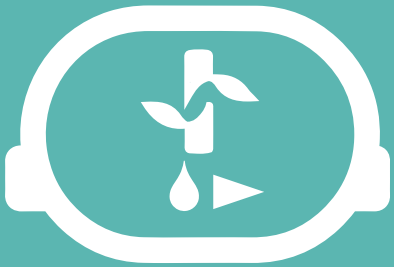
USER'S
MANUAL

FLOW UNIT
FLOW UNIT+
FLOWBOARD



FEB 2025

FLUIGENT

PRECAUTIONS

Do not open Flowboard and FLOW UNIT devices. Please refer all servicing to after-sales service department (support@fluigent.com)

Prevent any objects or liquid from entering the Flowboard and FLOW UNITs, this may cause a short-circuit failure or other malfunction. Failing to respect this advice would:

- Expose you to direct current/voltage in case the device is under voltage which may lead to severe damages
- Void device's warranty
- Discharge our company from any liability regarding physical or device damages.

Do not place the product in an unstable location with a level surface and a strong and stable support.

Do not use other power supply than the one provided, it has been carefully selected to meet the power requirements of the Flowboard in all configurations and to comply with all safety standards.

The diameter of the FLOW UNIT XS capillary is small: 25 µm. Filter your solution, if possible add a filter in the fluidic path.

Always clean the Flow UNIT at the end of each experiment.

SUMMARY

INTRODUCTION

The FLOW UNIT range provides a solution for measuring and/or controlling flow- rates for any fluidic applications. Combining the FLOW UNIT with our pressure handling system (Flow EZ™ or Flowboard combined with MFCS™) will give you the opportunity to check at all times flow-rate and volume of liquids flowing through your fluidic system. The four (4) different FLOW UNIT models offer an extensive choice of flow-rate ranges to best match your required precision, from 8 nL/min to 40 mL/min. Beside water based solutions, a second calibration for hydrocarbons is available on three (3) different FLOW UNIT models (S, M+ and L+), see §8.

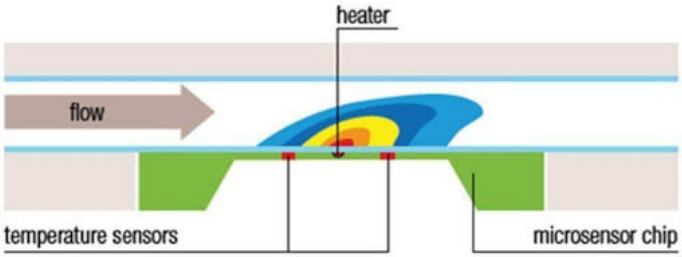
This user manual will show you how to install and use flow units in your daily work. It will describe all the Flow unit functionalities and will help you to connect all the different FLOW UNIT models and to use it with all the equipment: with Fluigent Flow EZ™ and MFCS™-EZ

General information

Technology principle

The Flow Unit enables flow-rate measurements, in a wide range of flow-rates thanks to the five (5) models: XS, S, M+, L+.

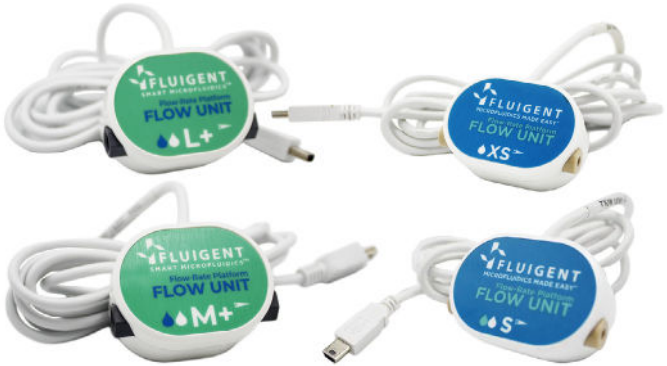
The flow-rate acquisition is based on a thermal technology. A heating element on the microchip adds a minimal amount of heat to the medium for the thermal flow measurement. Two temperature sensors, symmetrically located above and below the source of the heat, detect even the slightest temperature differences, thus providing the basic information about the spread of the heat, which itself is directly related to the flow- rate.



This user manual will show you how to install and use flow units in your daily work. It will describe all the Flow unit functionalities and will help you to connect all the different FLOW UNIT models and to use it with all the equipment: with Fluigent Flow EZ™ and MFCS™-EZ

Four (4) different FLOW UNIT models are available. They depend on flow-rate ranges and calibration.

Here is a picture of the Four (4) FLOW UNIT models with different ranges, with a dual calibration for each . All the fluidic specifications are diplayed in the specification table.



Note: The FLOW UNIT can work at its best performances with FLUIGENT pressure

flow control solutions (FLOW EZ™ and MFCS™-EZ). More details on www.fluigent.com.

