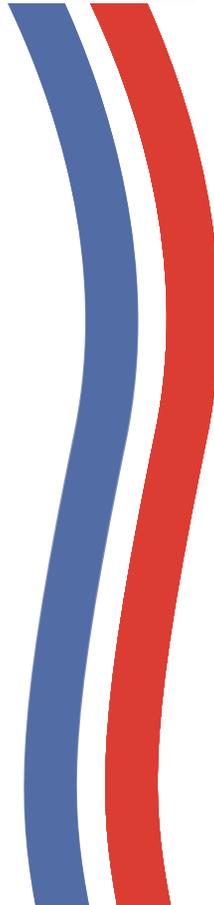# Microfluidic Dispenser

Model LFD1000

VA.1

Microfluidic Dispenser
with precise sensor control

LFD1000 Series

User Manual

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Attention ⚠

* Do not open or modify any hardware which may lead to irrecoverable damage.

* Do not use this product if you suspect any malfunctions or defection.

* Do not use this product for corrosive media or in a vibration environment.

* Use this product according to the specified parameters.

* Only the trained or qualified personnel shall be allowed to perform product services.

Microfluidic dispenser with precise sensor control

Model LFD1000

1. Features

- General purpose microfluidic dispense
- Controlled with proprietary thermal time-of-flight sensor
- Small dead volume with compact form factor
- Digital and analog control with fast response time
- Non-corrosive fluids

2. Performance

All specifications unless otherwise noted apply for calibration conditions with air at 20 °C and 101.325 kPa absolute pressure in water. The sensor is horizontally mounted at calibration.

	Value	Unit
Dispensing Range		
- Liquid	0.5 ~ 6.5	mL/min
- Gas	2.0 ~ 20.0	mL/min
Resolution [1]	± 0.05	mL/min
Accuracy	±3% or ±0.05mL/min, which ever is greater	
Pressure rating	2.0	bar
Back pressure		
- Liquid	0.6	bar
- Gas	0.1	bar
Temperature rating	0 ~ 60	℃
Humidity (for gas)	0~90%RH and no icing or condensation	
Power supply	5 (±10%)	Vdc
Warming up time	200	msec
Settle time [2]	<20 (liquid)	sec
	<5 (gas)	sec
Interface for control	I^2C	
Mechanical connection		
- Liquid	1/4" - 28	
- Gas	NPT or customized	
Wetted materials	Polyphenylsulfone, PEEK, SiNx, and stainless steel or aluminum alloy	
Reference conditions	20°C, 1013 mbar; DI water (liquid) or air (gas)	
Storage temperature	-10 ~ +70	℃
Pump lifetime	5000	Hours
Protection	IP50	
CE/RoHS	EN61326-1; -2; -3	

1. 0.02mL/min achievable for a stable flow.
2. Settle time is dependent on the requirements of a stable flow dispensing. If an larger than the specified errors allowed, a faster dispensing can be achieved.

3. Electrical Interface

3.1 Pin Definition

The LFD1000 has a 4-pin interface. The output connecting cable comes with the sensor. The sensor pin layout is shown in Figure 3.1 and the cable color code is defined in Table 3.1.

Figure 3.1: LFD1000 pin layout.

Table 3.1: LFD1000 pin assignment.

Pin	Definition
1	SDA(I^2C)
2	N.C.
3	VCC, Power supply
4	GND, Ground
5	SCL(I^2C)

3.2 Pin Description

VCC and **GND**: The LFD1000 requires a power supply of 5±10% Vdc. The voltage is internally filtered and regulated to power the circuit. The Dispenser consumes less than 50 mA normally and the minimum supply current must be larger than 50 mA.

SDA and **SCL:** Serial data line and serial clock line, which is used for control of the dispenser.

Optional cable with USB converter and an evaluation software can be requested upon ordering.

