e v o l u t i o n

Chassis and software
MAN-00079 R4

If the equipment described herein bears the CE symbol, the said equipment complies with the applicable European Union Directive and Standards mentioned in the Declaration of Conformity.

Contents

Certification Information

CE Declaration of Conformity

FISO Technologies Inc., located at 500, Saint-Jean-Baptiste Ave., Suite 195, Quebec, QC, Canada G2E 5R9

Declares under its sole responsibility, that the following products:

Product description:	evolution chassis for FPI modules
Model number(s):	EVO-SD-2
	EVO-SD-4
	EVO-EXP-6
Product category :	Electrical equipment for measurement, control, and laboratory use

To which this declaration relates, is in conformity with the following standard:

- **EN 61326: 1997 +A1:1998,+A2:2001, +A3:2003**

In accordance with the provisions of the following Council Directives:

- **Electromagnetic Compatibility (EMC) Directive 89/336/EEC,**
- **As amended by 92/31/EEC and 93/68/EEC**

Supplementary information:

This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

I, the undersigned, hereby declare that the equipment specified above conforms to the listed directives and standards.

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Director, Research & Developement
FISO Technologies Inc.
500 Saint-Jean-Baptiste Ave.
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E-mail: frederic.borne@fiso.com

Issued in: Quebec, QC, Canada **Date:** Friday, January 11, 2008

Safety Information

Safety Conventions

Before using the product described in this manual, you should understand the following conventions:

DANGER	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Do not proceed unless you understand and meet the required conditions.
WARNING	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. Do not proceed unless you understand and meet the required conditions.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in component damage. Do not proceed unless you understand and meet the required conditions.
IMPORTANT	Refers to information about this product you should not overlook.

Module Safety Information

The level of radiation emitted from the module and through the sensor is below the level known to cause eye injury through accidental short-term exposure. However, avoid prolonged exposure to light emitted from the fiber and do not stare directly at a light beam, visible or not.

The following safety instructions must be observed whenever the **evolution** Chassis is operated. Failure to comply with any of these instructions or with any precaution or warning contained in the **evolution** Chassis user guide is in direct violation of the standards of design, manufacture and intended uses of the **evolution** Chassis. FISO assumes no liability for the customer failure to comply with these safety requirements. THIS PRODUCT IS NOT DESIGNED FOR USE IN LIFE SUPPORT OR CRITICAL APPLICATIONS.

In no case will FISO be liable to the buyer, or to any third parties, for any consequential damage or indirect damage which is caused by product failure, malfunction, or any other problem.

When using any electrical appliance, basic safety precautions should be followed, including the following:

- FISO recommends using the power supply delivered with your **evolution** Chassis and verifying that the voltage specifications indicated on the power supply are compatible with the AC voltage and frequency delivered at the power outlet.
- Do not operate in wet/damp conditions.
- Do not expose to outdoor conditions. Install the unit in a protective enclosure.
- Do not operate in an explosive atmosphere.
- Keep product surfaces clean and dry.

WARNING

This equipment must be used as specified or the protection provided by the equipment may be compromised. You must use this product in a normal mode and should not deviate from the written instructions provided.

CAUTION

There are no user serviceable parts inside the evolution Chassis, other than the ones specified in the ***Maintenance*** section. Adjusting parts inside the unit can affect instrument performance. If you adjust parts, you will need to verify the equipment for good performance. Refer servicing of any other parts to qualified personnel.

evolution Chassis Overview

FISO manufactures the **evolution** Chassis. Its footprint, communication capabilities and speed make it the ideal tool for laboratory and in site test environments. The **evolution** Chassis can house different module types with different channel capabilities to combine results from a single acquisition source.

The **evolution** Chassis comes in different models to answer different test needs:

- The EVO-SD-2 is a compact, stand-alone chassis that can house up to two modules.
- The EVO-SD-5 is a compact, stand-alone chassis that can house up to five modules.
- The EVO-RM is a rackmount chassis unit that can house up to eight modules.

To configure a complete chassis, a series of modules are available. Each module is described separately in its respective user guide.

Your brand new **evolution** Chassis comes ready to use. This user guide describes the Chassis main characteristics.

The **evolution** chassis have a different number of module slots, depending on the model:

- The EVO-SD-2 has two module slots.
- The EVO-SD-5 has five module slots.
- The EVO-RM has eight module slots.

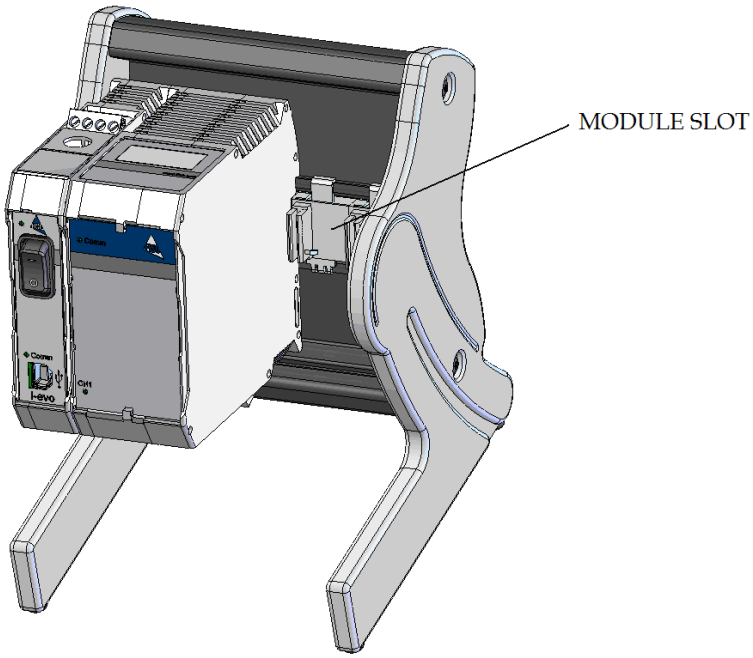


Figure 1: **evolution** chassis

Front Panel

All **evolution** Chassis units are composed of the same basic frame elements. Module capacities, communication ports, and overall width specifications differ from one model to the other. The following images show the basic differences between the units.

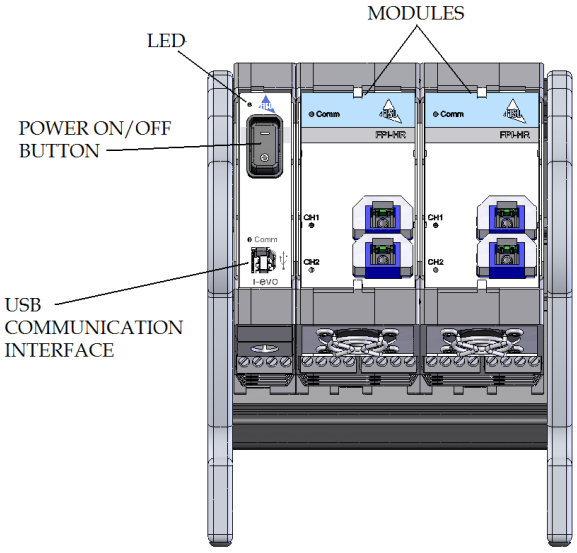


Figure 2: EVO-SD-2 front view

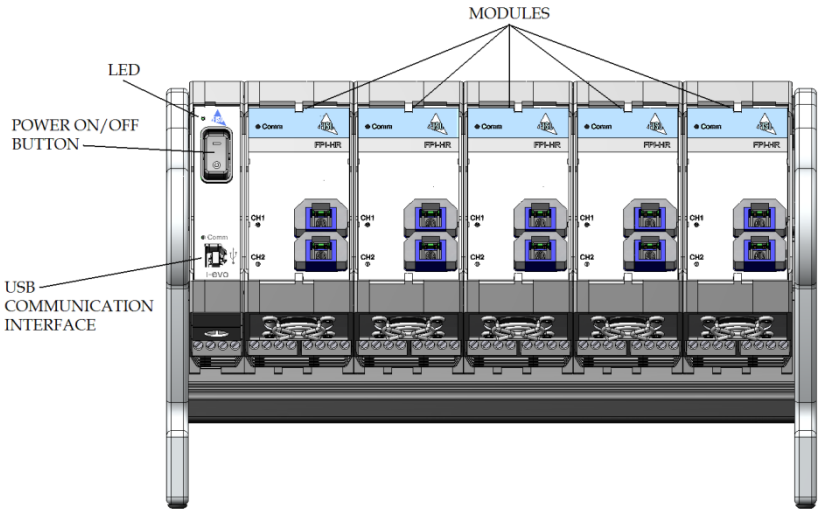


Figure 3: EVO-SD-5 front view

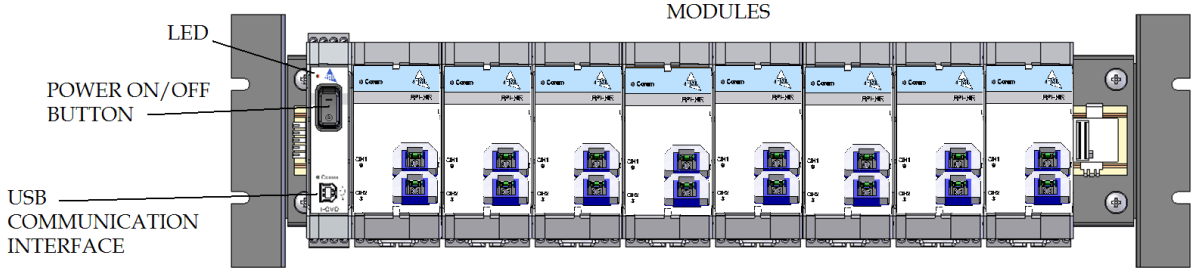


Figure 4: EVO-RM front view

The power on/off button is located near the top left corner of the front panel. It is a rocking switch. When the top of the button is pushed in, the unit is powered on. To turn the unit off, press in the bottom half of the button.

USB communication interface is available on all chassis. This interface allows communication with the computer.

The power source input connector is located under the I-EVO on all units.

Modules

We have different kind of modules.

