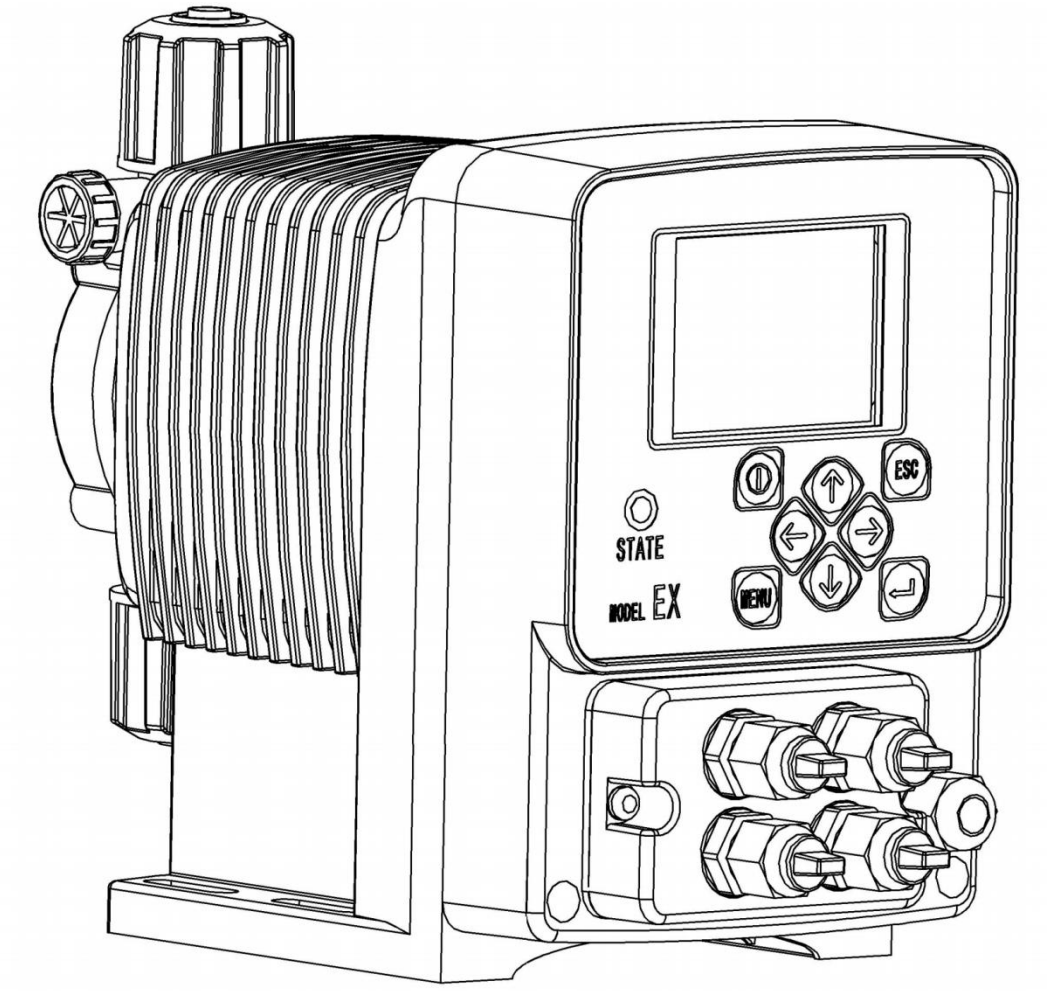
Digital Diaphragm Metering Pump
EX-B Serial
Operation Manual



Please read these instructions before use.

Thank you for choosing the EX-B series digital metering pump. This manual covers "Safety", "Function overview", "Operation demonstration", "Signal wiring" and "Product size". Please read this manual carefully to ensure the best performance and safety of the EX-B series.

Content

Important Note 1
Function Overview 3
1. Structure and Working Principle of the Pump 3
2. Characteristics 4
3. Model Identification and Selection 5
Operation Instruction 5
1. Preparations before operation 5
2. Commission 6
3. Calibration 7
Signal Wiring 8
1. Signal Line Connection 8
2. Operation Function 9
Installation Drawing 15

Important Note

For safety, please operate the pump correctly.

"The section" Safety Instructions" contains important details about the handling of the product. Please read this notice carefully before use to avoid personal injury or property damage.

