



## **All-in-One 2018**

### **User Manual**



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## **1. Introduction**

Fluigent All-in-One (or A-i-O) is a software solution for microfluidic flow control. Used with the LineUP™ Series and MFCS™ Series pressure control systems, A-i-O provides a quick, stable and accurate control of up to sixteen (16) pressure channels. By adding the Flow-Rate Platform, flow-rate measurement solution, A-i-O enables high resolution monitoring of up to sixteen (16) flow-rates in your microsystem(s).

The All-in-One User Manual describes how to use A-i-O for your day-to-day work. It describes all of the software's functionalities that will help you to perfectly control the flows in your microsystem(s). You will then be able to make the most of the All-in-One performances and features.

## **2. System Requirements**

This installation requires one of the following Microsoft operating systems:

- Windows 7 (32 and 64 bits)
- Windows 8 (32 and 64 bits)
- Windows 10 (32 and 64 bits)

This installation requires that version 3.1 of the MSI (Windows Installer) Engine is installed on your computer. If you do not have MSI 3.1 or a later version, the installer updates the engine automatically and might require that you restart your computer.

The All-in-One software requires:

- A minimum of 512 Mo of RAM (2Go recommended)
- Minimum processor Intel Pentium 1.6 GHz
- Minimum screen size 800 x 600

## **3. Installation Instructions**

Before installing the All-in-One software, **log on as Administrator or as a user with Administrator privileges**. The All-in-One software setup program must have Administrator privileges because the program modifies the configuration registry of your system. Complete the following steps to install the All-in-One software:

1. Plug the All-in-One USB key. The installer launches if the USB key plays data automatically. If the installer does not launch automatically, navigate into the USB key files using Windows Explorer and launch the setup.exe file from your All-in-One software USB key.
2. The installation wizard guides the user through the necessary steps to install the All-in-One software. Go back and change values where appropriate by clicking the **Back** button. Exit the setup where appropriate by clicking **Cancel**.
3. When the installation is complete, click **Finish**.

## 4. How to start

### 4.1 Material needed

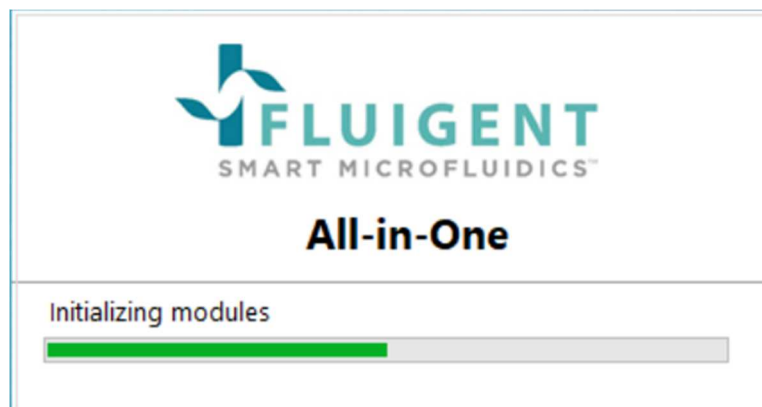
At least one supported Fluigent device must be connected to the computer before the All-in-One software can be launched. The supported products are listed below:

- Line UP™ Link module with at least one (1) Flow EZ™ module. Optionally, a Flow Unit can be connected to each Flow EZ™ module for flow-rate monitoring.
- MFCS™, MFCS™-EZ and MFCS™-EX.
- FLOWBOARD with at least one (1) Flow Unit for flow-rate monitoring.

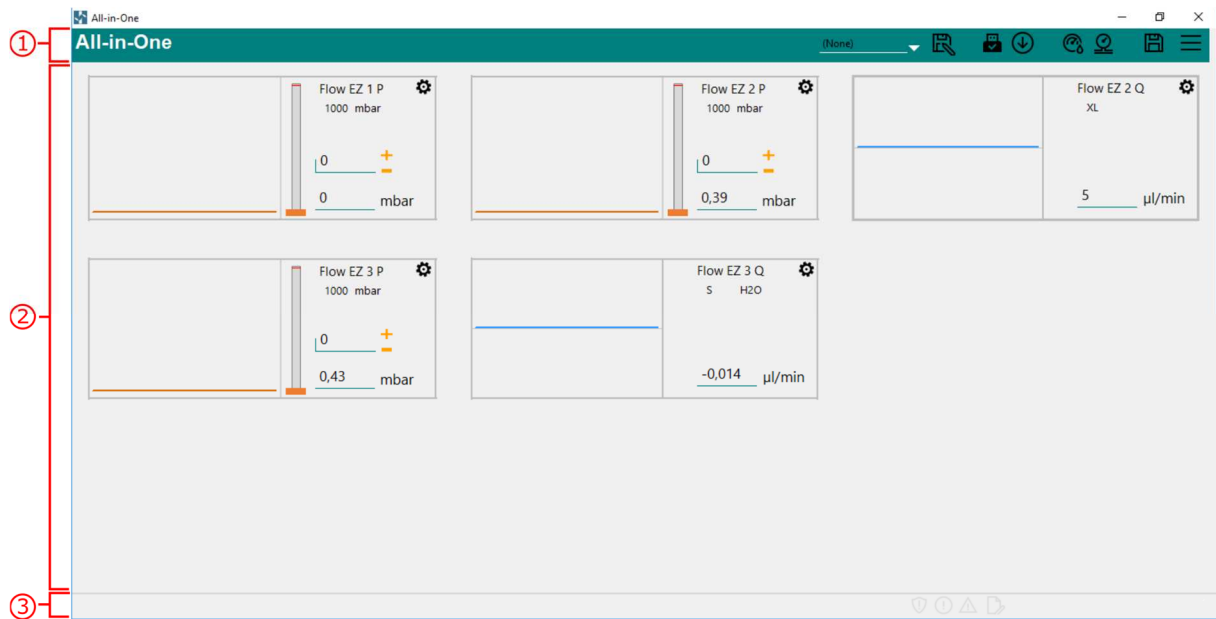
Please note that MFCS Series instruments reach their best performances after 10 minutes of usage.

