

MFP MICROFLUIDIC PRESSURE SENSOR

DOCUMENT REF: UGMFP 211004

USER GUIDE



Symbols used in this document



Important information. Disregarding this information could increase the risk of damage to the equipment, or the risk of personal injuries.



Helpful information. This information will facilitate the use of the instrument and/or contribute to its optimal performance.



Additional information available on the internet or from your Elveflow representative.

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Introduction

The flowplus fluid sensor is intended to measure and control the pressure of fluid media flowing through the sensor over a wider range of pressure up to 16 bar.

Flow-through pressure sensors are adapted to gases or liquids, and compatible with the Luer-lock standard. Its wide media compatibility, FDA Certification and ease of use make this sensor perfectly suited for food industry use. The sensor guarantees optimum process safety for almost all applications in which media are transported.

The MFP is compact, easy to clean, doesn't require maintenance, easy to install or integrate in existing plants. Its features make it a robust and reliable solution for demanding microfluidic applications

The flowplus Pressure Sensor is monitored by a computer through an interfacing device such as an Elveflow Sensor Reader or the OB1 pressure controller.

Last but not least, the Elveflow Smart Interface allows recording and exporting the data generated by all the Elveflow instruments connected and involved in your experiment.

Main Features & Benefits

- Accuracy up to 2% FS
- 1 range: 0 to 16 bar and Overlay 25 bar
- Wide media compatibility (FFKM)
- FDA-certified large range pressure sensor suitable for food industry use
- Inline sensor & comes with Luer-Lock adapter
- Compatible with gases and liquids
- Flow rate up to 100 mL/min depending on the viscosity and primary pressure of the medium
- Temperature compensated
- Polarization safe
- Integrated measurement amplification
- No dead volume
- No-maintenance and easy to clean

Principle of the MFP Luer-Lock Pressure Sensor

Elveflow's Flow Plus Sensor works as a relative Gauge pressure sensor, measuring positive relative to atmospheric pressure, that serves as the reference pressure.

What is a gauge pressure sensor?

A gauge pressure sensor measures the pressure at its port with respect to the local atmospheric pressure. For example, the pressure of 1 bar inside the vessel measured by a gauge pressure sensor is 1 bar more than the atmospheric pressure. Also, a 1 bar reading at high altitude (where air pressure is lower) would mean the pressure in the vessel has a lower absolute pressure than a 1 bar reading at sea-level.

Thus, the important thing is to understand the difference in pressure or vacuum compared to atmospheric pressure, not the exact pressure or vacuum being generated.

How does a MFP gauge pressure sensor work?

It works based on the piezoresistive effect of bonded or formed strain gauges to detect strain due to applied pressure, resistance increasing as pressure deforms the material. Generally, pressure changes the resistance by mechanically deforming the sensor membrane, enabling the sensor to detect pressure variations as a proportional differential voltage through a piezoelectric effect.

