S36 Micro Vacuum Liquid Pump

User Guide

Issue 07

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About This Document

Purpose

This document is related to the S36 micro vacuum liquid pump products,which is used to guide relevant technical personnel to initially understand the characteristics of the product.

Intended Audience

This document is intended for technical personnel. You should have a good understanding of your product and have a clear concept of the relevant parameters, specifications, and other information of the applications of the micro pump.

Keyword

LCD touchscreen speed control, frequency speed control, anti-loosening connector, knob speed control, related parameters, wiring instructions

Change History

Issue	Date	Description
01	2020-07-08	This issue is the first official release.

Contents

1 Characteristics

1.1 Working Status Indicator

The knob speed control type and frequency speed control type are equipped with working status indicator lights, which can visually feed back the working status of the pump. The Top configuration type is equipped with an LCD touch screen that can display working status and fault codes.

1.2 Brush-less DC Motors

This model is driven by brushless motors which have the advantages of long service life, low interference and high reliability.

1.3 Protections

Equipped with overheating protection, overload protection, power supply under-voltage and over-voltage protection and reverse connection protection function (except the basic type), which to the greatest extent prevents accidental damage to the pump.

1.4 Gas-liquid Dual Purpose

Liquid-gas dual-use, can be used as a liquid pump or a vacuum pump, can also be used to transfer gas-liquid mixed media; dry-run and self-priming

1.5 Modular Hydraulic Connector

This series of pumps has Rc1/8 internal thread interface, which can be installed with stainless steel push-in connectors (6mm and 8mm inner diameter), stainless steel hose connectors and PP hose connectors. This product is equipped with PP hose connectors as standard. The standard PP plastic hose connectors and the optional stainless steel hose connectors are recommended to match with 7*13 silicone hose. The size of the tube can be appropriately changed according to the softness and hardness of the hose.There are two options of stainless steel push-in connectors for matching with 6*8 or 4*6mm hard tubes. The user can select the corresponding hydraulic connectors when ordering according to the pipeline situation. For ordering options, see section 3.5.

2 Special Functions

2.1 Speed Control Function

The flow rate of the pump can be changed by adjusting the motor speed. The Top configuration type is equipped with an LCD touch screen and speed control signal interface, which can be used to start and stop and control the motor speed through the LCD touch screen, and also through frequency signals. Knob speed control type models have an external speed control knob, which can control the speed, start and stop of the pump. Frequency speed control type models can be controlled by user inputting frequency signal. Please refer to Chapter 5 Electrical Connection for specific usage of different speed adjustment methods.

2.2 Working Status Indication and Warning

1.The knob speed control type and frequency speed control type are equipped with working status indicator lights. Users can understand the working status of the equipment through the color change of the indicator lights:

When the green light is constantly on, it means that the power supply is normal and the pump is not working;

When the green light flashes, it means the pump is working normally;

When the red light flashes, it means the pump is working abnormally;

When the positive and negative poles are reversed, the indicator light is off, the pump does not work, but it will not damage the pump.

2. The touch control type and top configuration type are equipped with an LCD touch screen. Alarm codes will be displayed when different faults occur, which makes fault handling more convenient. (The figure below is for illustration only, please refer to Chapter 5 Alarms and Troubleshooting for details.)

2.3 State Memory Function

When the pump is stopped due to abnormal power failure, the pump will continue to run according to the state and speed of the last power-off when the power supply is recovered. When using the knob or touch switch to start the pump, the pump will continue to run at the speed before the last shutdown. (**Note:** This function is only valid on the frequency speed control type, knob speed control type and top configuration type.)

3 Technical Specifications

3.1 Key Specifications

Model	Voltage (V DC)	As a Vacuum Pump			As a Liquid Pump		Size (mm)	Weight (g)
		Load current (mA)	Flow Rate (L/min)	Relative Vacuum (-kPa)	Load current (mA)	Free Flow Rate (Pure Water) (L/min)		
S36L	24	≤550	≥2.2	≥23	≤650	≥3.0	143*63*83	≈450
S36M	24	≤500	≥1.6	≥15	≤550	≥2.0	143*63*83	≈450
S36S	24	≤450	≥1.0	≥9	≤500	≥1.3	143*63*83	≈450

Note: 1. The input voltage requires 24V±10%.

2. Unless otherwise specified, the technical parameters are measured under the conditions of temperature 25℃ and standard atmospheric pressure of 101kPa. For products with other parameters and specifications, you can contact us to customize.

3. The parameters in the table are measured at the maximum speed of the motor. When the motor speed changes, the pressure/vacuum level is basically unchanged.

4. The above parameters are measured under the configuration of standard PP plastic hose connectors. If other types of connectors are configured, the parameters may change slightly.

5. The average flow rate in the table is the flow rate value measured with a soap film flow-meter.

Model	Max. Suction Height (mWg)	Flow Rate@ Max. Suction Height	Max. Pressure Height (mWg)	Flow Rate@ Max. Pressure Height
S36L	3m	2.0L/min	11m	0.8L/min
S36M	2m	1.5L/min	9m	0.8L/min
S36S	1.7m	0.8L/min	7m	0.5L/min

Note: The maximum pressure height flow rate refers to the water flow rate at the maximum pressure height.

The maximum suction height flow rate refers to the water flow rate at the maximum suction height.

The above data is measured by pressure substitution method (water pressure instead of water height), for reference only.

3.2 Description of Types

Types	Function and Configurations
Basic Type	Equipped with brushless DC motor, long service life, low electromagnetic interference, and non-adjustable motor speed.
Knob Speed Control Type	Equipped with working status indicator and speed control knob switch, through the knob to adjust the speed, start and stop of the pump.
Frequency Speed Control Type	Equipped with working status indicator, equipped with a signal port to adjust the speed,start and stop through the input frequency signal.
Top configuration Type	Not only equipped with an LCD touch screen to control motor speed and display fault code, but also equipped with speed regulation and feedback signal port.