Please comply with the "Warning" or "Precautions" instructions attached to this manual. These instructions are important for protecting users from dangerous situations.

The symbols in this manual are defined as follows:

Matters marked "warning" and "caution" must be carried out. Non-compliance or incorrect operation of the "warning" section may lead to serious accidents, personal injuries, property damage and even death.

Indicates a prohibited action or operation. The sign depicts the behavior to be avoided.

Indicates that the pump must be executed or operated correctly. Failure to comply with these instructions may result in pump failure or damage.

Warn	
Turn off the power Failure to disconnect the power supply during operation can cause electric shock. Before performing any work procedures involving the pump, be sure to turn off the power switch and stop the pump and other related equipment.	 **Electric Shock**
Terminating operation When the dangerous sign or abnormal situation is found or realized during the operation, the operation should be stopped immediately and re-operated.	
Only for specified purposes The use of the pump without clear specifications may cause damage to the pump. Use the pump in strict accordance with the specifications and scope of use of the pump.	 **Prohibit**
Modification is prohibited Do not modify the pump. Otherwise, serious accidents may occur. The company is not responsible for any accident or damage caused by unauthorized or instructed modification of the pump by the user.	 **Renovation is prohibited**
Pay attention to protection If you touch or come into contact with any type of hazardous chemical liquid, including but not limited to chemicals, you may be seriously injured. Wear protective equipment (protective mask, gloves, etc.) when the pump is running.	 **Precautions**

Cautions

Only applicable to qualified operators The pump operator shall not allow any operator who knows little or nothing about the pump to operate the pump. The operator must have a full understanding of the pump and its operation.	 **Prohibit**
Only for specified voltage Do not operate the pump at a voltage not specified on the nameplate. This may cause damage or fire.	 **Prohibit**
Do not play empty Do not run the pump dry (no liquid in the pump). In the absence of liquid, heat generated by friction between internal components of the pump may damage the interior of the pump.	 **Prohibit**
Keep dry If electrical components or wires are wet with accidentally spilled liquids, fire or electric shock may occur. Install the system in a place where there is no spillage or leakage of liquids.	 **Keep Dry**
Pay attention to ventilation to prevent overflow Involvement in the handling of toxic or odorous liquids may lead to poisoning. The workplace shall be adequately ventilated. Protective measures should be taken to prevent accidental overflow or leakage of the working liquid due to accidental damage to pumps or related pipelines.	
Do not use faulty pumps Do not operate a damaged pump. A damaged pump may cause leakage or electric shock.	 **Prohibit**
Do not damage or replace the power cord Do not scratch, damage, process or pull power cables forcefully. Additional loads on cables, such as heating cables or placing heavy objects on cables, may damage the cables and eventually lead to fire or electric shock.	 **Caution**
Grounding layout Do not operate the pump without connecting the grounding wire. Otherwise, electrical shock may occur. Ensure that the grounding wire is connected to the grounding terminal.	 **Grounding**
Handling of power cables The use of defective or damaged electrical cables may cause fire or electric shock. Handle power cords with care.	
Follow the instructions Replace consumable parts as described in the instructions. Do not disassemble any parts of the pump if the instructions do not contain a disassembly procedure for the parts. The disposal of used or damaged pumps must be carried out in accordance with local relevant laws and regulations. (Consult a licensed industrial waste disposal company.)	
Limited operating locations and storage space Do not install or store the pump in the following locations: where flammable gases or materials are used or stored. Where ambient temperatures are extremely high (40 ° C or higher) or extremely low (0 ° C or lower).	 **Prohibit**