3.3 Accessories

A I^2C to USB cable can be ordered as the accessory. It also comes with a simple evaluation or demonstration software that allows the customer to drive the dispenser for various dispensing options per the specifications of the product.
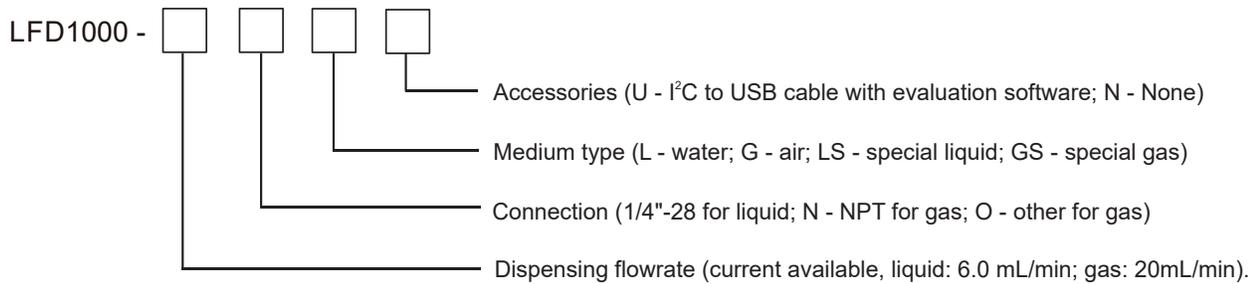
The cable has one end made of NS-Tech CD H-5 connector that can be directly plugged into the product while the other end is a USB type A connector that can be plugged into any PC with a USB interface.

The software "Siargo Test Studio_V0104" is executable in a Microsoft Window based operation system PC, and it shall be downloadable or be sent directly by the manufacturer in the electronic format. The detailed decription can be found in Appendix A.

4. Ordering Guide

4.1 Product Selection

The dispenser part number is composed of the product model number and suffix indicating the full scale flowrate for dispensing, as well as the other parameters. Refer the following for details.

LFD1000 - ☐ ☐ ☐ ☐

Accessories (U - I^{2}C to USB cable with evaluation software; N - None)

Medium type (L - water; G - air; LS - special liquid; GS - special gas)

Connection (1/4"-28 for liquid; N - NPT for gas; O - other for gas)

Dispensing flowrate (current available, liquid: 6.0 mL/min; gas: 20mL/min).

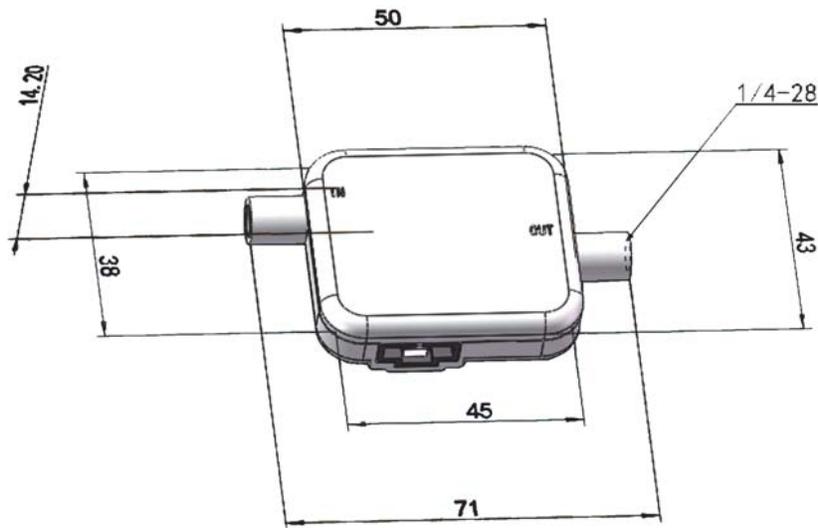Note: for special liquid or gas other than water or air, please contact the manufacturer.

4.2 Order Contact and Customer Support

The sales offices are listed at the end of this document. For small quantities, the order can be placed either through Siargo website: www.siargo.com or the sales office. For large quantities, please contact the sales office, distributors or sales representatives.

Siargo is making every effort to ensure the quality of the products. In case of questions and/or product supports, please contact customer service listed at the end of the document.
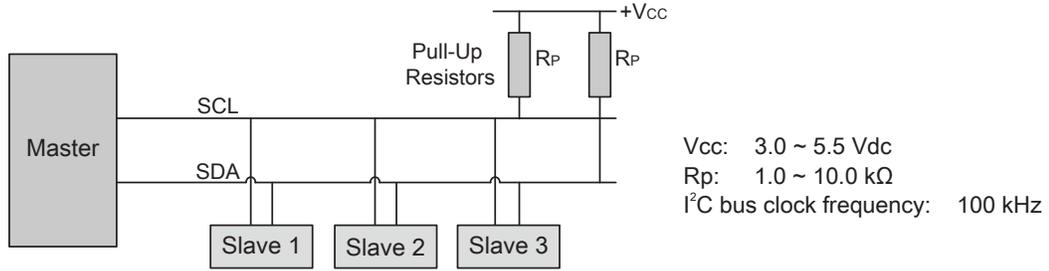
5. Mechanical Dimensions