### 4.2 Starting All-in-One

Click on the A-i-O shortcut on your desktop to launch the All-in-One with pressure control features.



## 5. All-in-One Main View



The Main Window is opened when the application is launched. It is divided into three main zones:

1. **Toolbar:** functions that affect all or multiple channels at once, as well as the Menu shortcut
2. **Smart Grid:** Displays the pressure and flow-rate channels corresponding to the connected instruments. Each of the pressure channels detected is displayed as a Pressure Small View, with an orange graph. Each of the Flow Units detected is also displayed as a Flow-Rate Small View, with a blue graph. The Smart Grid automatically chooses the Small View size based on the total number of channels.
3. **Status bar:** Displays notifications about the current state of the All-in-One application and the connected instruments.

## 6. All-in-One Toolbar



The Toolbar gives access to the main functionalities of All-in-One. It contains the following controls:

### 1. Configuration files

List of available configurations. When an item is chosen from the list, the pressure orders in the file are applied to the channels. The files available in the list can be chosen in the Menu.

### 2. Save Configuration

Click to save the current pressure orders to a file for later use.

### 3. Control On/Off

Click to turn control off or on.



When control is OFF, the button is orange with an X mark and the pressure orders are not sent to the instruments.



When control is ON, the button is black with a check mark and the pressure orders are sent immediately.

Turn control off in order to set the individual channel pressures, and then turn it back on to apply all pressure orders at once.

### 4. Zero Pressure

Click to set all pressure channels to zero. Use <Escape> shortcut key to toggle the Zero Pressure control.

### 5. Flow-Rate Graph

Click to open the Flow-Rate Graph in a separate Window.

### 6. Pressure Graph

Click to open the Pressure Graph in a separate Window.

### 7. Start/Stop Datalogger

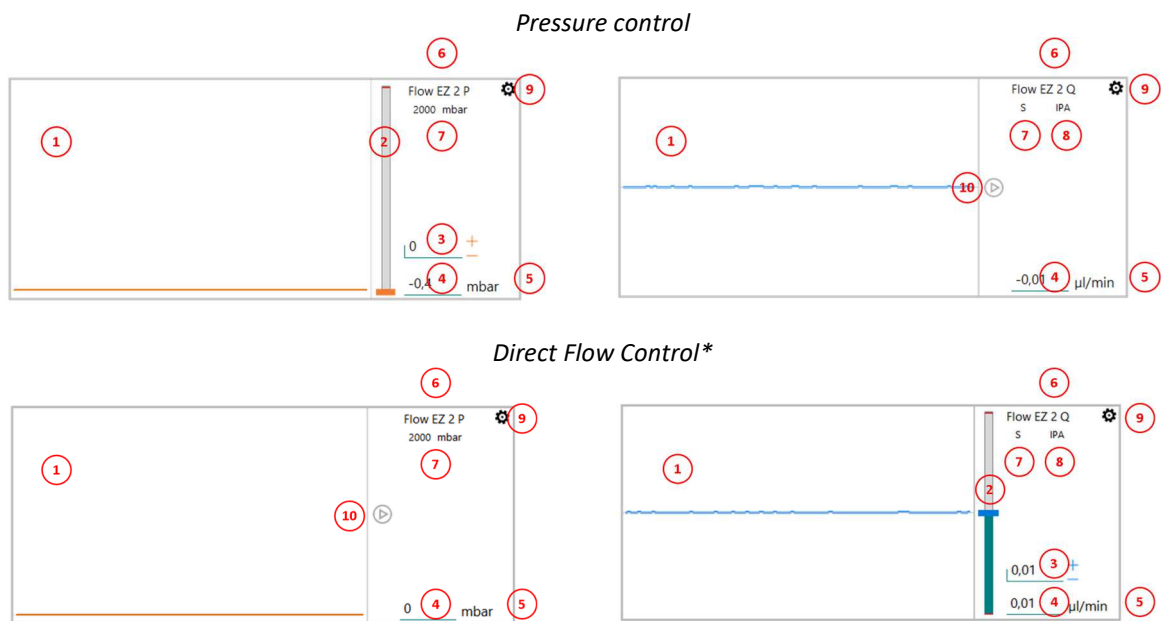
Click to start logging pressure and flow-rate data to a TDMS file. Click again to stop logging. Data Logger Settings can be changed in the Menu.

### 8. Menu

Click to open the All-in-One Menu.



