



D23 Flow Control Vacuum Pump and Compressor Series

User Guide

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About This Document

Purpose

This document is a description of the D23 flow control vacuum pump and compressor products in testing period, 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

PWM speed control, related parameters, wiring instructions

Change History

The change history accumulates each update of this document. The latest version of the document contains all the previous updates.

Issue	Date	Product Version	Issuer	Modification
01	2018-4	1.0	HX	First official release.
02	2018-5	1.0	HX	Initially determine the product model for the second time
03	2018-6	1.0	XYL	Determine the product model and parameters, add circuit signals and connection instructions
04	2018-8	1.0	XYL	Add a new product
05	2018-10	1.0	XYL	Add product pictures and models of matching speed controllers
06	2018-11	1.0	XYL	Add speed control adjusting range
07	2019-05	1.0	XYL	Modify the logic wiring diagram and wire sequence
08	2019-07	1.0	XYL	Update the lifetime of the standard version and premium version
09	2019-09	1.0	LYZ	Modify document format
10	2019-12	1.0	XYL	Add notes to the specifications
11	2020-04	1.0	XYL	Revise certain content in the lifetime section, update the flow curve

Issue	Date	Product Version	Issuer	Modification
12	2020-05	1.0	XYL	Add product model description
13	2020-06	1.0	XYL	Add cautions and certain content in the medium section

Contents

About This Document	I
Change History	II
Contents	IV
1 Characteristics	1
1.1 Compact Size.....	1
1.2 Brushless DC Motors.....	1
1.3 Protections.....	1
1.4 Excellent Air Tightness.....	1
2 Functions	2
2.1 Speed Control Function.....	2
2.2 Start-Stop Function.....	2
2.3 Speed Feedback.....	2
3 Technical Specifications	3
3.1 Key Specifications.....	3
3.2 Versions Description.....	4
3.3 Working Conditions.....	4
3.4 Pump Materials.....	4
3.5 Lifetime.....	5
3.6 Parameter Curve.....	5
3.7 Starting Current.....	6
4 Product Model Description	8
4.1 Brief Description of Model Naming.....	8
5 Electrical Connection	9
5.1 Definition of Signals.....	9
5.2 Logic Wiring Diagram.....	10

6 Cautions.....	12
7 Dimensions.....	13
8 Appearance.....	14

1 Characteristics



1.1 Compact Size

The product weighs about 80g with an overall size of about 35*51*56mm.

1.2 Brushless 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 overheat protection and overload protection functions, which can effectively extend the service life of the pump.

1.4 Excellent Air Tightness

The built-in double sealing structure offers excellent air tightness and makes the pump suitable for applications requiring high air tightness.

2 Functions

2.1 Speed Control Function

The flow can be changed by adjusting the motor speed of the pump (by adjusting the PWM duty cycle).

Or by ordering a special speed controller for micro pumps manufactured by our company (model: TS-E12) to adjust the speed, the speed range is 1300-2600r/min.

2.2 Start-Stop Function

The start and stop of the pump can be controlled through the start-stop control level signal, which is suitable for frequent start and stop working conditions.

2.3 Speed Feedback

The speed of the pump can be obtained through the speed feedback signal, which is convenient for realizing working condition monitoring and closed-loop control.

3 Technical Specifications

3.1 Key Specifications

(Standard atmospheric pressure 101kpa)

Model	Rated Voltage (VDC)	Load Current (mA)	Flow (L/min)		Relative Vacuum (-kpa)	Maxim Output Pressure (kPa)	Dimensions (mm)	Weight (g)
			Average Flow	Peak Flow				
D23L	12	≤170	≥1.3	≥0.95	≥15	≥17	35*51*56	≈80
D23S	12	≤120	≥0.8	≥0.5	≥9	≥10	35*51*56	≈80

- Note:**
- 1.The input voltage requires $24V \pm 10\%$.
 - 2.Unless otherwise specified, the technical parameters are measured under the conditions of temperature 25°C and standard atmospheric pressure of 101kPa.
 - 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 peak flow rate in the table refers to the flow value measured with a rotameter, and the average flow rate is measured with a soap film flow-meter.