The LFD1000 provides standard 1/4"-28 microfluidic pipe connection and for the gas dispenser, the default shall be NPT but other connectors can also be customized. The product has a total size of 50 X 43 X 14 mm.
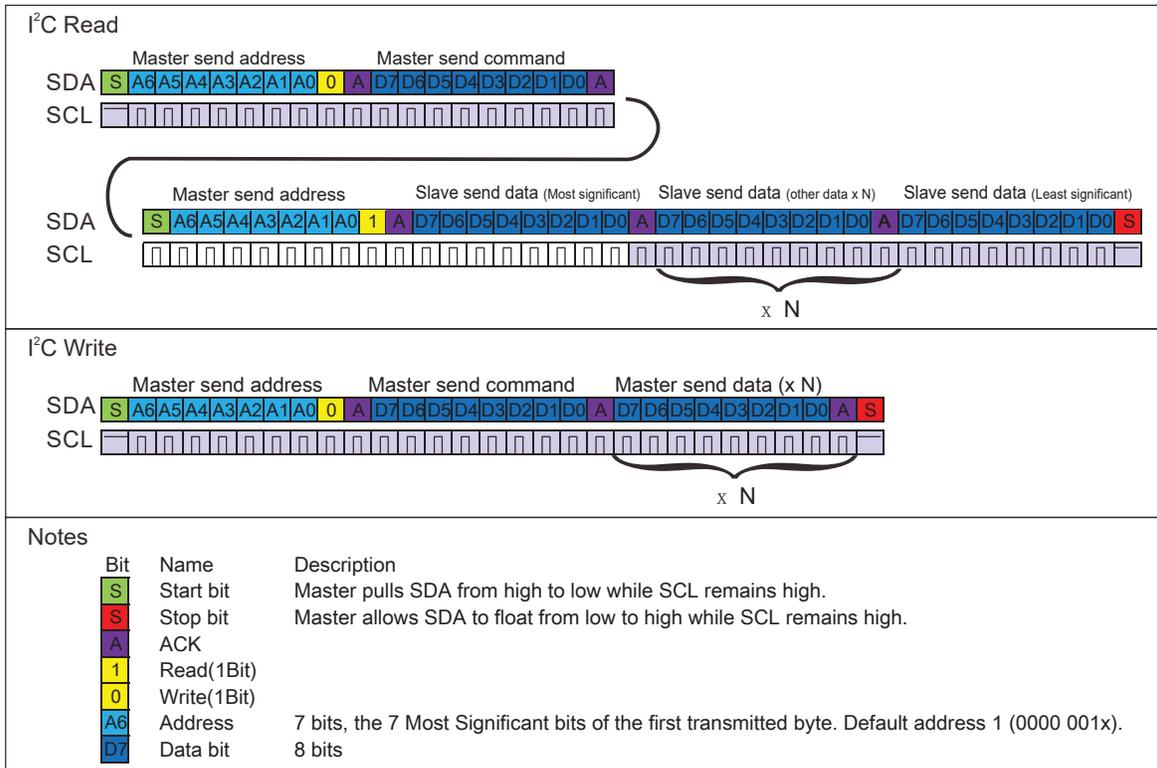
6. I²C Communication

6.1 I²C Connection

Vcc: 3.0 ~ 5.5 Vdc
Rp: 1.0 ~ 10.0 kΩ
I²C bus clock frequency: 100 kHz

6.2 I²C Read and Write Sequences

I²C Read

I²C Write

Notes

Bit	Name	Description
S	Start bit	Master pulls SDA from high to low while SCL remains high.
S	Stop bit	Master allows SDA to float from low to high while SCL remains high.
A	ACK	
1	Read(1Bit)	
0	Write(1Bit)	
A6	Address	7 bits, the 7 Most Significant bits of the first transmitted byte. Default address 1 (0000 001x).
D7	Data bit	8 bits

6.3 I²C Command description

Co□□and □□te □□e□□	Length	Co□□and Na□e	□ead □□rite	Notes
60H	4	Write SetFlow	W	Int32/1000 mL/min
81H	4	Read Flow	R	Int32/1000 mL/min
E0H	4	Read SetFlow	R	Int32/1000 mL/min

* The address is set with Bit□~Bit1，For instance, sensor I²C address 1, write address will be 0x02 (0000 0010) , while read address will be 0x03 (0000 10011).