SPECIFICATIONS

FLOW UNIT+ models

SENSOR PERFORMANCE				
Sensor model	XS	S	M+	L+
Calibrated media	Water	Water, IPA	Water, IPA	Water, IPA
Range	0±1.5µL/min	0±7µL/min 0±70µL/min	0±2mL/min	0±40mL/min
Accuracy (m.v.= measured value) also applies to negative values	10% m.v. above 75 nL/min 7.5 nL/min below 75 nL/min	5% m.v. above 0.42 µL/min 21 nL/min below 0.42 µL/min 20% m.v. above 4.2 µL/min 210 nL/min below 4.2 µL/min	5% m.v. above 10 µL/min 0.5 µL/min below 10 µL/min 10% m.v. above 50 µL/min 5 µL/min below 50 µL/min	5% m.v. above 1 mL/min 50 µL/min below 1 mL/min 10% m.v. above 2 mL/min 200 µL/min below 2 mL/min
Lowest detectable flow increment	3.7 nL/min	10 nL/min	/	/
MECHANICAL SPECIFICATIONS				
Inner diameter	25 µm	150 µm	430 µm	1 .4 mm
Max pressure	200 bar	200 bar	100 bar	15 bar
Wetted materials	PEEK & Quartz Glass	PEEK & Quartz Glass	PPS, stainless steel 316L	PPS, stainless steel 316L
Inner volume	1 µL	1.5 µL	28 µL	28 µL

Please note that the maximum pressure depends on the FLOW UNIT model. Ensure that the pressure applied to a FLOW UNIT does not go beyond this value at all times.
The FLOW UNIT suits your own fluid controller. If you use a pressure regulator you may have to enter a maximum pressure below this value. If you use other flow controller, be aware that pressure may go higher than 100 bar very easily and may cause damage to your FLOW UNIT.

FLOW UNIT models

SENSOR PERFORMANCE					
Sensor model	XS	S	M	L	XL
Part number	FLU-XS	FLU-S-D	FLU-M-D	FLU-L-D	FLU-XL
Calibrated media	Water	Water, IPA	Water, IPA	Water, IPA	Water
Range	0±1.5µL/min	0±7 µL/min 0±70 µL/min	0±80µL/ min 0±500 µL/min	0±1 mL/min 0±10 mL/ min	0±5 mL/min
Accuracy (m.v.= measured value) also applies to negative values	10% m.v. above 75 nL/ min 7.5 nL/min below 75 nL/ min	5% m.v. above 0.42 µL/min 21 nL/min below 0.42 µL/min 20% m.v. above 4.2 µL/ min 210 nL/min below 4.2 µL/ min	5% m.v. above 2.4 µL/min 0.12 µL/min below 2.4 µL/min 20% m.v. above 25 µL/min 5 µL/min below 25 µL/min	5% m.v. above 0.04 mL/min 1.5 µL/min below 0.04 mL/min 20% m.v. above 0.5 mL/min 100 µL/min below 0.5 mL/min	5% m.v. above 0.2 mL/min 10 µL/min below 0.2 mL/min
Lowest detectable flow increment	3.7 nL/min	10 nL/min	0.06 µL/min	0.7 µL/min	3 µL/min
MECHANICAL SPECIFICATIONS					
Sensor inner diameter	25 µm	150 µm	430 µm	1.0 mm	1.8 mm
Total internal volume	1 µL	1.5 µL	5 µL	25 µL	80 µL
Max pressure	200 bar	200 bar	100 bar	15 bar	15 bar
Wetted materials	PEEK & Quartz Glass	PEEK & Quartz Glass	PEEK & Borosilicate Glass	PEEK & Borosilicate Glass	PEEK & Borosilicate Glass

FLOW UNIT DESCRIPTION

FLOW UNIT FRONT AND BACK

1 Sensor model
2 Calibrations
3 Positive flow-rate direction
4 Range

The two (2) fluidic ports are on the sides of the device.
The front of the FLOW UNIT displays information about the range and the calibration: The letter indicates the “model”; Here it’s S.

The droplet indicates the calibration. If there is a single white droplet, It indicates that the sensor is calibrated for water. However if there is an additional blue droplet it indicates that there is a dual calibration for water and Isopropyl alcohol

The back of the FLOW UNIT also displays information about the range and the calibration: The letter indicates the “model”; Here it’s S.
The droplet indicates the calibration. Here there is a single white droplet: it indicates that the sensor is calibrated for water and IPA. The range is displayed clearly: 0 ± 7µL/min (water) ; 0 ± 70µL/min (IPA)

General fluidic connection

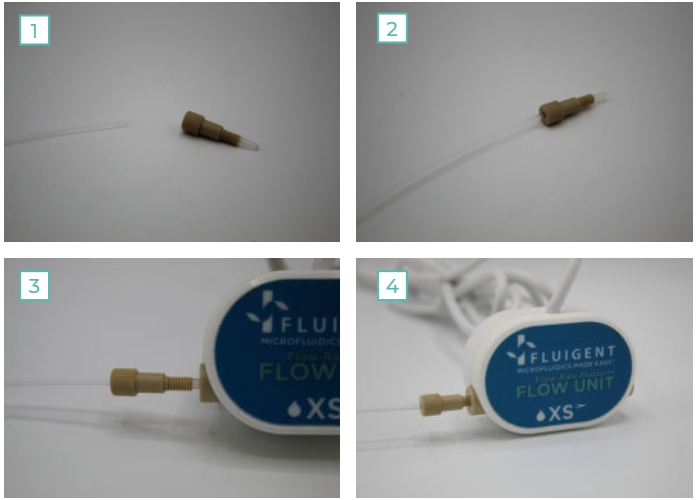
XS / S tubing & fittings

The XS and S FLOW UNIT models have two (2) fluidic ports.
The characteristics of those two (2) ports are: Thread-size: UNF 6-40.
Compatible with tubings of 1/32'' external diameter (1/32'' OD).
To get started, FLUIGENT can provide you a "CTQ_KIT_LQ" kit including:

