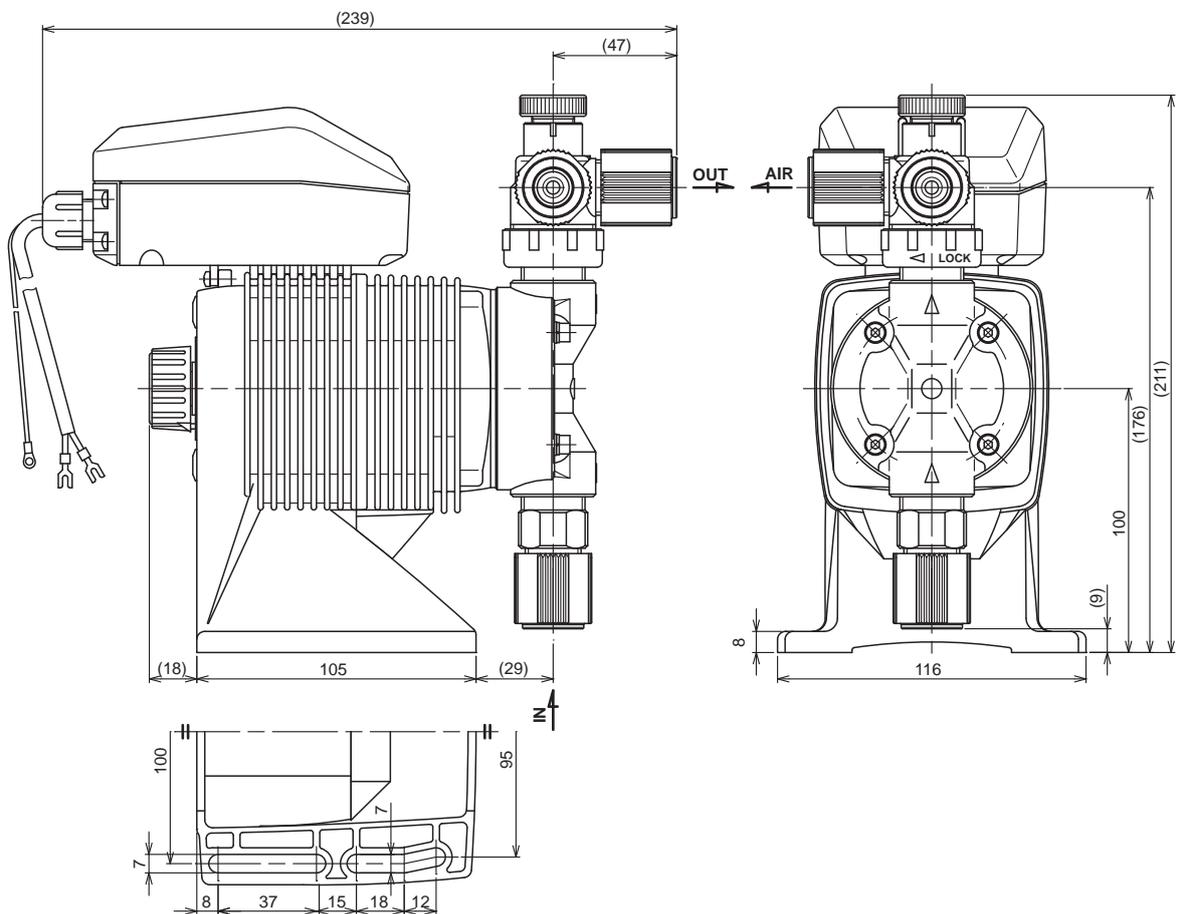
■ EHN-B31 VC/VH/PC/PH/PP



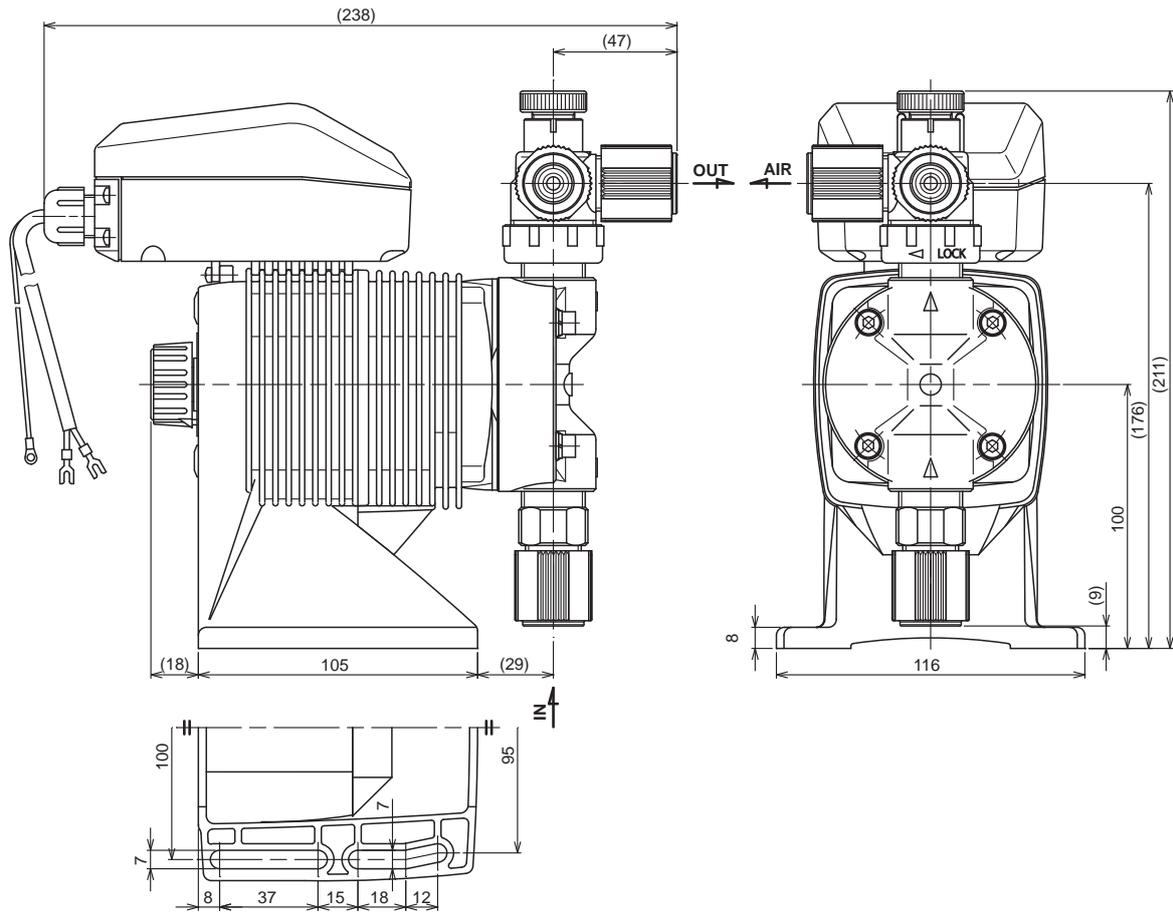
■ EHN-C16/-C21 VC/VH/PC/PH/PP