## 7. All-in-One Channel Small View



The Pressure Channel Small View allows you to interact with a single pressure channel. It provides the following functionalities:

### 1. Measurements over time chart

Displays the pressure (orange) or flow-rate (blue) measurements over the last 20 seconds. Vertical scale matches the range of the channel. For the flow-rate channel, the gray line in the middle is the zero-flow line.

### 2. Vertical pointer slide

Slide the pointer to change or adjust the requested pressure (orange) or flow-rate (blue) on the given channel. Vertical pointer slide responds to the mouse wheel when you hover the cursor over it: increment or decrement the value by 0.048% of the range. Holding 'Shift' key and scrolling using mouse wheel will increment or decrement the value by 2.4% of the range.

### 3. Numerical pressure control

Directly enter the requested pressure (orange) or flow-rate (blue) on the given channel. Numerical control responds to the mouse wheel when the cursor is above it: increment or decrement the value by 0.024% of the range on each step. You can also click to the right of any digit in the numerical control and use the mouse wheel to increase or decrease the digit's value by one.

### 4. Measured value

Displays the current pressure or flow-rate on the given channel.

### 5. Unit display

Displays the pressure unit used for both the command (pressure only) and measurement. The unit can be changed in the channel settings. Pressure units are mbar (default), PSI and kPa. Flow-rate units are nl/min,  $\mu\text{l/s}$ ,  $\mu\text{l/min}$  (default),  $\mu\text{l/h}$ , ml/min and ml/h.

### 6. Channel name

Displays the name of the given channel. The name can be changed in the channel settings.

### 7. Channel range

For pressure channels: displays the maximum output pressure available at this channel.

For flow-rate channels: displays the type of the Flow Unit (XS, S, M, L or XL) associated with the channel.

### 8. Flow-rate calibration

Flow-rate channels only. Calibration table currently set for the Flow Unit: H<sub>2</sub>O (water) or IPA (isopropyl alcohol). If no text is displayed, the Flow Unit does not have the double calibration feature and is calibrated for water. If available, the calibration can be changed in the channel settings. Use H<sub>2</sub>O for water-based solutions and IPA for oil-based solutions for more accurate flow-rate measurements.

## **9. Channel Settings**

Click to open the channel settings charm.


## **10. Start button\***

By default, A-i-O starts in pressure control mode. You can switch from pressure control to Direct Flow Control mode by clicking on the start button on the Flow-rate Channel Small View. Switch back to pressure control mode by clicking on the start button on the Pressure Channel Small View.

\* Only available with Flow EZ and a Flow Unit connected to it

## 8. All-in-One Channel Settings

Properties

①	Name	Flow EZ 1
②	Unit	mbar
③	Limit	2000
④	Detach	

Click on the gear icon on one of the channel Small Views to open its channel settings. The channel settings panel allows you to customize the appearance and behavior of each individual channel and view information about the associated Fluigent instrument. To accept and enable changes made to settings, the check mark in the bottom left corner of the All-in-One channel settings must be pressed.

The Channel settings panel is divided into 3 parts:

**Properties:** General customization of the Small View

**1. Channel name:** The channel name is displayed on the Small View, Graphs and log data. You can change the name of each channel to match your experiments. When using the Flow EZ™ with a Flow Unit, the two channels will have the same name, with a “P” appended to the pressure channel name and a “Q” appended to the flow-rate channel name.

**2. Unit:** Choose which unit will be used for this channel on the Small View. Does not affect the Graph and the Datalogger. Pressure units are mbar (default), PSI and kPa. Flow-rate units are nl/min,  $\mu\text{l/s}$ ,  $\mu\text{l/min}$  (default),  $\mu\text{l/h}$ , ml/min and ml/h.

**3. Limit:** Only available for pressure channels. Specify the maximum allowed pressure that the channel should output. If you attempt to set the pressure above the limit, the pressure will be set to the limit. The unit for the limit is the same unit chosen in control above. The default value is the maximum pressure available for the channel.

**4. Detach:** Click to detach the Small View from the Smart Grid and display it in a separate window, which can be moved and resized at will. Reattach the Small View by exiting out the Small View window.

**Advanced Properties:** Click on the switch to show or hide the advanced properties. These settings change the behavior of the instruments and the measurement data. Use them carefully. The properties are different for each instrument.

**MFCS™ and MFCS™-EZ:**

**1. Calibrate:** Sets the pressure order to 0 and then sets the measured pressure as the zero of the pressure channel.

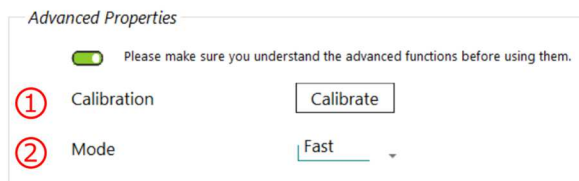
**2. Feedback coefficient:** With this parameter, you can set the pressure response shape. The factory default value is 5.

Response mode:

If the feedback coefficient is higher than 5 the response is faster, but it can overshoot or become unstable.

If the feedback coefficient is lower than 5 the response is more stable without overpressure but it will lead to a slower response.

**Note: It is highly recommended not to change the**



**default value.** The MFCS™ and MFCS™-EZ have been optimized by Fluigent experts and should provide you with the best compromise between stability and fast response.