3.2 Versions Description

Version Performance	Simplified Version	Standard Version	Premium Version
Lifetime	≥2500h	≥6000h	≥10000h
Noise	★	★★	★★★
Reliability	★	★★	★★★
Parameter Consistency	★	★★	★★★

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

2.The accurate noise data of the premium version is not updated and that of the simplified version and the standard version is not specified, for this information, please refer to the noise date of the premium version.

3.3 Working Conditions

1. Environment: Permissible ambient temperature range of the pump is 0 °C ~ 50 °C . 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 °C ~ 50 °C . The medium is allowed to be rich in water vapor, but cannot contain particles or oil mist.

3.Load: Both the inlet and outlet can operate at full load (i.e the inlet is completely blocked), but the applied load at the inlet cannot exceed the maximum vacuum of the pump; the load applied at the outlet cannot exceed the maximum pumping pressure.

3.4 Pump Materials

The materials of the wetted parts are reinforce nylon, ABS and EPDM rubber.

Except the retaining bracket for the intake valve of the pump is made of ABS, the material of the other plastic parts is reinforced nylon, and the rubber parts are EPDM rubber.

3.5 Lifetime

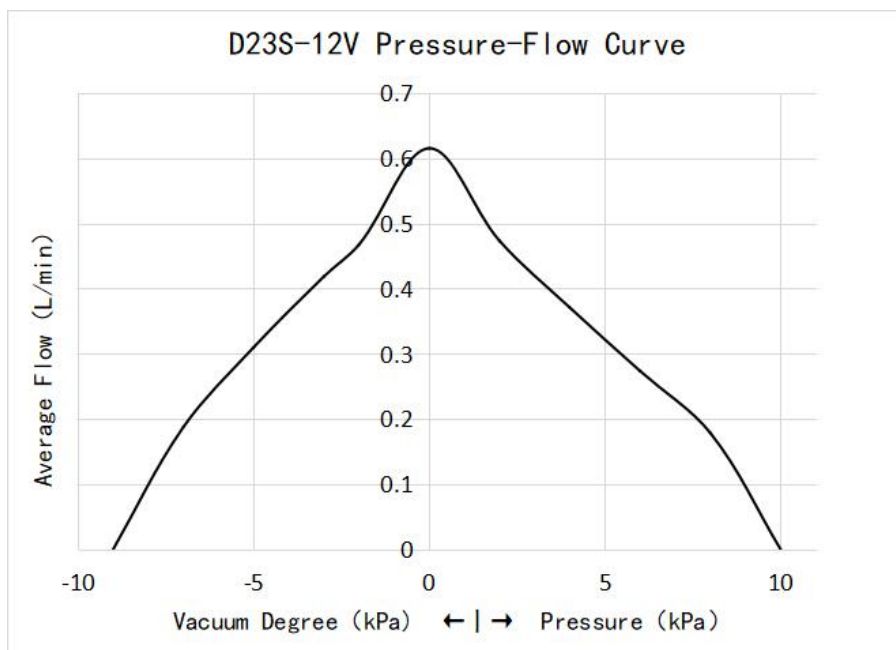
1. Lifetime test conditions: In a clean, non-corrosive laboratory, with the inlet blocked and outlet connected to the atmosphere, the pump runs at high speed continuously around the clock. Ambient temperature $5^{\circ}\text{C} \sim 33^{\circ}\text{C}$, fluctuates with the climate; the relative humidity $< 90\%$, fluctuates with the climate.