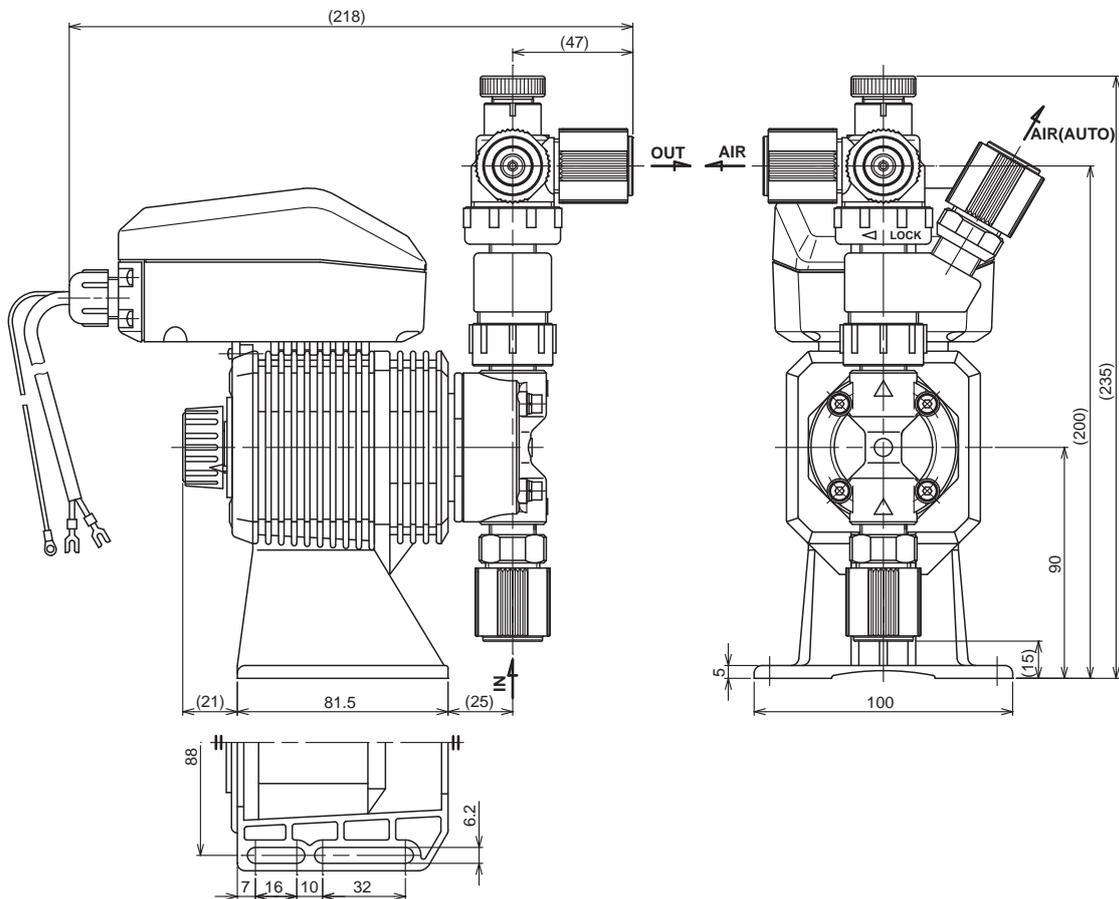
■ EHN-C31 VC/VH/PC/PH/PP



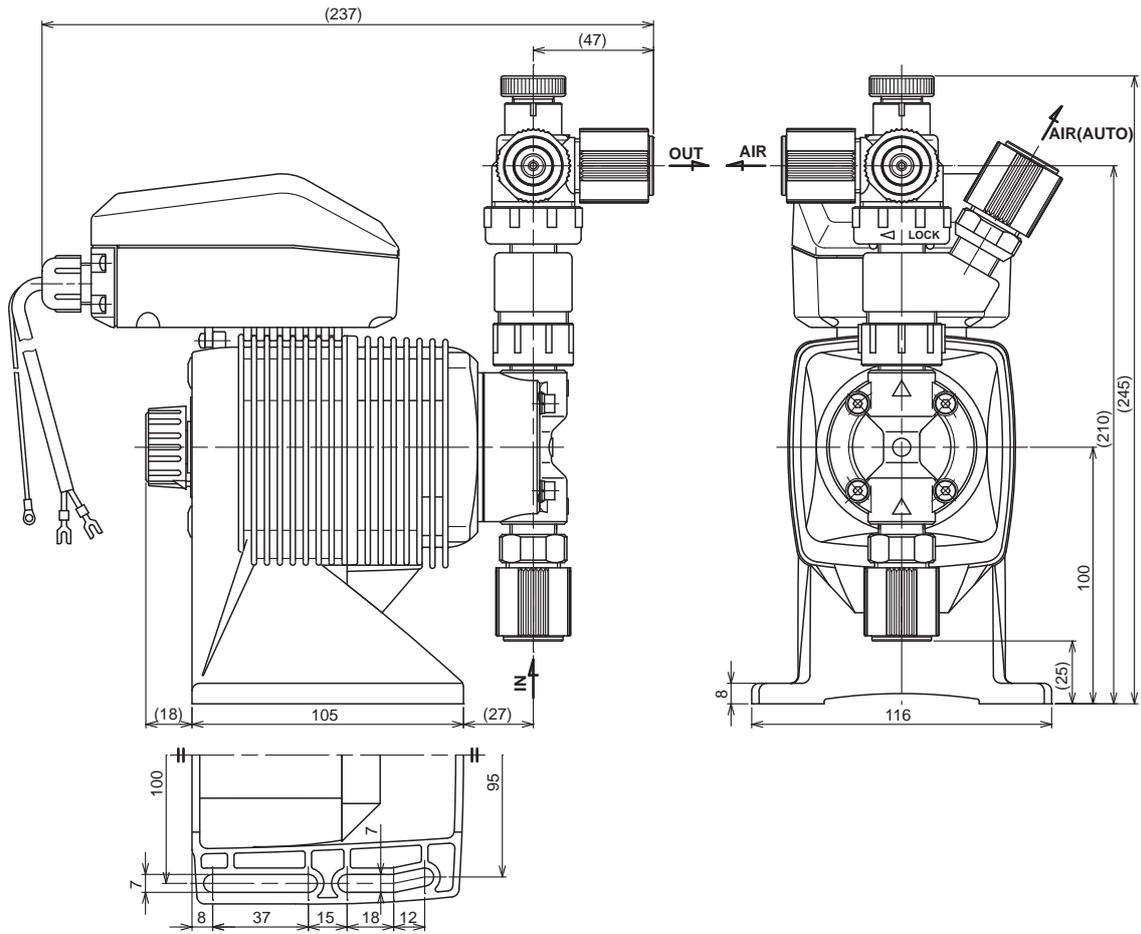
■ EHN-C36 VC/VH/PC/PH/PP

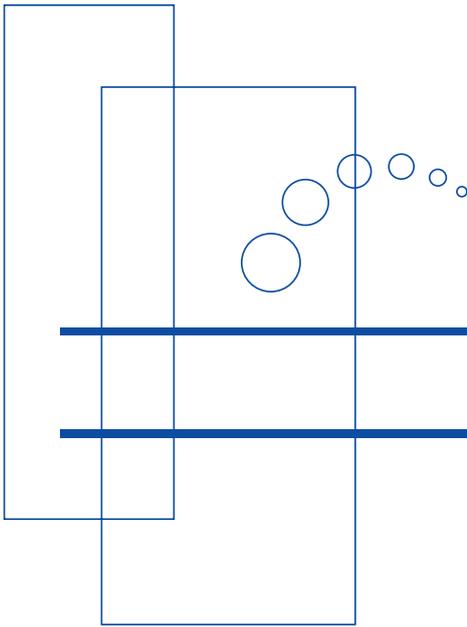


■ EHN-B11/-B16-NAE



■ EHN-C16/-C21 NAE





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