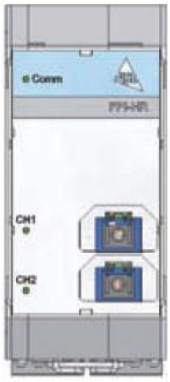


Figure 5: FPI-HR module

Figure 6: FPI-HS module

Figure 7: FPI-HERO module

Figure 8: FPI-HS/HE module

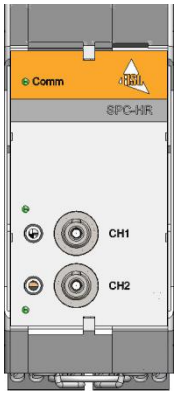


Figure 9: SPC-HR module

Getting started with your evolution Chassis

Unpacking and Inspection

The **evolution** Chassis is packaged in a way that provides maximum protection during shipment. If the outside of the shipping carton is damaged, notify your receiving department immediately. Your receiving department may want to notify the carrier.

If the shipping case is not damaged, carefully remove and identify all of the components listed below. Contact FISO or your local representative if any of the components are missing. We recommend you save the shipping case for future storage or transportation.

The SD-2, SD-5 and RM **evolution** Chassis package should include the following components:

- **evolution** Chassis unit
- **i-evo** module
- Power supply adaptor and cord
- USB interface cable
- Module removal tool
- User guide
- CD containing software, driver and manual (PDF)

Inserting and Removing Modules

evolution Chassis are compatible with all **evolution** modules.

During these procedures, be sure to turn-off the power of your chassis and to close the **evolution** software.

To insert a module in a module slot:

1. Tilt the module backwards and hang the top back side on the back plate of the Chassis.
2. Align the module with the backplane rail connector.
3. Push the bottom of the module back until a clipping sound is heard.

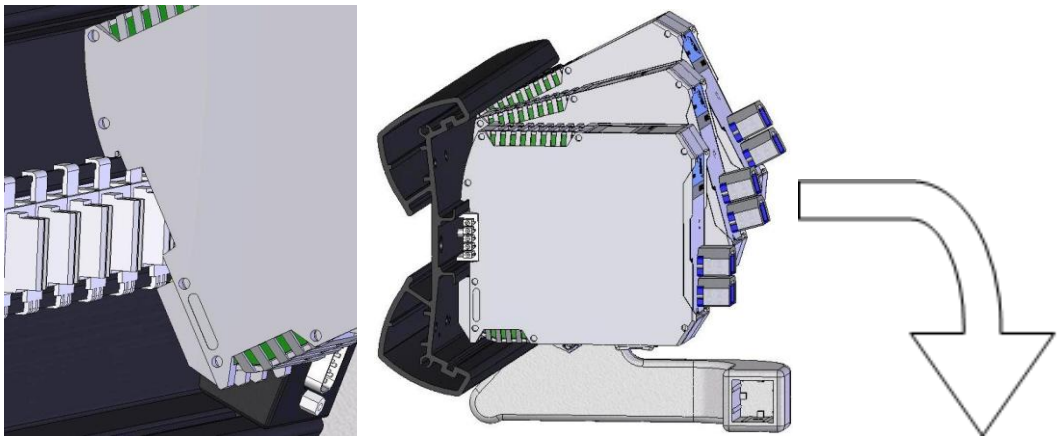


Figure 10: Inserting Module

To remove a module from a module slot:

1. Insert the provided module removal tool in the module clip slot.
2. Tilt the tool upwards to pull the clip downwards and release the module.
3. Remove the module by tilting the top backwards and pull it out of the slot.

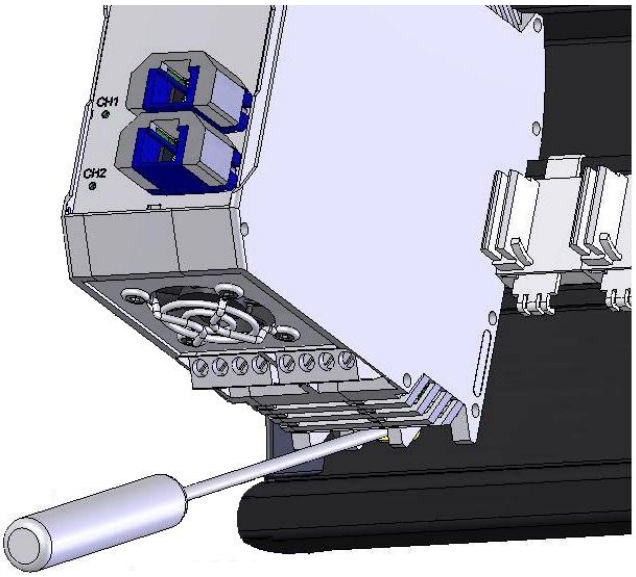


Figure 11: Removing Module

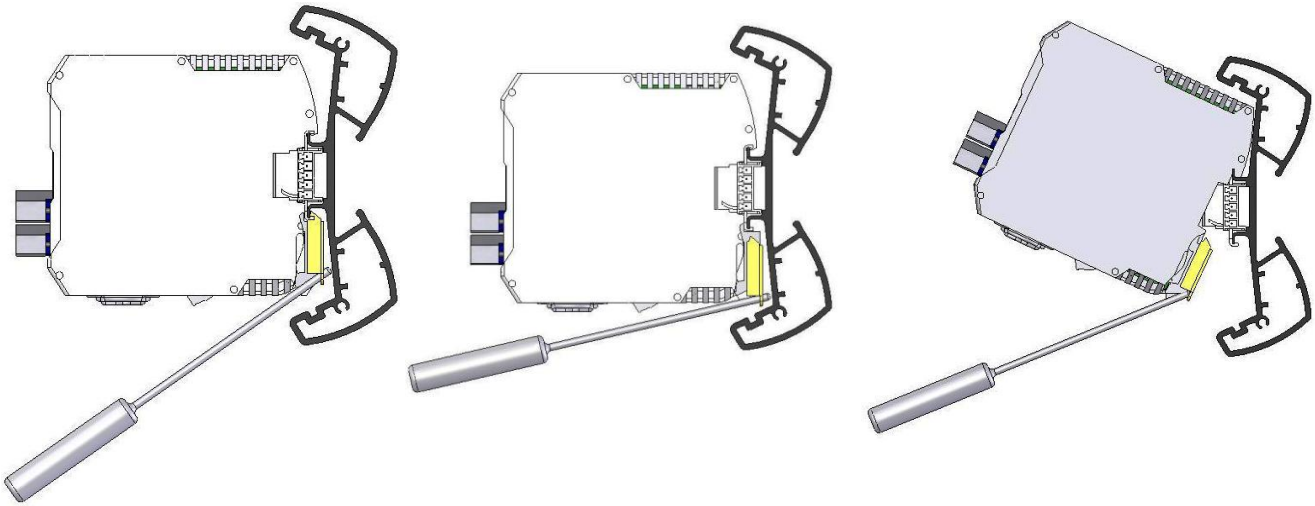


Figure 12: Removing Module

Connecting the Interfaces

Before proceeding with product setup and use, read the safety information and instructions.

WARNING

To avoid damaging the unit, make sure that the power fed into the power port complies with technical specifications power input range. No other voltage level or range is accepted.

The power supply adaptor is provided with the unit. Connect the power supply to the unit power input connector, located under the I-EVO, according to the figure below.

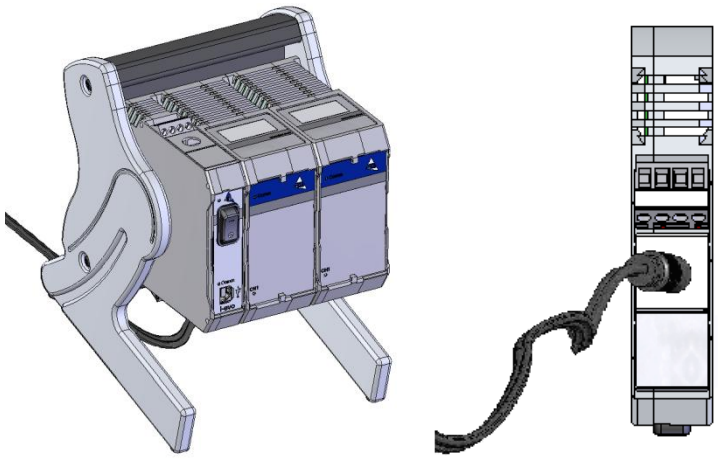


Figure 13: Connect the power supply

CAUTION

Use care in handling fiber optic connectors. Always clean the fiber end prior to insertion into the connector for optimum performance and to avoid measurement errors. For details on connector handling and maintenance, please refer to section ***Handling the Sensors***.

To Connect the Sensors to the Unit:

1. Align the connector key with the slot on the mating sleeve.
2. Slide the connector into the sleeve until you hear a clicking sound.

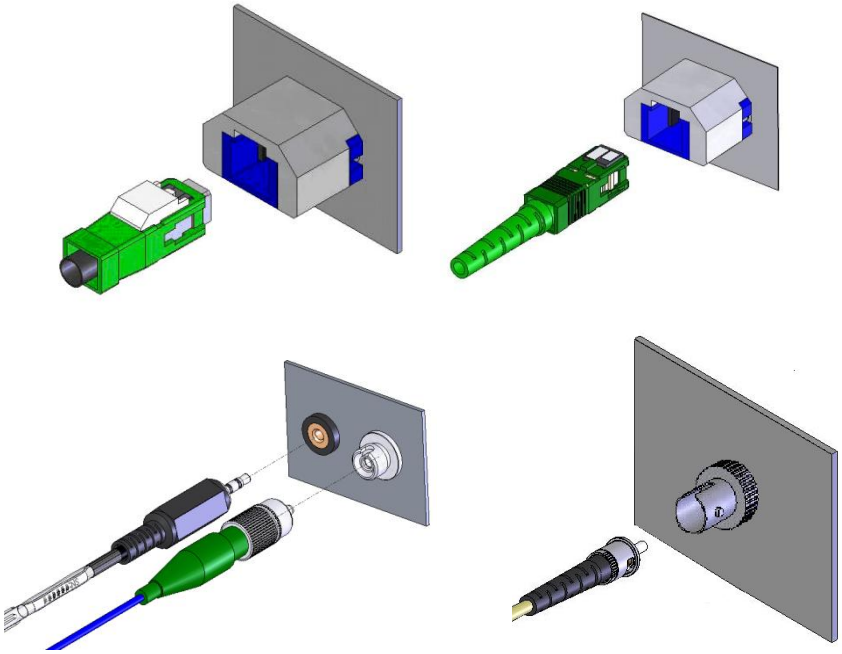


Figure 14: SCAI-type 1 and SCAI-type 2
SMA-type and ST-type mating sleeves and connectors

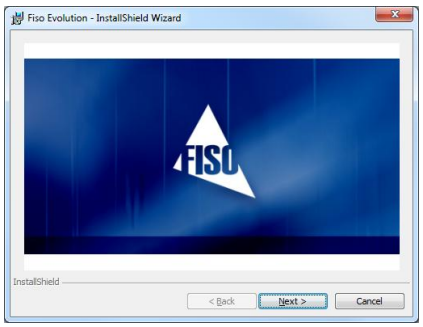
Powering Up the Unit

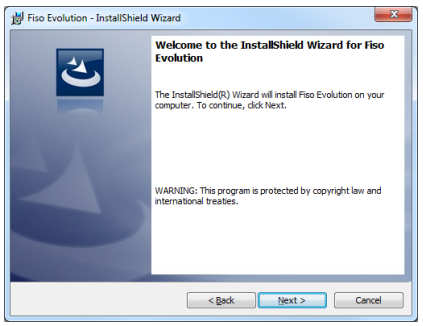
1. Install the software on your computer.
2. Make sure that power is off when connecting the power supply to the unit.
3. Make sure that all the necessary modules are properly connected to the chassis.
4. Connect the USB cable to the computer and your chassis
5. Attach the line cord to a power source. Use the power supply provided with the unit.
6. Turn the power on to power up the unit using the ON/OFF switch on the front panel.