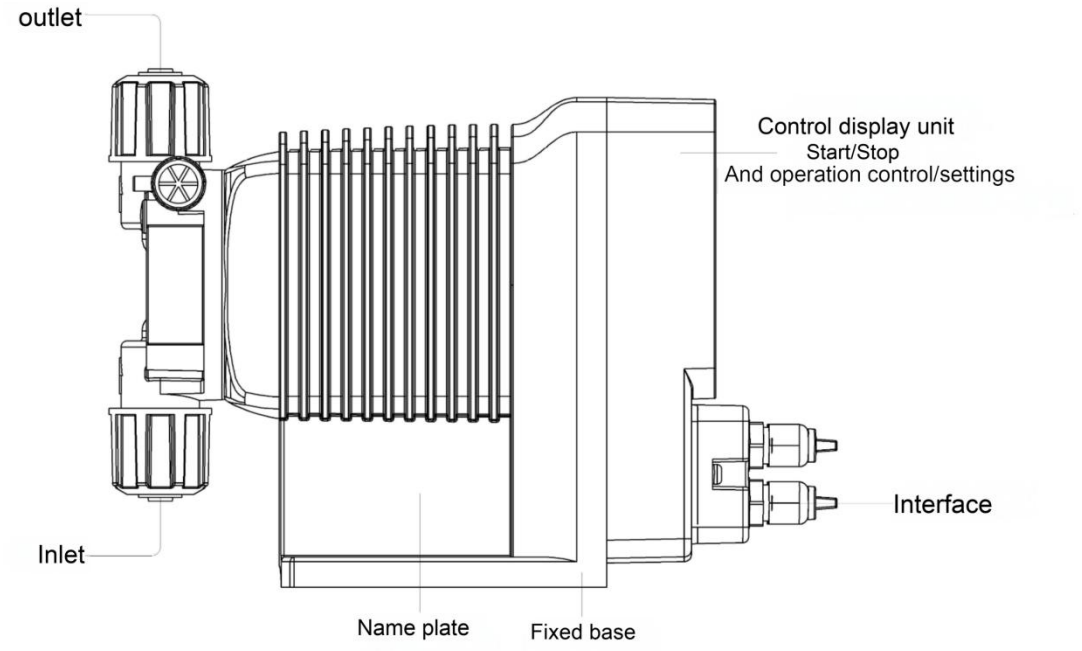
Function Overview

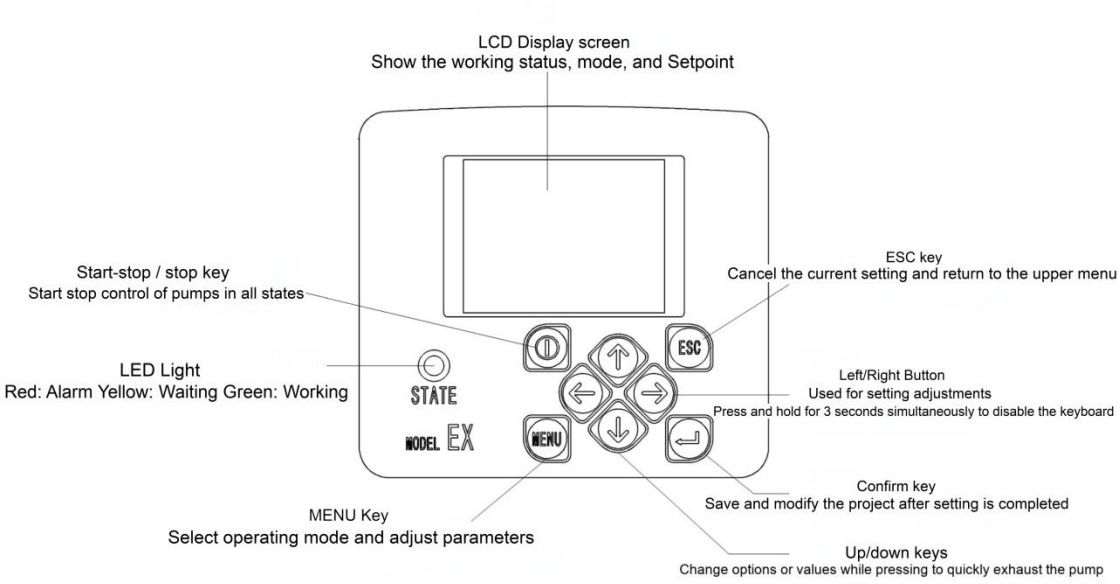
This section introduces the principle, characteristics and model selec- tion of the pump.

1. Structure and Working Principle of the Pump

The EX-B series products use a stepper motor, which is a diaphragm metering pump with high regulation ratio and highly integrated automatic control functions. In the design of the EX-B series, the flow rate is controlled by the rotation of the stepper motor. The motor's rotational motion is transmitted through a reduction gear to an eccentric cam, which then converts into reciprocating motion. As the diaphragm moves back and forth and the liquid is conveyed through the check valves for suction and discharge, the volume of the pump chamber changes. The reciprocating speed alters the flow rate, while the suction rate remains constant under any flow conditions.

