

TECHNIFLO

Smart Digital Metering Pump

EX Series User Manual



Overview

This section describes the features, functions, and component names of the pump.

Introduction

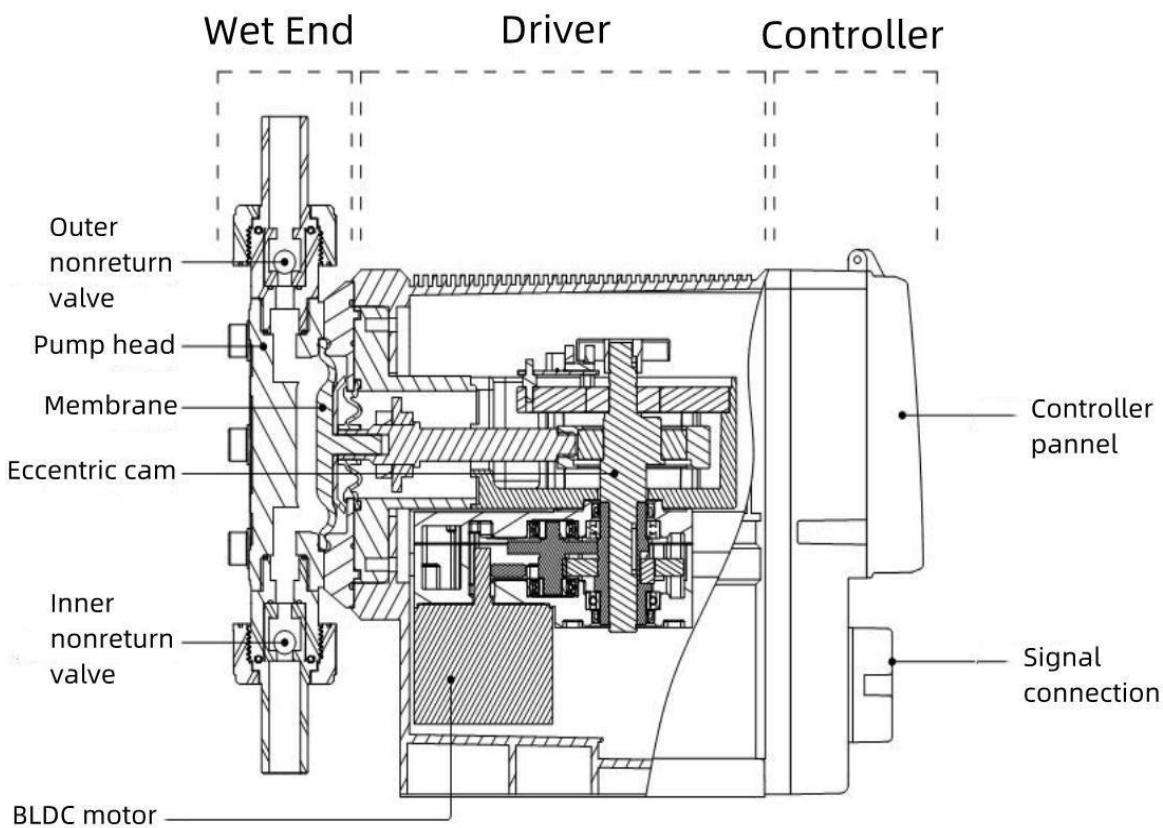
Pump structure and working principle

The EX series features a diaphragm metering pump with a brushless direct current (BLDC) motor, a high regulation ratio characteristic and a highly integrated automatic control function.

Working Principle

In the design of the KEX series, the flow rate is controlled by the rotation of the BLDC motor.

The motor rotation motion is transferred to the eccentric CAM through the reduction gear, and then converted to reciprocating motion. The volume of the pump chamber changes as the diaphragm moves back and forth and delivers liquid through a check valve for suction and discharge. The reciprocating speed will change the flow rate, while the suction rate will remain constant under any flow condition.



Features

- **High regulation ratio, high integration**

Using BLDC motor closed-loop control (non-stepper motor), highly integrated industrial electronic control. Achieve accurate control and feedback with high regulation ratio.

- **Cavitation resistance and high precision**

The suction/discharge speed can be controlled independently and accurately, and the liquid with high viscosity and easy decomposition can be transported, ensuring the high repeatability of chemical application ($\pm 1\%$).

- **Efficient and energy saving design**

Through the use of helical gear and auxiliary spring design, reduce power consumption; At the same time, it eliminates the need of oil bath and prolongs the service time of pump.

- **Automatic control**

EX can automatically operate according to simulation, pulse, batch or interval batch operation Settings.

- **Wide voltage**

The TEX series uses a wide supply voltage(100-240VAC), available in all countries/regions.

- **Standard rich control signal interface**

It is standard equipped with pulse signal, current signal receiving and current signal output, STOP, emergency STOP, alarm and RS485 bus interfaces to meet various complex working conditions.

- **Humanization design**

3.5-inch LCD colored HD screen, simple and clear.

- **Adhesive free diaphragm**

Use "full PTFE" composite diaphragm, improve the resistance to chemical corrosion.

- **LED indicator light**

The large LED prompt light on the control unit can clearly show various running states and alarm conditions.

- **Various pump head materials are available**

The flow end material is optional, can adapt to different liquids, the appearance of high strength composite material, excellent structure design, further improve the ability of chemical corrosion resistance.

- **Overpressure protection function**

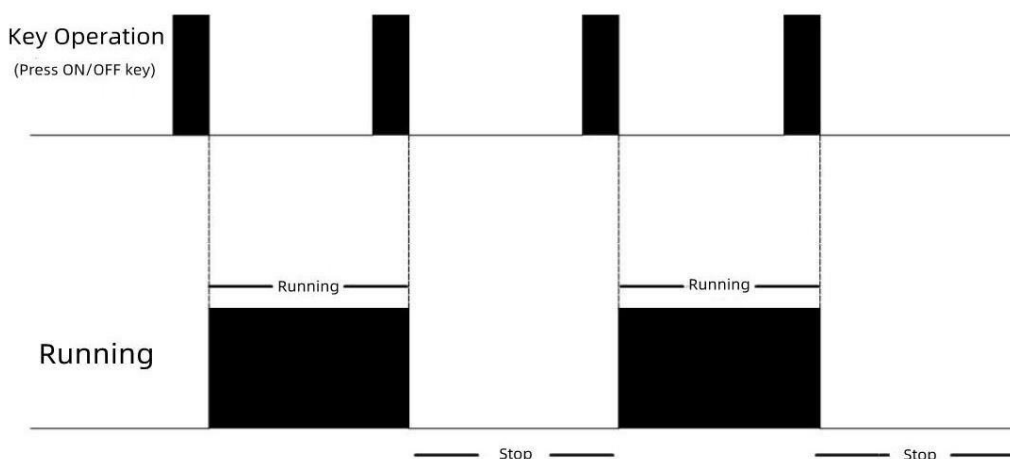
When the output pressure exceeds the pump operating pressure, the metering pump can automatically stop running and alarm to avoid the burning of the metering pump due to pressure suppression.

- **IP65 protection rating**

Operating Function

Manual Type

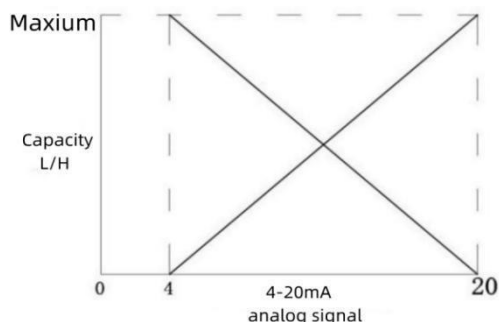
To run/stop the pump by switch key operation. The flow rate can be changed at any time by the up and down keys during operation or stop. Green LED during operation the cue light will come on.