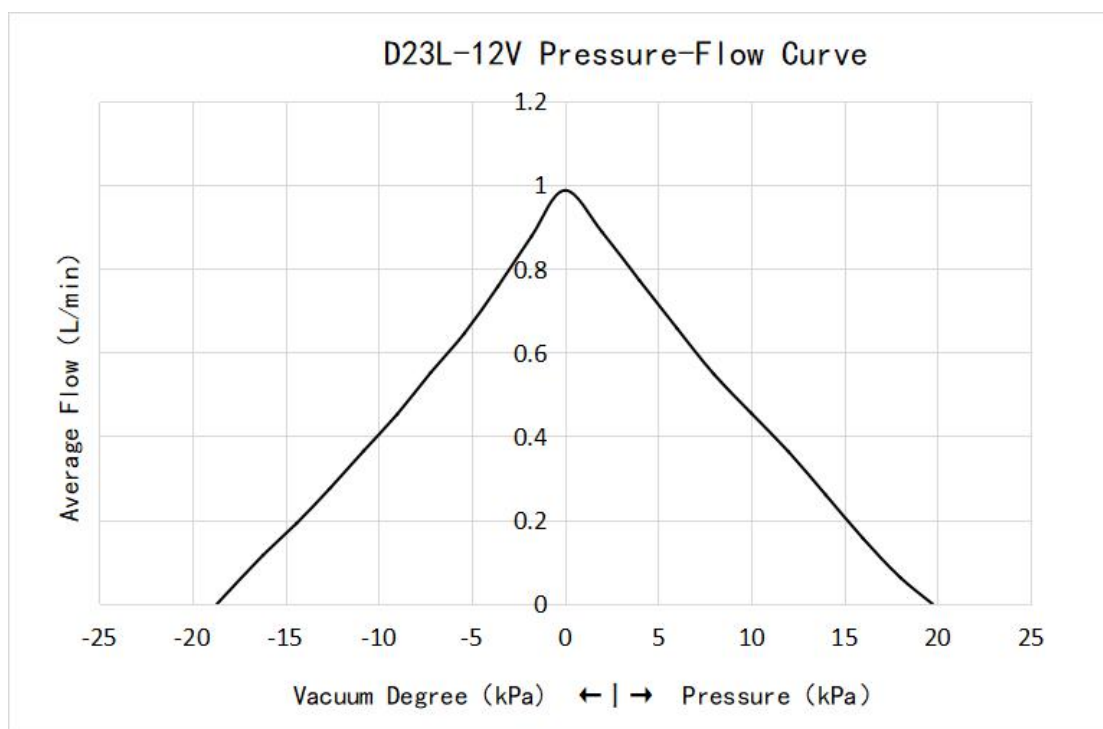
2. The lifetime value of the simplified version is 2500h. The lifetime test of the standard version and the premium version is still in progress. The standard version currently has a lifetime greater than 6000h, and the premium version greater than 10000h, and will be updated later.

Note: If the actual working conditions are better than our test conditions, the lifetime will be prolonged.

3.6 Parameter Curve

Pressure-flow curve, there are individual differences between different micro pumps, this curve is a statistical value, only as a technical reference for users to confirm the working point. The "flow" mentioned in this section refers to the "average flow".

