



S15 Flow Control Vacuum Liquid Pump Series User Guide

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About This Document

Purpose

This document is a description of the S15 flow control vacuum liquid pump series in the test period, which is used to guide the relevant technical personnel to understand the product characteristics.

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, working status indicator, 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	2019-7	1.0	XYL	First official release
02	2019-09	1.0	LYZ	Modify the document format
03	2019-09	1.0	XYL	Update the maximum pumping height
04	2019-11	1.0	XYL	Update the pumping flow curve
05	2019-12	1.0	FB	Update notes in section 3.1
06	2020-02	1.0	FB	Add model description; update the outline drawing
07	2020-03	1.0	FB	Update definition of FG feedback signal
08	2020-03	1.0	FB	Update specifications and correct some descriptive terms
09	2020-04	1.0	FB	Update some descriptive terms
10	2020-06	1.0	FB	Update medium description

Contents

About This Document	I
Change History	II
Contents	III
1 Product Characteristics	1
1.1 Compact Size.....	1
1.2 Working Status Indicator.....	1
1.3 Brushless Motor.....	1
1.4 Protections.....	1
2 Special Features	2
2.1 Speed Control Feature.....	2
2.2 Working Status Indication and Warning.....	2
3 Technical Specifications	3
3.1 Key Specifications.....	3
3.2 Description of Versions.....	4
3.3 Life-time Test Conditions.....	5
3.4 Working Conditions.....	5
3.5 Materials.....	5
3.6 Parameter Curve.....	6
4 Product Model Description	7
4.1 Brief Description of Model Naming.....	7
Only basic type is available for this series of pumps.....	7
5 Electrical Connection	8
6 Cautions	11
7 Dimensions	12
8 Appearance	13

1

Product Characteristics



1.1 Compact Size

The product weighs about 50g and the overall size is about 50x29x36mm

1.2 Working Status Indicator

The bottom case of the pump is made of light-transmitting material ABS, which can visually reflect the working status of the pump through the indicator light.

1.3 Brushless Motor

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

1.4 Protections

Equipped with overheating protection, overload protection and reverse connection protection function to prevent accidental damage to the pump.

2 Special Features

2.1 Speed Control Feature

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

2.2 Working Status Indication and Warning

The color of the indicator light displayed on the transparent bottom case (as shown in Figure 2-1 and Figure 2-2) can feedback the working status of the pump:

1. It is normal when the blue light flashes regularly;
2. When the light remains red, it is abnormal, i.e. the motor runs too low;
3. When the red and blue lights flash alternately, it is abnormal, and at this time, the motor speed is low and unstable;
4. The indicator light is off when the positive and negative connections are reversed;
5. When the voltage is out of the working voltage range (3.2V~6V), the indicator light is off.



Figure 2-1 Normal working status



Figure 2-2 Abnormal working stat

3 Technical Specifications

3.1 Key Specifications

Model	As a Vacuum Pump				As a Liquid Pump			Product Weight (g)
	Rated Voltage (V DC)	Load Current (mA)	Average Flow (L/min)	Relative Vacuum (-kPa)	Rated Voltage (V DC)	Load Current (mA)	Free Flow (PURE WATER) (L/min)	
S15S	5	≤280	≥0.2	≥14	5	≤350	≥0.02	≈50

Note: 1. Working voltage is 3.2V~6V, the change of working voltage will affect the load current;

2. Unless otherwise specified, the technical parameters are all measured values under the conditions of 25°C and standard atmospheric pressure of 101kPa. When used as a liquid pump, the test medium is pure water at room temperature;

3. The parameters in the table are measured at the rated voltage and the maximum speed of the motor. When the speed changes, the vacuum degree is basically unchanged;

4. When used as a vacuum pump, the average flow rate is the flow rate measured with a soap film flowmeter.

Model	Max. Suction Height (m)	Flow Rate@ Max. Suction Height(L/min)	Max. Pressure Height (m)	Flow Rate@ Max. Pressure Height (L/min)
S15S	1.8	0.015	4	0.005

Note: The maximum suction height flow rate refers to the water flow rate at the maximum suction height;

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

3.2 Description of Versions

Version Performance	Simplified Version	Standard Version	Premium Version
Lifetime	>2500h	>6000h	>10000h
Noise	★	★★	★★★
Reliability	★	★★	★★★
Parameter Consistency	★	★★	★★★
Speed Feedback	None	FG signal feedback available	

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

2. The noise data of the simplified version and the standard version are not specified. For the noise data of the premium version, please refer to the latest information.