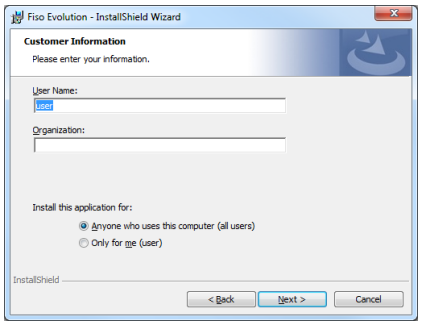
evolution software

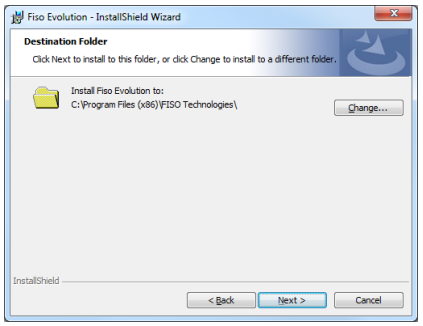
Software installation

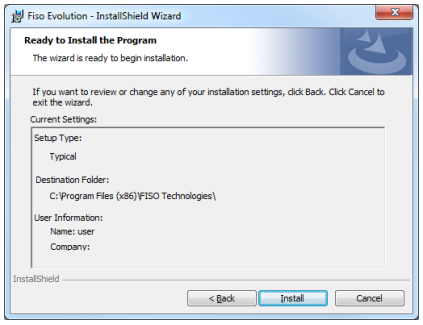
Insert the **evolution** CD-ROM into your CD-ROM drive. If auto run does not start, open Windows Explorer to view the CD-ROM's contents and double-click on **setup.exe.** The InstallShield wizard will automatically start. Click **Next** a couple of time following the instructions to proceed with the installation.

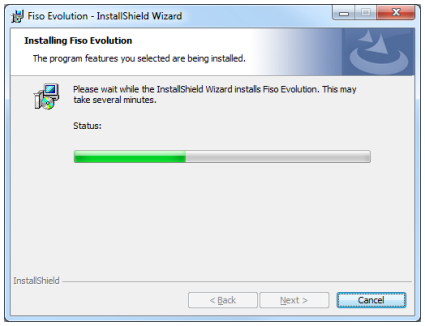




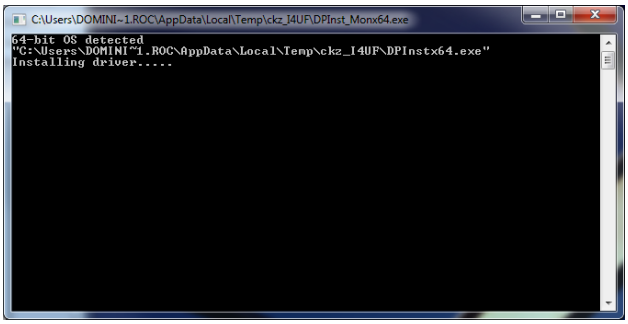


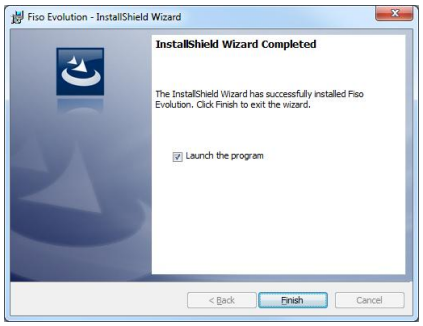






A black window is prompt at the end of the procedure, let it proceed, it installs the platform drivers. When the installation is over, click **Finish** to exit the Wizard.



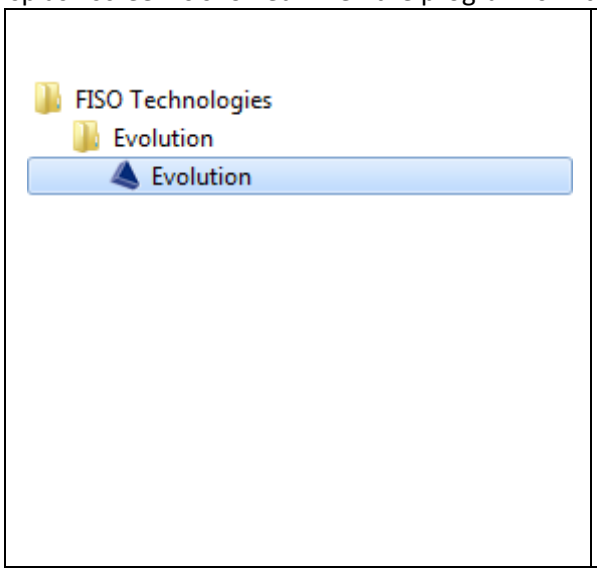


Driver installation

For newer platform (I-Evo), drivers are located in the “Drivers\I-Evo” folder on the CD. Run the CDM Setup.exe.
For older platform (USB400), drivers are located in the “Drivers\USB400” folder on the CD. Select your operating system folder (Windows Xp, Vista or 7 and 32 or 64 bits), then run DpInst32.exe or DpInst64.exe.

Accessing the program

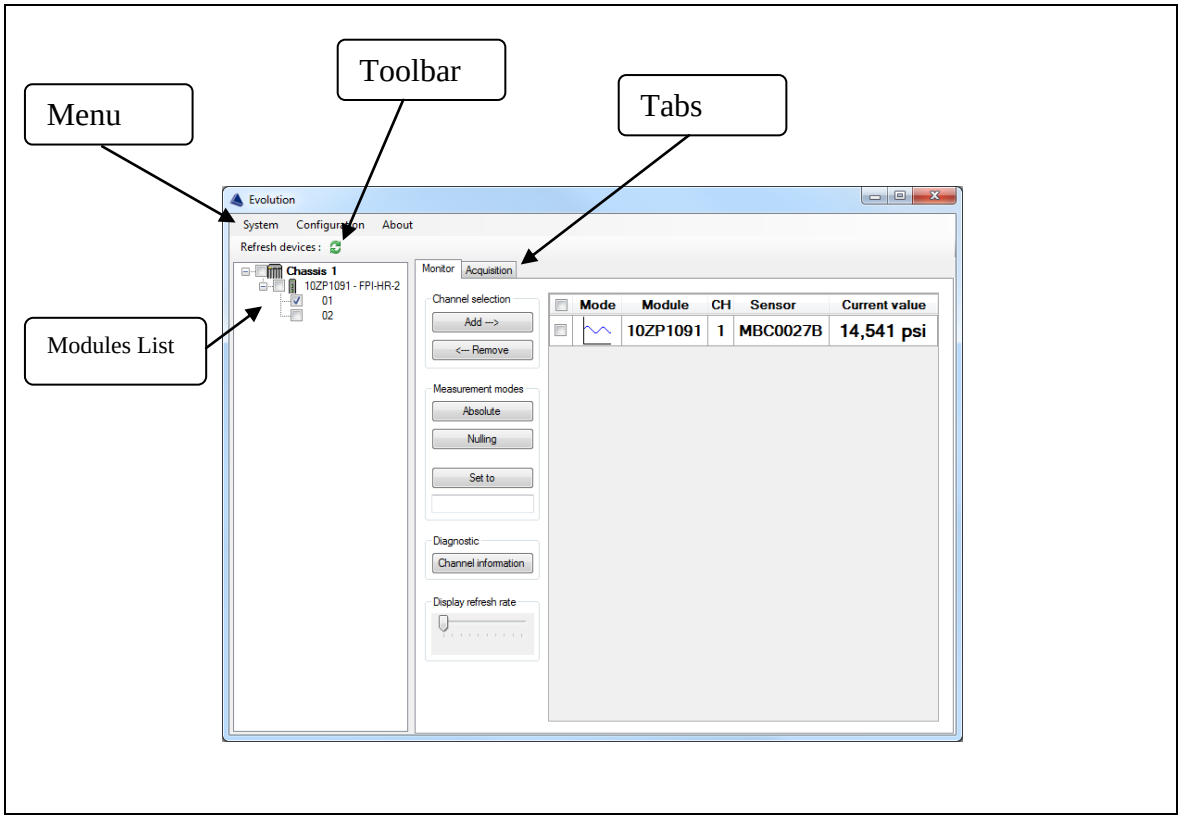
The program installation adds a shortcut to the desktop, so it can easily be launch with the Evolution desktop shortcut. The program shortcut should also be found in the installed program list, under **FISO Technologies**. The complete access menu is:
Start ► All Programs ► FISO Technologies ► Evolution ► Evolution
A splash screen is showed when the program is initializing.



Software overview

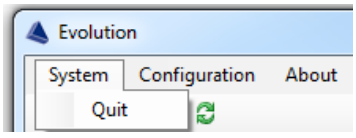
evolution is the operating and data acquisition software for FISO **evolution** chassis. It can communicate with all type of Evo module.