Automatic Type

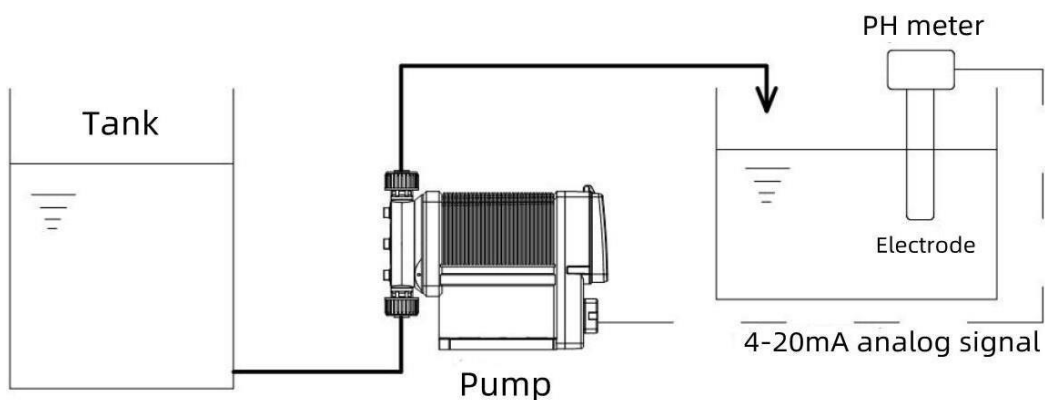
■ Proportional Integral control (Optional, no details)

Select the analog proportional control mode. 4-20mA or 20-4mA control is available. During operation, the display displays the current flow rate and the current received signal value. * Please note that pressing the switch once will immediately stop the control.



- If the external signal is below 4mA, the flow of the pump will reach 0ml/H.
- Under any current conditions, the pump won't exceed the set maximum value.

Example: PH control in the water treatment system.

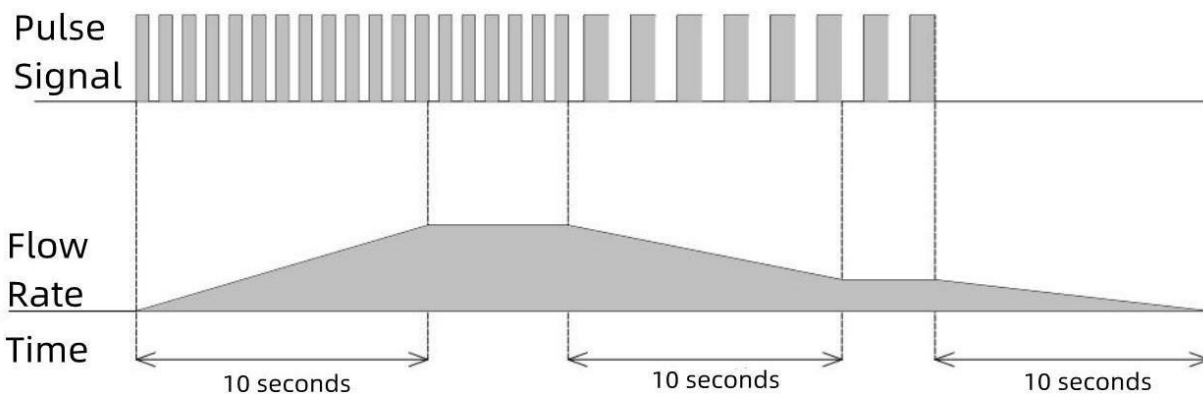


■ Pulse control (optional , no details)

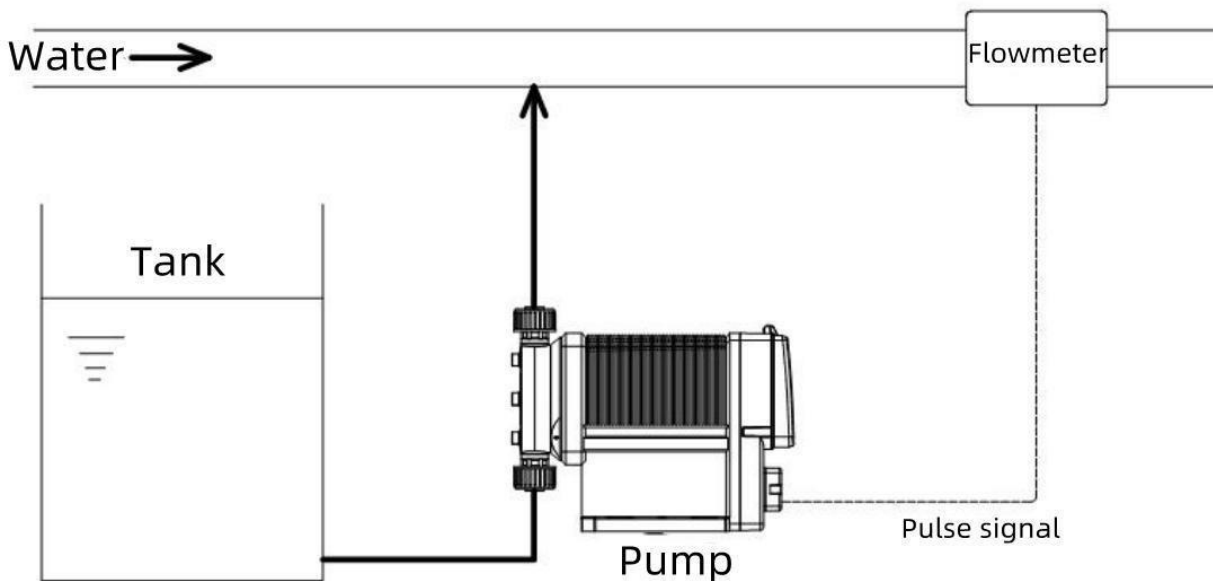
The flow rate is automatically controlled by the flow rate of each pulse (ml) and the pulse signal frequency of the flowmeter.

It takes about 10 seconds for the EX to catch up with the frequency change. In other words, the pump stops 10 seconds after the pulse stops. An external interlock (or stop) signal can be used to shut down the pump, in which case there will be no delay.

*Please note pressing the switch once will immediately stop the control.



Example: Addition of chemicals to sewage treatment



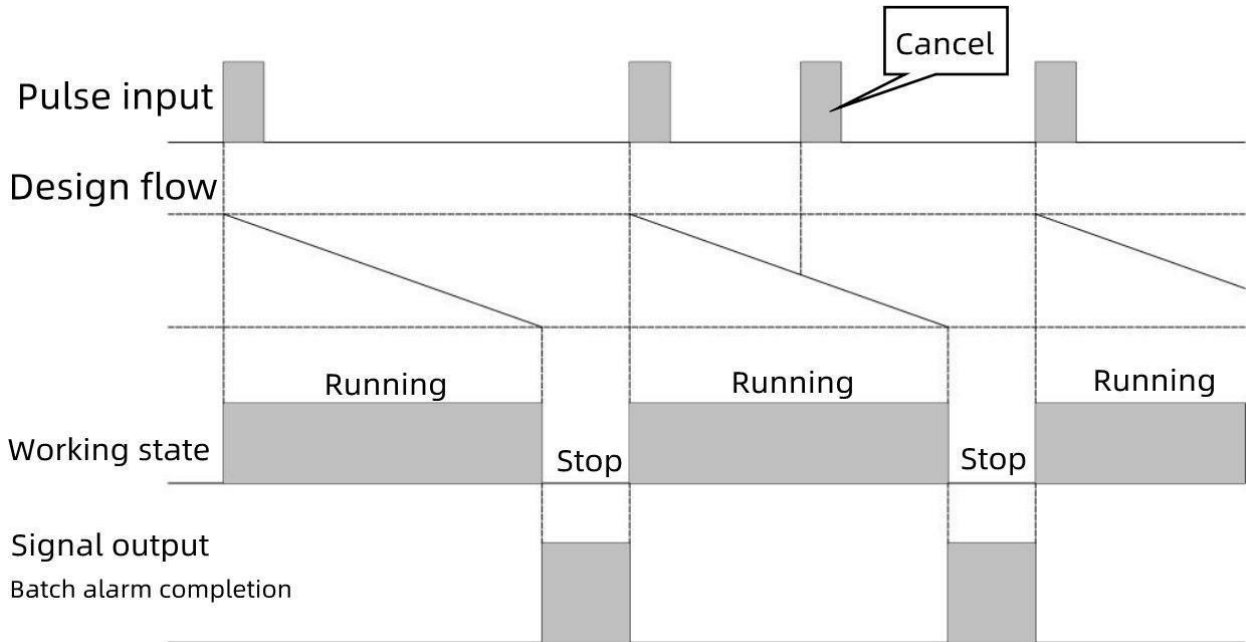
■ Batch control (Optional , no details)

EX releases preset flow by pulse and stops when finished. The preset or residual flow is displayed on the controller until it is reduced to zero. In this control mode, the pump operates at the MAN rate (pump speed in manual mode). The way the pump works may change depending on the buffer Settings.