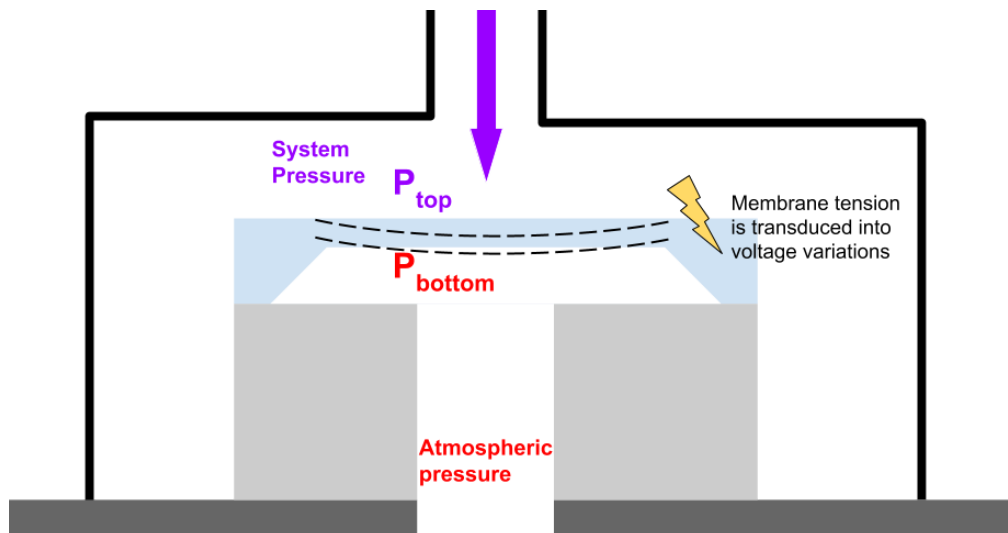


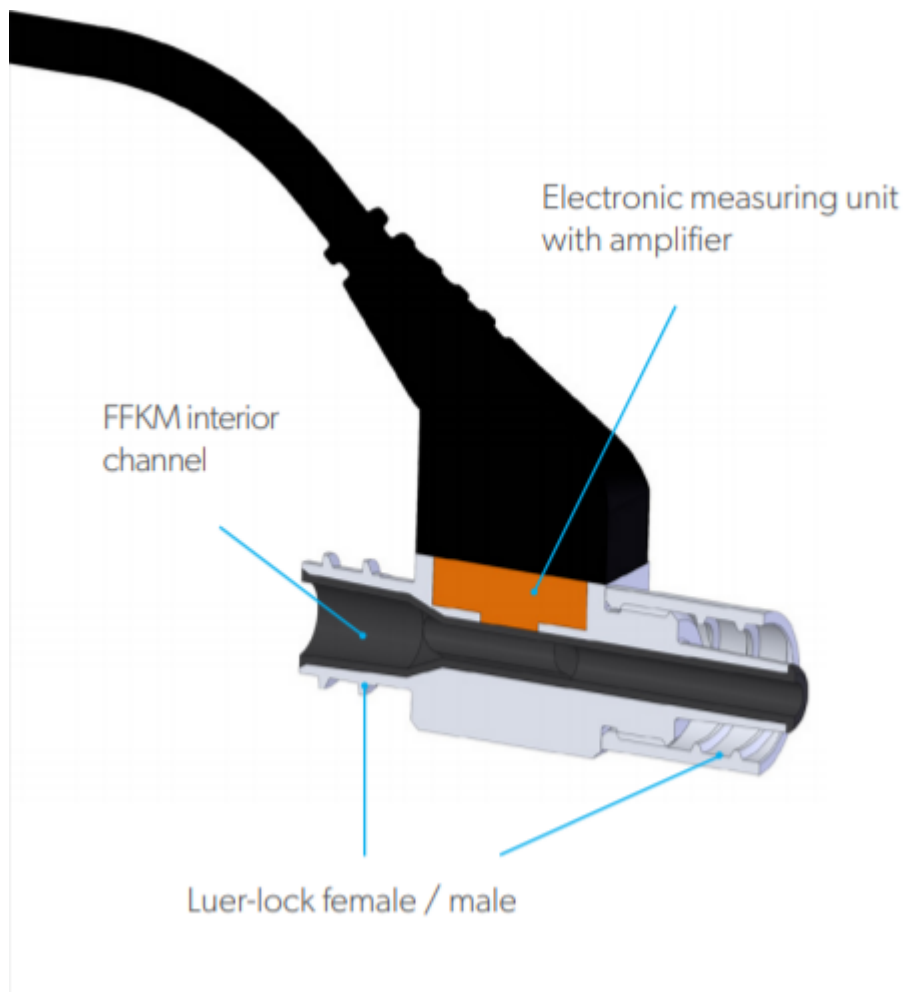
Fig 1. Pressure variations are detected in the MPS sensor through the mechanical deformation of a semiconductor sensing membrane that is transduced into resistance changes by means of the piezoresistive effect.