3.3 List of Models Combination for Sale

Combinations	Simplified Version	Standard Version	premium Version
Basic Type	√	Customizable	Customizable
Frequency Speed Control Type		√	√
Knob Speed Control Type		√	√
Top Configuration Type			√

Note: √ in the above table means that there is a corresponding product for sale, unchecked means that there is no corresponding product. (The above table does not include customized products)

3.4 Versions Description

Version / Performance	Simplified Version	Standard Version	Premium Version
Life-time	≥2500h	≥6000h*	≥9000h*
Reliability	★	★★	★★★
Parameter consistency	★	★★	★★★
EMC	★	★★	★★★
Ambient temperature	0~40℃	0~50℃	0~50℃

Note: 1. The more ★, the better performance of this item.

2. * Indicates that the life-time of the standard version and premium version is still under test, which is expected value.

3.5 Options of Modular Connectors

Connector Option	Material	Recommended Hose/Tube
Default PP plastic hose connector	PP (polypropylene)	Silicone hose with inner diameter 6~7mm
Stainless steel hose connector	Stainless steel	Silicone hose with inner diameter 7~8mm
PC6 push-in connector	Stainless steel	6mm outer diameter hard tube
PC8 push-in connector	Stainless steel	8mm outer diameter hard tube
Nylon Rc1/8 internal thread	fiber reinforced nylon	Install connectors above or other kind of connectors

Note: The products are shipped with PP plastic hose connectors by default. If you need to configure other types of connectors, please specify when ordering.

3.6 Life-time Test Conditions

In a clean and non-corrosive laboratory, the pump inlet connected to the silicone hose extends below the surface of clear water, and the outlet connected to the silicone hose extends below the surface of clear water, running continuously around the clock; ambient temperature 5 ℃ ～ 33 ℃ , fluctuating with the climate; relative humidity 30% to 85%, fluctuating with the climate.

3.7 Working Conditions

1. Environment: Permissible ambient temperature range of the simplified version products is 0 ℃ ～ 40 ℃ , and the permissible ambient temperature of the standard and premium versions is 0℃～ 50℃. The permissible relative humidity of all pumps in this series is ≤90%, no condensation. The pump should not be exposed to the sun, and should work in a clean and ventilated environment.

2.Medium: Permissible gaseous media temperature range is 0℃～50℃. The medium is allowed to be rich in water vapor, but cannot contain particles or oil mist. The permissible liquid medium temperature range is 5℃~50℃. It is not allowed to pump oily liquid and high viscosity liquid.Do not use this product to transfer liquid that is easy to precipitate and crystallize for a long time.

3. Load: The suction port can run with full load (ie completely block the inlet), but the load applied by the inlet cannot exceed the maximum vacuum of the pump. Do not block the outlet when pumping liquid.

Note：1. Customers who have special requirements for the medium temperature can customize a high-temperature medium model. The customized high-temperature models are only available in premium versions, such as S36L-43D-GJ (the premium version equipped with a high-temperature medium feature, which allows gaseous medium temperature range of 0°C～100°C)

2. The inlet of the micro vacuum pump can carry a large load or even being completely blocked is permissible operation. The outlet of the pump must be unobstructed, and there must be no damping elements in the exhaust line!

3.8 Pump Materials

1. The materials of the wetted parts: fiber reinforced nylon, EPDM rubber, depending on the type of optional hydraulic connectors, it may also be in contact with PP polypropylene and stainless steel. Please check the chemical resistance and compatibility of the medium according to the wetted material.If you have special needs, you can customize or change the material of hydraulic connectors.

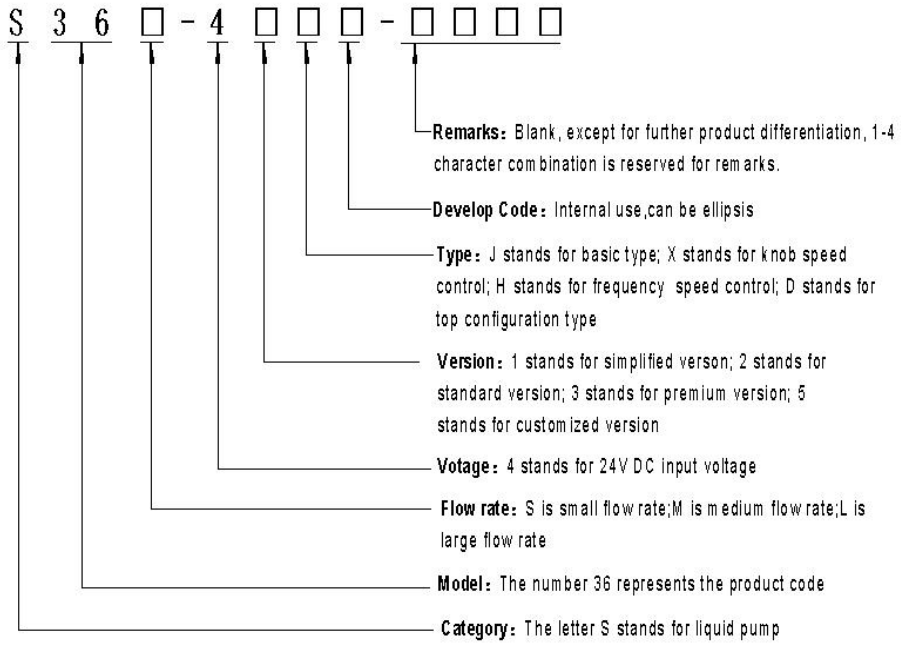
2. The material of the plastic parts of the pump body is fiber reinforced nylon, and the material of the shock absorb foot is PVC.

3.Before using a corrosive medium, check the compatibility and the chemical resistance of the wetted material of the pump.

4 Product Model Description

4.1 Brief Description of Model Naming

This series of products are divided into three versions: simplified version, standard version and premium version and divided into four types of configurations: basic type, knob speed control type, frequency speed control type and top configuration type. Please specify the version and configuration type when ordering.



Note: If the remarks starts with a letter, it means a special custom function. For example, letter"GJ" means customized high-temperature medium function, and "GH", means customized high-temperature environment function. If it starts with a number, it means other information.