When the buffer is OFF:

When the pump is activated in response to an early pulse input, any external pulse input is cancelled. After the preset flow is completed, the next measurement is ready.

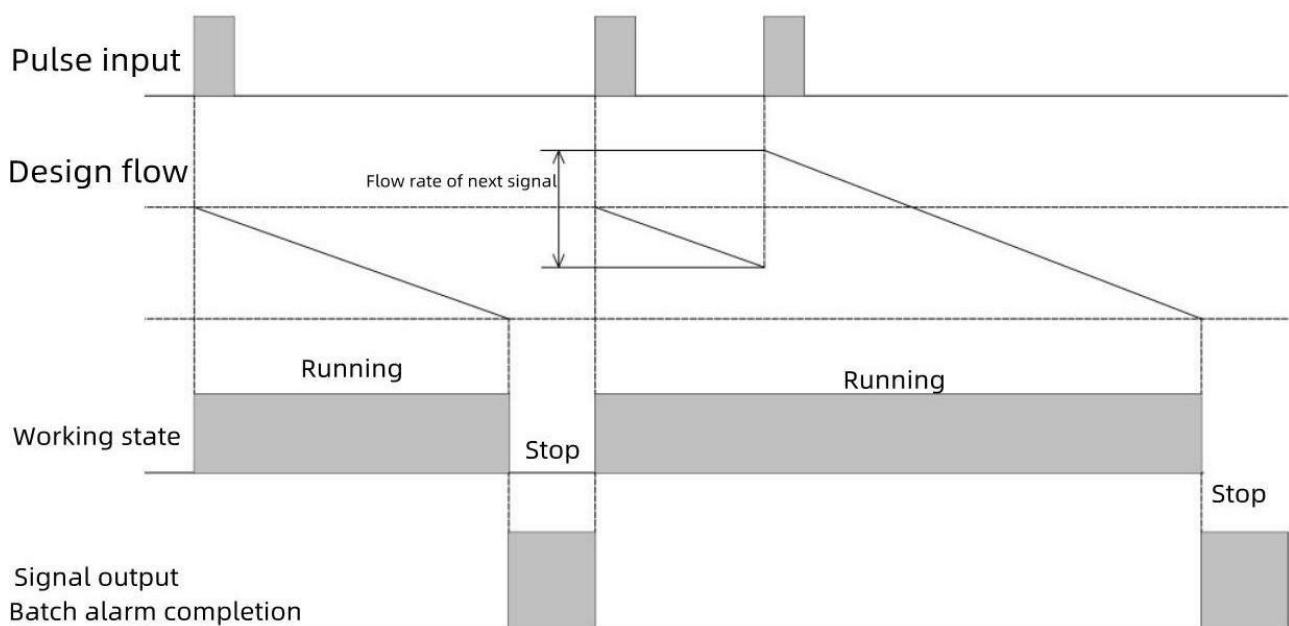
* Please note that pressing the switch once will immediately stop the control.



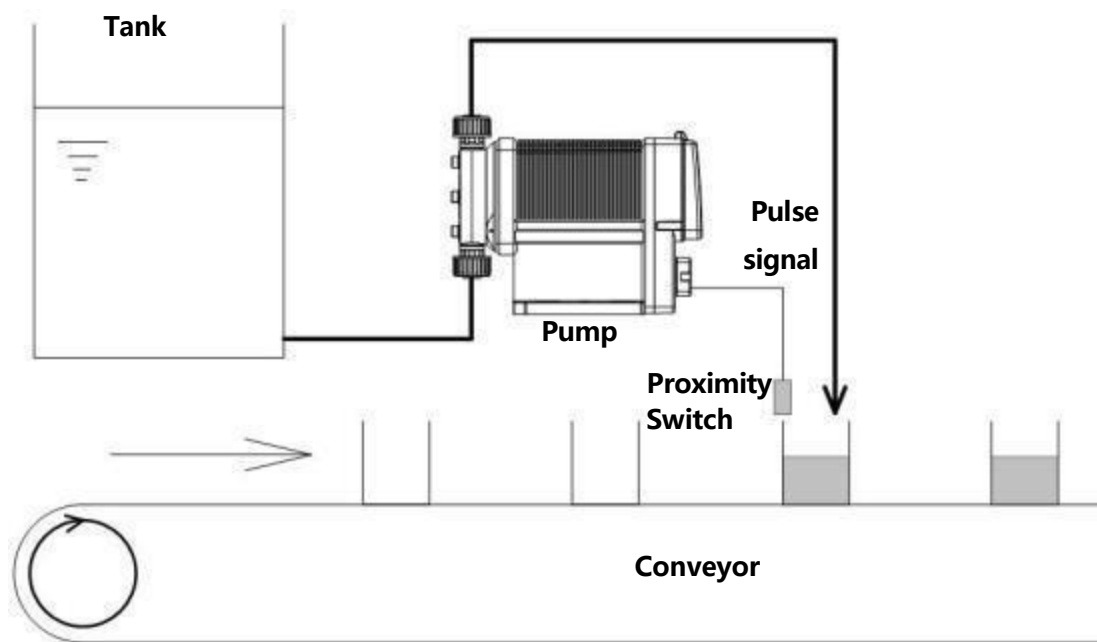
When the buffer is ON:

Each time an external pulse is input, the preset flow rate for each pulse is accumulated (up to 65535 pulses), even if the pump has been primed previously.

* Pressing the key once will immediately stop the control and clear all pulse buildup.



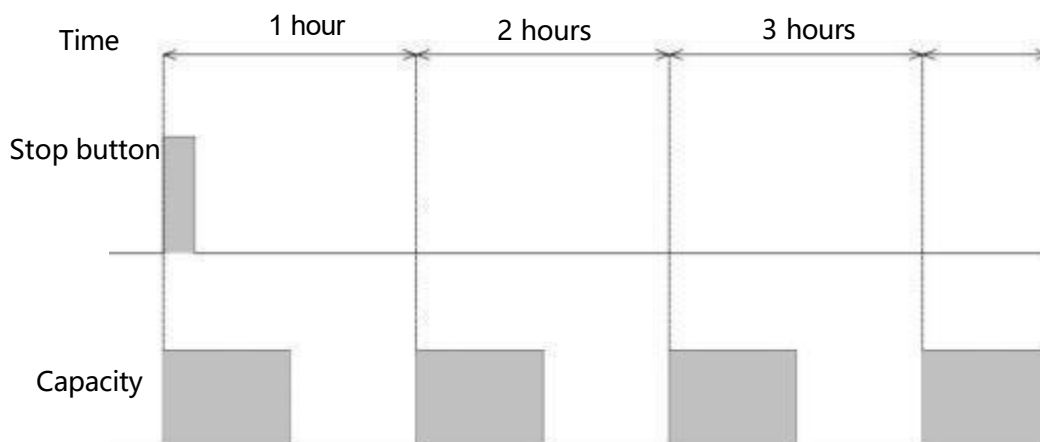
Example: chemical dosing in manufacturing system



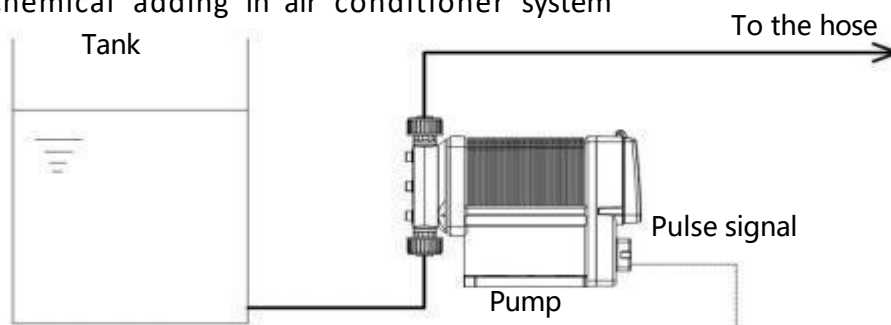
■ Interval batch control (Optional, no details)

To perform interval batch control, set stall time and flow. The pump will discharge a preset flow rate at a preset interval. In the figure below, the interval is set to 1 hour.