**Flow EZ™:**

- 1. Calibrate:** Sets the pressure to 0 and then sets the measured pressure as the zero of the pressure channel.
- 2. Mode:** Specify how the Flow EZ responds to large steps of the pressure set points. Options are Fast and Smooth. In Fast mode, the response time is below 100ms but it can overshoot slightly. In Smooth mode, the response time is below one second and it does not overshoot.

**Flow Unit:**

- 1. Calibration:** if the Flow Unit has the double calibration feature, you can choose between water and isopropyl alcohol.
- 2. Q max:** indicates the maximum flow-rate that the Flow Unit can measure. Not directly modifiable.
- 3. Custom scale factor:** when working with liquids that have different properties from water and isopropyl alcohol such as some Fluorinated oils (HFE 7500, FC40, etc.), one can use a polynomial function to adjust the flow-rate measurements. In this control, you can choose the order of the polynomial: linear, square or cube.
- 4. Scale Factor Coefficients:** specify the coefficients of the polynomial function. The number of coefficients matches the order chosen in the control above. Qmax is updated accordingly.



**Information:** Details about the instrument associated to the channel



- 1. Serial Number:** For the MFCS™ and MFCS™-EZ, it is the serial number of the instrument (the same for all channels). For the Flow EZ™, it is the serial number of the module (different for each channel). For the Flow Unit, it is the serial number of the FlowBoard or Flow EZ™ module to which it is connected.

**2. Type:** Only for the Flow Unit. The type indicates the maximum flow-rate that the device can measure. Types are XS, S, M, L and XL.

**3. Range:** The maximum pressure or flow-rate of the channel.

**4. Status:** Indicates if the instrument is connected and ready to use.

**5. Status (Flow EZ™ version):** Indicates if inlet pressure is correct.

**6. Status (MFCS™ version):** Indicates if the output is enabled.

## 9. All-in-One Status Bar



The Status bar is displayed at the bottom of the Main Window. It indicates the current state of the application and of the connected instruments. The messages and indicators in the Status bar deserve attention, as they may indicate unwanted conditions that will prevent the instruments from responding as intended.

When there are no messages or warnings to display, the icons appear in gray and no text is displayed. When one of the warning signs is active, the message to the left indicates the condition that caused it.

If more than one warning sign is active, the message displayed corresponds to the most critical condition detected.

### 1. Status display

The left half of the Status bar displays the last status message generated by the application.

### 2. Software warning

Indicates that an unexpected condition was detected while running the application.

### 3. Hardware warning

Indicates that one of the channels is in a state in which it cannot respond properly to commands. For example, if a Flow EZ™ module or MFCS™ is in sleep mode, or if a Flow Unit has been disconnected.

### 4. Error

Indicates that the connection to instrument has been lost, such as if the instrument is powered off or if the USB cable is disconnected.

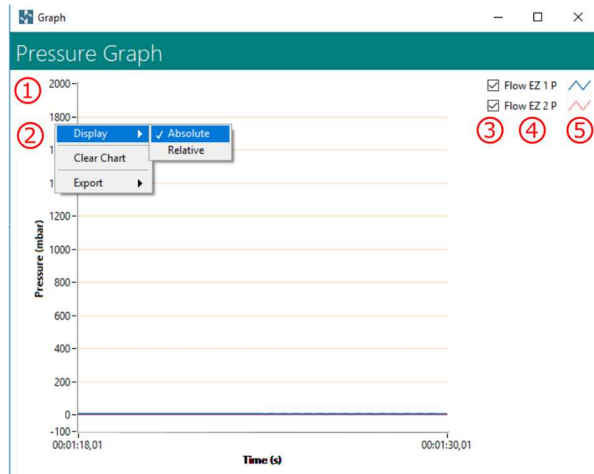
### 5. Datalogger status

This icon is visible while the Datalogger is running. This icon is not a warning sign, but merely a reminder that data is being recorded.

### 6. Log file name

If the Datalogger is currently recording data, the name of the log file is displayed on the right end of the Status bar.

## 10. Graph Windows



### Pressure Graph window:

Displays pressure measurements of the different channels in absolute values (default) or as a percentage of the full scale for each channel. As with the main view, negative pressure channels are displayed as positive.

This window can be rescaled.

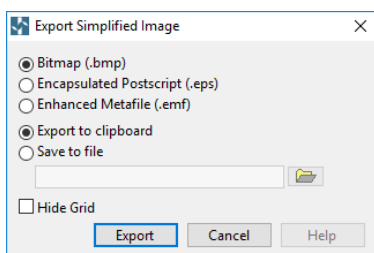
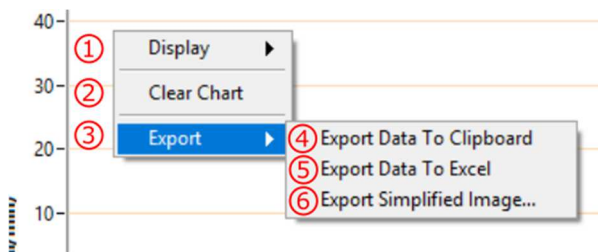
1. In absolute mode, the displayed unit is always mbar for the pressure graph and  $\mu\text{l}/\text{min}$  for the flow-rate graph, regardless of the unit chosen for each individual channel in the main window. The default upper limit is the highest maximum pressure among the available pressure channels. Limits can be rescaled by clicking on the top or bottom of the pressure axis and typing the desired values.