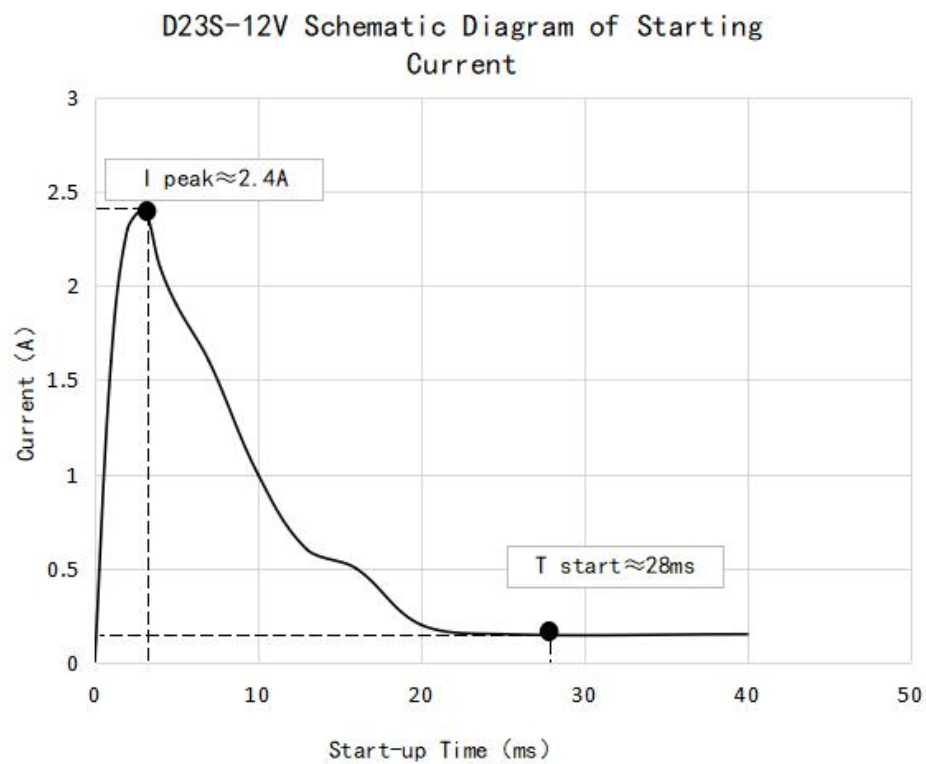
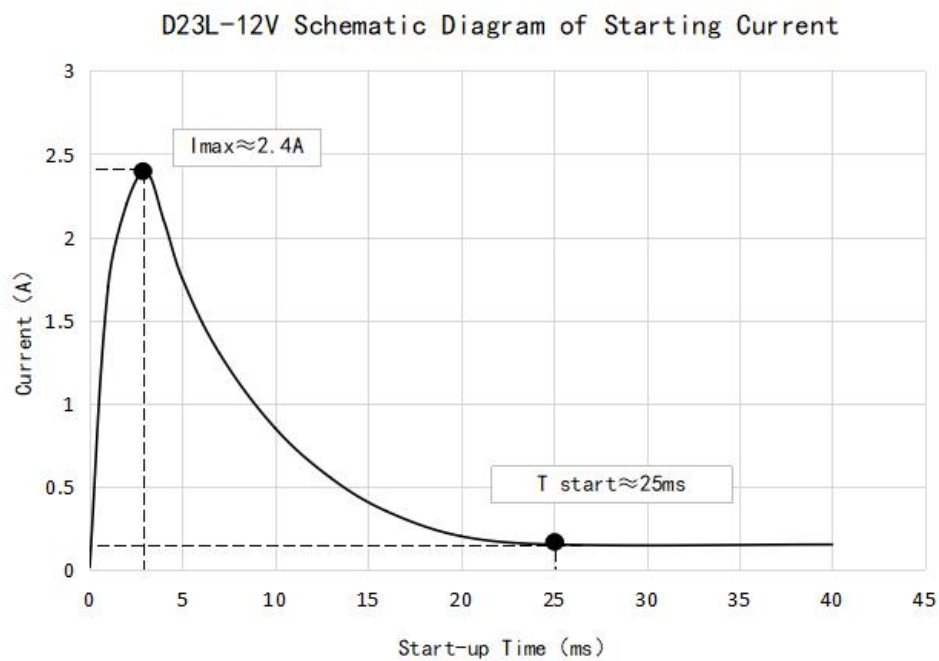




- Note:**
1. The maximum average flow rate of the curve will be slightly lower than the nominal value, which is due to the resistance of the test pipeline components, which leads to the attenuation of the flow;
 2. The value of this curve is for reference only, not as a basis for product acceptance.

3.7 Starting Current

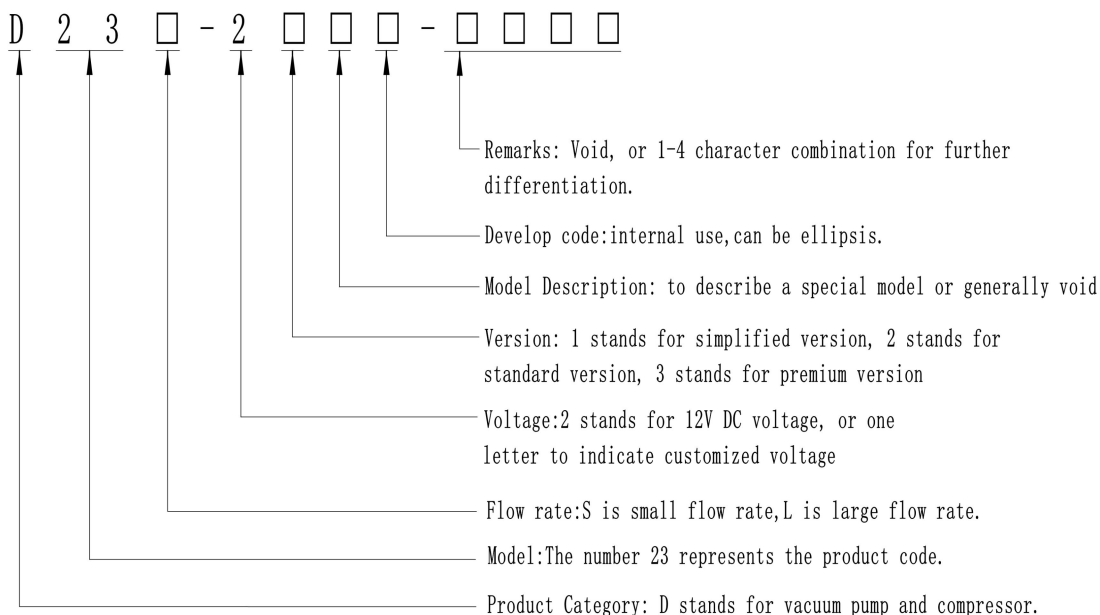
The starting current curve is measured under the working condition that the inlet and outlet are directly connected to the atmosphere, and there are certain individual differences between different micro pumps. This curve is a statistical value, which is only used as a technical reference when users determine the power supply system, and is not for acceptance data.