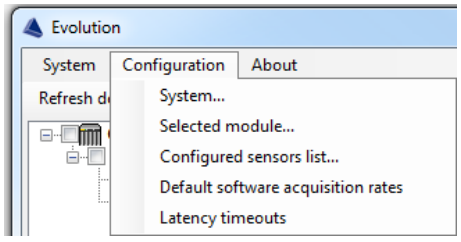
Main screen

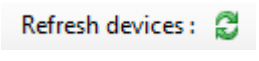


Menu and toolbar

The **System ► Quit** menu closes the application. The **Configuration** menu gives access to all the configuration windows and the **About** menu shows the software version. The **toolbar** button gives quick access to refresh the system devices communication.

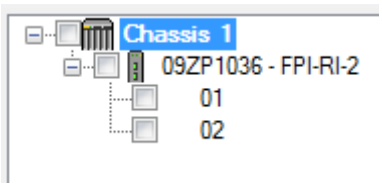






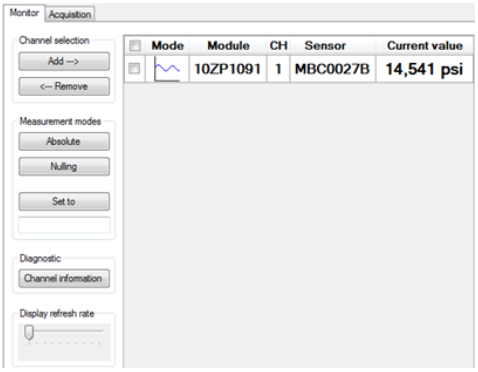
Module list

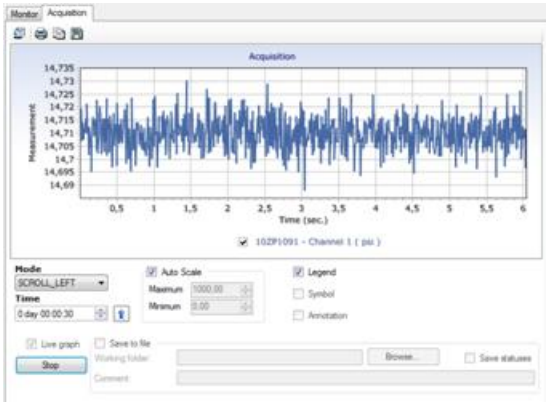
Located on the left side of the main screen, the module list shows all the modules and channels configured.



Monitor and Acquisition tabs

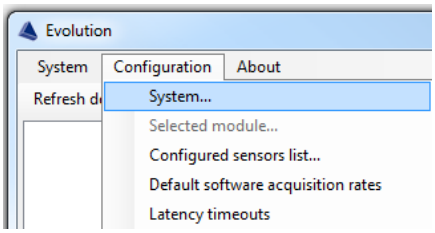
The monitor tab shows current channel reading in a tabular view, and the acquisition tab is used to start a chart / file acquisition.

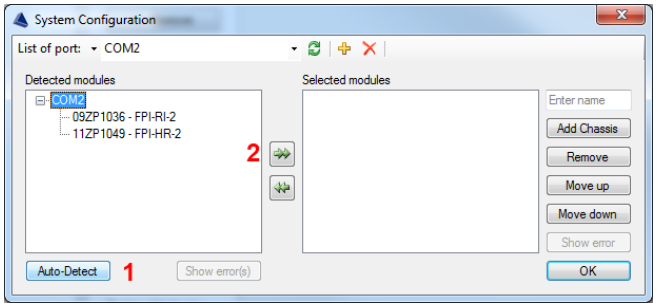


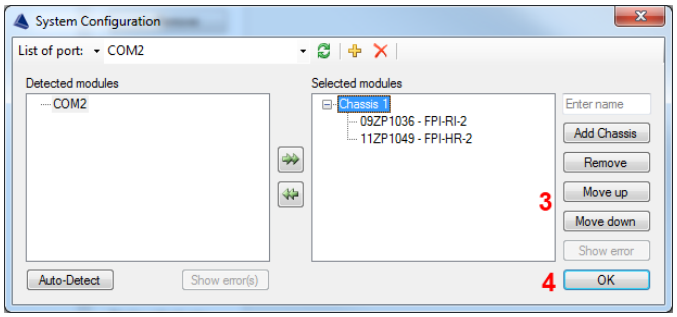


Quick steps

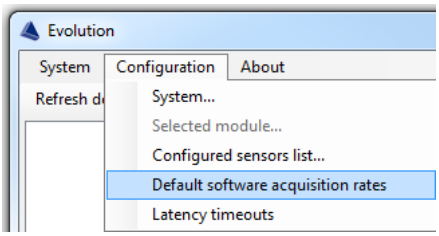
1. Connect **evolution** chassis with a USB cable to the PC. Power on the platform. Launch the **evolution** software.
2. Configure your system.
    - Open System configuration window via menu **Configuration ► System**.
    - Click **Auto-Detect**. Transfer detected modules to selected modules.
    - Reorder modules to reflect the physical order on your chassis.
    - Close the window.

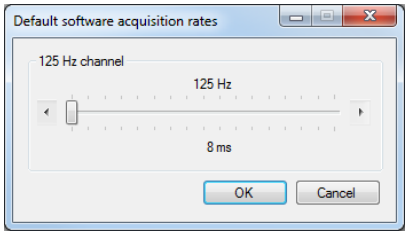




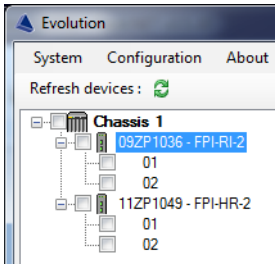


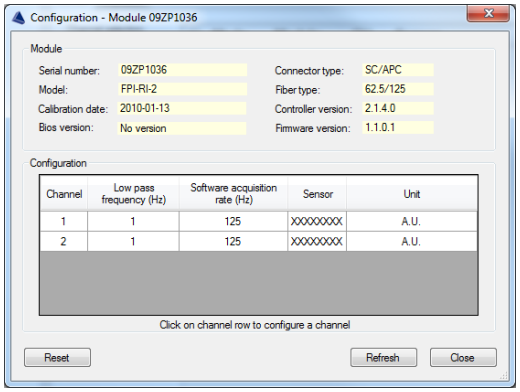
3. Define acquisition rates.
    - Open menu **Configuration ► Default software acquisition rates**.
    - Use slider(s) to define default values.
    - Close window.

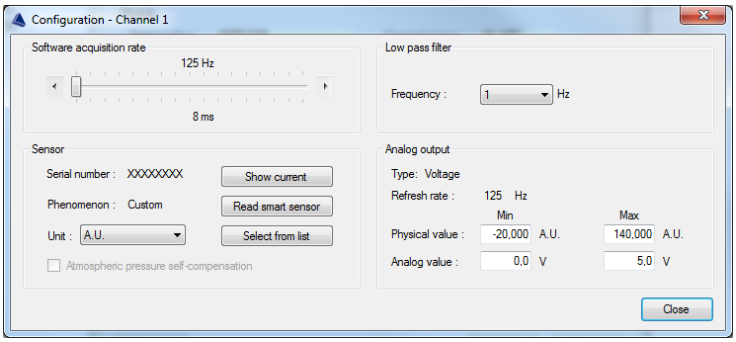




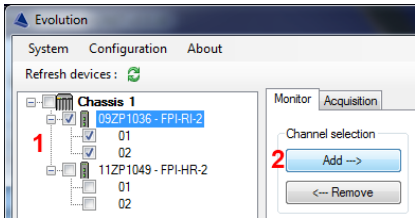
4. Configure channels / sensors information.
    - Double click on module in the left tree.
    - Click on each channel row to configure channel and sensor information.
    - Close the windows.

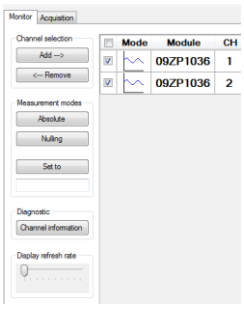




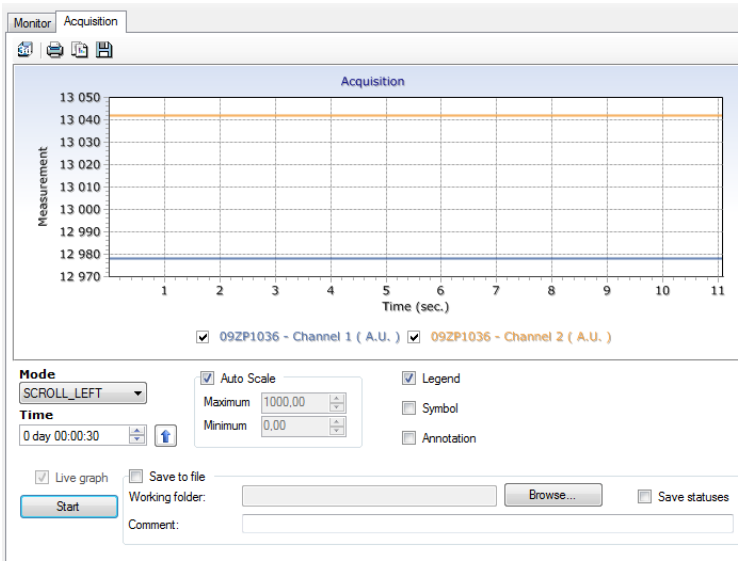


5. Monitor and set up channels.
    - Add channels to the monitoring window.
    - Configure measurement modes when needed.



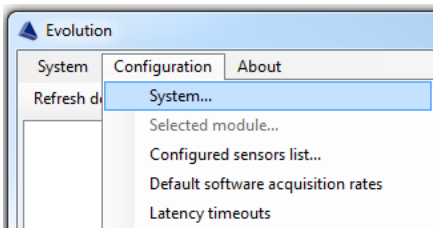


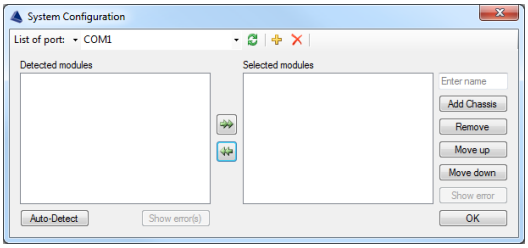
6. Start an acquisition
    - Configure acquisition parameters.
    - Click Start.