Technical Specifications & Design

LUER-LOCK PRESSURE SENSOR	SPECIFICATIONS
Maximum flow rate (1)	100 mL/min
Pressure range	0 - 16 bar
Power supply	12 - 30 VDC
Wetted materials	housing: coated aluminium interior flow channel: FFKM, molding TPU
Output signal	0.1 to 10 V
Electrical connection	"push-pull" connector / M8 sensor plug
Mechanical connection	LUER-LOCK DIN EN 1707
Temperature range	15 to 45°C
Internal Volume	205 µL
Dimensions	inner diameter: between 4 mm and 1.8 mm length: 31.2 mm

(1) Depends on the viscosity and primacy pressure of the medium.

Design



Product package contents

Each MFP Luer-Lock pressure sensor includes the following:

- 1 x MFP - MICROFLUIDIC FLOW PLUS SENSOR
- 1 x "push-pull" connector / M8 sensor plug

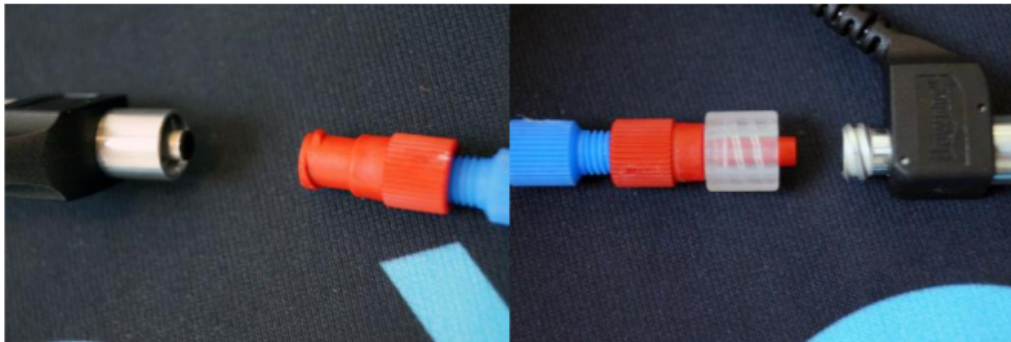
In addition to the above items. The user should have the necessary fluidic accessories (tubing, additional fittings) to connect the inlets/outlets to the rest of the setup.

Installation & use

The Elveflow Pressure Sensors have inlet/outlet ports which can be used in either direction. Ensure that the internal chamber (interior flow channel) of the fluid sensor is free of foreign bodies

Microfluidic connections

Use Luer-Lock connectors to connect the fluid sensor to the pipe carrying the pressurised fluid.



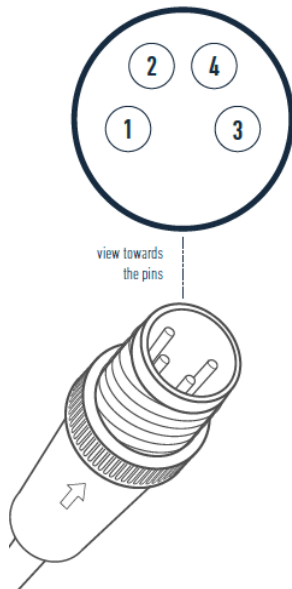
Electronic connections

Make the connection to the measuring unit (connect the fluid sensor to the extension cable using a "push pull" connector, Fig. 1).



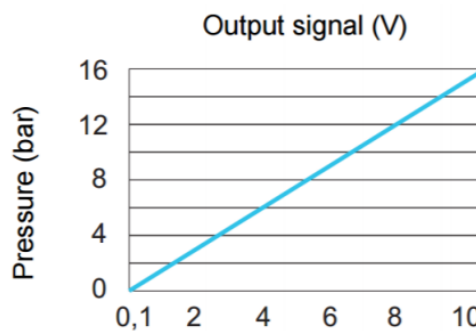
Custom Sensor Connection

The MFP Luer-Lock pressure sensor can also be readout analogically without requiring the sensor reader. The pin out diagram and the specifications are listed in detail below.