2. Right-click inside the graph area to open a menu with additional options.

3. Choose which pressure channel to display by clicking on the corresponding box. By default, all channels of the corresponding type are displayed

4. The name of each channel is the one displayed in the Small View, which can be changed in the channel settings. Note that only the first 12 characters of the name are displayed.

5. The color of each channel's curve is displayed.



1. Choose to display data in absolute or relative mode. Select "Relative" to visualize channels of different ranges. Their measurements will be displayed as a percentage of each channel's range.

2. Delete all of the data in the graph and restart the time from 0.

3. Export the data in the graph. Opens a submenu to choose the export mode.

4. Export data to the clipboard as a tab-separated table, which you can paste to Excel, to a text editor or to other compatible software.

5. Open an Excel spreadsheet containing the data.

6. Export the graph as an image. A dialog window is opened with additional options.

## 11. List of keyboard shortcuts

The Following table lists keyboard shortcuts of the All-in-One software:

<b>Keyboard Shortcut</b>	<b>Description</b>
Ctrl-Q	Exit the All-in-One software
Escape	Set all pressure channels to 0
F1	Open the Help Menu
F2 to F12	See <i>Configuration panel (All-in-One Menu)</i>

## 12. All-in-One Menu

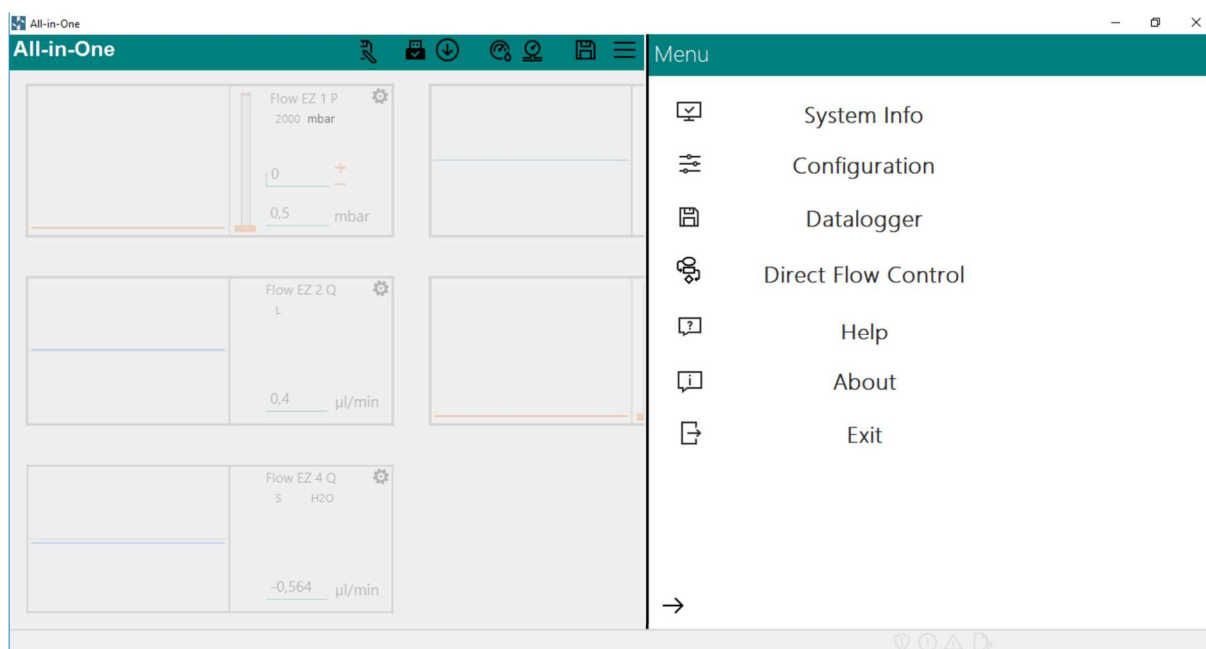
Click the right most button on the Toolbar to open the All-in-One Menu. Press the menu button again in order to go back to the main menu screen after pressing one of the option below.



Through the Menu, you can access the following charm views:

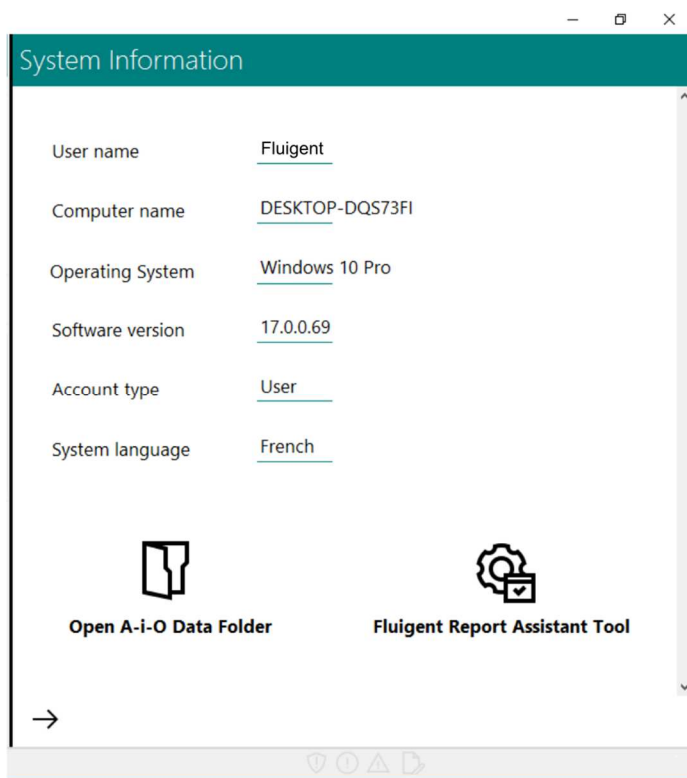
- **System Info:** Information about your operating system, software version and a link to the Data Folder.
- **Configuration:** Set options for configuration files.
- **Datalogger:** Set options for log files.
- **Direct Flow Control:** Information and options for the Direct Flow Control.
- **Help:** Links to offline user manuals and online help.
- **About:** Software version and Fluigent contact information.
- **Exit:** Exit the All-in-One application.