- One (1) green sleeve 1/16'' OD x 0.033''x1.6"
- Two (2) LQ flow unit connector for 1/32''OD tubing,
- One (1) meter of PEEK Tubing Blue 1/32'' OD x0.010'' ID
- One (1) adapter PEEK 1/16" to 1/32'' OD tubing

Note: As there is a wide variety of tubings and fittings for the different applications that you may use, FLUIGENT advises you to make sure that your fluidic connection system fits with the two (2) fluidic ports of the FLOW UNIT. If not, please note that there is a large panel of adapters and unions to connect your tubings to ours. Visit www.fluigent.com to learn more about materials and ID available with 1/32'' or 1/16" OD tubing, nuts and ferrules from fittings suppliers to suit your application.

XS / S connection



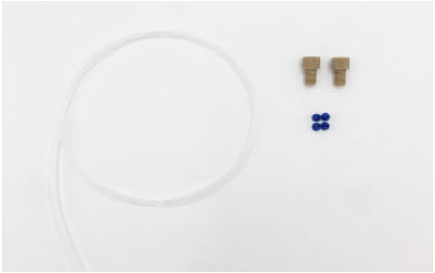
1. Cut the 1/32'' OD tubing to the desired length, leaving a square-cut face.
2. Slide the fitting over the tubing.
3. Insert the assembly into the receiving port, and while holding the tubing firmly against the bottom of the port, tighten the fitting finger tight.
4. To check the tightness of your connection, you may pull gently on the tubing: it must stay fitted in the ferrule and nut.
5. Do the same thing on the 2nd port.

M+ / L+ TUBING & FITTINGS

The M+ and L+ FLOW UNIT models have two fluidic ports.
The characteristics of those two (2) ports are: Thread-size: ¼-28.
Flat-bottom type (FB).
Compatible with tubings of 1/16'' external diameter (1/16'' OD).

To get started, FLUIGENT can provide you the "CTQ_KIT_HQ" kit including:

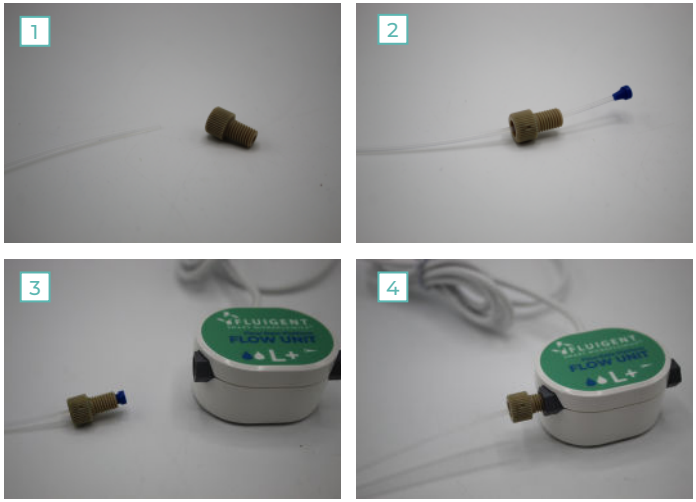
- Two (2) Flow Unit HQ connector ¼-28 Flat
- Bottom for 1/16'' OD tubing
- Four (4) ferrules for HQ flow unit
- 1 m FEP tubing 1/16'' OD * 0.020''ID



Note: As there is a wide variety of tubings and fittings for the different applications that you may use, FLUIGENT advises you to make sure that your fluidic connection system fits with the two (2) fluidic ports of the FLOW UNIT. If not, please note that there is a large panel of adapters and unions to connect your tubings to ours. Visit www.fluigent.com to learn more about materials and ID available with 1/32'' or 1/16'' OD tubing, nuts and ferrules from fittings suppliers to suit your application.

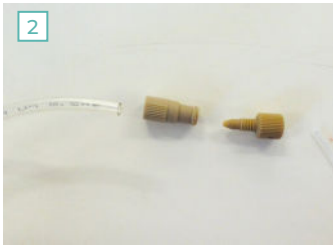
Using a Flow UNIT L+ at a flow rate above 15 mL/min, please use the alternative connectors provided in the flow unit L+ kit along with the 4 mm tubing (see p.14 for the connexion instructions).

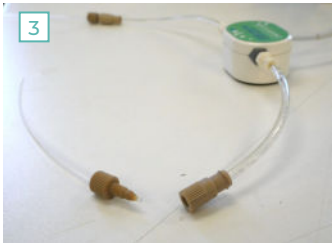
M+ / L+ CONNECTION



1. Cut the 1/16'' OD tubing to the desired length, leaving a square-cut fac.
2. Slide the nut over the tubing with the nut thread facing the tubing end being connected.
Slip the ferrule over the tubing, with the tapered portion of the ferrule facing the nut. NB: the nuts and ferrules are specifically designed to work together. (FLUIGENT advises you to only associate the provided ferrules with the provided nuts and vice-versa).
3. Insert the assembly into the receiving port, and while holding the tubing firmly against the bottom of the port, tighten the nut finger tight..
4. To check the tightness of your connection, you may pull gently on the tubing: it must stay fitted in the ferrule and nut.
5. Do the same thing on the 2nd port.