MFP Pressure Sensor Amplification module pinout

1. 24 VDC V +/- 10%
2. Not in use
3. Ground
4. 0.1 to 10 VDC



Important warranty Notice



About custom sensor wiring: This information is for understanding purposes only. Sensor wiring modification is not covered under warranty. Any damage resulting from a miswiring or any other type of misuse is not covered by warranty.



The use of our sensors with instruments that are not part of the Elveflow range is not guaranteed. If you use these sensors with different electronics (eg: Arduino) or with a wiring diagram different from the standard wiring, any damage that may occur to these sensors will not be covered by the warranty.

Sensors compatibility chart with Elveflow instruments

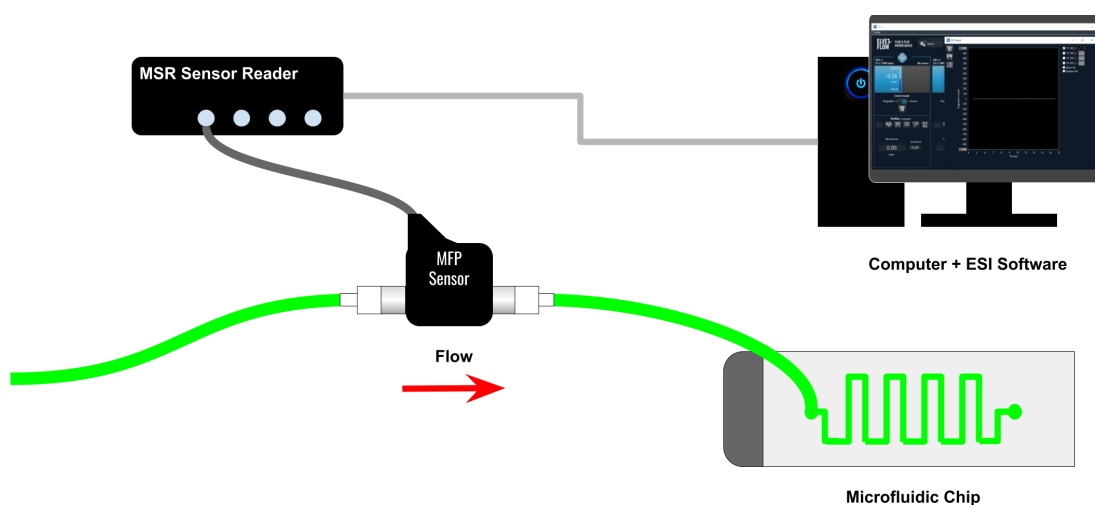
		MFS		MPS	MFP	Bubble Detector	Custom
		Analog	Digital				
OB1	Mk2	✓	✗	✗	✗	✓	
	Mk3	✓	✗	✗	✗	✓	✓
	Mk3+	✓	✓	✓	✓	✓	✓
	Essential	✓	✓	✓	✓	✓	✓
AF1	Pressure	✓	✗	✗	✗	✗	✓
	Dual	✓	✗	✗	✗	✗	✓
MSR	V1	✓	✗	✓	✓ (1)	✓	✓
	V2	✓	✓	✓	✓ (1)	✓	✓
	Flow Reader	✓	✗	✗	✗	✗	✓

✓ compatible
✗ not compatible

(1) USB 3.0 is recommended if more than 3 sensors are connected.

Application example: pressure monitoring

You can connect the MFP sensors wherever you want in the setup in order to monitor your microfluidic experiment. When used with e.g. the Sensor Reader, this allows you to control 4 sensors simultaneously via our ESI software.