EX-B Main Structure





2. Characteristics

- High adjustment ratio
  Using a stepper motor, highly integrated industrial electronic control can achieve precise control and feedback, and has a high adjustment ratio.
- Anti-cavitation and high precision
  Can independently and accurately control the inhalation/exhaust speed, can transport high viscosity and easily decomposed liquids, to ensure the high repeatability of chemical dosage (± 1%).
- High integration density
  Small size, high integration, friendly installation.
- Auto Control
  EX-B can automatically operate according to the operation setting of simulation, pulse, batch or interval batch.
- Wide voltage operation
  The EX-B series uses a wide power supply voltage (100-240VAC) and can be used in all contries/ regions.
- Plenty of control signals
  Pulse signal, current signal input and output, STOP, emergency stop, alarm and RS485, and other interfaces to meet a variety of complex working conditions.
- Humanized design, LED indicator light
  The visual screen can clearly and intuitively understand the dosage. The LED indicator on the control unit can clearly display various running states and alarm conditions.
- Standard PVDF pump head
- The exterior is made of high strength composite material, excellent structural design, further improve the chemical corrosion resistance.
- Overpressure alarm function

If the output pressure exceeds the pump operating pressure, the metering pump can automatically stop running and alarm to avoid the metering pump being burned out due to over pressure.

- It has IP65 protection level
  With a waterproof and dustproof rating of IP65, it can be used in harsh working environments.
- Low pulse output
  Fast pumping, slow beating and low pulse, precise dosing is realized through the motor, which realizes the innovation of dosing and opens a new chapter of intelligent dosing of metering pump.

3. Model Identification and Selection

EX - B 30 F R
a b c d e

a. Series name: EX

b. Driving device : B

c. Head (maximum flow rate)
06 : 6 [L/H] 20 : 20 [L/H] 30 : 30 [L/H]

d. Liquid end material : PVDF

e. Connection:
R: Hose

Model selection

Model	Max Pressure Mpa	Max Flow L/H	Power	Voltage	Hose Size mm
EX-B06FR	1.0	6	22 W	AC100-240V	4*6
EX-B20FR	0.3	20			8*10
EX-B30FR	0.3	30	24 W		

Operation Instruction

This section describes the pump's commissioning, calibration, operation, and other functions.

1. Preparations before operation

First check that the pipes and wiring are correct, then debug before starting up.

Check points

Before operation, check whether:

- The liquid level in the drug tank is sufficient.
- The pipeline is firmly connected, no leakage and blockage.
- The expel/inhale valve is open.

- Voltage range is correct.
- Electrical wiring is correct and there is no risk of short circuit or leakage. Tighten the pump head fixing bolts again

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* important information

When plastic parts creep due to temperature changes during storage or transportation, the pump head fixing bolts may loosen, which can lead to leakage.

Before starting operation, be sure to retighten the bolts evenly in diagonal order.

It is recommended to tighten the fixing bolt once every three months.

2. Commission

When the pump is first installed in the system or when it is restored after a long shutdown, commission must be performed.

1. Open the exhaust port and suction line.

Please do not open the calibration line (if any).

2. Provide rated voltage for the 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 and check for any abnormalities in the pump and piping.

4. Close the exhaust pipe and introduce the liquid into the main line. Before a long shutdown (one month or more)

Clean the overcurrent end and inside the pipe.

Run the pump with water for about 30 minutes to flush out the chemicals.

Preparations before removing the pump

Be sure to stop the pump by pressing the button and wait three seconds, then remove the pump. Otherwise, the last button press may not be stored in memory, and the pump will start running unexpectedly when powered on, discharging liquid.

When the pump does not convey liquid after resuming operation

- Clean the valve group and remove foreign matter.
- If there is air in the pump head, air is discharged through the debugging program mentioned above.

Calibrate regularly and monitor the precise flow rate by controlling the display screen.