* The pump operates at a manual rate. Press the stop button to stop/start the control.



Example : Chemical adding in air conditioner system



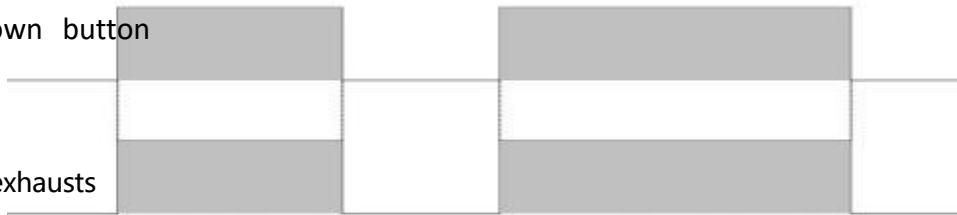
Inject Function

When the up and down keys are held simultaneously, the pump runs at the MAN rate (or the maximum stroke rate set by factory default). This function can be used to fill or exhaust air. Release both keys simultaneously to stop the pump.

*This feature is always available when the pump is in wait mode or run mode.

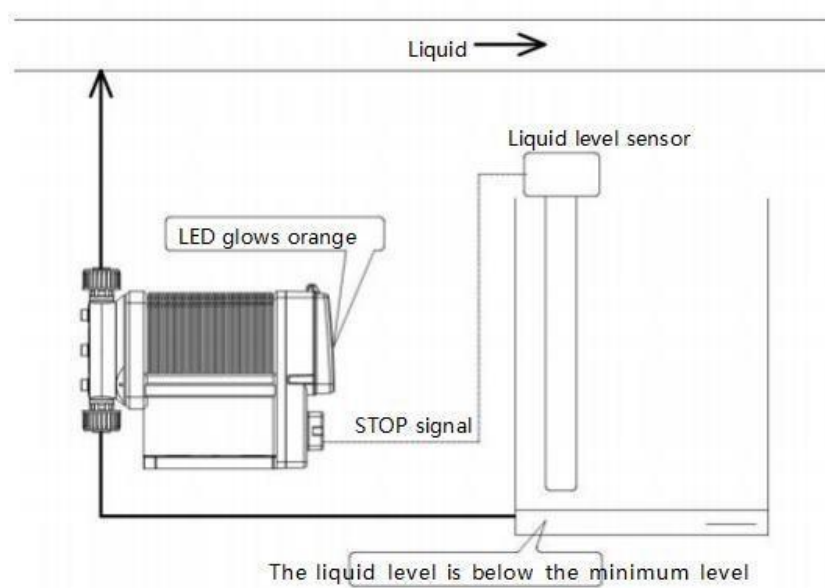
Press the up down button

Pump works and exhausts



STOP Function

Start/stop operation can be controlled by a signal from the level sensor. The LED light changes from green to orange when the pump receives the STOP signal from the operating level sensor.



Protection Function

■ Safety Instrumented Function

The interlocking function works in the same way as the STOP function. You can use this feature for an emergency stop.

■ Overpressure protection function

The pump will stop and the red LED light will flash when the built-in pressure sensor detects a discharge pressure 1.2 to 1.5 times higher than the maximum pressure level, or when the integrated circuit used to monitor motor rotation fails. If the pump is suspended by the overcurrent protection function in either case, the pump will resume operation after 30 seconds. If the suspension is repeated three times in a row, the pump will not resume operation and will remain stationary. A single press of the start/stop key can resolve these error conditions.

Output Function

■ Alarm output function

Enables or disables output of pulse control, batch control, interval batch completion, STOP, interlocking, pressure overload detection and/or drive device error detection functions.

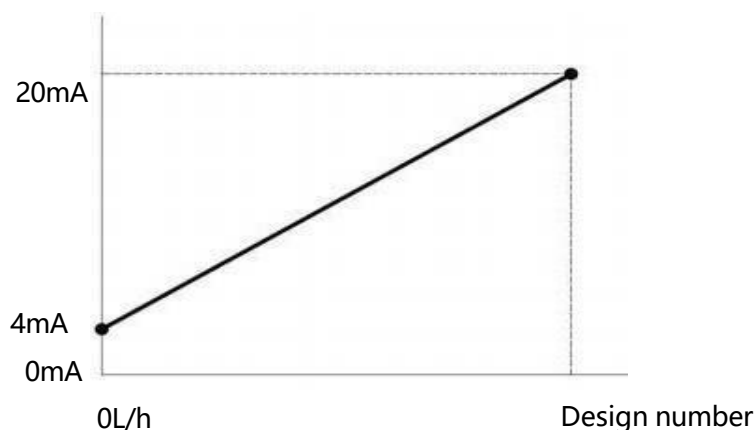
Alarm output: Output of mechanical relay (No voltage contacts 30VDC/250VAC 3A, resistive load)

■ Analog output function

The pump transmits a 4-20mA analog signal proportional to the preset flow rate.

*The maximum flow rate of the pump shall not be exceeded at any flow setting of the set value, and the current intensity shall not be less than 4mA or more than 20mA.

*When the current is 0mA, please check the operation of the pump, indirect alarm function.



Other Function

■ Suction rate setting

The suction rate can be adjusted up to 4 levels, depending on the liquid characteristics. The suction rate is reduced to reduce the inertial resistance of viscous liquid delivery or to prevent cavitation of gaseous liquid. Select 100% (default), 75%, 50%, or 25%.

* When the suction rate is reduced from 100% to 75%, 50% or 25%, the maximum flow rate of the pump is automatically reduced to the appropriate level.

■ Maximum flow rate setting

The automatic mode runs according to the flow velocity of the manual mode. If you need to change the flow velocity of the automatic mode, return to the manual mode to change the required flow velocity.

■ MODBUS RS485 signal(optional , no details)

It can read the running status and data of pump in real time. For more information, please contact us.

■ **Replace membrane mode**

The pump shaft position can be extended or retracted for easy diaphragm replacement.

■ **Anti-signal jitter setting**

The pulse recognition time of the TEX is set so that it is not adversely affected by jitter or noise. The factory default setting is 5 milliseconds. This means that the pump can recognize pulse lengths of 5 milliseconds or more. Other options include 1 and 2 milliseconds and should be selected for shorter pulse lengths. However, please note that the shorter the recognition time, the more susceptible the pump is to noise interference.

■ **Output logic setting**

Alarm output 1 and alarm output 2 types can be edited.