3. When the liquid pump is pumping liquid medium and gaseous medium, the noise varies greatly with the medium;

4. The lifetime above refers to continuous pumping life. If the actual working conditions of the pump better than our test conditions, the actual lifetime of the pump will be extended.

3.3 Life-time Test Conditions

In a clean and non-corrosive laboratory, the pump carries a load (both the inlet and outlet are connected with silicone hoses, and the pump inlet is 30cm high above the water surface, and the pump outlet is 30cm away from the water surface), running continuously around the clock; ambient temperature 5 °C ~ 33 °C, fluctuate with climate; relative humidity 30% ~ 85%, fluctuates with climate.

3.4 Working Conditions

1. Environment: The permissible ambient temperature of the pump is 0 °C ~ 50 °C, the relative humidity is $\leq 90\%$, no condensation, the pump should avoid exposure in the sun, and should work in a clean and ventilated environment.

2. Medium:

1) As a vacuum pump: the temperature of the gaseous medium is 0 °C ~ 50 °C, and the medium is allowed to be rich in water vapor, but cannot contain solid particles or oil mist.

2) As a liquid pump: the permissible temperature of the liquid medium is 5 °C ~ 50 °C. The medium is not allowed to contain solid particles or to be oily liquids or liquids with high viscosity. Do not use this product to transfer liquid that is easy to precipitate and crystallize for a long time.

3. Load:

1) As a vacuum pump: the inlet can run at full load (i.e completely block the inlet), but the applied load cannot exceed the maximum vacuum of the pump; the outlet must be unobstructed.

2) As a liquid pump: the outlet is not allowed to be completely blocked, but can be applied with load less than the nominal load (the equivalent pressure of the maximum pressure height water column); the inlet is allowed to be blocked for a short time, and the long-term load is not greater than the nominal load (the equivalent pressure of maximum suction height water column).

3.5 Materials

1. The materials of the wetted parts: fiber reinforced nylon, EPDM rubber, both of which have certain corrosion resistance. Please check the chemical resistance and compatibility of the medium according to the contact material.

2. The pump body is made of reinforced nylon for plastic parts, EPDM for elastomer parts and light-transmitting ABS for bottom case.

3.6 Parameter Curve

Suction/pressure height-flow curve, there are certain individual differences between different micro pumps. This curve is a statistical value and is only used as a technical reference for users to confirm the working point. The "flow" mentioned in this section refers to the "water flow".

Curve Test Conditions

Medium	Temperature (°C)	Atmospheric pressure (kPa)	Internal diameter of hoses (mm)	Non-test tube length (mm)	
				Outlet (Testing suction)	Inlet (Testing discharging)
/	/	/	/	/	/

Curve

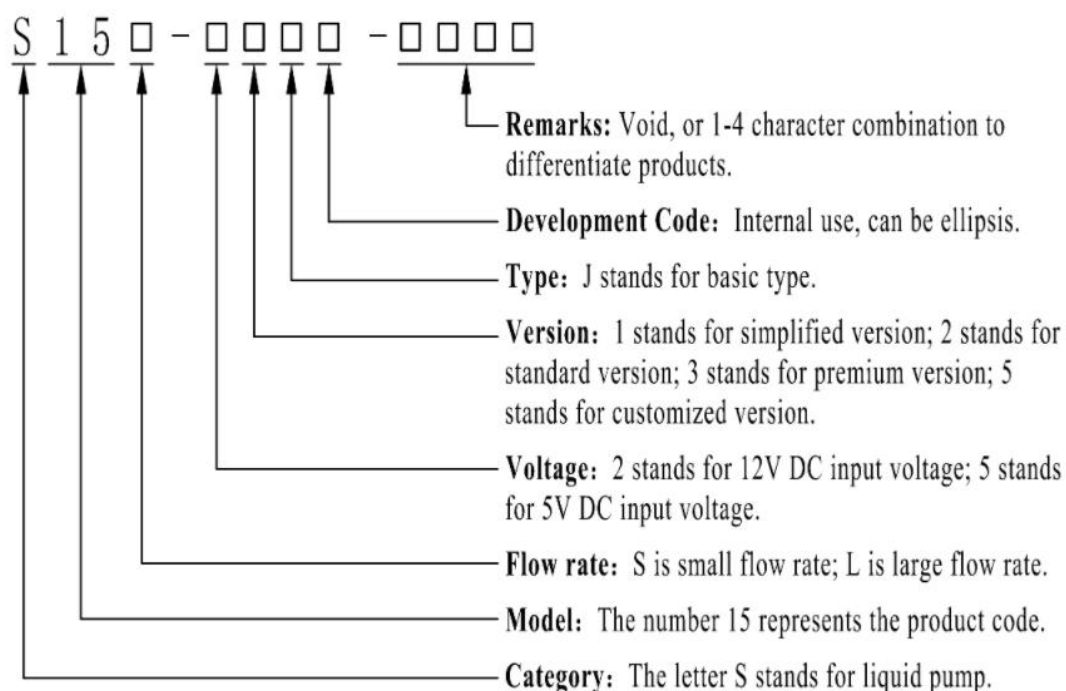
(To be updated.....)