Example 1: S36L-42X (S36 pump with large flow-rate,24V input voltage, standard version, knob speed regulation type)

5 Electrical Connection

5.1 Basic Type

Wire	Input	Definition	Explanation
1Red	VCC	24V Power supply	Rated voltage 24V±10%
2Black	GND	Ground	Connect to the negative pole of DC power supply

Table 5-1 Wiring Instruction for Basic type

Note: Only have the pump connected by an authorized specialist;

Only have the pump connected when the power supply is disconnected.

This type does not have a speed regulation function. Please connect the wiring strictly according to the instructions in the table above, otherwise it will damage the motor.

User must make sure that the input voltage is 24V before wiring. The wrong input voltage will cause damage to the product and is not covered by the warranty.

5.2 Knob Speed Control Type

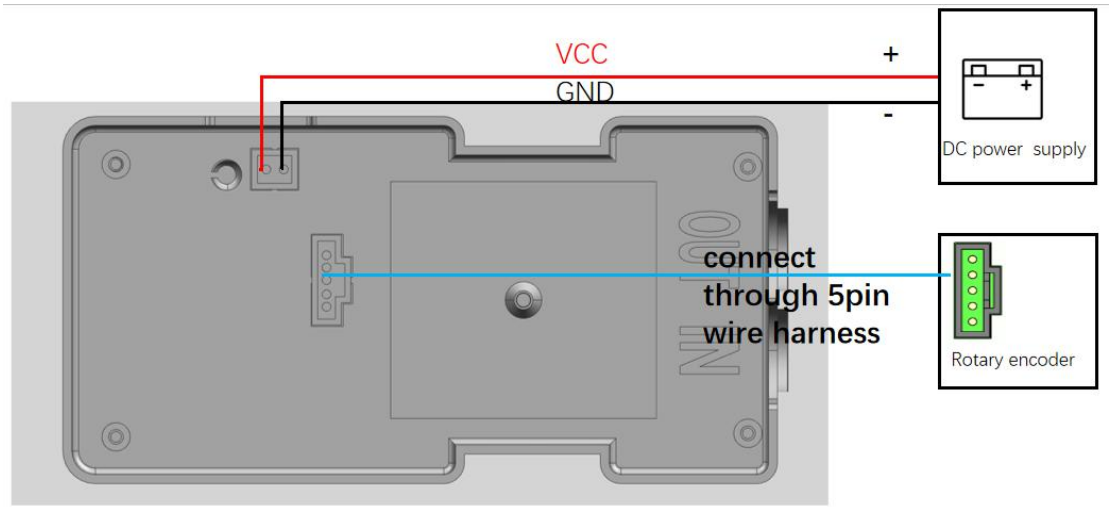


Figure 5-1 Wiring Description of Knob Speed Control Type

Note: The colors of the connecting wire in the above figure may be different from the actual ones.Check the wire order before connecting.

The red wire of the power connector is connected to the positive pole of the DC power supply, the black wire is connected to the negative pole of the DC power supply.

The speed regulation connector is connected to the knob circuit board through a wire harness. This type of pump is equipped with a speed control knob switch (rotary encoder) as standard. Rotate the knob clockwise to increase the motor speed. When it reaches the maximum speed, if continue to rotate clockwise, the motor will maintain the maximum speed. Rotate the knob counterclockwise to decrease the speed. When it decreases to the minimum speed, if continue to rotate counterclockwise, the motor will maintain the minimum speed. Press down the knob to start or stop the pump. The pump also has a state memory function, when the pump is started, it will run at the speed before the last stop.

Connector	Wire	Input	Definition	Explanation
5Pin Connector	1-5	Knob signal	Knob speed control switch connector	Connect to the knob speed control switch through the 5Pin harness
2Pin Connector	1	VCC	24V DC Power supply	Rated voltage 24V±10%
	2	GND	DC power ground	connect to the negative pole of the DC power supply

Table5-2 I/O Interface Definition of Knob Speed Control Type

Attachment: Installation instructions for speed control knob switch

(1) Nut installation: first make a hole with a diameter of about 7mm on the mounting plate, then unscrew the nut on the encoder and remove the gasket, insert the knob of the encoder into the opened hole on the mounting plate, and finally install the gasket and screw back the nut.

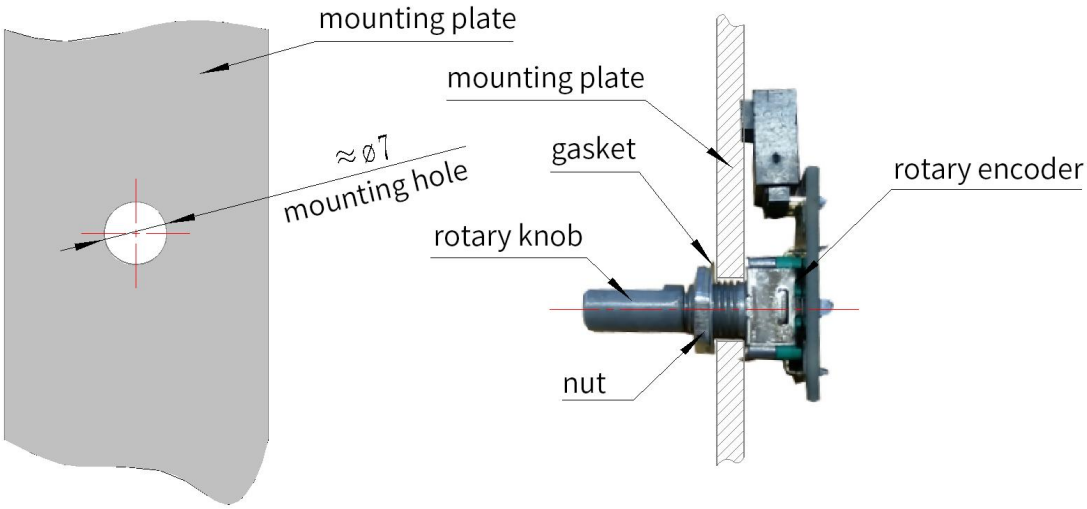


Figure 5-2 Nut Installation

(2) Screw installation: Use two M3 screws to pass through the screw holes and washers of the speed control knob switch, and then fix them to the mounting plate.