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.



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.

Example1: D23L-21 (D23 large flow pump, 12V voltage simplified version)

Example2: D23S-23-GJ (D23small flow pump, 12V voltage premium version, customized high temperature medium function)

5 Electrical Connection

The Electrical Connection section introduces how to connect this product to an external power supply and the wiring instruction of signal wires. This product is equipped with standard connection wires at the factory, and the wire definitions are distinguished by colors.

5.1 Definition of Signals

There are 5 motor wires for this product. The wiring and usage instructions are as follows.

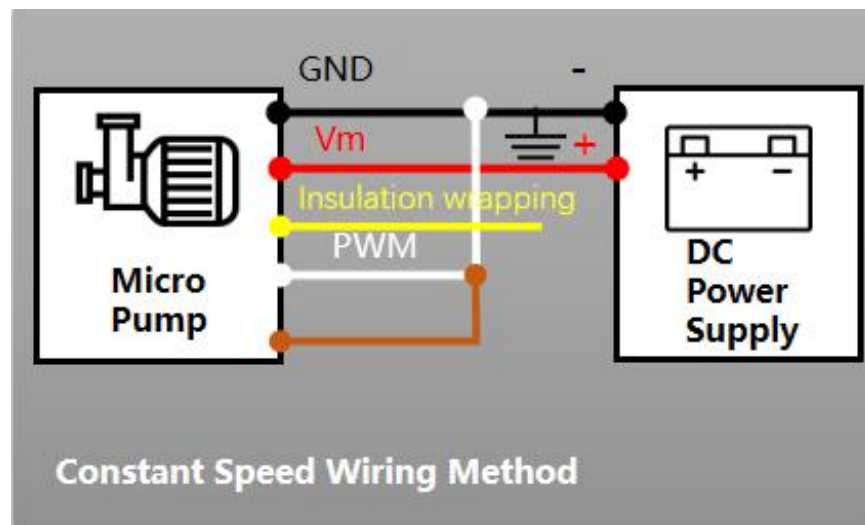
S.N.	Color	Function	Explanation	Remarks
1	Black	Negative pole of the power supply		
2	Red	Positive pole of the power supply	DC12V (±10%)	
3	Yellow	FG feedback signal (motor speed feedback signal, pulse signal), the motor outputs 6 pulses per rotation	Output: $4V \leq \text{High Level}$ $\text{Low Level} \leq 0.6V$ The maximum rated current of the FG feedback signal is 3mA.	The internal of the motor is open-drain, which requires a pull-up externally. Voltage DC 5V, resistance 4.7kΩ.
4	White	Pulse Width Modulation (PWM)	Input: $0V \leq V_{IL} \leq 0.8V$ $2V \leq V_{IH} \leq 5V$ (15kHz~25kHz)	Use PWM to change the motor speed and adjust the flow. PWM input signal frequency range: 15kHz ~ 25kHz. This port cannot be used to control the start and stop of the pump.
5	Orange	Control the start and stop of the motor.	Input: Level Signal: $2V \leq \text{Stop} \leq 5V$ $0V \leq \text{Start} \leq 0.8V$	This signal line can be used to control the start and stop of the pump, especially for frequent start and stop. If the