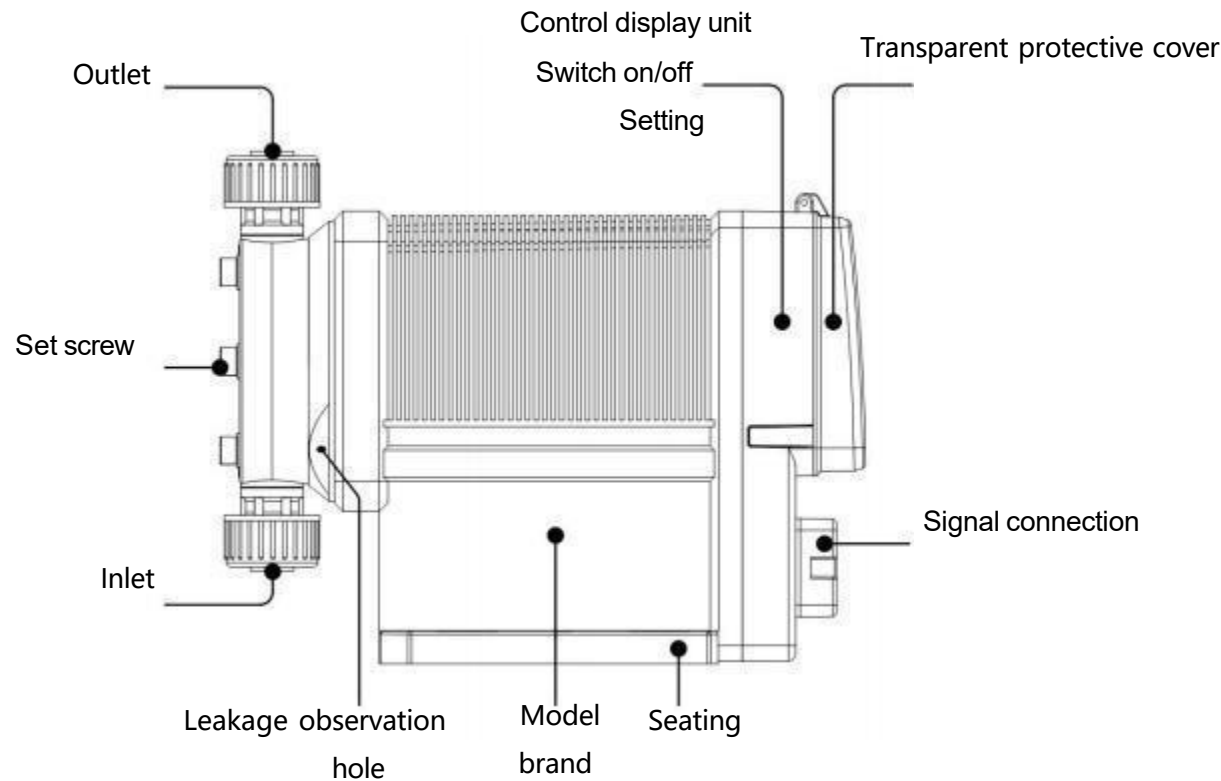
■ **Languages setting**

Select your language through the language selection option.

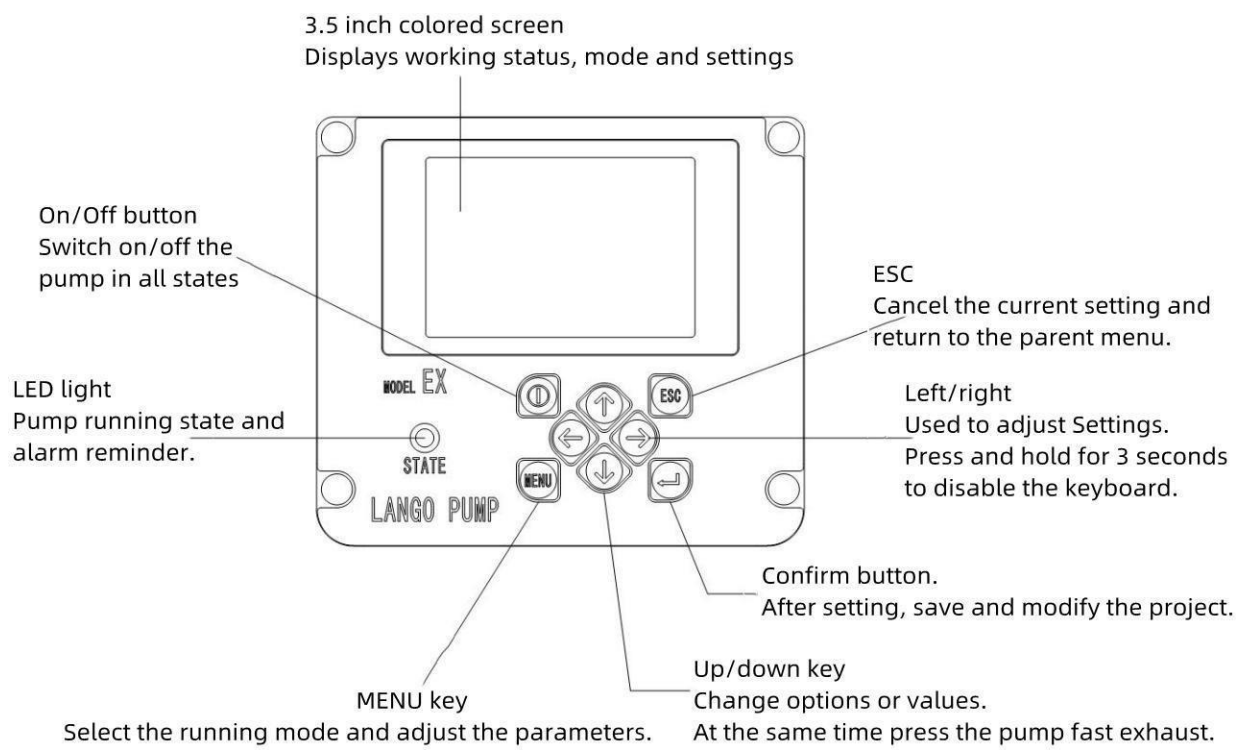
■ **Factory default**

The factory defaults can be invoked by powering on the pump while holding down the ESC key. Note that the flow rate per stroke obtained through the calibration procedure remains constant.

Pump



Operation Panel



Model selecton

Model	Max pressure MPa	Capacity L/H	Power W	Voltage V	Current A	Connection		
EX-C022	1.0	22	72	AC110~240	1	DN15		
EX-C045	1.0	45						
EX-C090	0.5	90						
EX-C120	0.5	120						
EX-C160	0.4	160						
EX-D260	0.7	260	260	AC220	6	DN15/DN20		
EX-D500	0.5	500						
EX-D800	0.5	800						
EX-E1000	0.4	1000	400					DN25
EX-E1200	0.4	1200						
EX-E1500	0.3	1500						DN40
EX-E2000	0.2	2000						

Installation

This chapter describes the installation process of the pump, as well as piping and wiring. Read this section carefully before you begin.

Notes

Please pay attention to the following when installing the pump.

- Risk of electric shock. Be sure to turn off the power to stop the pump and associated equipment before performing repairs.
- If you find any abnormal or dangerous conditions, stop the operation immediately and check/resolve the problem.
- Do not place explosive or flammable materials near the pump.
- Use of a damaged pump may result in shock or death.

Installation

1. Choose the right location.

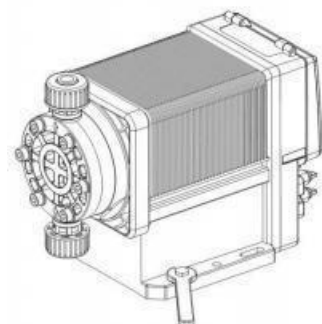
Be sure to choose a horizontal position without vibration.

2. Secure the pump with four M8 bolts.

Make sure the pump is fixed at four points.

* Note

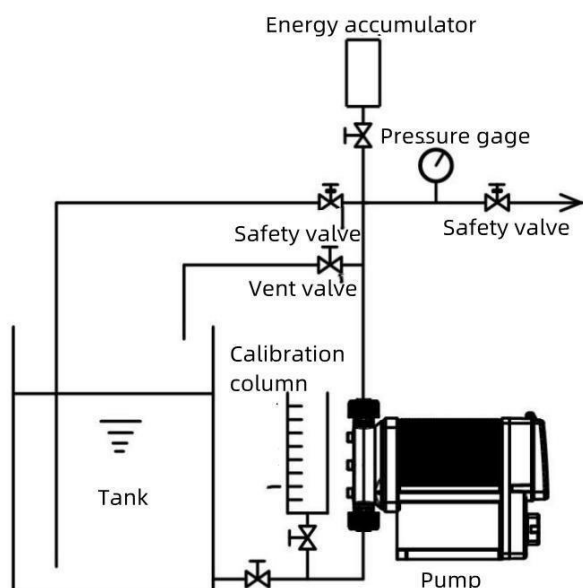
Choose a horizontal position, otherwise the flow rate may decrease.