L+ CONNECTION FOR HIGH FLOW RATE USE (>15 ML/MIN)





1. Screw the white fitting (female 1/4-28 UNF connector) onto the receiving port of the Flow UNIT.
2. Cut the 4 mm pneumatic tubing to the desired length (we recommend cutting it as short as possible). Then, connect it by firmly inserting one end into the white fitting and the other end into the female luer adapter.
3. Insert the 1/16" tubing into the Coned Fingertight Adapter. Ensure that a small length of tubing protrudes from the connector.
4. Screw the two adapters together firmly.
5. Do the same thing on the 2nd port.

SETTING UP WITH FLOW EZ™

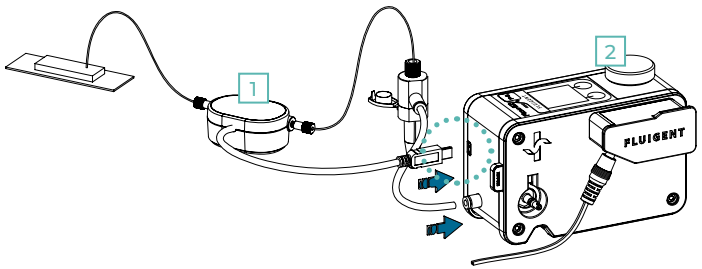
FLOW EZ™ DESCRIPTION

The Flow EZ™ is the most advanced system available for pressure-based flow control. The compact device stands near the microfluidic device, allowing the user to minimize bench space use without the need of a PC. One can be operational and generate data rapidly. The Flow EZ™ supports reservoir sizes from 2 mL to one liter laboratory bottles. One can use large reservoirs and maintain continuous, pulseless flow for days without refilling.

Combined with FLOW UNIT it allows access in real time flow rate measure and control on your system.

Connection to Flow EZ™

For connection of FLOW UNIT to Flow EZ™ simply connect the USB cable from the FLOW UNIT to the Flow EZ™.



1 FLOW UNIT (sensor)

2 FLOW EZ™ (Pressure-based flow controller)

For more information about how to connect and use the Flow EZ™ check our webpage and Flow EZ™ user manual:

https://www.fluigent.com/research/instruments/pressure-flow-controllers/lineup-series/flow-ez/

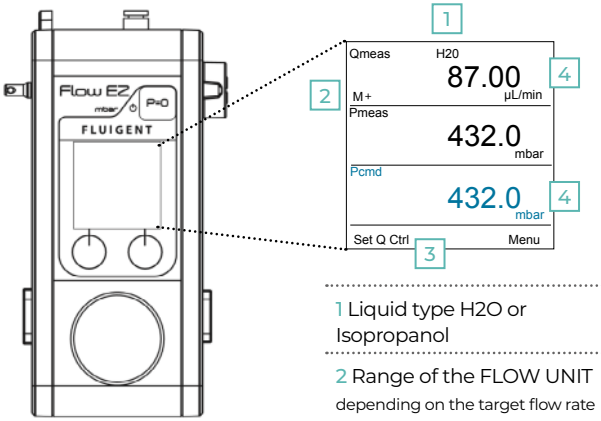
Once connected to the Flow EZ™ and to the fluidic system (reservoir and chip) flow rate can be measured either directly on the Flow EZ™ in local mode or by using OxyGEN.

Local mode: measure and control the flow-rate

Flow-rate measure

Once a FLOW UNIT is connected, the device automatically detects it and the "Operation window" will display an additional zone including the flow rate measurement.

The measured flow rate (Qmeas) is only monitoring purposes. To directly control the flow rate, see next page (Flow rate control)



In this configuration you will have access to the measure of the flow rate in real time. You can then adjust the pressure to reach the flow rate you want to target.

1 Liquid type H2O or Isopropanol

2 Range of the FLOW UNIT depending on the target flow rate (XS, S, M+, L+)

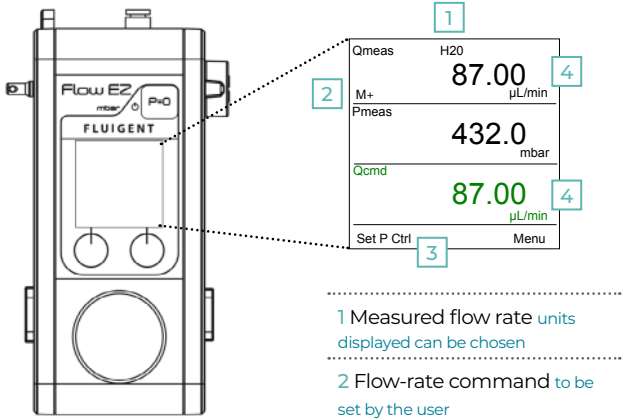
3 Switch to flow rate control mode see next page

4 Measured flow rate units can be changed using the menu

5 Pressure command to be set by the user

Flow-rate control

When a FLOW UNIT is connected, press the left button "Set Q Ctrl" to switch to the flow rate control mode.



1 Measured flow rate units displayed can be chosen

2 Flow-rate command to be set by the user

3 Go back to pressure control mode

The user can directly control the flow rate, by setting the flow rate command (Qcmd)

Although the control mode is in flow rate, the live pressure section value in the reservoir (Pmeas) is still displayed in the middle, giving information on the fluidic set-up. Abnormal flow rates may reflect problems in the microfluidic set-up (leakage, clogging, etc.)