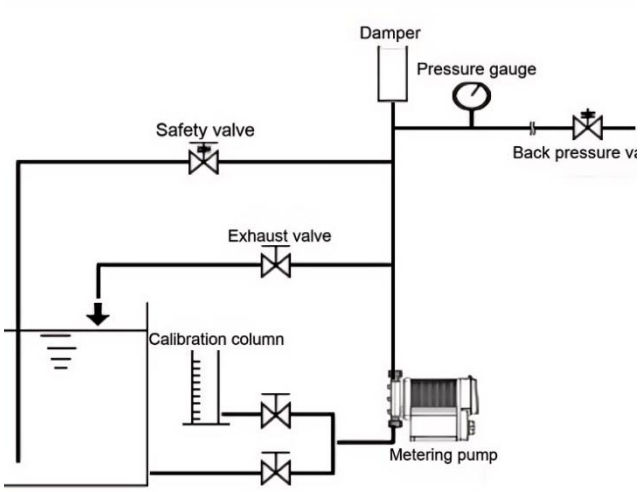
Before shipment, (unless specified by the user) the pump has been calibrated by pumping clear water at maximum working pressure, but please recalibrate under actual working conditions if necessary. Perform the calibration process described in this specification.

***Cautions**

The flow rate displayed on the screen is based on a calculated value from the calibration process, not the actual flow rate.

Calibrate to determine the liquid flow per stroke. Arrange the piping system according to the following instructions to ensure correct calibration.

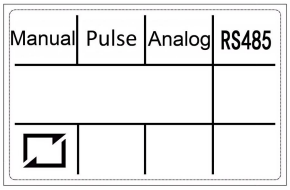
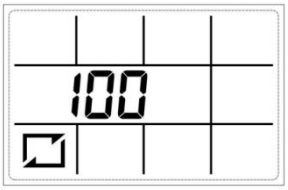
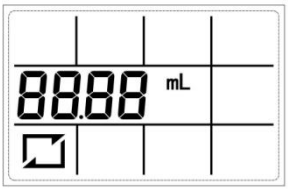
Recommended piping arrangement.



* Use a calibration column connected to the suction line.

3. Calibration

Calibration process

1	In manual mode, press the up and down keys simultaneously to perform the exhaust action at the highest frequency.
2	After the exhaust, open the calibration pipeline, guide the liquid from the chemical supply tank to the calibration column, mark it, and start the calibration.
3	The calibration mark is in the lower left corner of the screen. Press the left or right key, select the calibration mark, click OK, and enter the calibration interface. 
4	The screen displays the number of strokes. Click OK and the pump starts working. 
5	After the screen displays all strokes, the pump stops working.
6	Record the data, click OK, and enter the calibration data in the calibration column. 
7	Click OK to complete the calibration.

Signal Wiring

This section describes the signal line connection and operation of the pump.

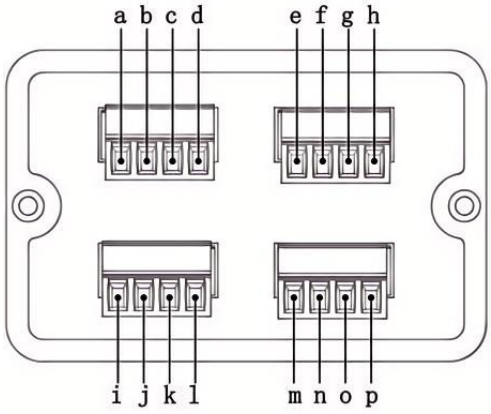
1. Signal Line Connection

* Cautions

- Check that the power supply is off.
- Use shielded cables for signal input and output.
- 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 5 mA or less.
- Tighten the skirt plate as much as possible to achieve a firm connection.
- Use a voltage-free contact or an open collector for the external pulse input signal.

Definition of wiring

For more details, see the figure below.



● **The EX-B series ports are illustrated as follows:**

√ *When analog proportional control is used*

Note polarity, port (e) is 4-20mA positive (+), port (f) is 4-20mA negative (-).

√ *When pulse control and batch control are used*

When using an open collector:

Note the polarity. Port (g) is positive (+) and port (h) is negative (-).

When using a voltage-free contact:

Use a mechanical relay designed specifically for electronic circuits.

The minimum load should be 5 mA or less.

√ When using the STOP function

When using an open collector:

Note the polarity. Port (c) is positive (+) and port (d) is negative (-).

When using a voltage-free contact:

Use mechanical relays designed for electronic circuits. The minimum load should be 5 mA or less.

√ When using interlock functions

When using an open collector:

Note the polarity. Port (m) is positive (+) and port (n) is negative (-).