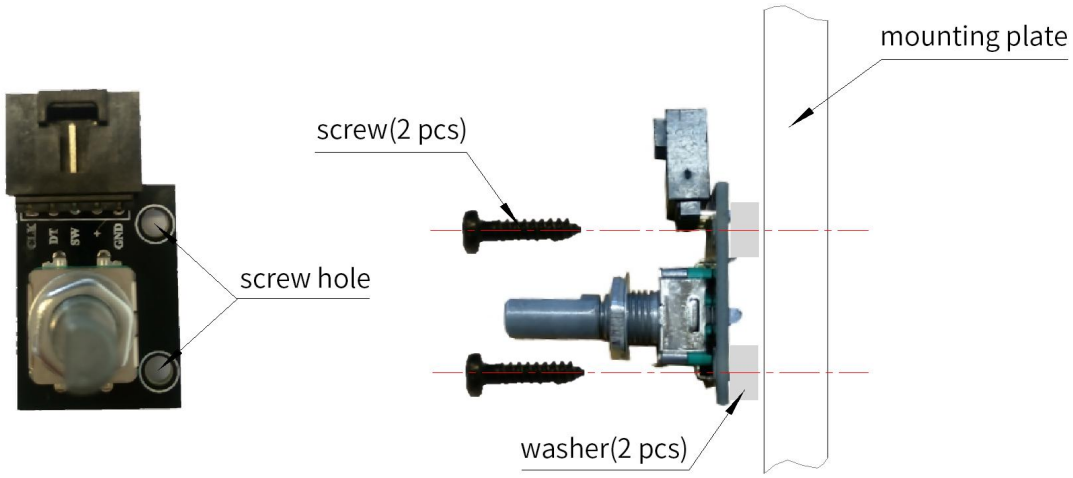


Figure 5-3 Screw Installation

Note: In order to avoid welding protrusions on the back of the speed control knob switch to affect the installation, we have attached two Φ3* Φ7*3 insulating washers in the installation accessories. Two M3 screws are usually used for the screws, which need to be prepared by the customer.

5.3 Frequency Speed Control Type

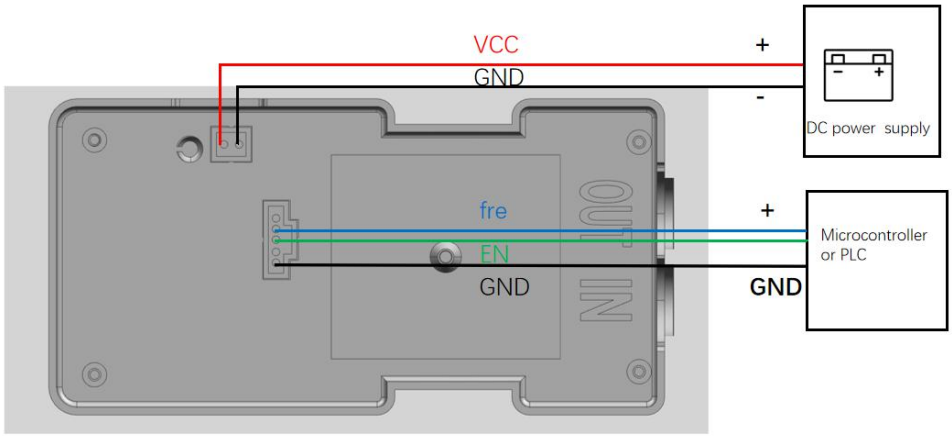


Figure 5-4 Wiring Description of Frequency Signal Control Type

Note: The colors of the connecting wire in the above figure may be different from the actual ones. Check the wire order before connecting.

The red wire of the 2pin power connector is connected to the positive pole of the DC power supply, and the black wire is connected to the negative pole of the power supply, as shown in the figure above . Check the pin sequence of the 5pin speed regulating connector before wiring. The black wire of pin 5 (GND) is connected to the ground of the MCU or PLC, and the green wire of pin 3 (En) is connected to the low-level output of the MCU or PLC.The blue wire pin 2 (Fre) is connected to the frequency signal output of the MCU or PLC.

Connector	Wire	Input	Definition	Explanation
5Pin Connector	1	NC	Not connected	
	2	Fre	Frequency speed control signal 0V≤VIL<0.8V 3.3V≤VIH≤5V Note: Input high level>3.3V, the maximum input voltage should not exceed 5V or it may cause permanent damage.	Input square wave, the recommended amplitude value is 5V, the duty ratio is 50%, and the DC bias voltage is 2.5V. The signal frequency 700hz-3100Hz corresponds to motor speed of 700-3100rpm, when 100<frequency<700Hz, it runs at the minimum speed, when frequency>3100Hz, it runs at the maximum motor speed, and when the frequency≤100Hz, the pump stops running.
	3	EN	Enable signal 0V≤VIL<0.8V 3.3V≤VIH≤5V	Enable signal, the low level is effective to enter the frequency speed control mode; the high level or floating is operating based on the speed and state recorded at last power-off.
	4	NC	Not connected	
	5	GND	Ground	Power and signal ground
2Pin Connector	1	VCC	24V DC power supply	Rated voltage DC 24V±10%
	2	GND	Power ground	Connect to negative pole of DC power supply

Table5-3 I/O interface definition of frequency speed control type

Note: In the case of pumping water, the speed may not reach the set speed due to the influence of the medium load.

5.4 Top configuration Type

The top configuration type is not only equipped with an LCD touch screen speed regulation function and fault display function, but also equipped with a control signal I/O port, as well as frequency speed regulation function and speed feedback function. The following is a description of the signals corresponding to the top configuration type I/O port.