OxyGEN: measure and control the flow-rate

Flow-rate measure

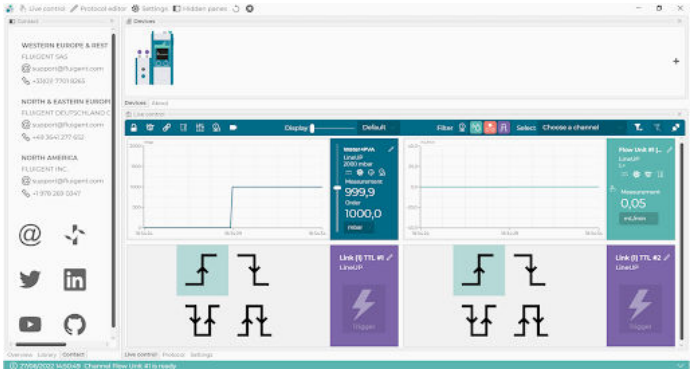
For control using the OxyGEN software a Link module must be added to the setup:

The link module is a module which allows communication between the Flow EZ and the computer. For more information please refer to the lineup user manual :

https://www.fluigent.com/resources-support/support-tools/downloads/user-manuals/lineup-series-user-manual/

The Link module must be connected to the Flow EZ first.
When the Link is connected to the Flow EZ, coneect the Flow unit to the Flow EZ.

After the flow unit has been successfully connected in the Flow EZ in order to measure and control flow rate you just need to launch the Oxygen software.



The Oxygen software will automatically detect the instrument connected to the flowboard and show immediately the flow rate measure of each connected flow unit on the Flow rate graphs.

FLOW-RATE GRAPH

The flow rate graph reports the current flow-rate sensor measurements . If Flow rate control is needed it's possible to click on the Hand icon to launch the DFC (Direct flow control mode).

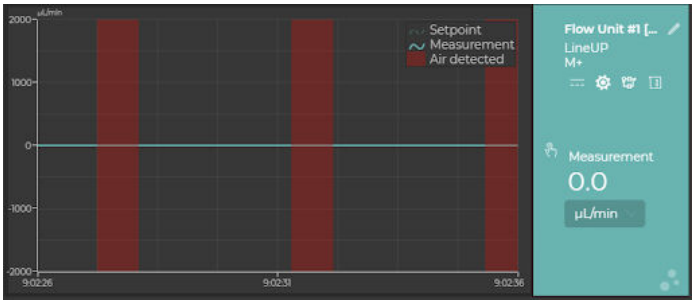
After the flow unit has been successfully connected in the Flow EZ in order to measure and control flow rate you just need to launch the Oxygen software.

The new order can be either given via the vertical cursor if a DFC has been set up Flow rate graphs or as a number in the dedicated text field. One can change the unit of reference via the select box under the "Order" field. The name of the channel (that can be modified) and its characteristics can be seen in the top right corner.

For more detailed information please see the Oxygen user manual in the following link: https://www.fluigent.com/resources-support/support-tools/downloads/user-manuals/

Bubble detection

When air is detected, red aeras will be displayed on the flowgraph over the period of detection.

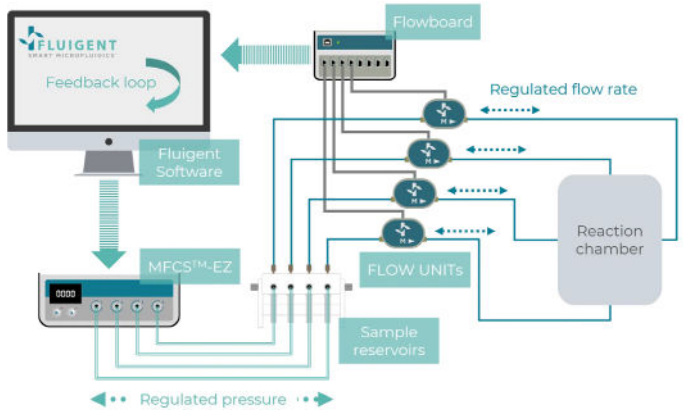


SETTING UP WITH FLOWBOARD

For the use of our FLOW UNIT sensor range without Flow EZ™ the Flowboard is a product that must be used. This device hosts up to eight (8) FLOW UNIT models and provides them power supply.

The Flowboard is also the link between the connected FLOW UNIT models and the software OxyGEN.

When combining the FLOW UNIT with the MFCS™-EZ, one must use the OxyGEN software.



Description of the Flowboard

The Flowboard is a hub that powers and communicates between Fluigent Software and up to eight FLOW UNITs.

They act as the Flow-Rate Platform to measure and display flow rates in real-time. The Flowboard is required for flow rate control when using a MFCS™ series flow controller. It can be used to measure and display flow-rate with any flow control system.

1 A green indicator (power LED) lights up when the FLOWBOARD is connected.

2 A USB port (type B) links the FLOWBOARD to a computer for software control

3 There are eight (8) mini USB ports (to connect up to eight (8) FLOW UNIT devices).

On the back of the FLOWBOARD a table summarizes all the FLOW UNIT models available and their characteristics.
On the bottom of the FLOWBOARD a label indicates the product number, the serial number, the current and the voltage.

Connection to Flowboard and PC

USB connection
Connect the type B plug of the USB cable provided with the Flow- Rate Platform into the type B USB port on the front of the FLOWBOARD.