- 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.

4 Product Model Description

4.1 Brief Description of Model Naming

Only basic type is available for this series of pumps.



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: S15S-51J (S15S pump, 5V voltage simplified version basic type)

5 Electrical Connection

The electrical connection is used for connecting the external power supply and signal wires of this product. The definition of the wires is distinguished by color.

5.1 Definition of Signals

This is a product with basic functions. There are 3 wires. The wiring and usage instructions are as follows.

S.N	Wire	Signal	Function	Definition of Signal	Remarks
1	Red	Vm	Positive pole of the power supply	+3.2V~+6V	The voltage is not allowed to exceed 6V, otherwise it will burn the motor.
2	Black	GND	Negative pole of the power supply,ground		
3	White	PWM	Pulse Width Modulation (PWM)	Pulse width modulation signal, active at low level $0V \leq \text{low level} \leq 0.8V$ start $2V \leq \text{high level} \leq 5V$ Stop carrier-frequency range: 15kHz~25kHz	Select a fixed a value of frequency within the range of 15kHz ~ 25kHz, and adjust the speed by changing the duty cycle
4	Yellow	FG	FG feedback signal	The motor speed feedback signal is a 3.3V pulse signal, and the motor outputs 6 pulses in one rotation	No speed feedback function in simplified version and no such wire.

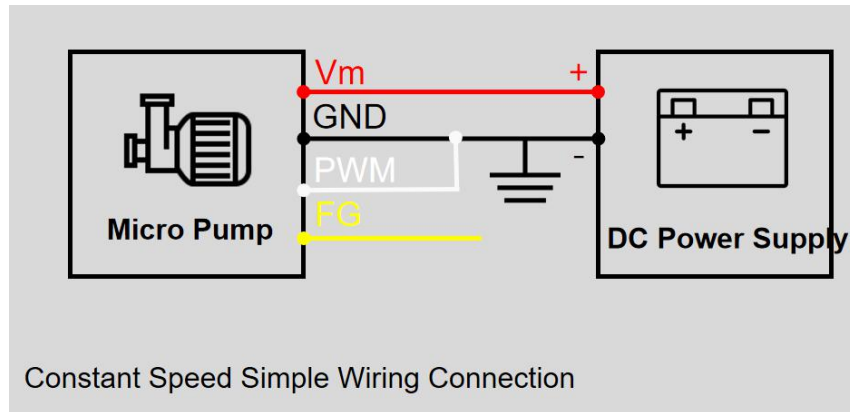
Note: The speed feedback function is unavailable with the simplified version so there is no speed feedback signal line.

When pumping liquid, it is normal that the speed decreases with the load.

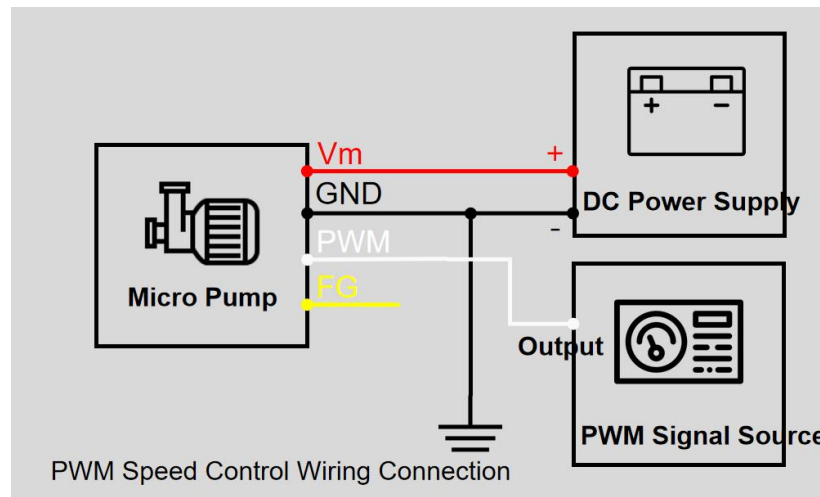
5.2 Logical Wiring Diagram

When the speed control function is not needed, the white connection wire PWM input signal and the black connection wire can be grounded together, the yellow wire must be insulated and wrapped, and the micro pump will work at the rated speed.