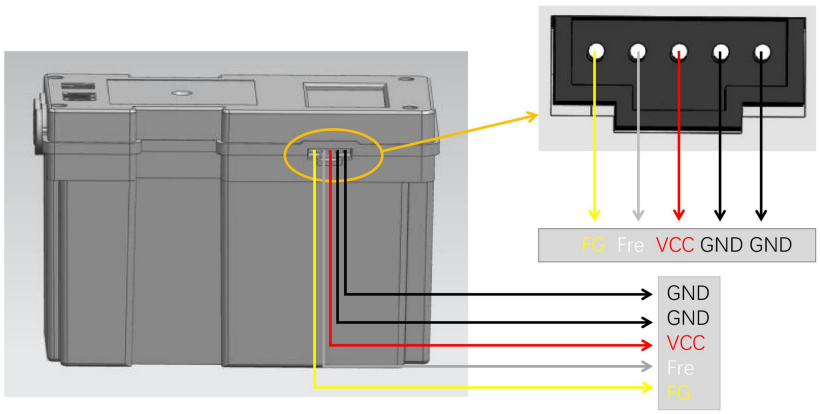


Figure 5-5 Signal and Pin Sequence Description of Top Configuration Type

Pin	Signal	Input/Output	Definition
1 White	Fre	Frequency speed control signal 0V≤VIL<0.8V 3.3V≤VIH≤5V	Input square wave, the recommended amplitude value is 5V, the duty ratio 50%, and the DC bias voltage 2.5V. The signal frequency range 700hz-3100Hz corresponds to motor speed of 700-3100rpm, when 100<frequency<700Hz, it runs at the minimum speed, when frequency>3100Hz, it runs at the maximum motor speed, and when the frequency≤100Hz, the pump stops running.

2 Yellow	Fg	FG speed feedback output 0V≤VOL<0.8V 3.3V≤VOH≤5V	The rotation speed of the motor can be obtained through the feedback signal of Fg, and the 6 square waves fed back are one rotation of the motor. If feedback is not needed please connect this wire to ground.
3 Red	VCC	24V DC power supply	Rated voltage DC 24V±10%
4 Black	GND	Power ground	Connect to the negative pole of power supply
5 Black	GND	Power ground	Reliable grounding helps improve operational reliability!

Table5-4 I/O interface definition of top configuration type

Note: 1. In order to prevent the start-stop button on the touch screen from being accidentally touched, it is necessary to hold a certain area during operation and long press to trigger.

2. If the user who purchases the top configuration type does not use our matching power supply, it may cause interference to the operation of the pump.Reliable grounding helps improve operational reliability!

3. If the cable sequence color of the accessory cable does not correspond to the table, please check the cable definition and connect according to the sequence!

There are two speed control modes for the top configuration type: (1) LCD speed control and (2) frequency speed control. The following is the wiring instructions for the two speed control methods.

1. LCD Speed Control

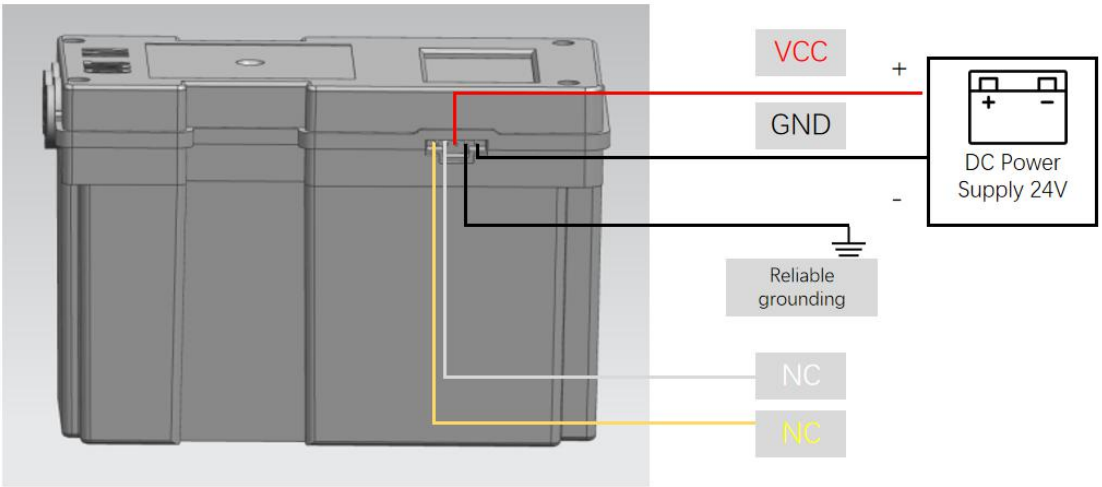


Figure 5-6 Wiring Diagram Using LCD Touchscreen of Top Configuration Type

The red wire at the power connector is connected to the positive pole of the 24V DC power supply, and the black wire is connected to the negative pole of the power supply. Control the pump operation by controlling the LCD screen.

Note: 1. In order to prevent the start-stop button on the touch screen from being accidentally touched, it is necessary to hold a certain area during operation and long press to trigger.

2. If the user who purchases the top configuration type does not use our matching power supply, it may cause interference to the operation of the pump.

2. Frequency Speed Control

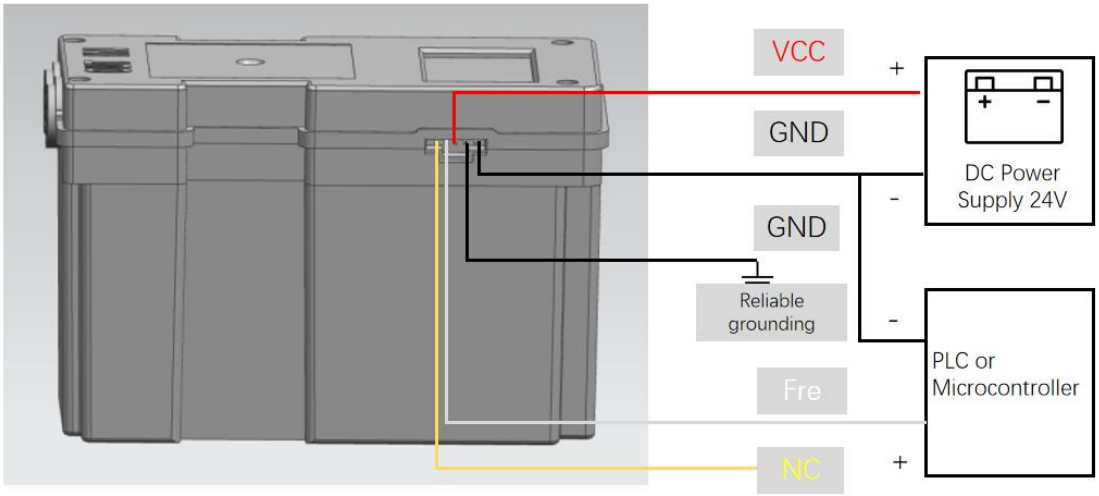


Figure 5-7 Wiring Diagram Using Frequency Signal of Top Configuration Type

The red wire at the power connector is connected to the positive pole of the DC power supply, and the black wire is connected to the negative pole of the power supply. If not using our standard adapter, it is recommended that this ground wire be reliably grounded to make the system more stable. Fre is connected to the square wave output port of the PLC or MCU, and GND is connected to the

ground port of the MCU or PLC. Control the pump running speed by adjusting the frequency of the square wave.