Connect the other end of the USB cable (type A standard plug) to the computer where the corresponding software is installed

FLOW UNIT connection
To connect a FLOW UNIT to the FLOWBOARD, plug the end of the mini-USB plug fixed with the FLOW UNIT to one of the eight (8) mini-USB ports on the FLOWBOARD.

Quick start guide

1. First, you may want to integrate the different FLOW UNIT to your microfluidic system, with the right fittings.

2. Then, connect the FLOW UNIT models to the FLOWBOARD.

3. Then connect the FLOWBOARD and the computer with the USB cable.

4. To finish, start the software (Oxygen) installed on your computer (user manual) from the following link : https://www.fluigent.com/resources-support/support-tools/software/oxygen/

5. You can now use your Flow-Rate Platform for your application.

Do not forget to clean and rinse your FLOW UNIT after use.

FLOWBOARD: MEASURE AND CONTROL THE FLOW-RATE

After the flow unit and flowboard have been successfully connected, in order to measure and control flow rate you just need to launch the Oxygen software.

The oxygen software will automatically detect the instrument connected to the flowboard and show immediately the flow rate measure of each connected flow unit on the Flow rate graphs.

For more detailed information please see the Oxygen user manual in the following link: https://www.fluigent.com/resources-support/support-tools/downloads/user-manuals/

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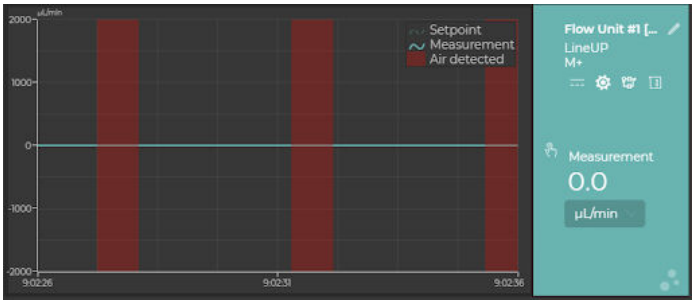


DUAL CALIBRATION

PRINCIPLE OF SINGLE AND DUAL CALIBRATION

The different FLOW UNIT models are calibrated to provide an accurate reading when used with the corresponding fluid, water or isopropyl alcohol.

For the FLOW UNIT model XS, only one single calibration for water is available.

For the FLOW UNIT models S/M+/L+, two calibrations are available:

Water and Isopropyl alcohol.

The FLOW UNIT can be used to handle different fluids not originally calibrated for. When possible, select a standard calibration field that most closely matches your fluid. For example, water calibration can be used for water-based solution and isopropyl alcohol calibration for hydrocarbons or oil. The calibration can be selected and switched in the software.

In order to obtain accurate flow-rates for alternative fluids, it is necessary to use correction factors (scale factor), to convert the displayed value into the actual value. The scale factor can be added in the software (see Custom scale factor in the corresponding user manual).

Adding the scale factor ensures that the flow sensor reading is now accurate for the target fluid.

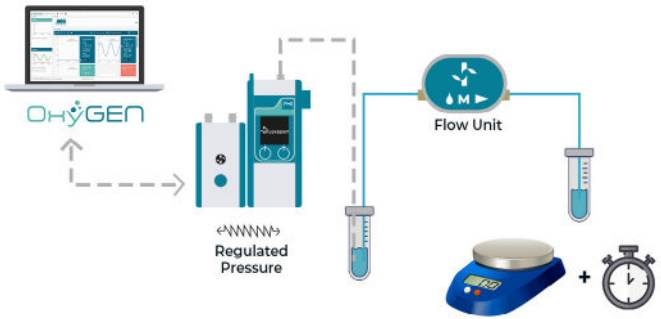
The following section explains how you can calculate this scale factor and shows an example with a fluorinated oil: HFEHFE.

CALIBRATION METHOD: EXAMPLE WITH HFE CALIBRATION

A method for providing a known flow-rate is required to work out the scale factor for the selected fluid. This could be a syringe pump, a peristaltic pump or a pressure regulator delivering fluid onto a precision balance with volume calculated from known density.

Here is an example using Flow EZ™, a fast and stable pressure-based flow controller delivered by FLUIGENT. The aim of this FASTABTM technology is to pressurize a reservoir containing the fluid of interest to be injected through the microfluidic system.

Make a table that contains the time for each measurement, the flow-rate of the pump and the data measured by the FLOW UNIT.
A minimum of 3 measurements is recommended for each flow-rate.



The principle of the experiment is to inject the desired fluids, here HFE, through the desired FLOW UNIT model connected to the Flow EZ™ Simultaneously record the flow-rate given by the software and measure the weight of fluid collected over a chosen period of time. Knowing the fluid density, you are able to determine the actual flow-rate.

Note that if a peristaltic or a syringe pump is used, one must wait until the target flow- rate is reached (settling times can be long) and to calculate an average flow-rate due to the pulsations.

The list of materials needed to reproduce the experiment is given below:

- One (1)FLOW EZ™
- One (1) FLOW UNIT model
- One (1) precision weighing scale

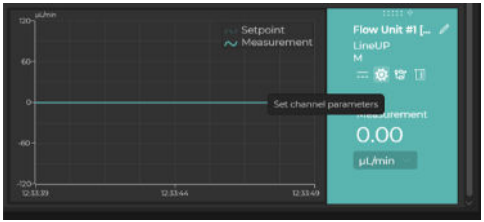
The table below displays the information recorded during the experiment: the pressure imposed by the Flow EZ™, Qs the flow-rate recorded by the FLOW UNIT sensorthrough the Flow EZ™ or OxyGEN, Qw the flow-rate measured with the precision weighing scale, and Qw/Qs the calculated scale factor for a single point calibration.