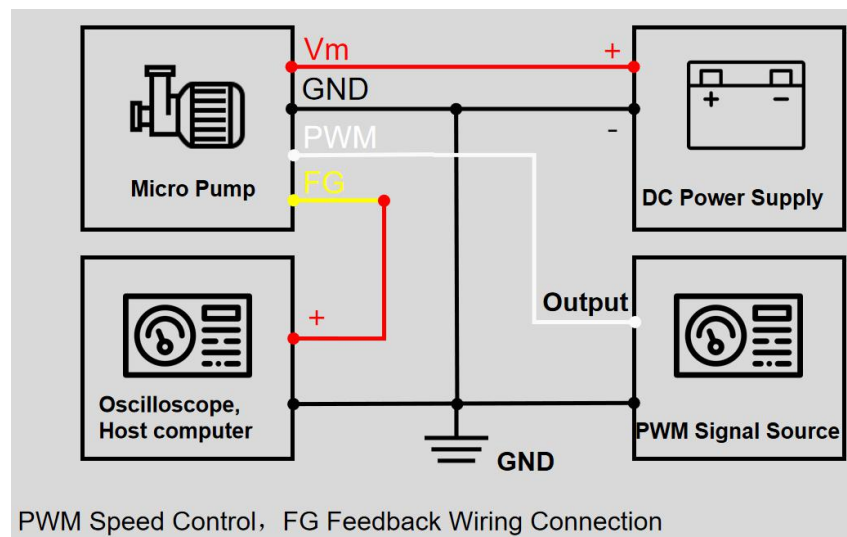
Note: The speed feedback function is unavailable with the simplified version so there is no yellow FG signal line.



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 DC power ground. If you do not need to monitor the speed feedback signal, the FG signal line must be insulated and wrapped. The speed feedback function is unavailable with the simplified version so there is no yellow FG signal line.



When you need to use the PWM speed control function and obtain the FG feedback, you need to use a signal source that supports PWM signal output (function signal generator, MCU, PLC and other controllers) and an oscilloscope or host computer, and connect the signal source output to the white PWM input. Connect the PWM signal source ground to the DC power ground, connect the yellow FG feedback signal line to the oscilloscope probe or the host computer input, and connect the oscilloscope or upper computer ground wire to the black ground wire. If the FG signal wire is not used, it must be insulated and wrapped. The speed feedback function is unavailable with the simplified version so there is no yellow FG signal line.



6 Cautions

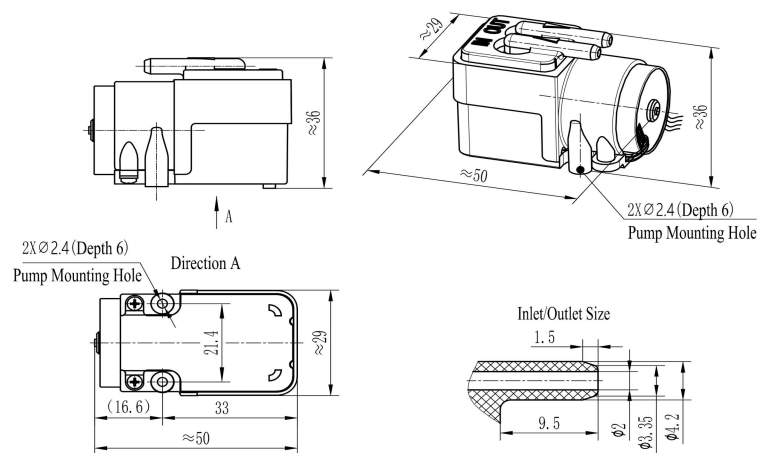


Please read the instructions in this chapter carefully and follow the instructions strictly before use.

- 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 gas nozzles, and there should be no solid particles in the medium, otherwise the micro pump will be damaged!**
- 3. The outlet must keep unobstructed, otherwise the micro pump will be damaged!**
- 4. When this product is used to transfer harmful medium, it must be double-sealed to ensure personal safety!**
- 5. The matching piping components and containers must have sufficient strength to ensure personal safety!**
- 6. Please follow the instructions strictly!**

7 Dimensions

Overall Dimensions of C15 D15 S15 (Unit: mm)



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