Important Notices

Wetted Materials and Compatibility

The wetted materials for this dispenser is constituent of polyphenylsolfone, PEEK and silicon nitride and stainless steel or aluminun alloy. These materials are generally in compatible with medical applications. The products have been tested for both RoHS and REACH compatible.

Cautions for Handling and Installations

The product at the time of shipment is fully inspected for product quality and meets all safety requirements. Additional safety measures during handling and installation should be applied. To prevent ESD (electrostatic discharge) damage and /or degradation, take customary and statutory ESD precautions when handling. Do power the product with the correct polarity, voltage & amperage. All precautions and measures for electrical voltage handling must apply. The product sealing is ensured to work under a maximum working pressure of 2 bar or 200 kPa and is leakage proof before the shipment. But cautions and further leakage test are important at installation as well since any leakage could cause severe safety issue.

This product contains no user serviceable components. Do not attempt to disassemble, substitute parts or perform unauthorized modifications to the product. Doing so will forfeit the terms of the warranty and cause the liability to any damages thereafter. It should only be serviced by authorized personnel. Upon requests, Siargo will provide necessary technical support and/or training of the personnel.

Cautions for Product Applications

The product is designed for use with general purpose micrfluidic liquid or gases such as water and air. It is advised that the products are best used for non-corrosive and non-explosive clean liquid or gases. The products cannot be used for fluoride or fluoride-containing gases. For updates of the product certification information, please contact the manufacturer. Use for a media such as extreme corrosive and toxic may cause the product malfunctioning or even severe damages.

Don't expose the product's electronics other than the inner flow channel to any heavy particle containing media, the unit does not have a particle proof pathway. For medical sterilization procedure, please consult the manufacturer. Don't flow media in conditions that can cause condensation or large viscosity which may block the flow channel inside the unit during operation and the performance could be significantly altered.

It is suggested to design your application so that nominal dispensing flowrate is less than 90% of the full scale flowrate of the specified product. Don't use the product with a flow range at the extreme cases.

Warranty and Liability

(Effective January 2018)

Siargo warrants the products sold hereunder, properly used and properly installed under normal circumstances and service as described in this user manual, shall be free from faulty materials or workmanship for 180 days for OEM products, and 365 days for non-OEM products from the date of shipment. This warranty period is inclusive of any statutory warranty. Any repair or replacement serviced product shall bear the same terms in this warranty.

Siargo makes no warranty, representation, or guarantee and shall not assume any liability regarding the suitability of the products described in this manual for any purposes that are not specified in this manual. The users shall be held for full responsibility for validating the performance and suitability of the products for their particular design and applications. For any of the misusage of the products out of the scope described herein, the user shall idemnify and hold Siargo and its officers, employees, subsidiaries, affiliates and sales channels harmless against all claims, costs, damages, and expense or reasonable attorney fee from direct or indirect sources.

Siargo makes no other warranty, express or implied and assumes no liability for any special or incidental damage or charges, including but not limited to any damages or charges due to installation, dismantling, reinstallation or any other consequential or indirect damages of any kind. To the extent permitted by law, the exclusive remedy of the user or purchaser, and the limit of Siargo's liability for any and all losses, injuries or damages concerning the products including claims based on contract, negligence, tort, strictly liability or otherwise shall be the return of products to Siargo, and upon verification of Siargo to prove to be defective, at its sole option, to refund, repair or replacement of the products. No action, regardless of form, may be brought against Siargo more than 365 days after a cause of action has accrued. The products returned under warranty to Siargo shall be at user or purchaser's risk of loss, and will be returned, if at all, at Siargo's risk of loss. Purchasers or users are deemed to have accepted this limitation of warranty and liability, which contains the complete and exclusive limited warranty of Siargo, and it shall not be amended, modified or its terms waived except by Siargo's sole action.

The product information provided in this manual is believed to be accurate and reliable at the time of release to or made available to the users. However, Siargo shall assume no responsibility for any inaccuracies and/or errors and reserves the rights to make changes without further notice for the relevant information herein.

This warranty is subject to the following exclusions:

(1) Products that have been altered, modified or have been subject to unusual physical or electrical circumstances indicated but not limited to those stated in this document or any other actions which cannot be deemed as proper use of the products;

(2) Siargo does not provide any warranty on finished goods manufactured by others. Only the original manufacturer's warranty applies;

(3) Products re-sold to the third parties.