				pump does not work for a long time, disconnect the red power cord.
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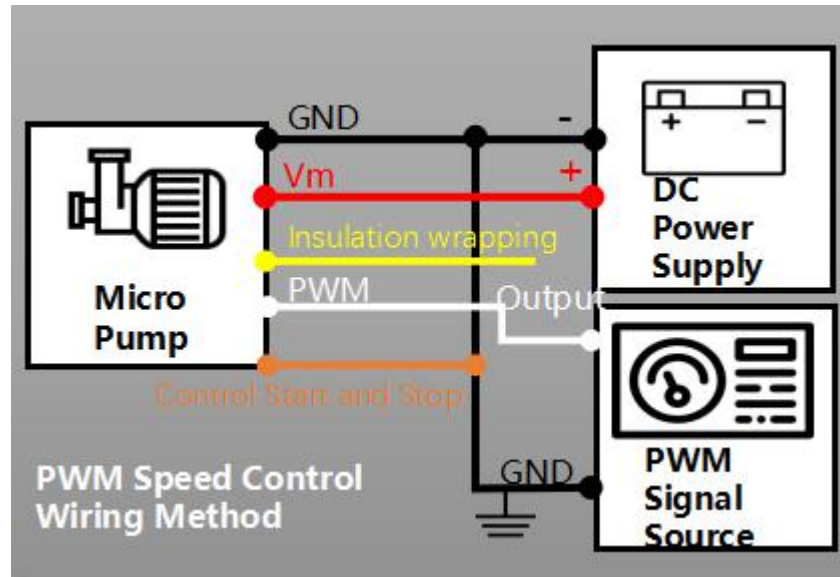
Note: If speed control and speed feedback are not needed, the red wire shall be connected to the positive pole of the power supply, and the black, white and orange wires connected to the negative pole of the power supply; the yellow wire shall be insulated and wrapped.

5.2 Logic Wiring Diagram

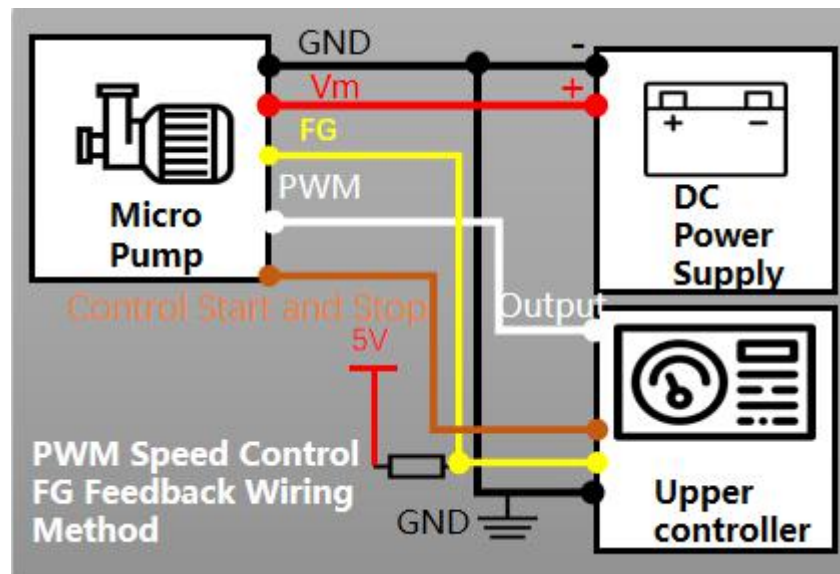
If speed control and speed feedback are not needed, the red wire shall be connected to the positive pole of the power supply, and the black, white and orange wires connected to the negative pole of the power supply; the yellow wire shall be insulated and wrapped and the pump will work at the rated speed.



When you need to use the PWM speed control function, you need to use a signal source that supports PWM signal output (function signal generator, MCU, PLC, etc.), connect the signal source output to the white PWM input cable, and connect the PWM signal source ground to the ground of the DC power supply and wrap the yellow wire with insulation.



When you need to use the PWM speed control function and monitor the pump operation or perform feedback control through the FG signal, you need to use an upper controller (MCU, PLC, host computer, etc.) that supports PWM signal output, FG signal input and start-stop control. Connect the signal source output to the white PWM input wire, and connect the PWM signal source ground to the DC power ground. The yellow FG feedback signal needs to pass a $4.7k\ \Omega$ resistor before connecting to DC 5V for a pull-up, and then connect to the FG signal input terminal of the upper controller; if using our matching micro-pump speed controller, no additional pull-up is required.