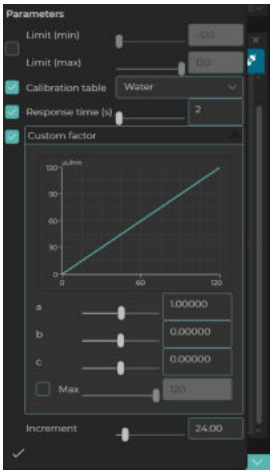
	1	2	3
Pressure (mbar)	90	90	90
Q_s (µl/min)	100,00	100,00	100,00
Q_w (µl/min)	459,87	469,07	473,66
Q_w / Q_s	4,60	4,69	4,74

Consequently, when working around 100 µl/min (target flow-rate), you have to add the scale factor of 4.68 so that the measurement of the sensor corresponds to the actual flow-rate for HFE.

This custom calibration can be directly implemented on OxyGEN software using the “Set channel parameters” on OxyGEN *(more information on OxyGEN user manual)*, where a, b and c represent factors of a polynomial function, $ax + bx^2 + cx^3$. For liquids where a linearity between different imposed flow rate is observed, only a can be used.

For more complex liquids that do not have a linear behavior, we recommend to perform several measures at distinct points (for instance 10%, 50% and 90% of the flow rate range), generate a polynomial function using a spreadsheet program, and apply the calculated coefficients on OxyGEN.





CLEANING PROCEDURE

FLOW UNIT models are highly sensitive and should be properly cleaned to always maintain high performance. With proper care and maintenance, the Flow Units can last many years. No cleaning or improper cleaning may leave deposits on the internal capillary wall which could result in measurement deviations and even clogging.

General handling

The following section describes the steps to perform the cleaning of the **FLOW UNIT,** depending on your application.

This protocol should be performed daily. For biological applications, we recommend conducting **a more thorough cleaning every two weeks** to ensure optimal reliability and accuracy.

Following these cleaning procedures is essential to **maintain the device’s precision** and **achieve optimum results**.

GENERAL RECOMMENDATIONS

- Use **clean tubing** upstream of the FLOW UNIT. This procedure can also be used to clean the tubing if they are reused for extended periods of time.
- Use tubing that have a **smaller iner diameter** (ID) than the **FLOW UNIT** to clean. This will ensure that no clogging occurs due to unfiltered particles, as tubing can be cut or replaced.

MANDATORY PRACTICES

- **Always clean** the sensor **between experiments** or at the **end of each day**.
- **Always filter the solutions used,** including the cleaning solutions with proper filters (usually <20 µm pore size, at least < 5µm for the FLOW UNIT XS) and with the appropriate solvent compatibility.
- **Never** let a **solution dry in the sensor.**

For more details on cleaning protocols for the Flow UNIT, please refer to the **dedicated document on Fluigent website** or contact the customer support team.

DAILY PROTOCOL FOR BIOLOGICAL APPLICATIONS

6 steps

Step 1: Filter your solutions

Select a **cleaning solution compatible with the wetted materials** and the liquids used that will **dissolve likely contaminants**. **Filter** the cleaning solution.

Filter
- For **FLOW UNIT XS**, please use 5 µm pores
- For other **FLOW UNIT**, please use 20 µm pores

Step 2: Rinse with water or your solution

Rinse the system with the liquid solution that you were using during the experiments for **1 min**. Do not use biologicals. The **recommend flow rate** will depend on your flow sensor. Recommendations are at the end of the cleaning procedure section.

Step 3: Wash with a Detergent solution

Change the solution to a **detergent solution or other solution that will dissolve likely contaminants** that is compatible with the device wetted materials.

If you're working with **cells or any biologicals**, use an enzyme detergent. We highly recommend using **Tergazyme** for this step (1% fresh solution in DI Water).

Clean during **1 min at maximum pressure** followed by **10 min at the recommended flow rate** for your sensor (refer to the table at the end of this section).

If you are using a **Flow UNIT XS**, we recommend extending the washing time to 15 minutes instead of 10 for the detergent step.

Step 4: Wash with DI Water

Fill your reservoirs with **DI water** and rince the system at the **recommended flow rate for 5 min** (refer to the table at the end of this section).

Step 5: Flush with Isopropanol

Change the solution in your reservoir for **isopropanol.** Wash for **5 min at the recommended flow rate** (refer to the table at the end of this section).

Step 6: Air Dry

Empty the reservoir. **Dry the Flow UNIT** at **maximum pressure** until air comes out **for at least 5 min.** This will evaporate the IPA inside the capillary to **avoid building up deposits** that can degrade the Flow UNIT's performance.

Place the yellow plugs on the sensor if it is to be stored.

DAILY PROTOCOL FOR OTHER APPLICATIONS

(DROPLET, CHEMICAL...)
4 steps

Step 1: Rinse with your liquid

Rinse your system with the solution in use during the experiments for **1 min**. The **recommend flow rate** will depend on your flow sensor. Recommendations are at the end of the cleaning procedure section.