Configuring system parameters

To configure your system, use the menu **Configuration ► System**…





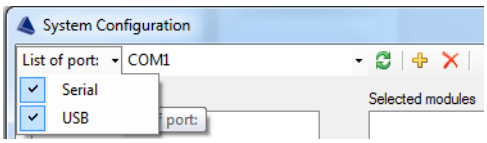
List of ports

The list of port may contain different type of port: Serial (Com port), USB (I-Evo serial number). Use the arrow and check the type of port to display on the list (normally both **Serial** and **USB** are checked). Use the **Refresh port list** button to refresh the list and detect newly added ports.

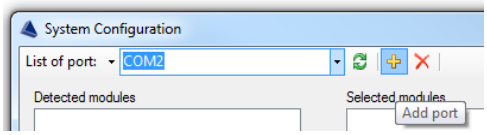
Modules detection

For an easy detection of your system, use the **Auto-Detect** button. It will scan the list of port to detect all the modules connected to the PC. If you know the name of the port of the platform you want to add, you can also choose it from the list of port and click **Add port** (**+**). If your modules are not detected, be sure the platform drivers are installed, the platform is power on, connected to the PC with USB cable and detected by the operating system. Use the **Show error(s)** button to check for possible error on port after detection.

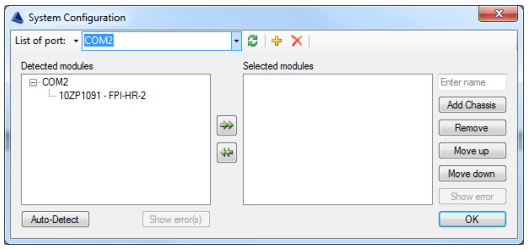
Select the type(s) of port to display on the list. Use **Refresh port list** to refresh the list.



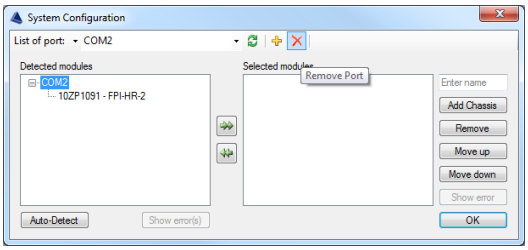
To add a port, select a port from list and click **Add port** (**+**).



List of detected modules grouped by port name.

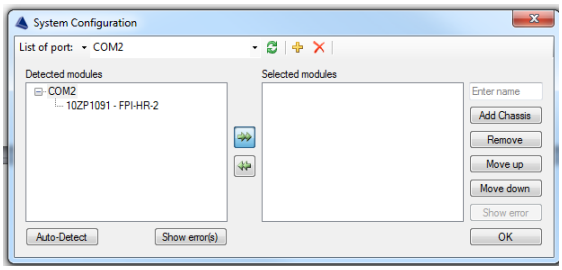


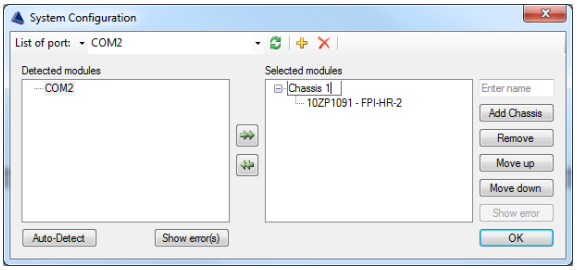
To release a port, select it in the Detected modules list and click **Remove port** (**X**).



Chassis configuration

When all the connected modules are detected, you need to configure your platform's tree on the right side, the **Selected modules** list.
From the **Detected modules**, double-click on the port node or a module node to add the module(s) to a chassis on the **Selected modules** list. You can also use the arrows buttons to move modules between lists.



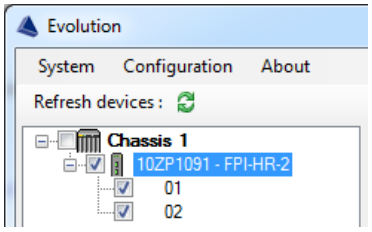


Use **Add Chassis** or **Remove** to configure chassis list. Rename chassis if you like. Use **Move up**, **Move down** to reorder modules in the chassis (platform) to reflect modules order on the platform or as you wish. Once your configuration is completed, click **OK.** Your configuration will now be shown in the main window.

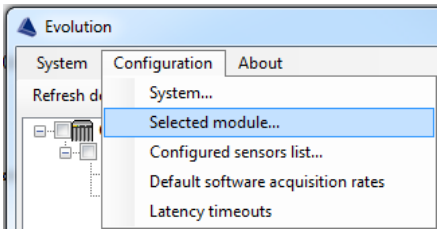
Configuring module

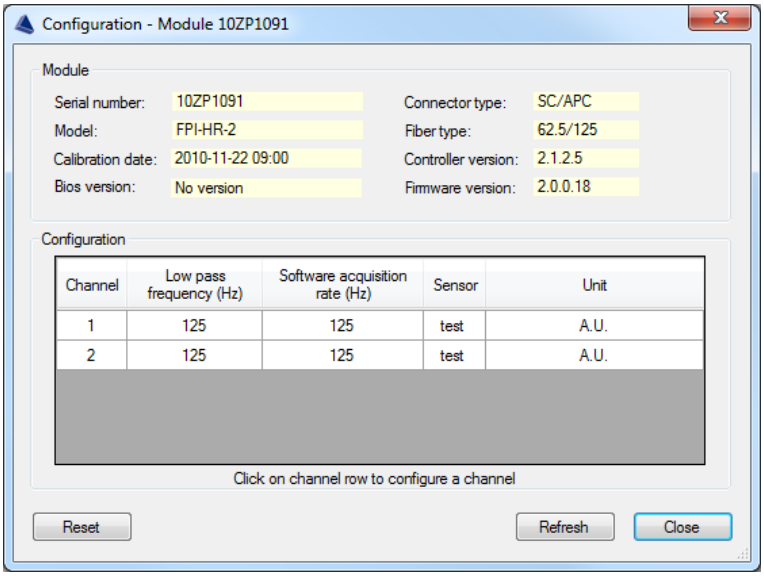
Now that your modules are shown in the system tree, you can configure them using the Module configuration window.

Select a module in the list and double click on it to show module configuration



Or select a module or channel node in the list and click menu **Configuration ► Selected module…**

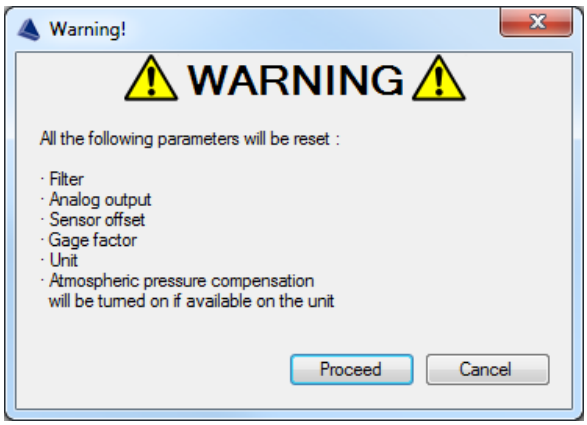




The Module section on top contains embedded module information such as serial number, model and software/hardware versions. The Configuration section provides access to the channel configuration parameters.

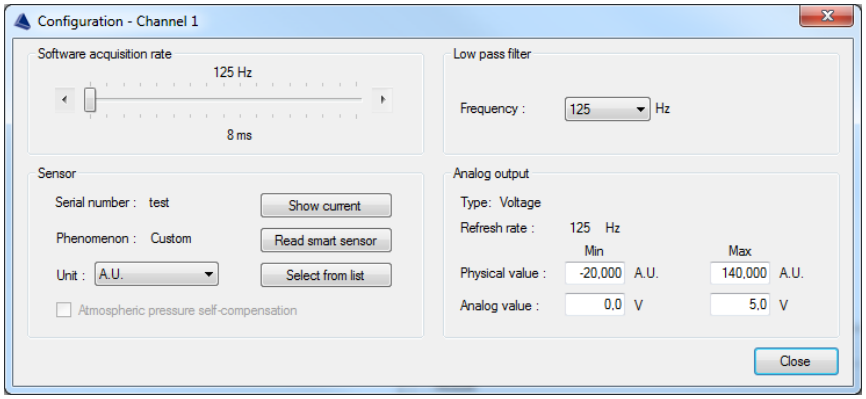
To refresh channels configuration and read newly connected smart sensors use the **Refresh** button.

To reset all channel settings, you can use the **Reset** button.



Configuring channel

To configure a channel, click on the channel row in the bottom grid of the module window, to show the channel configuration window:



Software acquisition rate

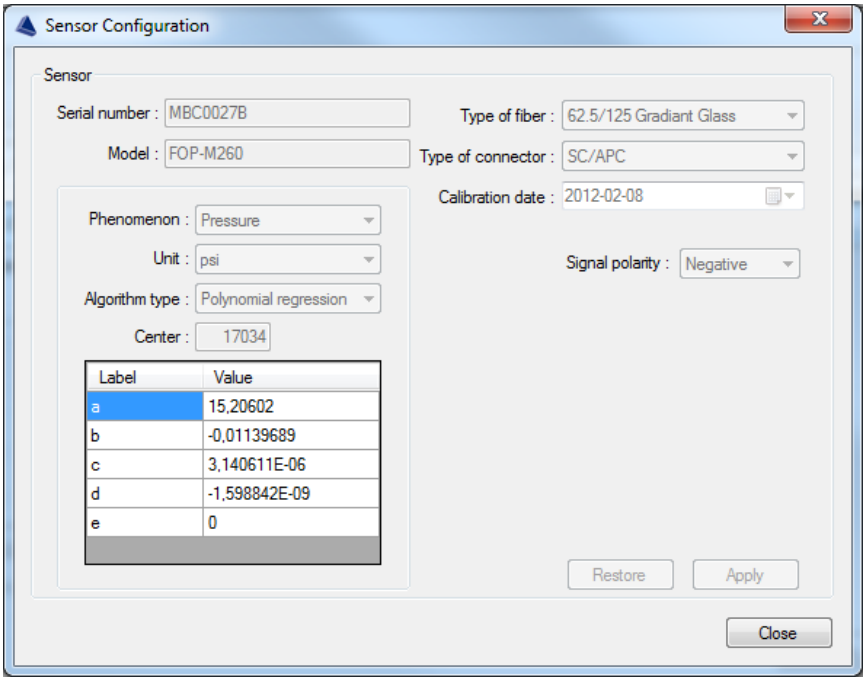
Use the slider to set the frequency or period of the software data acquisition. Note that this is not the module's internal frequency, but the acquisition rate of the **evolution** software. The analog output is always at the maximum rate.