To close the Menu or any of the charms, click on the arrow on the bottom left corner





## 12.1 System Info panel



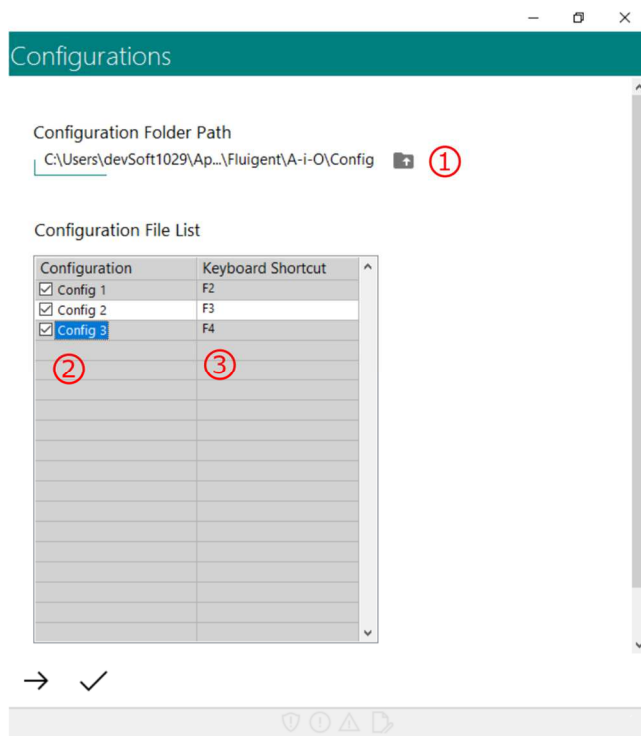
In the System Info panel, you can find information about the operating system:

Windows user name, computer name, OS version, account type and language. You will also find the version of All-in-One currently installed.

The bottom left of the charm is a shortcut to the All-in-One Data Folder, which contains the saved Configurations and the logged experiment files.

The bottom right is a shortcut to launch the Fluigent Report Assistant Tool (FRAT). The FRAT creates a list of all Fluigent software installed on the computer, as well as all Fluigent products currently connected.

## 12.2 Configuration panel(All-in-One Menu)



Configurations are a snapshot of a pressure and flow-rate (Direct Flow Control only) settings. One can name different configurations, assign keyboard shortcuts and choose to display them or not in the drop-down menu of the Toolbar.

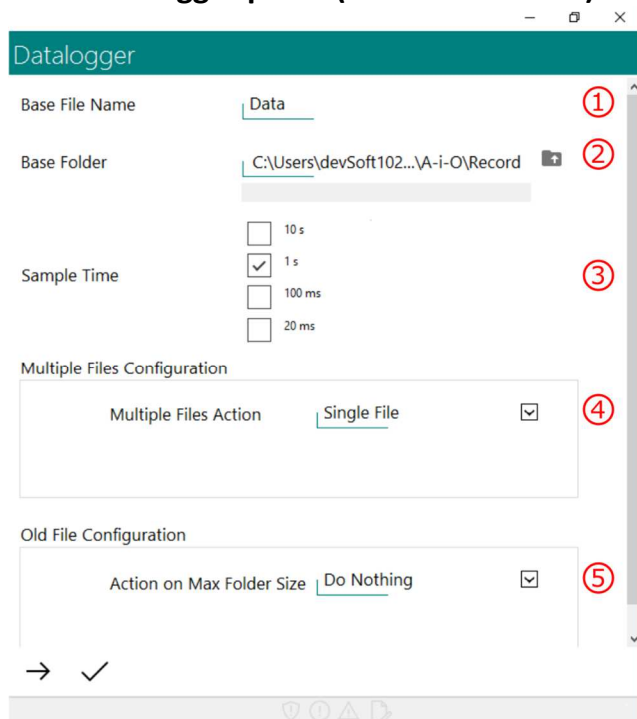
**1. Configuration Folder path:** Choose the path for the directory containing your configurations. Default path is:

C:\Users\
 Note: The Appdata folder is hidden by default on Windows Explorer. You can open it using the shortcut in the All-in-One System Info charm.