When using a voltage-free contact:

Use a mechanical relay designed specifically for electronic circuits.

The minimum load should be 5 mA or less.

√ When using the alarm output function

The metering pump provides a passive dry node mechanical relay port for port (o) and port (p), with a maximum load current of 4A.

√ When using an analog proportional signal output

Note polarity, port (k) is 4-20mA output positive (+), port (l) is 4-20mA output negative (-).

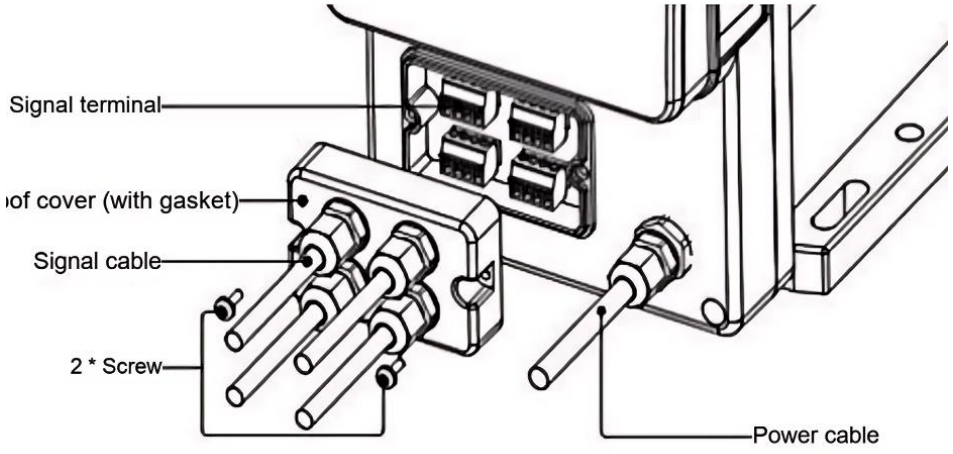
The metering pump can provide a DC12V power interface

Note polarity, port (a) is positive (+), port (b) is negative (-). The maximum external load current is 50mA.

*Note: When the external load exceeds the allowable load current of 50mA, it will cause abnormal operation or failure of the metering pump.

√ When using MODBUS RS485 communication to read the metering pump data

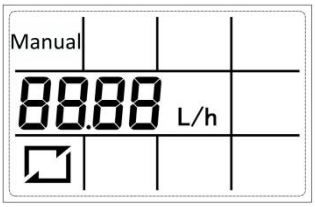
Note the polarity, port (i) is (A), and port (j) is (B).



2. Operation Function

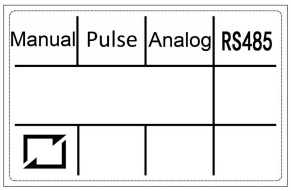
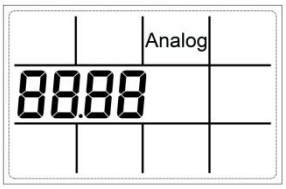
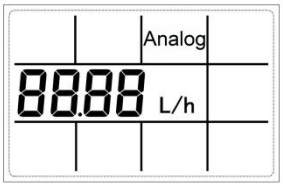
Manual Mode

The pump is operated by pressing the switch button to run or stop. During operation or stop, the flow rate can be changed at any time by pressing the up and down keys. During operation, it is green The LED indicator light will come on.



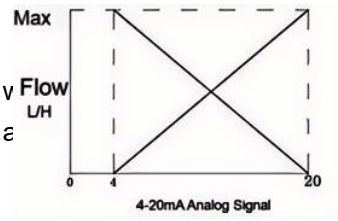
Auto Mode

● **Analog Proportional Control**

1	Select the simulated control mode of the main menu.	
2	Click OK and the interface displays the number of pulses.	
3	Click right mouse button to enter the 20mA calibration value setting.	
4	According to the flow rate required by 20mA, adjust the flow parameter of the liquid surface through the up and down keys.	
5	Click the confirm and start keys, enter the 4-20mA signal, and the pump can be automatically dosed under the control of the analog signal.	