Low pass filter

Low-pass filters provide a smoother form of a signal, removing the short-term fluctuations, and leaving the longer-term trend. Defining a lower frequency than the module's frequency will therefore reduce the noise in the reading.

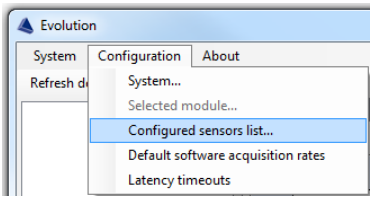
Sensor

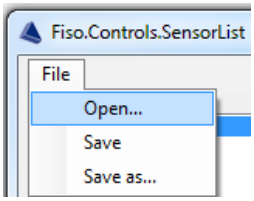
Current sensor serial number, phenomenon and physical unit is shown. Use the **Unit** dropdown to define the physical unit.
To show more information of the current sensor configured in the channel, use **Show current**.

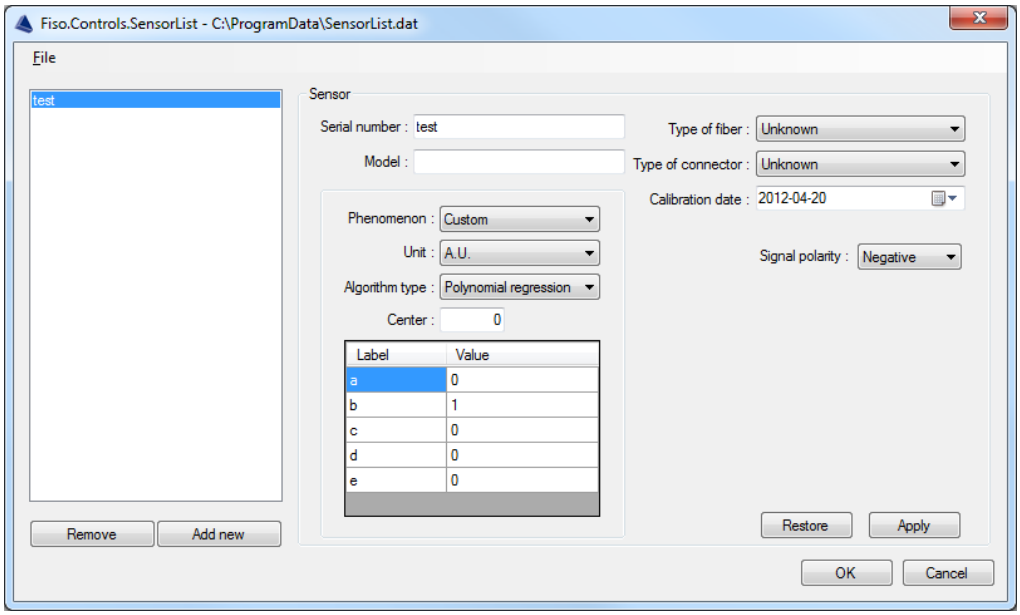


Every time you connect a new smart sensor on the module, sensor information from the smart connector is loaded into the channel configuration. The channel information can also be overridden by a user defined sensor.
To refresh current channel sensor information with the smart sensor values, use the **Read smart sensor** button.
With standard sensors (without intelligence) or to customize the sensor information, use the **Select from list** button to show and edit the list of sensors.

The list is also accessible via the menu **Configuration ► Configured sensors list...**







Using the **File** menu, you can **Open** any list to load it, **Save** list modifications, or save a copy (**Save as...**).
To add a new sensor to the list, click **Add new**.
Fill up **serial number**, **model**, **type of fiber**, **type of connector** and **calibration date**, which are informative information only.

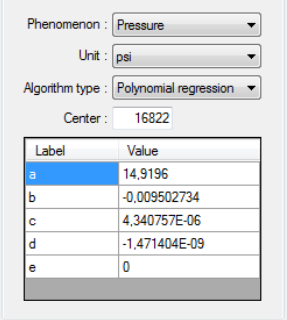
Type of fiber	**Type of connector**
Unknown	Unknown
50/125 Gradient Glass	SC/APC
62.5/125 Gradient Glass	SC/PC
100/400 Gradient Glass	ST/PC
200/220 Step Glass	FC/APC
	FC/PC

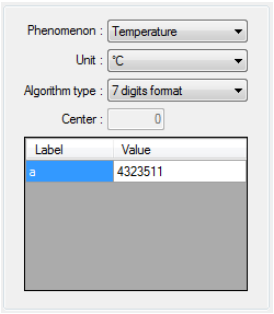
Define sensor phenomenon, then select the coefficients unit.

	Phenomenon				
Units	**Pressure**	**Length**	**Force**	**Angle**	**Acceleration**
	psi bar mmHg mmH20 kPa atm torr	mm in µm mil nm m	N dyn gf ozf lbf	° rad grad min sec am	m/s² g ft/s²
	Temperature	**Strain**	**Mass**	**Current**	**Magnetic**
	°F °C K	µε ppm %	g oz lbm	mA A C/s	T G gamma
	Refraction	**Humidity**	**Custom**	**Unknown**	
	RIU	%RH	A.U.	unknown	

Select the algorithm type.

Algorithm type
Unknown : invalid, **do not use**.
Polynomial regression : polynomial fit (see definition below)
Sqrt. poly. regression : square polynomial fit (rarely used)
7 digits format : Fiso gauge factor

Polynomial regression	
	For polynomial regression algorithm type, enter **center** and coefficients (*a,b,c,d,e*) values of the polynomial fit used to convert internal reading (**L** in nm) to physical phenomenon reading (**P** in unit). $\mathbf{P} = a + b * (\mathbf{L} - \mathbf{center})^1 + c * (\mathbf{L} - \mathbf{center})^2 + d * (\mathbf{L} - \mathbf{center})^3 + e * (\mathbf{L} - \mathbf{center})^4$ If **center** is left to 0 : $\mathbf{P} = a + b\,\mathbf{L}^1 + c\,\mathbf{L}^2 + d\,\mathbf{L}^3 + e\,\mathbf{L}^4$

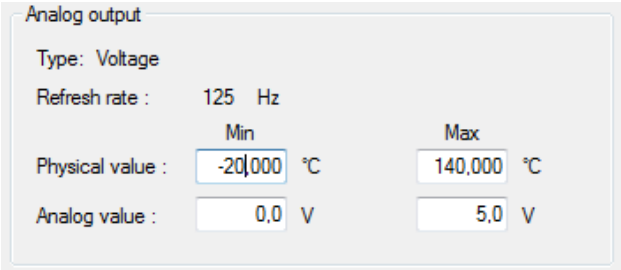
7 digits format 	For 7 digits format, fill up the gauge factor provided to you by Fiso, in the "*a*" value.

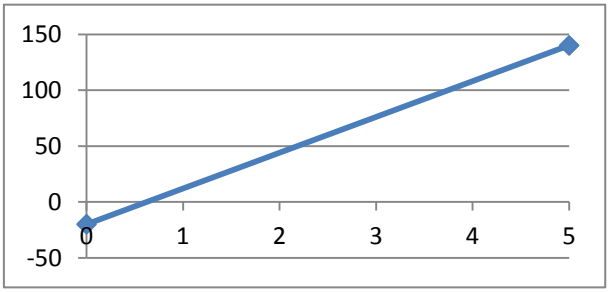
Fill up the coefficient values.

Signal polarity must be left to **Negative**, choose **Positive** for HERO sensors.
When your sensor configuration is done, click **Apply** then **OK** to close the window. The selected sensor will be set in the channel configuration.
To delete a sensor from the list, select it serial number in the list and press the **Remove** button.

Analog output

If your module is equipped with an analog output, you can define the range of value in the physical unit corresponding to the analog output value. The formula to evaluate physical value based on the analog value is equivalent to the linear equation: y = mx + b , where m = ΔY/ΔX.



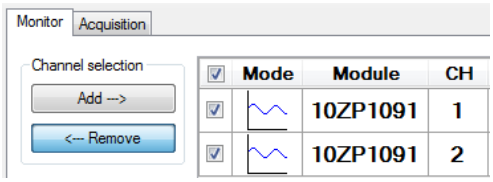


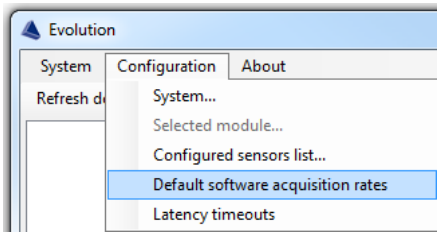
In this example, with a temperature sensor, 0 Volt on the analog output will be corresponding to -20 degree, and a 5 Volt reading on the analog output equal to 140 degree.

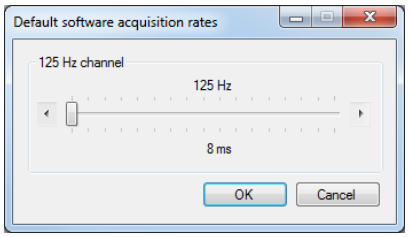
m = ΔY/ΔX = (PhysicalMax – PhysicalMin) / (AnalogMax – AnalogMin) = 160 / 5 = 32
b = y- mx = 140 – 32*5 = -20
Y = mx + b = 32x -20
So for example, for a 3 V reading, temperature would be : 32*3 – 20 = 76 degree.

Default acquisition rates

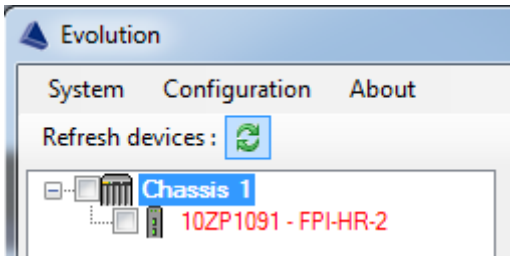
To configure the software acquisition rate of multiple channels at once, remove channels from the monitoring window then use menu **Configuration ► Default software acquisition rates**. Set the default rates, and click **OK**. All channels that are **not in monitoring** will be updated with these values.