3. Frequency Signal Definition

Input square wave, the recommended amplitude value is 5V, the duty ratio is 50%, and the DC bias voltage is 2.5V.

The signal frequency 700Hz-3100Hz corresponds to motor speed of 700-3100rpm, when 100<frequency<700Hz, it runs at the minimum speed, when frequency>3100Hz, it runs at the maximum motor speed, and when the frequency≤100Hz, the pump stops running.

5.5 Alarms and Troubleshooting

Alarm definition	Error code	Possible reason	Troubleshooting
Power supply over voltage	EE01	The output voltage of the DC power supply is greater than the normal voltage range.	1. Check whether the output voltage of the power supply is consistent with the product label, and power on again. 2. If there are frequent alarms, please contact our customer service.
Power supply under voltage	EE02	The output voltage of the DC power supply is less than the normal voltage range.	1. Check whether the output voltage of the power supply is consistent with the product label, and power on again. 2. If there are frequent alarms, please contact our customer service.
Insufficient output power	EE03	The output power of the DC power supply cannot meet the pump running power requirements or power supply output stability is poor.	1. Replace the DC power supply with higher output power. 2. If there are frequent alarms, please contact customer service.
Abnormal motor stop	EE31	Motor stalls, abnormal speed feedback.	1. Check whether the pipeline load is normal (reduce the running load of the pump), and power on again. 2.If there are frequent alarms, please contact customer service.

Large motor speed deviation	EE32	The deviation between the actual motor speed and the set speed is too large.	1. Check whether the pipeline load is normal (reduce the running load of the pump), and power on again. 2.If there are frequent alarms, please contact our customer service.

Table 5-5 Error Code Definition of Top Configuration Type

6 Cautions

Please read the instructions in this chapter carefully and follow the instructions strictly before use.

1. This product has no waterproof, dust-proof, and explosion-proof functions and cannot be used in flammable and explosive environments!

2. Foreign matter must not fall into the hydraulic connectors, and there should be no solid particles in the medium, otherwise the micro pump will be damaged!

3. When this product is used to transfer harmful medium, it must be double-sealed to ensure personal safety!

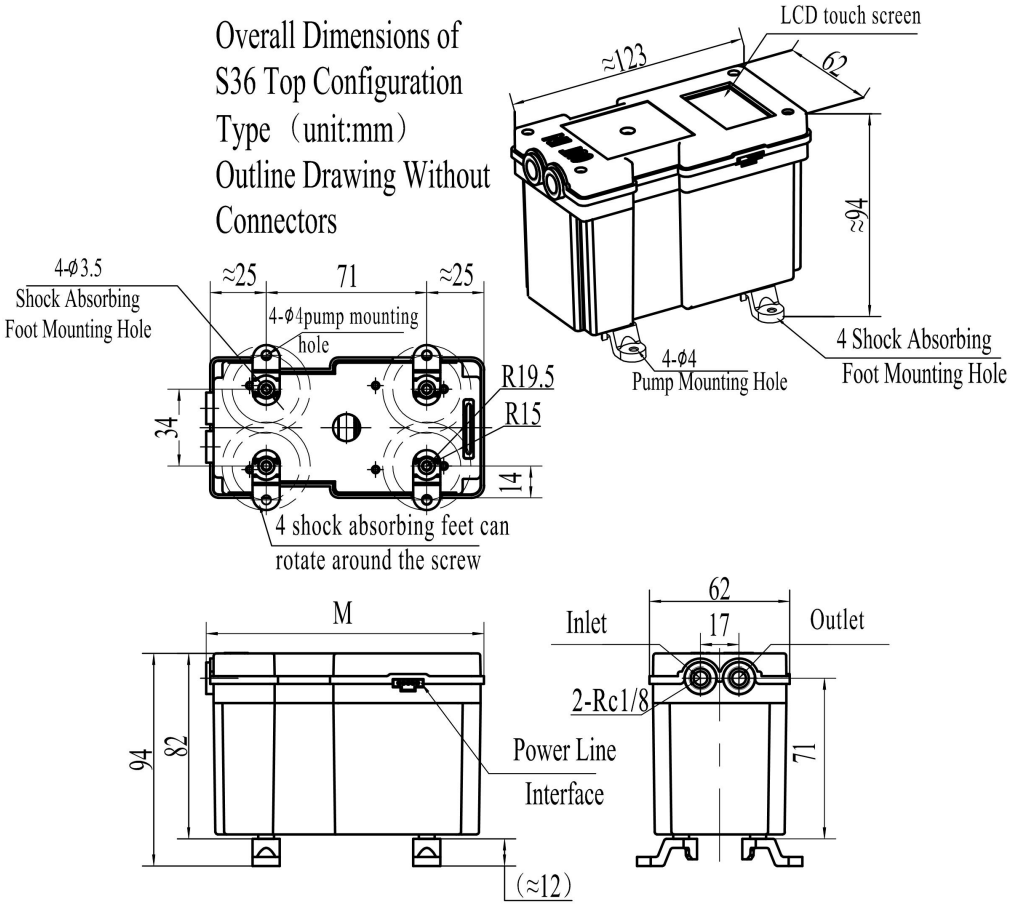
4. The matching piping components and containers must have sufficient strength to ensure personal safety!

5. Built-in precision control circuit, need to use high-quality DC power supply to power the pumps!

6. Oil mist, high-viscosity liquids and liquids that are easy to precipitate and crystallize are not permissible!

7. If this series of pumps do not use the matching power supply, it may cause interference to the operation of the pump. Please follow the instructions strictly!