6 Cautions

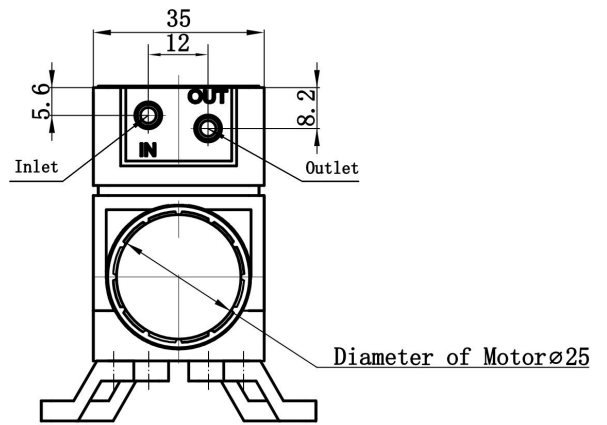
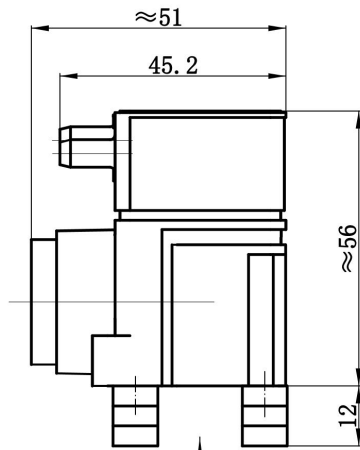
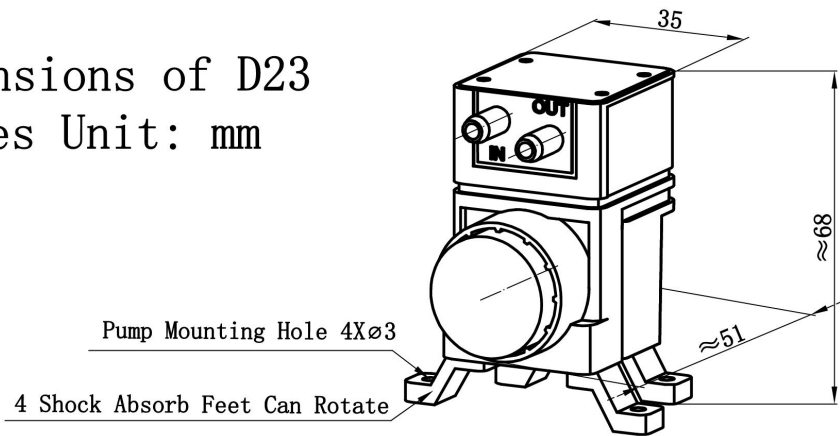


Please read the instructions in this chapter carefully and follow the instructions strictly before use.

- 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 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. Please follow the user guide instructions strictly!**
- 6. Do not use it to pump oil mist!**

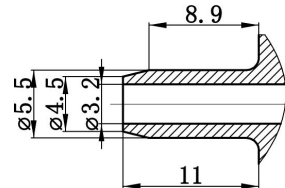
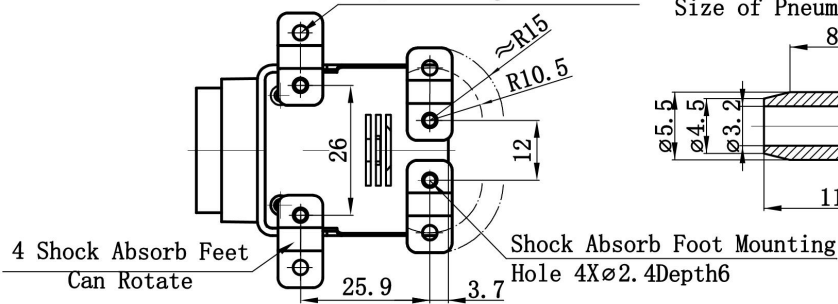
7 Dimensions

Dimensions of D23 Series Unit: mm



Direction A
Pump Mounting Hole 4X∅3

Size of Pneumatic Connector



8

Appearance