Refreshing system

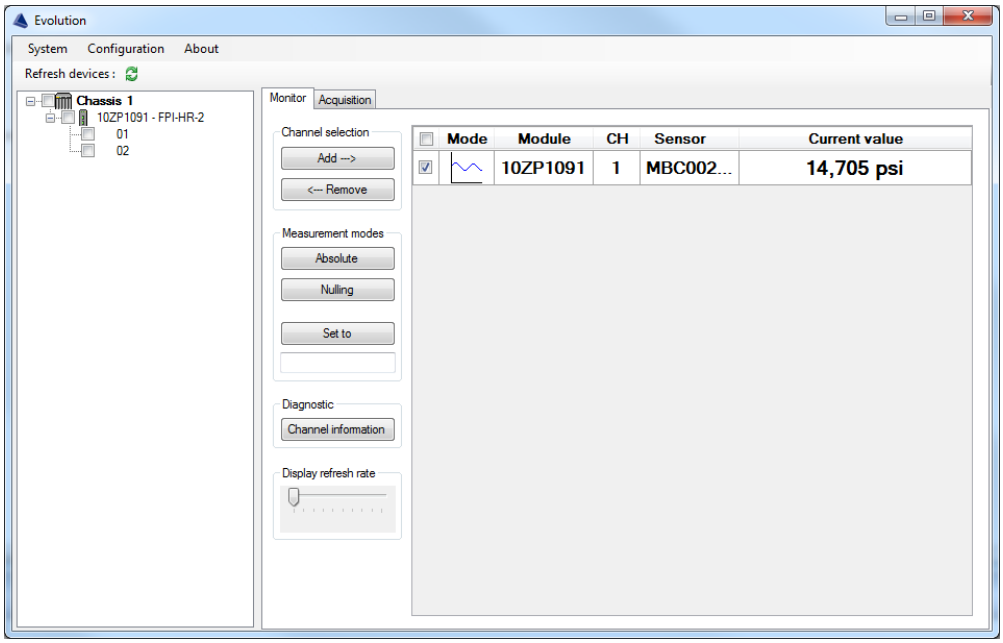


When a module is in error or not detected by the software, the module node is red. Use the **Refresh devices** button in the toolbar to reinitialize communication with the system. If the module is still in error, reboot platform, and check error on the system configuration window.

Once all the channels for all the modules have been configured, you may proceed with the monitoring and acquisition.

Monitoring

The monitoring tab collects channels data at regular interval and displays them in a tabular view.

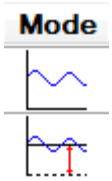


Channel selection

To add channel(s) to the monitoring and acquisition window, select the desired channels with their check box from the Chassis tree on the left, and click the **Add→** button from the monitor tab. To remove unwanted channels, use the checkbox from the monitoring grid and click the **← Remove** button.

Measurement modes

Absolute button: sets selected channels to absolute reading (no offset).
Nulling button: sets selected channels reading to 0.
Set to button: sets selected channels reading to the provided value (text box below).

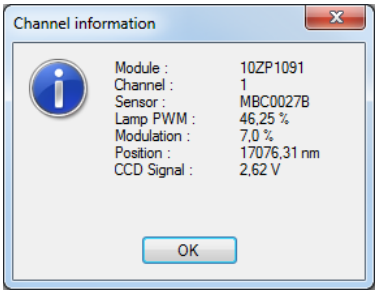


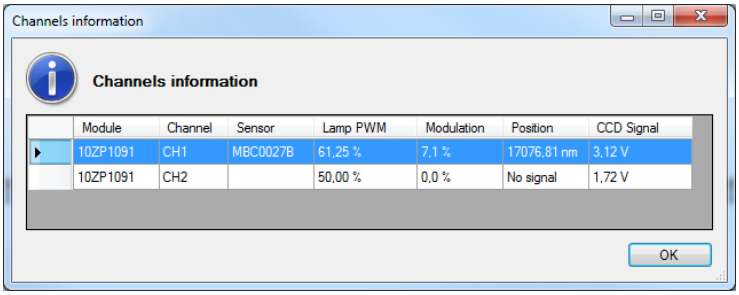
Absolute measurements

Offset measurements (nulling and set to)

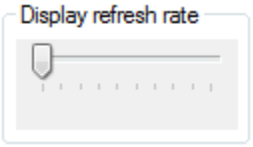
Diagnostics

Channel information button: Show selected channel(s) diagnostics.





Display refresh rate



Use slider to increase or decrease monitoring speed.

Acquisition

The acquisition tab collects the device data in real time and displays them graphically and / or saves them to text files. To add channels to the acquisition, you must add them via the **Monitor** tab. Be sure to also configure the desired software acquisition rate on each channel (with the channel configuration or the Default acquisition rates windows).

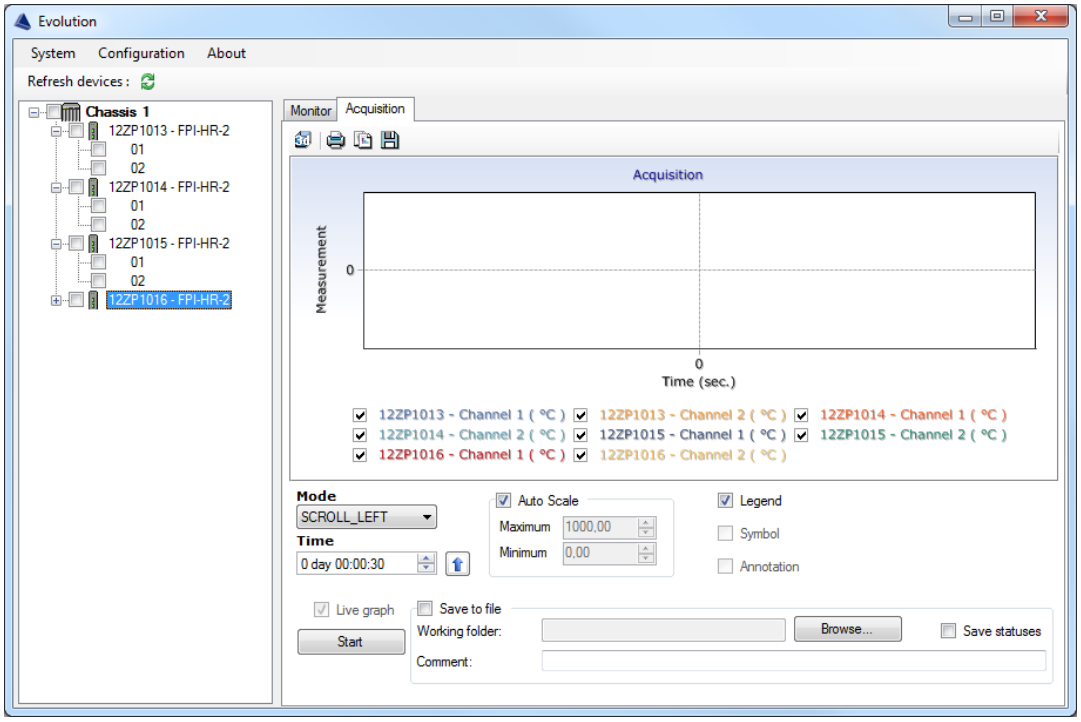


Chart acquisition

When the **Live graph** option is checked, the real-time acquisition data will be plotted to the chart. See the bottom legend for the list of channels colors. To hide a channel series from the chart, uncheck the channel in the bottom legend, or remove it completely from the monitored channels in the monitoring tab.
Before starting the acquisition, please set the chart **Mode** and **Time** (duration):

Mode

- **Scroll left**, **Scroll right**: scrolls the chart to display the latest points for the time period.
- **Loop**: Rather than scrolling through the time scale, the time scale is fixed and value are added in loop.
- **Accumulation**: accumulates data in the chart for the desired period of time and auto-**Stop** the acquisition.

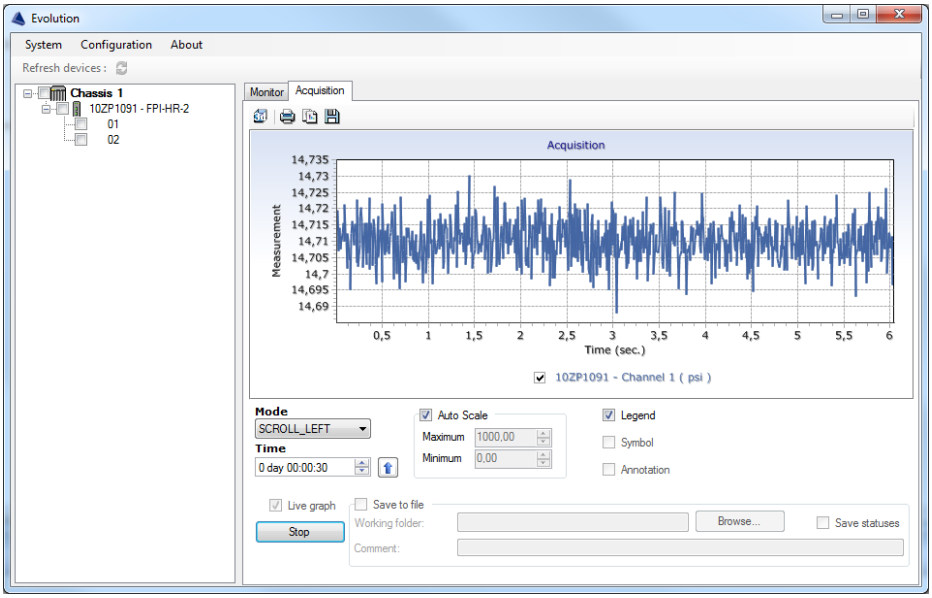
Time

Set the time duration displayed on the chart for the acquisition. The minimum value is: 1 second and the maximum value vary depending of the number of channels and their software acquisition rate, preventing too large amount data to be plotted. Use the **Up Arrow** to set it to maximum value.

Auto Scale

When the option is checked, the Y axis scale self adjusts according to the chart values. To define Y axis scale manually, uncheck the **Auto Scale** option and set the **Minimum** and **Maximum** values.

Live graph



To start or stop a live chart acquisition, check the **Live graph** checkbox and use the **Start/Stop** button.