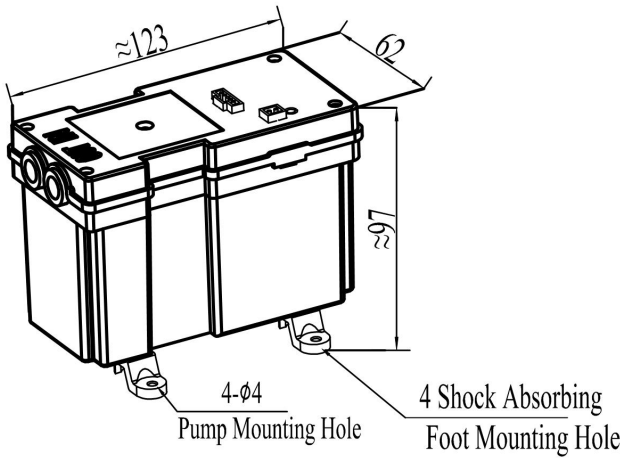
7 Dimensions

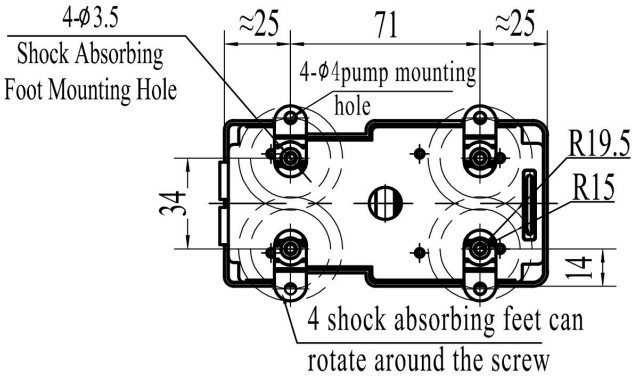


Type of Connectors		M Value
No Connector		≈123
Push-in Connector	6mm	123+X(≈143①)
	8mm	123+X(≈144②)
Stainless Steel Hose Connector		123+Y(≈143③)
PP hose Connector		123+Z(≈143④)

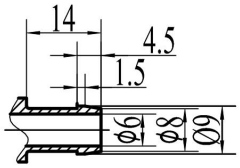
Size of ①②③④ is related to the hydraulic connectors and its installation dimensions, for reference only, the error may be a few millimeters

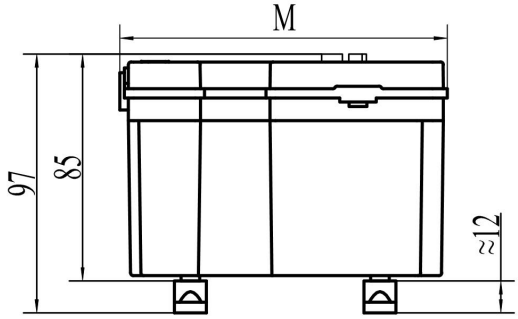
Overall Dimensions of S36 Knob Speed Control Type （unit:mm） Outline Drawing without Connectorsang

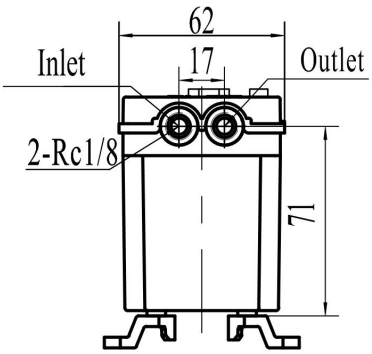


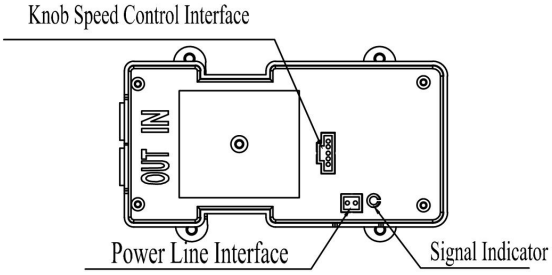


PP hose Connector (inlet/outlet)









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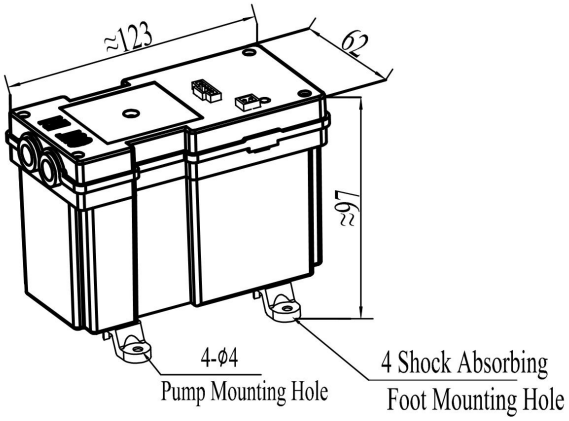
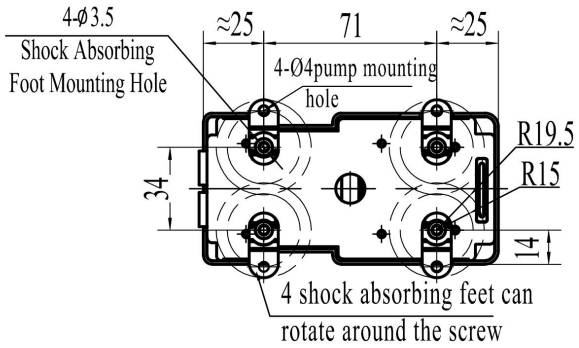
	8mm	123+X(≈144②)
Stainless Steel Hose Connector		123+Y(≈143③)
PP hose Connector		123+Z(≈143④)

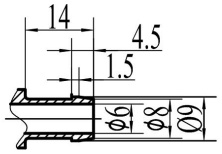
Size of ①②③④ is related to the hydraulic connectors and its installation dimensions, for reference only, the error may be a few millimeters