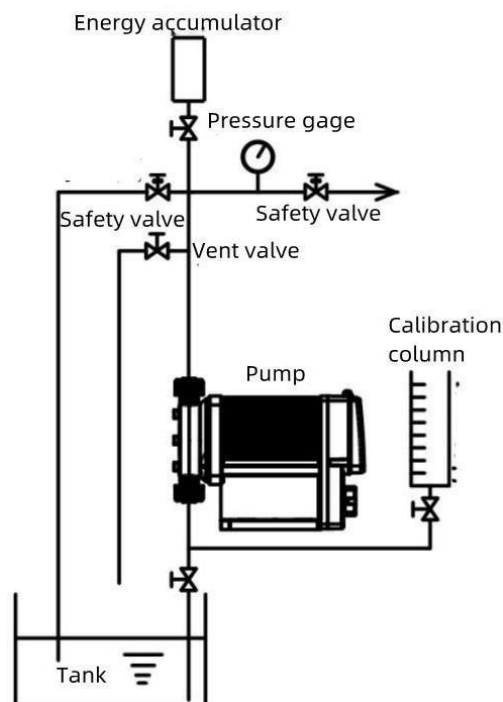
Pipeline

Pipeline layout

Example of irrigated application



Example of updraft application



Note

- The inner diameter of the suction line should be equal to or wider than the inner diameter of the pump.
- Install the pump in a cool place when handling bubbling liquids (sodium hypochlorite or hydrazine solutions). It is highly recommended that the installation be filled in.

Hose connection

A. Insert the hose into the fastening nut and pressure ring, and slide it into the adapter as far as possible.

B. Place the hose end (adapter) into the connector. Then tighten the fastening nut by hand.

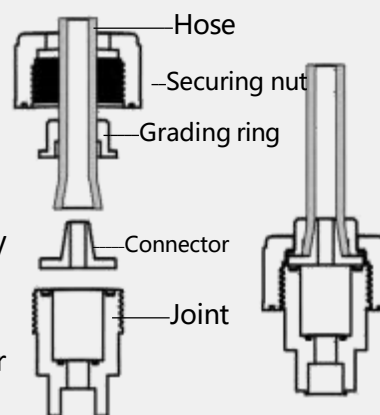
C. Rotate the nut 180 degrees using an adjustable wrench or a common wrench (for extruding tubes) to tighten the nut.

* Do not apply excessive force to plastic fastening nuts.

* When you try to remove the connection, the adapter may get stuck in the broken hose and pressure ring.

Try not to damage the adapter cone used to hold the tube against the pressure ring. If damaged, please contact us for a new adapter/pressure ring.

* Do not reuse the same tube end for the squeeze seal. Cut it off, make sure you build a new seal.



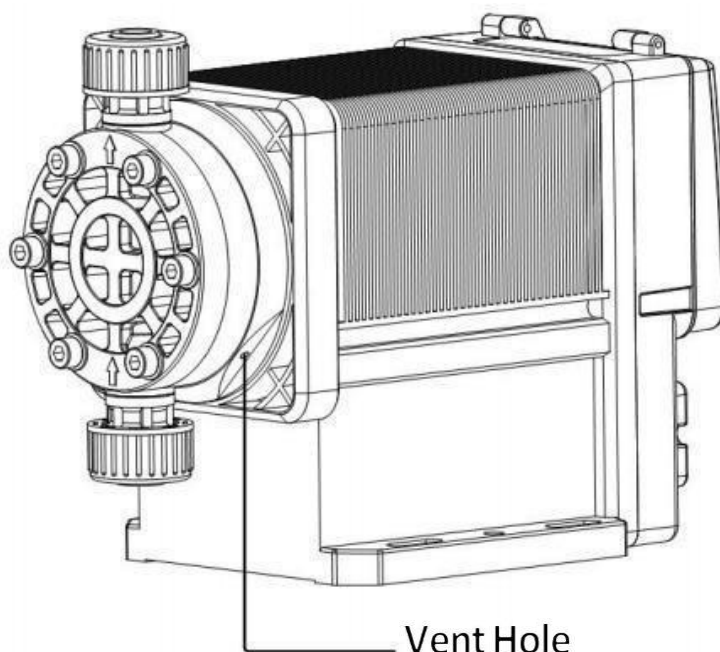
Discharge Outlet (Vent Hole)

If the diaphragm ruptures accidentally, the leaking liquid will be discharged through the vent.

Use chemical resistant pipes and drain tanks to safely collect liquids.

Note

- Don't block the drain. This port is used as an exhaust hole to restore the pressure behind the diaphragm to atmospheric pressure.
- If there is liquid in the drain tank, it means the diaphragm is damaged. It must be inspected or repaired immediately. Don't let the situation go unanswered. Smoke or vaporization from some solutions may travel up the drain and into the pump interior.



Wires Connection

Connect power cables, ground cables, and external signals.

Notes:

Please pay attention to the following points when wiring.

- Electrical work shall be performed by qualified electrical personnel. Must comply with applicable laws or regulations.
- Use only the power supply specified on the nameplate. Otherwise, a fault or fire may occur.
- Do not connect cables with power on. Otherwise, an electric shock or short circuit may occur. Be sure to turn off the power before wiring.
- Do not turn on the power while working.
- The power cord should be replaced by the manufacturer or its agent, or by an experienced technician. Otherwise, accidents may result.

Power cable/ground cable

Check points

- Check whether the power supply is turned off.

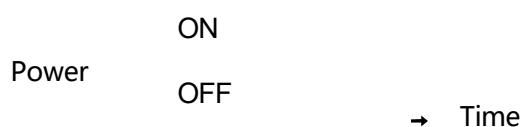
Insert the plug completely into the socket.

Note

- Do not share power with high-power equipment that may generate surge voltage. Otherwise, the electronic circuit may malfunction. Conductive noise caused by the frequency converter can also affect the circuit.
- Use a mechanical relay or switch to power the pump. Do not fluctuate the voltage or the CPU may malfunction. Notes on the use of mechanical relays for "on-off" control,

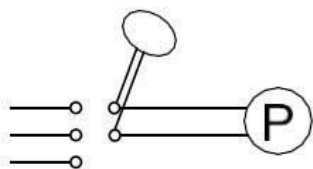
Quick power on

Do not switch on the power gradually



Electronic circuits in the control unit may fail due to surge voltage. Do not place the pump near 200W or more power equipment, as this may create a large surge voltage. Otherwise, take any of the following steps.

Install surge absorbing elements (such as varistors with capacity of 2000A or more) through the power line, or surge absorbing elements.

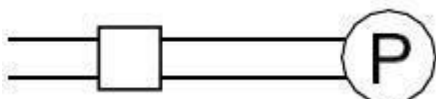


Recommended Adjustable resistor: Panasonic ERZV14D431 KOA NVD14UCD430

See manufacturer's catalog for details.

A noise reduction transformer implemented through a power line.

Noise reduction transformer



Precautions for "on - off" control by mechanical relay

The control unit is equipped with CPU. To ensure that the CPU works properly, be sure to start/STOP the pump with the STOP signal for "on-off".

Control. Try not to turn the main power on and off. Otherwise, note the following:

1. Make sure the minimum shutdown time is 10 minutes.
2. Mechanical relays should have a contact capacity of 5A or higher, otherwise contacts may break.
3. If the mechanical relay has a contact capacity of 5A, the maximum number of times the power is allowed to be turned on/off is 150,000. Contact capacity should be 10A or higher when actual times exceed 150,000 or when power is shared with high-capacity devices (which may cause surge voltages and damage contacts).
4. Use solid state relays (SSR) when necessary (e.g. OMRON G3F) .

Signal connection

Check whether the power is turned off.