Contact Information

Headquarters

Siargo Ltd.
3100 De La Cruz Boulevard, Suite 210,
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Phone: 01(408)969-0368
Email: info Siargo.com

Representative in US

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5 Allen Street, Lexington, MA 02421
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Fax: 1 (81) 862-9244
Email: info Servoflo.com

# Appendix: Evaluation software

The evaluation software "Siargo Test Studio V0104" can be requested at the time of order. It runs on any PC with a Microsoft Window □and later version based operation system. The software shall be downloadable at Siargo□s designated webpage or shall be sent directly to the customer in an electronic format via the internet.
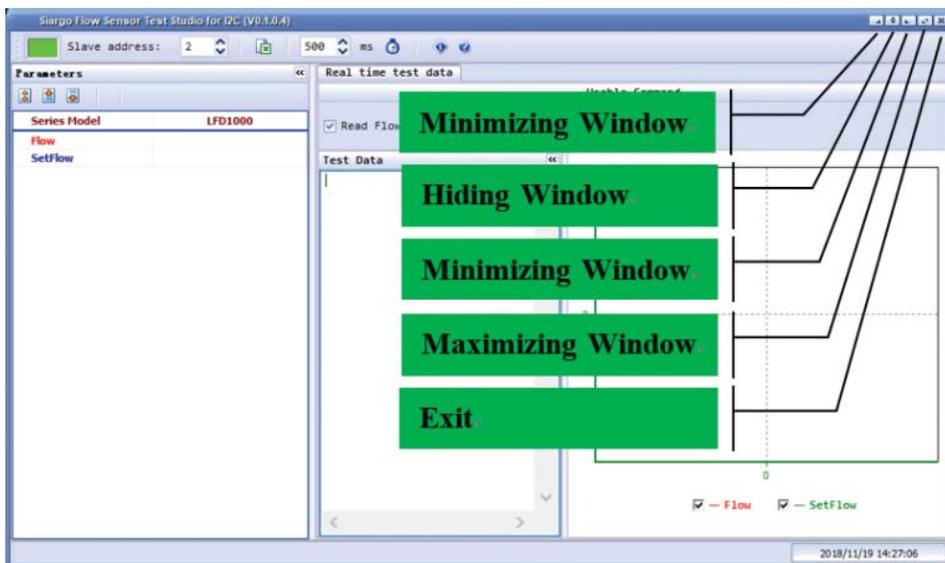
Upon the receipt of the software and installation, double click on the icon,
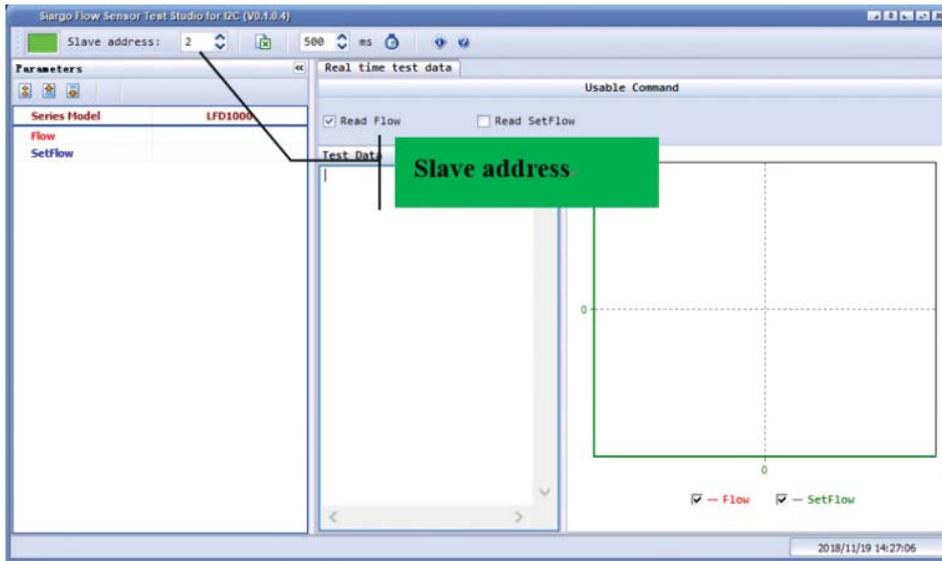
it shall lead one to the following window:
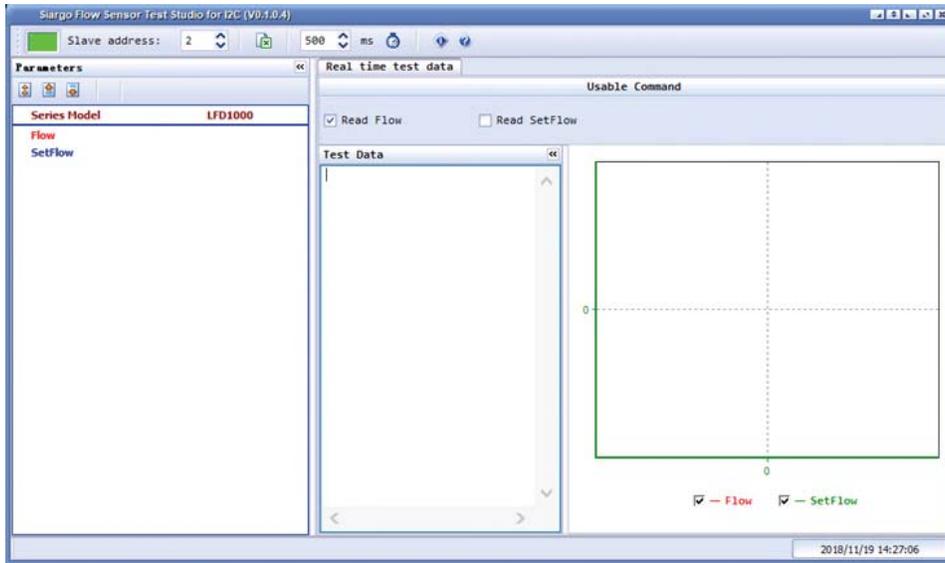
The five buttons on the upper right corner are used for Minimizing Windows, Hiding Window, Maximizing Window and Exit from the Window.