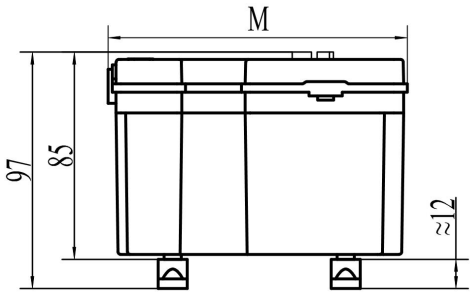
Overall Dimensions of S36 Frequency Speed Control Type（unit:mm） Outline Drawing Without ConnectorsSpeed

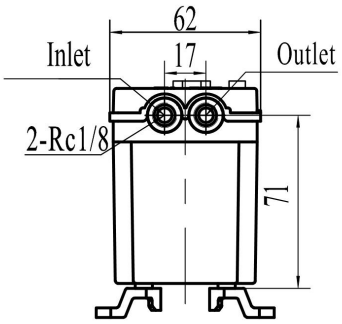


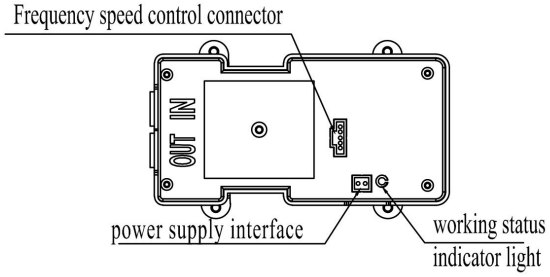


PP hose Connector (inlet/outlet)



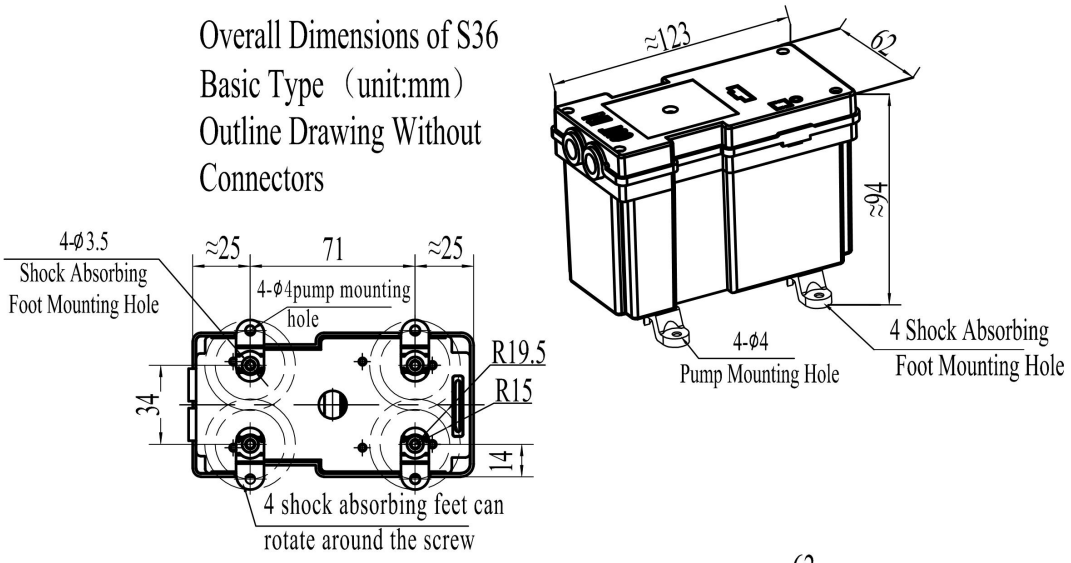




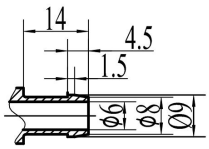


Type of Connectors		M Value
No Connector		≈123
Push-in Connector	6mm	123+X(≈143①)
	8mm	123+X(≈144②)
Stainless Steel Hose Connector		123+Y(≈143③)
PP hose Connector		123+Z(≈143④)

Size of ①②③④ is related to the hydraulic connectors and its installation dimensions, for reference only, the error may be a few millimeters



PP hose Connector (inlet/outlet)



Type of Connectors		M Value
No Connector		≈123
Push-in Connector	6mm	123+X(≈143①)
	8mm	123+X(≈144②)
Stainless Steel Hose Connector		123+Y(≈143③)
PP hose Connector		123+Z(≈143④)

Size of ①②③④ is related to the hydraulic connectors and its installation dimensions, for reference only, the error may be a few millimeters

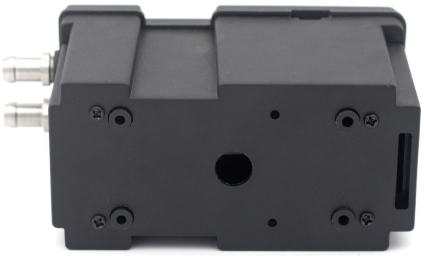
Installation instructions:

1. The screws on the pump cannot be removed, otherwise it will damage the pump;

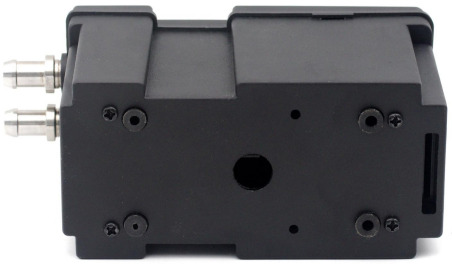
2. The mounting holes are self-tapping screw holes, not suitable for repeated tightening and disassembly, otherwise the installation will be loose and unreliable.

8 Appearance

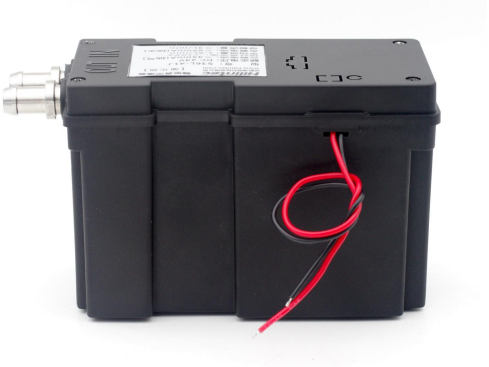
Top Configuration Type



Knob Speed Control Type/Frequency Speed Control Type



Basic Type



Note: The appearance of the above-mentioned hydraulic connector differs with optional configurations.