Step 2: Wash with DI Water

Fill your reservoirs with **DI water** and rinse the system at the **recommended flow rate for 5 min** (refer to the table at the end of this section).

If working with oils, this step is unnecessary. Go to step 3 and wash your system directly with IPA or ethanol.

Step 3: Wash with Isopropanol or Ethanol

Change the solution in your reservoir for **isopropanol or Ethanol.** Wash for **10 min at the recommended flow rate** (refer to the table at the end of this section).

Step 4: Air Dry

Empty the reservoir. **Dry the Flow UNIT** at **maximum pressure** until air comes out **for at least 5 min.** This will evaporate the IPA inside the capillary to **avoid building up deposits** that can degrade the Flow UNIT's performance.

ADVANCED CLEANING PROTOCOL

When working with **cells or biological content**, we recommend performing this protocol **twice a month**. Regular cleaning ensures the removal of residues and contaminants, maintaining the accuracy and reliability of the device.

Following this protocol is essential if you notice **any deviation in your sensor readings over time,** which is likely due to the formation of a biofilm.

The main steps are the same as the daily protocol. The main difference resides in the exposure times of the sensor to the different solutions.

PROTOCOL

1. **Filter** your solutions

2. Rinse the system with your **liquid** at recommended flow rate for **5 min.**

3. Fill with your **detergent solution** (Tergazyme) and **let stand without flow for 2 hours.**

4. Rinse with **DI Water** at recommended flow rate for **30 min**.

5. Wash the system with **Isopropanol** at recommended flow rate for **30 min**.

6. **Dry** properly your system with **air** at **maximum pressure** for **10 min**.

Details of the Step 3: Wash with Tergazyme

Prepare a **1% fresh Tergazyme solution**. Fill the entire system, including the sensor, with the Tergazyme solution.

Once the system is filled, **stop the flow** to allow the **solution to remain static**. If necessary, close the circuit during this step. Let the Tergazyme solution sit in the system for **2 hours.** This allows the detergent to dissolve and remove contaminants effectively.

RECOMMENDED FLOW RATES

The following table provides the recommended flow rates for each sensor to ensure optimal performance and efficiency during the cleaning process.

Sensor model	Recommended Flow Rate
Flow UNIT XS	750 nL/min
Flow UNIT S	3,5 µL/min
Flow UNIT M	40 µL/min
Flow UNIT L	500 µL/min
Flow UNIT XL	1 mL/min
Flow UNIT M+	500 µL/min
Flow UNIT L+	1 mL/min

CLEANING METHODS THAT ARE NOT RECOMMENDED

In general, any cleaning by mechanical means should be avoided. Never enter the sensor's flow path with sharp objects that could scratch the glass surface.

Furthermore, no abrasives or liquids containing solids that can grind the surface clean should be used. Anything that affects the glass wall will cause deviations in the measurement performance or permanently damage the sensor. Strong acids and bases should also not be used to clean the sensor.

SERVICING & WARRANTY

SERVICE SCHEDULE

Component	Servicing interval
All system	Regular inspection for external damage / leaks
FLOW UNIT	Regular inspection for external damage / leaks Cleaning after each use to prevent buildup of debrit
Flowboard	Regular inspection for external damage / leaks

WARRANTY TERMS

What This Warranty Covers

This warranty is granted by Fluigent and applies in all countries.
Your Fluigent product is guaranteed for one year from the date of delivery at your laboratory against defects in materials and workmanship.
If found to be defective within the warranty period, your Fluigent product will be repaired or replaced free of charge.

What This Warranty Does Not Cover

This warranty does not cover routine maintenance, or damage resulting from the failure to maintain the product in accordance with instructions provided by Fluigent. This warranty also does not cover damage that arises from accidental or intentional misuse or abuse, alteration or customization, or repaired by unauthorized persons.

How to Get Service

If something goes wrong, contact the Fluigent dealer from whom you purchased your product. Arrange a mutually convenient time for Fluigent service representative to discuss over the problem and find a solution to fix the issue. Will be favored any remote repairs, but in case more actions need to be taken, the system will come back to Fluigent offices (for no additional cost, only if it is under warranty).

The warranty conditions are:

- Do never open the FLOWBOARD and the FLOW UNIT devices
- Do not use other cables than cables provided by Fluigent
- Prevent foreign objects or liquids from entering the FLOWBOARD
- Prevent foreign objects from entering the FLOW UNIT
- Do not place the product in an unstable location, place the unit in a location with a level surface and a strong and stable support
- Respect the temperature compatibility (from 5°C to 50 °C)
- Filter your solution, if possible add a filter in the fluidic path (§ 10) and clean your FLOW UNIT after each use, especially the FLOW UNIT XS (cf § 4.3). The diameter of the FLOW UNIT XS capillary is small: 25 µm. Fluigent rejects any liability in the event of clogging or surface modifications.
- Do not allow the FLOW UNIT to dry with media in the capillary tube without flushing
clean first.
- Fluigent advises to realise a cleaning procedure after use.
- The FLOW UNIT yellow plugs must be installed for storage
- Check the fluid compatibility with the FLOW UNIT wetted materials before using it or ask Fluigent customer support.
- The customer is responsible for fluid used with the FLOW UNIT. Before use, the customer has to check the compatibility of the fluid with the FLOW UNIT .

For specific use, please contact our Support team at support@fluigent.com

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