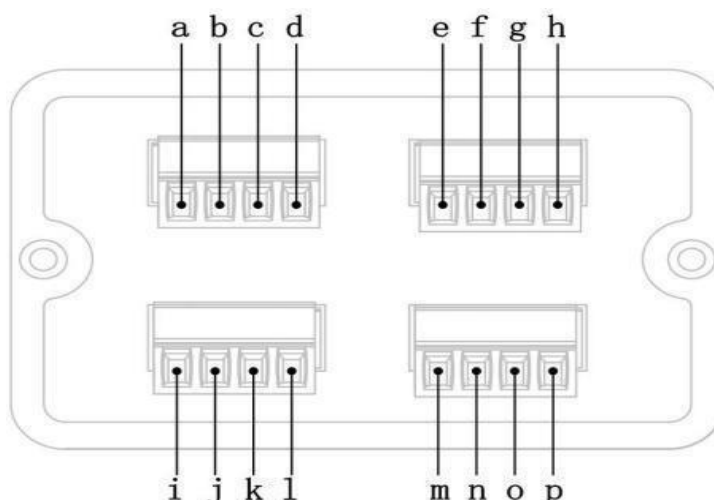
Use shielded cables for signal input and output.

Note

- Do not place these signal cables side by side with the power cord, otherwise electromagnetic induction noise will be generated and may cause failure or loss. When
- Using mechanical relays for signal input, the minimum load should be 5mA or lower.
- Tighten the skirt plate as much as possible to achieve a firm connection.
- Use voltage-free contacts or open-circuit collectors for external pulse signal.

Connection definition

For more information, see the figure below.



When using analog proportional control

Note the polarity. Port (E) is 4-20mA positive (+) and port (F) is 4-20mA negative (-).

When you use impulse control, batch control

When using open collector:

Note the polarity. Port (G) is positive (+), port (H) is negative (-).

When using non-voltage contacts:

Use mechanical relays designed for electronic circuits. The minimum loading shall be 5mA or lower.

When the STOP function is used

When using open collector:

Note the polarity. Port (C) is positive (+), port (D) is negative (-).

When using non-voltage contacts:

Use mechanical relays designed for electronic circuits. The minimum loading shall be 5mA or lower.

When interlocking is used

When using open collector:

Note the polarity. Port (M) is positive (+), port (N) is negative (-).

When using non-voltage contacts:

Use mechanical relays designed for electronic circuits. The minimum loading shall be 5mA or lower.

When using the alarm output function

The metering pump provides a passive dry node mechanical relay port at port (O) and port (P) with a maximum load current of 4A.

When using analog proportional signal output

Note the polarity. Port (K) has a positive (+) output from 4 to 20mA, and port (I) has a negative (-) output from 4 to 20mA.

Metering pump can provide DC12V power interface

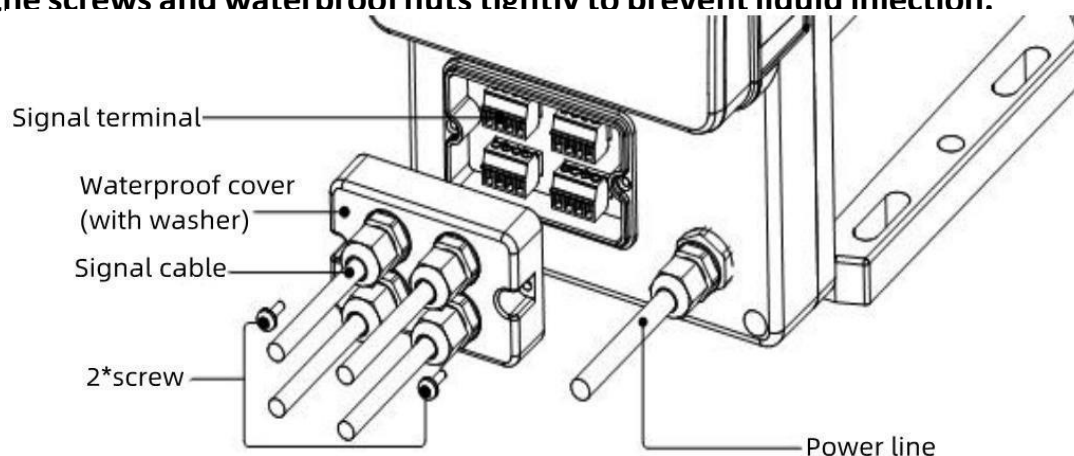
Note the polarity. Port (A) is positive (+) and port (B) is negative (-). The maximum external load current is 50mA.

* Note: When the external load exceeds the allowable load current by 50mA, the metering pump will work abnormally or fail.

When using MODBUS RS485 communication to read metering pump data

Note the polarity, port (I) is (A) and port (J) is (B).

Please install the signal cable in the following way. After installation, please fix the screws and waterproof nuts tightly to prevent liquid injection.



Operation

This section describes the operation and setup of the pump. Run pump after piping and wiring is complete.

Preparatory Work Before Operation

First check that the plumbing and wiring are correct. Then debug it before it starts running.

Check Point

Before running, check whether:

- The liquid level in the feeding tank is sufficient.
- The pipes are securely connected without leakage and blockage.
- The discharge/suction valve is open.
- The voltage range is correct.
- The electrical wiring is correct and there is no risk of short circuit and leakage.

Retighten pump head retaining bolts

Important information

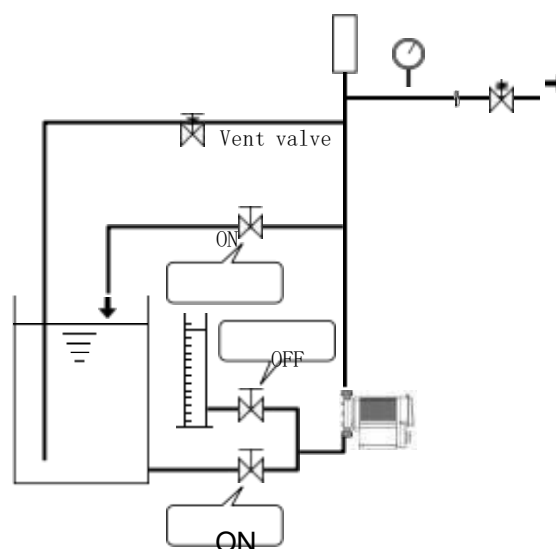
When plastic parts creep due to temperature changes during storage or transportation, the pump head retaining bolts may become loose, which can lead to leakage. Be sure to retighten the bolts evenly in diagonal order before starting operation.

* It is recommended that the fixing bolts be tightened every three months.

Debugging

When installing the pump into the system for the first time or resuming operation after a long downtime, be sure to debug it.

- 1 Open the exhaust port and suction line.
Please do not open the calibration line (if any).



- 2 Provide voltage rating for pump.
- 3 Start the pump at a low flow rate and gradually increase the flow rate to the target rate. Continue running for 10 minutes to check the pump and pipes for abnormalities.
- 4 Close the exhaust line and lead the liquid to the main road.

Before a long period of downtime (one month or more)

Clean the overflow end and inside the pipe.

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

Preparation before removing the pump

- Be sure to stop the pump by pressing the button and wait for three seconds before removing the pump. Otherwise, the last key operation may not be stored
And the pump, when energized, will accidentally start running and drain the liquid.

When the pump does not deliver liquid after resuming operation.

- Clean valve set and remove foreign matter.
- If there is air in the pump head, it shall be discharged by the above commissioning procedure.

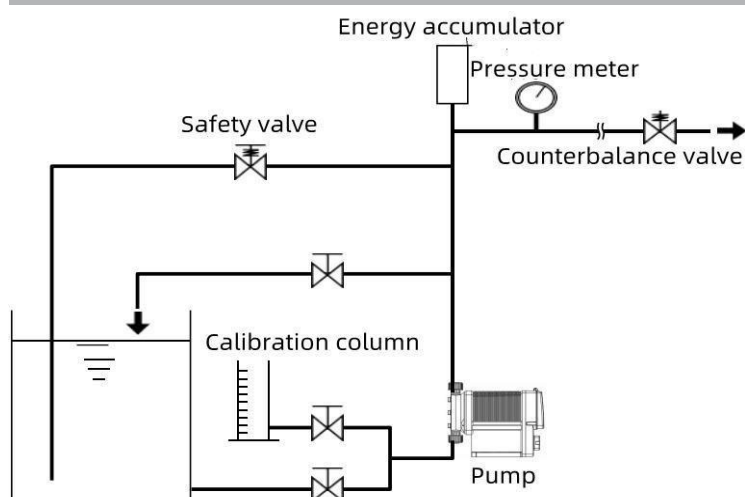
Calibration is performed regularly to monitor accurate flow rate through the control display.