To monitor pressure in a simple microfluidic setup, the basic steps would be:

1. Place the pressure sensor ([MFP](#)) anywhere you want on your fluidic path and electrically connect your sensors to the microfluidic sensor reader. Thanks to their small footprint, sensors can be placed anywhere within your fluidic system.
2. Connect the microfluidic sensor reader ([MSR](#)) to your computer via USB and monitor sensor data using the Elveflow Smart Interface ([ESI](#)).
3. Connect the chip for which you'd like to monitor pressure to your flow path. In this position, the sensor directly measures the pressure entering the microfluidic chip. you can add another pressure sensor at the chip outlet in order to get the difference in pressure and/or the microfluidic resistance.

Tips & tricks - Recommendations

Cleaning

A cleaning procedure should be performed at the end of each day or in between two different experiments. The MFP sensor should be wiped outside with a moistened scarf. The channel where the fluid is going through can be flushed with a syringe filled with a cleaning liquid.

For an effective cleaning, pass one of the solutions below (depending of your application) at least twice:

- Bleach solution to kill microorganisms : 1% chlorine bleach and deionized water
- Detergent solution to remove debris: 1% detergent (Mucosol for example) and deionized water Note: 2% RBS 25 can also be used. For blood or plasma manipulation, you may use 1% Alconox.
- Rinsing water to prepare the valve for your next experiment: deionized water Note: Before the rinsing step with the deionized water, you can add a washing step with a solvent such IPA or 70% ethanol (same manipulations as for the rinsing step)

Advanced gentle cleaning using 2.5mm interdental brushes can give good results for cleaning the internal capillary.



The cleaning procedure above are just examples. Consider this as a basis that you can adapt depending on the specificities of your experiment.



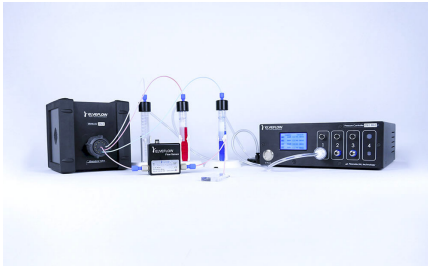
The MFP needs to be cleaned very carefully. Be careful not to put the outside of the sensor in contact with liquid, even briefly. Moisture that can get into the electrical connection can quickly create a short circuit and damage the electronic measuring unit without it being possible to repair it afterwards. **This failure is not covered by the warranty, and you will be offered the purchase of a new sensor.**



Material compatibility

Remember to always check your fluids for compatibility with the Elveflow equipment's wetted materials. Exposing Elveflow equipment to multiple chemicals and compounding application factors like temperature, pressure, concentration, etc... can result in significantly different performance. Specific material compound formulations can significantly alter generalized performance ratings. Elveflow makes no warranty, expressed or implied of actual performance in specific end user applications. It's the user's responsibility to evaluate specific chemical compatibility of parts prior to use. Contact customer@elveflow.com if you'd like to know the wetted material of the sensor you're using.

Linked products



[Live Cell Perfusion Pack](#)

A liquid handling platform for cell-based experimentations



[OB1 MK3+ Flow Controller](#)

The most responsive and stable flow controller on the market



[Microfluidic Reservoirs](#)

microfluidic adapters for eppendorf © , falcon © tubes or gl45 threaded glassware

Customer Support

You are welcome to browse through the Elveflow Support Portal accessible online anytime (<https://support.elveflow.com/support/solutions>). You can find lots of guidance on how to use our product line. It is most likely that the answers you're looking for are already here. In case there are still some questions and you'd like further clarification, please don't hesitate to let us know by email at customer@elveflow.com.



With critical context information readily at hand, Elveflow Support employees will be better prepared to help you.

The elements usually required are:

- the serial number of the Elveflow device(s) used (Sensors, Instrument)
- the ESI software initialization file located in C:\Users\Public\Documents\Elvesys\ESI\data. It is called either "ConfigESI.ini" or "ESI.ini", depending on your ESI version.
- the screenshots of the error messages received, if applicable.
- Some pictures, or movies of your setup and your issue. [WeTransfer](#) is perfect for easily sending us large files.

We are always happy to help ❤️