First, one needs to set the slave address which by default is 2 (0x0000 0010)

Then one can set the test parameters as follows,
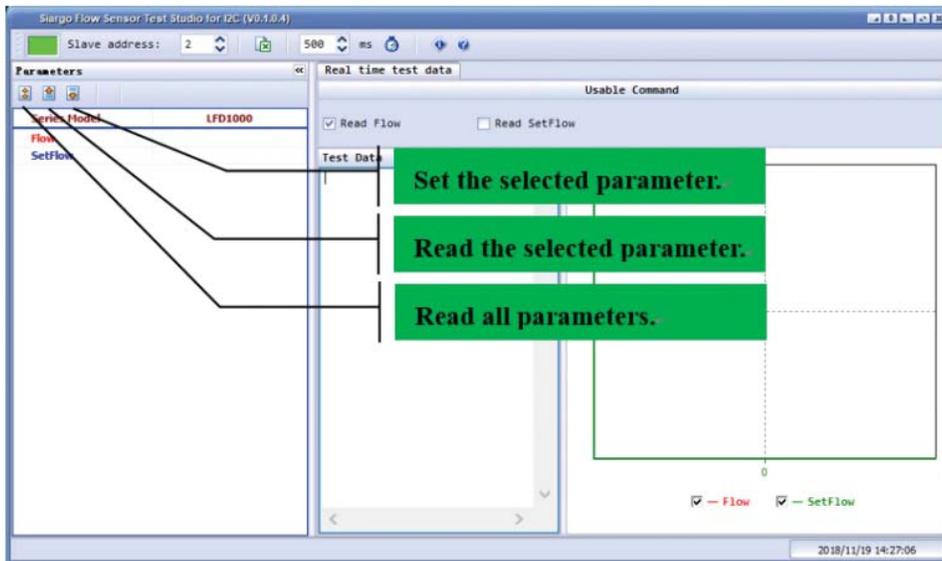
Where, setflow has the parameters from 500 to 6000 which means 0.5ml/min to 6mL/min. Then one can double check the input value by "Read" the parameters that was entered by the user. After verification, click on the "set" button to write the desired parameters to the product. A pop-up window will ask one to confirm.
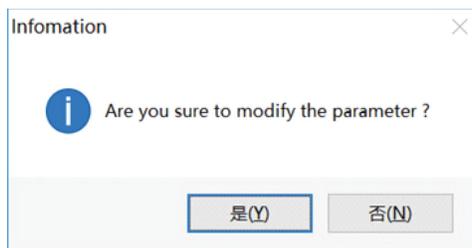
After the confirmation and write the dispensing flowrate, one can proceed to input the time interval as shown in the following picture. Finally click on "Start" the dipensing process shall be shown in the dynamic graph of the following window.