**2. Name:** Displays the configuration name of the configuration saved in the Folder path directory. Ticking a configuration will display it in the drop-down menu of the Toolbar

**3. Keyboard Shortcut:** You can assign shortcuts (with the F2 to F12 keys) to commonly used configurations.

## 12.3 Datalogger panel (All-in-One Menu)



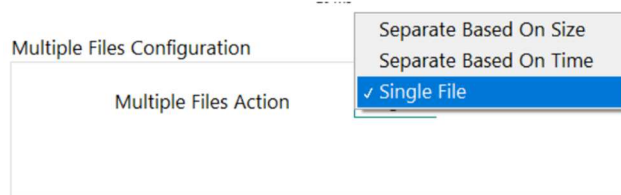
Log the pressure and flow-rate (Direct Flow Control only) settings, measured pressures and flow-rates of your experiments at any time.

**1. Base File Name:** This is the prefix of the log files created. When the Datalogger is launched, the file name is created by appending the current date and time to this base name, as well as an index if the log is split between multiple files.

**2. Base Folder:** Choose the path of the log file location. Default path is:

C:\Users\
 Note: The Appdata folder is hidden by default on Windows Explorer. You can open it using the shortcut in the All-in-One System Info charm.

**3. Sample Time:** Choose the sampling period from four preset values. This sampling period is indicated in the log file.



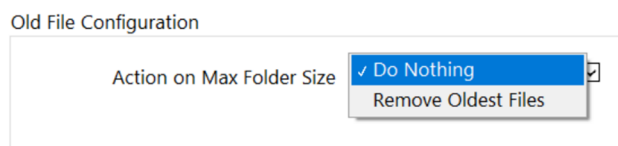
#### 4. Multiple Files configuration:

Choose to split a long experiment log into multiple files. When a specified condition is met, the current log file is closed and a new one is created, continuing from where the previous one stopped. All files created in this manner will have the same base name, date and time, regardless of how long the acquisition lasts. Two types of conditions can be set:

**Separate Based on Size:** When the current file reaches the specified size in MB, a new file is started.

**Separate Base on Time:** When the specified number of seconds has passed, a new file is started.

If the Single File option is selected (default), a new file is created at midnight every day.



**5. Old Files configuration:** If the option Remove Oldest Files is chosen, specify the maximum number of files to store in the Record folder. When the maximum number is reached, the oldest log file will be removed each time a new log is created.

#### 12.3.1 TDMS explanation

The Datalogger records files using the TDMS format. TDMS is a file format created by National Instruments for the purpose of fast streaming and compact storage of measurement data. It is compatible with National Instruments software and can be read using third-party software by installing the add-ins provided by National Instruments.

TDMS files also automatically generate a complimentary \*.tdms\_index file. This file provides consolidated information on all the attributes and pointers in the bulk data file that drastically speeds up read access to the data on larger data sets. This index file is not required for storage or distribution and automatically regenerates.

#### 12.3.2 TDMS Excel Add-In Tool for Microsoft Excel

You can load and process TDMS files including descriptive information in Microsoft Excel. You need to install the TDM Excel Add-In for Microsoft Excel.

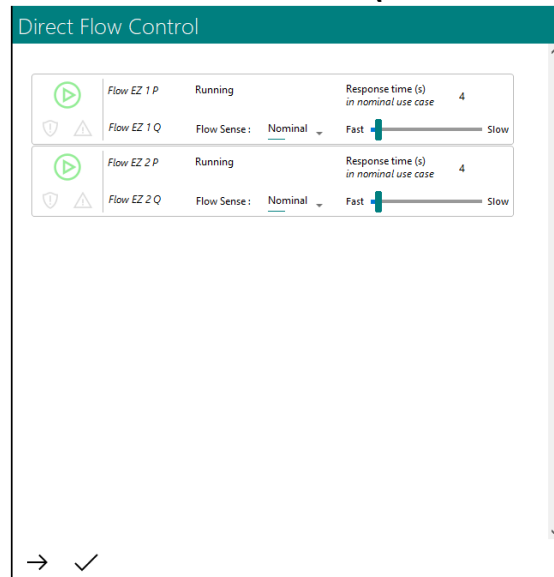
Supported Excel versions:

- Excel 2002 (XP), 2003, Excel 2007, Excel 2010 (32-bit and 64-bit), and Excel 2013 (32-bit and 64-bit)
- Excel 2000 and earlier are not supported

#### 12.3.3 TDMS Add-In Tool for OpenOffice.org Calc

You can load and process TDMS files including descriptive information in OpenOffice.org Calc. You need to install the TDM Excel Add-In for OpenOffice.org Calc.

## 12.4 Direct Flow Control (All-in-One Menu)



The Direct Flow Control (DFC) charm displays the list of all Direct Flow Control devices (Flow Units) available with the connected hardware.

### 12.4.1 Direct Flow Control explanation

Pressure control provides very smooth flow-rates and leads to very fast settling time. However, the physical dimension users generally want to monitor and to control is the flow-rate. Indeed, flow-rate is related to fluid speed in the channel, volume or residence time for instance. Also, depending on the hydrodynamic resistance, a certain pressure can lead to different flow-rates in two different microfluidic channels.

During an experiment, liquid heights in the reservoir change leading to changes in hydrostatic resistance. In a long-term procedure, a constant pressure can lead to slow flow-rate changes. Direct Flow Control is an algorithm which adjusts the pressure in the reservoir to reach the desired flow-rate and maintain it over long time period protocols. A "classic" algorithm would need the user to adjust some parameters in order to fit his/her set-up. Direct Flow Control does it automatically for extended ease of use and, of course, with the best performance.