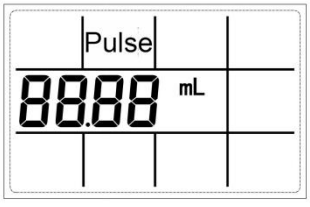
*** Cautions**

- The default flow value for a pump of 4 mA is 0 ml/H.
- If the external signal is less than 4mA, the pump flow rate v
- Under any current conditions, the pump will not operate at a maximum.



● **Pulse Control**

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

1	Select the pulse control mode of the main menu.
2	Click OK to enter pulse mode Settings.
3	The interface displays the injection amount corresponding to a single pulse, and presses up and down keys to adjust the injection amount corresponding to a single pulse. 
4	Click OK to complete the setting. Click the start button, and then input the pulse signal, and the pump can automatically add medicine under the control of the pulse signal.

* Cautions

- Control will stop immediately after pressing the key once.
- The EX-B needs about 10 seconds to catch up with the frequency change. In other words, the pump will still work 10 seconds after the pulse signal stops.

- **RS485 control**

Communication protocol is shown in the following table:

Classify	Data access type		Run	Hexadecimal function code		address (decimal system)	data definition	Data examples	
				a sign or object indicating number	subcode			Value	Note
Public code	coil (read -write)	1-bit access	Read the coil	0x01	NULL	00000	Pump start and stop	Read: 0, write: 0x0000	Shut off
			Write a single coil (1) (2)	0x05	NULL			Read: 1, write: OxFF00	On (valid only if the pump is set to 485 mode)
	Input storage implement (read only)	16-bit access	Read input registers	0x04	NULL	100	STOP input mode	0x0000: invalid input; 0x0001 valid input	
						101	Interlocking input status	0x0000: invalid input; 0x0001 valid input	
						102	running mode	0x0000	Set the mode
								0x0001	manual mode
								0x0002	Automatic mode-Batch mode
								0x0003	Automatic mode-pulse proportional control
								0x0004	Automatic mode-analog proportional control
								0x0005	Automatic mode-interval batch control
								0x0006	RS485 Mobbus control mode
						103	Output alarm status 1	0x0000	All work well
								0x0001	STOP exception
								0x0002	Interlock stopped
								0x0004	Overloading and drive unit error
								0x0008	Other faults
		FLOAT				104	Minimum flow rate	Unit: litres	
		FLOAT				106	Max Flow Rate	Unit: litres	
		FLOAT				108	Total pump flow	Unit: litres	
	holding register	16-bit access	Read the holding register	0x03		200	Modbus address	The range of values is [1~247], and the default value is 1	
		FLOAT	Write multiple holding registers	0x10	NULL	201	RS485 mode flow rate-L	The value is between the minimum and maximum flow rates. Unit: litres	
Encapsulate interfaces	Device identification code (read only)		Read the device identification code (Only basic device identifiers are supported, access classes Type: 01)	0x2B	0x0E	0	Producer name	ASCII string: "LANGO PUMP"	
						1	Product code	ASCII string: "DH Series"	
						2	Main revision	ASCII string: "Ver1.0.0"	

Error Code Definition		
Code	**Name**	**Meaning**
1	Illegal function	Function code is not supported.
2	Illegal data address	Modbus register address request error.
3	Illegal data value	The Modbus register data is incorrect.

- Only one circle is supported
- Hexadecimal value 0XFF00 requests the circle to be ON. Hexadecimal value 0X 0000 requests the circle to be OFF. All other values are illegal and have no effect on the circle.

Reference standard: GB/T 19582.1-2008 "Industrial Automation Network Specification based on Modbus Protocol-Part 1: Modbus Application Protocol"

Serial Port Connection		
No.	Item	Numerical Digit
1	data bit	8 Position
2	stop bit	1 Position
3	check bit	not have

No.	Register Type	Starting Address (decimal)	Number of registers
1	Discrete output (coil)	0	1
2	incoming register	100	10
3	holding register	200	3