Prior to delivery, the pump has been calibrated (without user specification) by pumping clean water at maximum operating pressure, however, if necessary

Please calibrate again under actual working conditions. Perform the calibration process described on the next page.

Note

The flow rate displayed on the screen is based on the calculation of the calibration process, not actual.



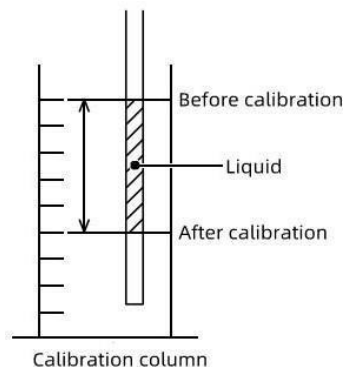
Calibrate to determine fluid flow per stroke. Arrange piping according to the instructions to ensure proper alignment.

Recommended pipe layout

Use a calibration column that has been connected to the suction lines.

Calibration Executive

Wrong sample:

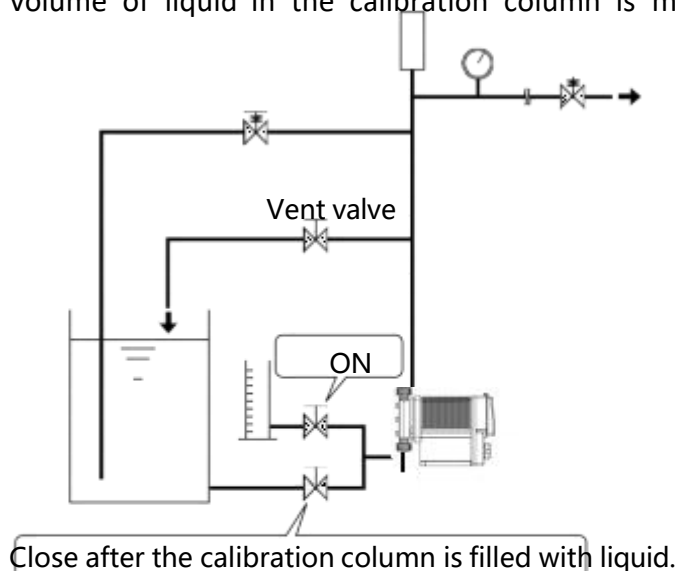


Do not immerse the calibration line in the liquid in the calibration column. The fluid capacity in the tube will be added to the tested fluid capacity and the calibration will be incorrect.

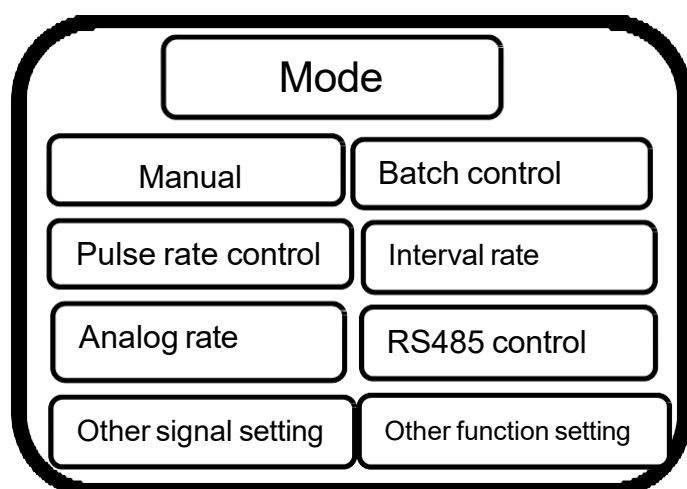
Calibration Process

The exact flow rate per stroke was obtained by dividing the volume of liquid delivered by the number of strokes.

- 1 Inject liquid into the calibration column. Open the calibration line and direct the liquid from the feeding tank to the calibration column. The suction line is then closed and the volume of liquid in the calibration column is measured.



- 2 Provide voltage rating for pump and set flow rate in manual mode.
Note: The calibration accuracy will not change at any flow rate. The higher the flow rate, the shorter the time required, and vice versa.
- 3 Select the calibration mode from the menu
- 4 Calibrate the operation Settings. Set the wait time and number of strokes. The number of strokes should be determined based on the volume of liquid in the calibration column. Wait time before starting the calibration operation: 10 (default) - 999 seconds Number of strokes: 60 (default) - 120



Press the menu key to enter the mode selection interface.
Select other functions.
Press Enter

Other function setting	
Drawing back rate setting	Calibration
Alarming output setting	Languages
Parameters view	Change the membrane mode
Resume to default setting	Analog signal output setting

To enter other function Settings.
Select pump calibration .
Press Enter.

Calibration	
Waiting	**
Stroke(s/min)	**
Calibration	**
Start	Done

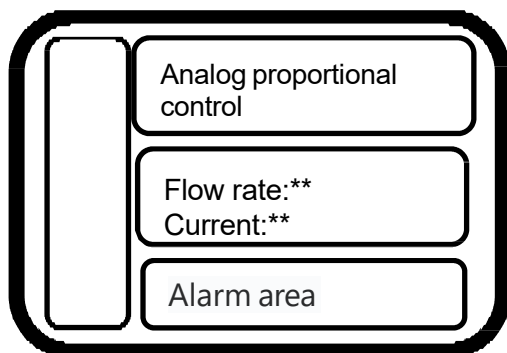
Use the left and right keys to set the waiting time.
Use the left and right keys to set the number of strokes.
Start calibration, press Enter
Use the left and right keys to enter the volume reduction.
When you're done, hit Enter

Analog proportional control setting

1. Press the menu key to select Analog proportional control. The analog signal calibration screen is displayed.

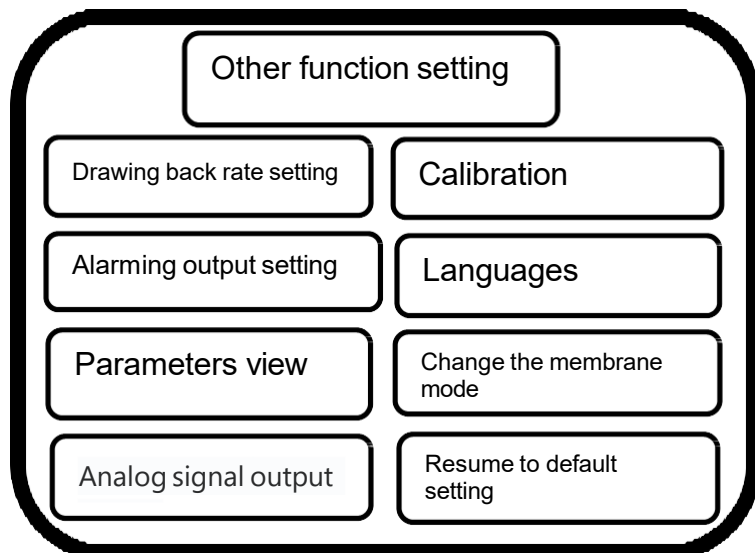
Analog proportional control setting	
Present signal	**
4mA signal calibration	Confirm
20mA signal calibration	Confirm
20mA flow rate setting calibration	**
	Done

2. Current Signal value Displays the current recognized current value. External input 4mA analog signal to the pump, select the confirmation calibration of 4mA signal calibration, calibrate 4mA signal.
3. Current Signal value Displays the current recognized current value. External input 20mA analog signal to the pump, select 20mA signal calibration confirmation calibration, calibration 20mA signal.
4. Enter the flow rate corresponding to 20mA.
5. When the selection is confirmed, the simulation proportional control interface is entered. The metering pump will run automatically according to the set flow rate.



Analog proportional output setting

1. Press the menu key and select Other functions. The screen for setting other functions is displayed.



2. Select analog output Settings and change the flow rate corresponding to 20mA.