Only available for Flow EZ with a Flow Unit connected to it.

### 12.4.2 Single Direct Flow Control



Positive flow direction (as marked on the Flow Unit)



Negative flow direction

1. Pressure channel name
2. Flow-rate channel name
3. Flow-rate direction:

Nominal: by default, positive flow direction.

Invert: select when the flow direction is inverted.

#### 4. (5.) Status:

- Running (green): Indicates the DFC is running on the specified Flow EZ™.

- Warning (orange): Indicates that a warning condition was detected while running the DFC (Low fluidic resistance, High counter-pressure, High fluidic resistance, Pressure limit reached, Flow limit reached, Command is not achievable, Reservoir may be empty).

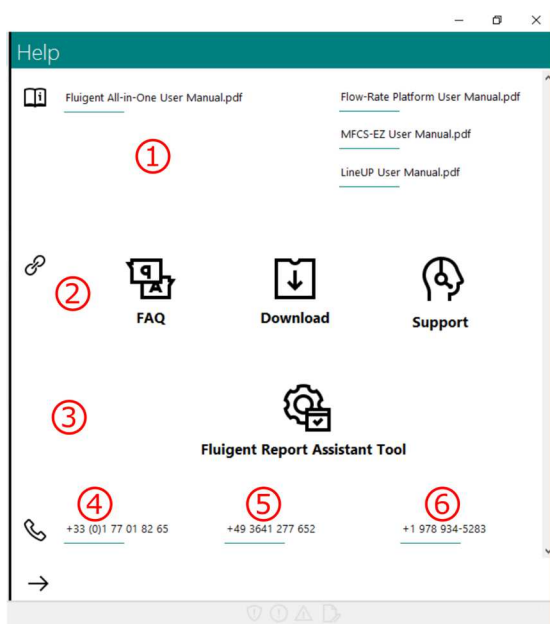
- Error (red): Indicates that an unexpected condition

was detected while running the DFC (Invalid microfluidic set-up).

**6. Response time (s):**

Characteristic time of the dynamics of the pressure orders sent to the Flow EZ™.

## 12.5 Help panel (All-in-One Menu)



**1. Manuals:**

Find this manual, as well as user manuals for the supported Fluigent products in PDF form.

**2. Online help:**

Links to the Fluigent Website:

-Frequently Asked Questions

-Downloads

-Support

**3. Fluigent Report Assistant Tool:**

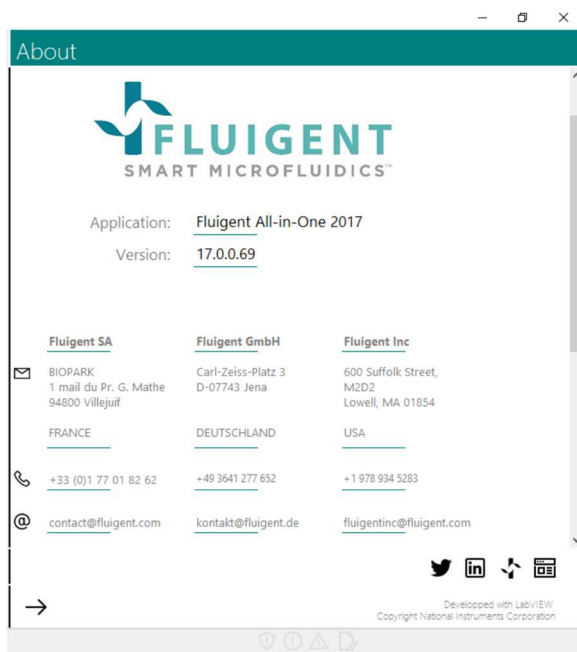
The FRAT creates a list of all Fluigent software installed on the computer, as well as all Fluigent products currently connected. This shortcut is identical to the one in the System Info charm.

**4. Fluigent Support Phone Number (France)**

**5. Fluigent Support Phone Number (Germany)**

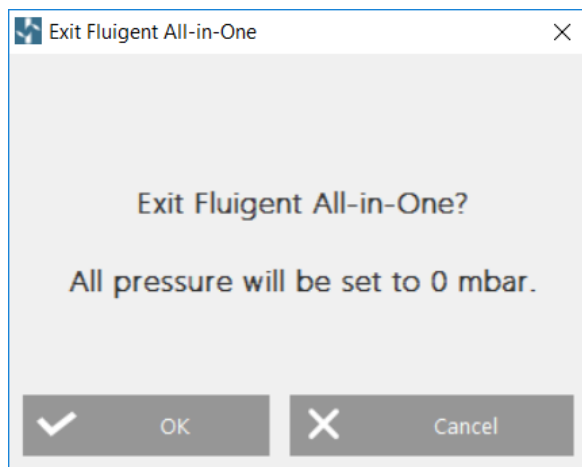
**6. Fluigent Support Phone Number (United States)**

## 12.6 About panel (All-in-One)



The About charm displays the All-in-One software name and currently installed version, contact information for Fluigent in France, Germany and the United States, as well as links to various Fluigent pages on the web.

## 13. Exit application



In order to quit the application, use Windows close button at the top right of the All-in-One Main window. Alternatively, open the Menu and click on the Exit option, or use the keyboard shortcut Ctrl+Q.

A confirmation pop-up window will appear to confirm your intention to exit the application. When quitting all pressures will be reset.



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