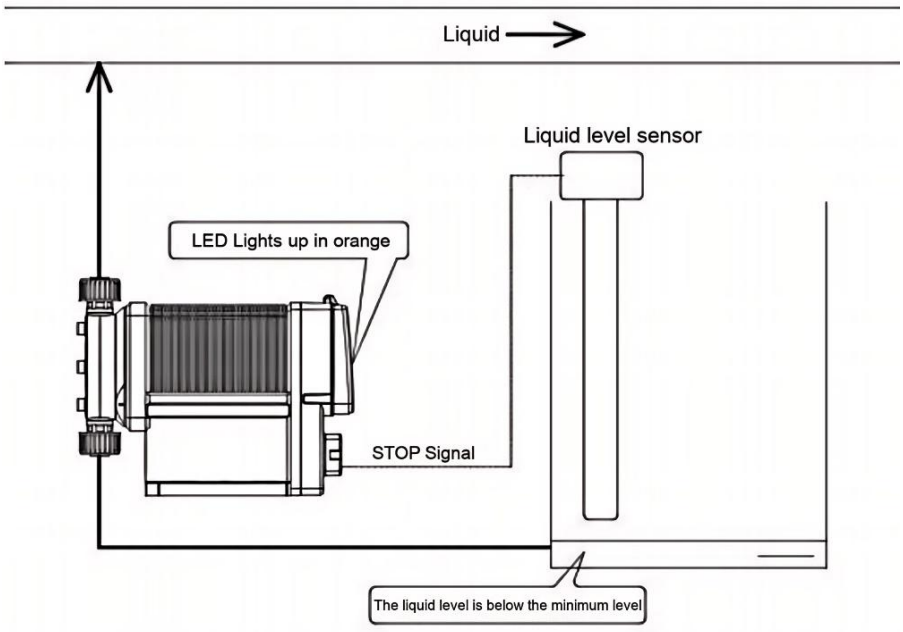
- **<u>Inflow Function</u>**

When both the up and down keys are pressed at the same time, the pump operates at the maximum stroke speed (200spm) set by the manufacturer. This function can be used for injection or exhaust. Release both keys at the same time to stop the pump.

* This function is available at any time when the pump is in standby mode or operation mode.

- **STOP Function**

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



● Overpressure Protection Function

When the pump detects that the pressure exceeds the rated pressure, it will alarm and output. After troubleshooting on site, restart the pump by pressing the key or trigger the start again with STOP signal.

- **Output Function**

● Alarm Output Function

Output of emergency stop, overload pressure detection or drive device error detection function.

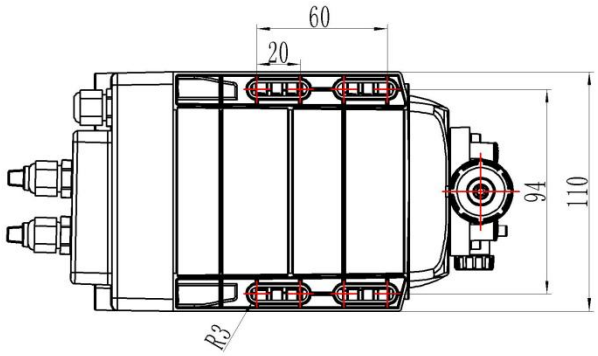
Alarm output: mechanical relay output (no voltage contact 30VDC/ 250VAC 3A, resistance load)

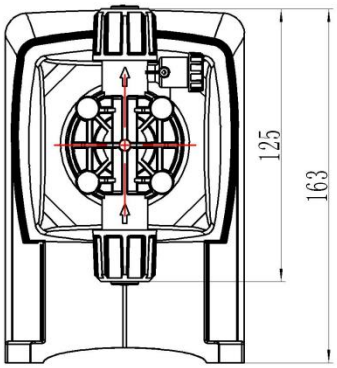
● Analog Output Function

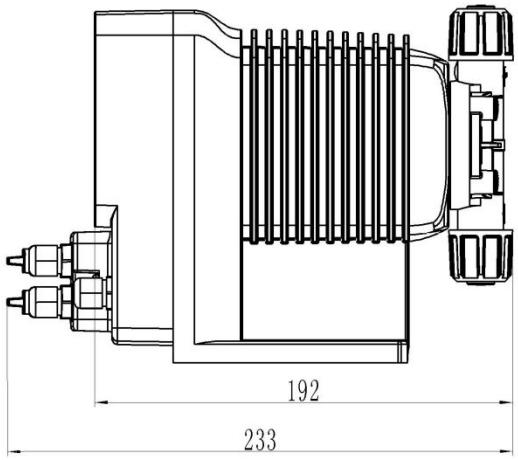
The pump transmits the 4-20mA analog signal in proportion to the preset flow rate.

Installation Drawing

EX-B06FR







EX-B20FR

EX-B30FR