Symbol and Annotation

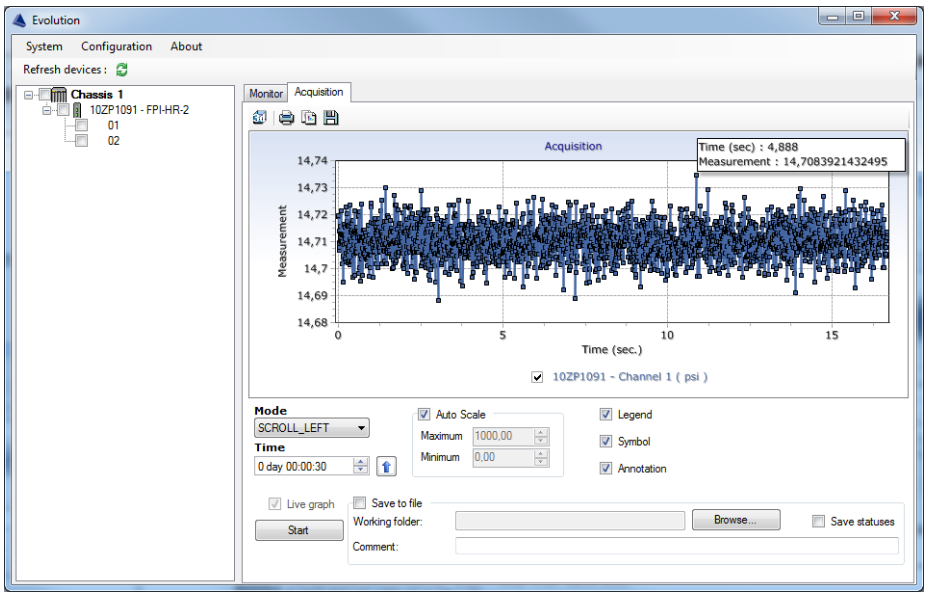


Chart options

To Show/Hide the chart legend, use the **Legend** checkbox.

To Show/Hide the values, use the **Symbol** checkbox.

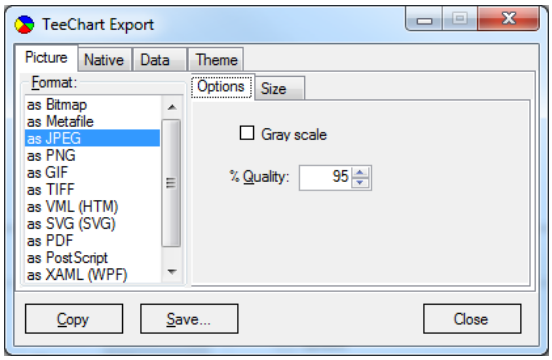
To Show/Hide the annotation window, use the **Annotation** checkbox.

To zoom in on the Chart, press the **left mouse button** at the top left hand corner of the area you wish to zoom in on and, maintaining the mouse button pressed, drag out the rectangle to the bottom right hand corner of the zoom area. Releasing the mouse button will force the Chart to redraw the area selected. To undo the zoom, press the left mouse button anywhere on the Chart area and drag up and left with the mouse button depressed. Releasing the button will force the Chart to redraw to the originally defined Chart area.

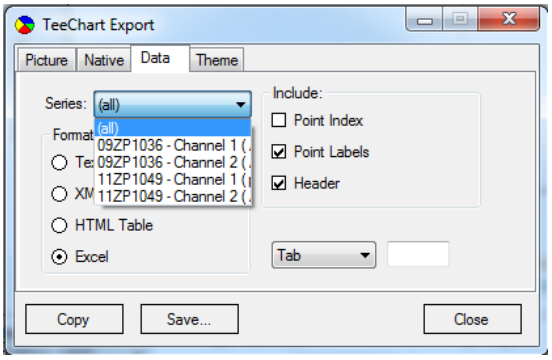
To scroll the Chart across, press the **right mouse button** and, maintaining the mouse button pressed, drag the mouse in the direction you wish to scroll the Chart. When you release the mouse button the Chart will remain at the new location. To undo the scroll, press the left mouse button anywhere on the Chart area and drag up and left with the mouse button depressed. Release the button and the Chart will redraw to the originally defined Chart area.

Use the Chart toolbar to print, copy or save the chart data to different file formats.

To save the chart as a picture, choose the file format, define options, then use the **Save** button.



To save the chart as data, Select the **Data** tab, define the serie(s) you want, select the file format, define data to include and click the **Save** button.

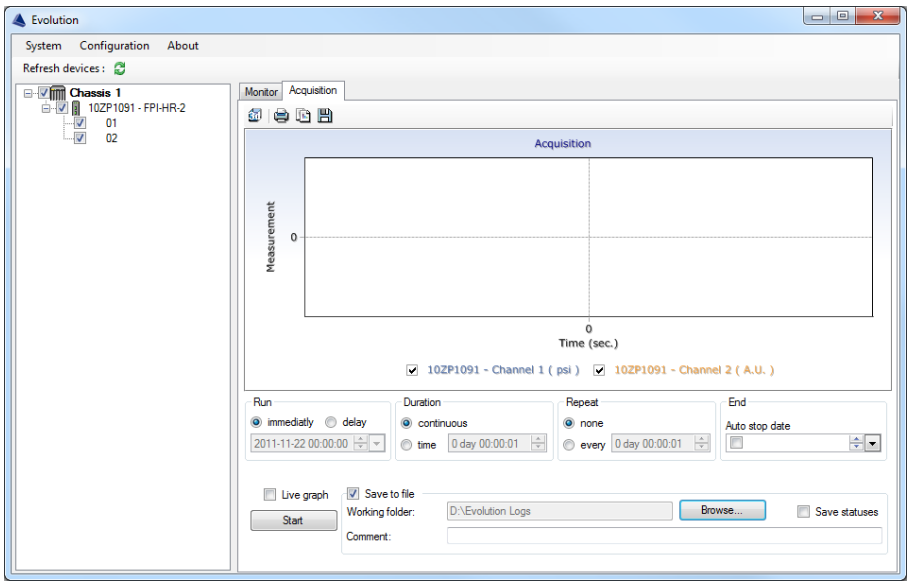


File acquisition

Check the **Save to file** option to save the acquisition data to files. Before starting a file acquisition, select the folder where you want the files to be saved, using the **Browse...** button.
Data are stored in a folder identified with the date and time of the acquisition. Each data file contains a series of .txt documents.

- The Acquisition file, which contains acquisition date, time and any comments that were written in the **Comment** text box.
- One file for each channel used during the acquisition session. This file is identified with the module serial number and channel number. It contains the module, channel and sensor information and the data with timestamps. The **Save statuses** checkbox should only be checked for troubleshooting, it adds a status column (valid, no signal, lost) to the data.

The acquisition can run simultaneously in the files and chart. But if you uncheck the **Live graph** option, no data will be plotted to the chart and new options will become available to configure and schedule the file acquisition:



Scheduler

To show the file acquisition schedule, check the **Save to file** option and uncheck the **Live graph** option.

Run

Immediately: start acquisition when you push Start.
Delay: start acquisition at the date and time you set.

Duration

Continuous: no time duration for the acquisition, stops when you click **Stop**.
Time: acquisition will last the time duration you set.

Repeat

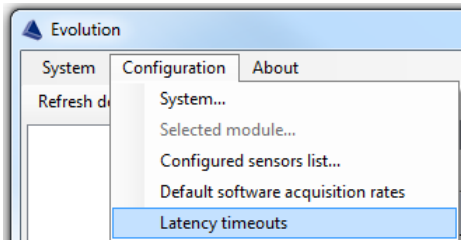
None: no repetition of the acquisition.
Every: time between each **Start** Acquisition.

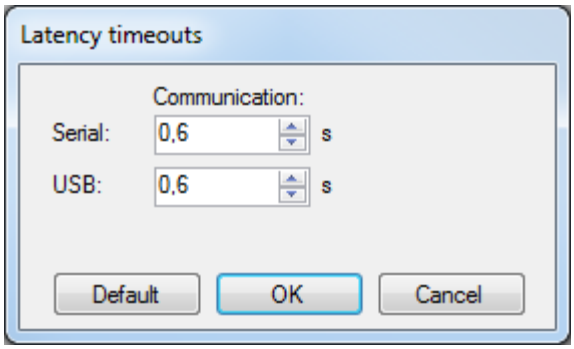
End

Auto stop date: The date when you want to stop the process (stop a continuous acquisition or stop a repeated acquisition).

Timeouts

The menu **Configuration ► Latency timeouts** opens a configuration window for the software timeouts. On normal use, leave **Serial** and **USB** values to the default **0.6 s**.





Maintenance

Handling the Sensors

Read the following precautions prior to installing and when using sensors:

- Avoid sharp bending radius in the fiber-optic cable (< 50 mm).
- Avoid tension, pinch points or twisting of the fiber-optic cable.
- Do not pull on fiber-optic cable to clear tangles; instead, carefully unwind.
- Do not allow the fiber-optic connectors to drop or scrape on hard surfaces.
- Keep the surface of the fiber-optic connector clean.
- Always use protector caps on the fiber-optic connectors when sensors are disconnected from the signal conditioner.

Cleaning a Fiber Optic Connector

To make good optical measurements, it is extremely important to clean the fiber-optic connector before each connection. Dirt on the connector can degrade the reliability of the measurement and cause permanent damage to the connector resulting in non-functional sensors.

Modern fiber-optic connectors rely on a glass-to-glass contact to reduce Fresnel reflections at the connector interface. A dirty or damaged connector on the cable can damage the input connector. Always use a good quality cable connector. If there is any question about the surface quality on the tip of the cable connector, inspect it under a microscope for scratches or debris.

Some general recommendations:

- Never use a metal or other hard object for cleaning; it would scratch the ferrule.
- Do not apply index-matching gel or oils.
- Always keep connectors covered for protection when not in use.

To clean the end of the connector on the fiber-optic cable:

1. Deposit one drop of isopropyl alcohol on a lint-free wiping cloth.
2. Gently wipe the entire ferrule (and especially the end) in a straight-line motion.
3. Using a dry lint-free wiping cloth, gently wipe the same surfaces to ensure that the connector and ferrule are perfectly dry.
4. Throw out wiping cloths after one use.
5. As soon as the connector is clean, insert it in the panel or cover it for later use.

Cleaning Signal Conditioner Ports

It is equally important to make good optical connections and to clean the fiber-optic detector port before each connection. Dirt on the detector can degrade the reliability of the measurement and cause permanent damage to the connector resulting in an expensive repair.

To clean the connector on the fiber-optic detector port:

1. Moisten a cleaning swab with one drop of isopropyl alcohol.
2. Insert the cleaning tip into the connector using a slow clockwise rotating movement until it reaches the ferrule inside.
3. Gently rotate the cleaning tip one full turn.
4. Continue to turn as you withdraw the cleaning tip.
5. Repeat steps 2 to 4, but this time, use a new dry cleaning swab.

Replacing Parts

When handling optical fibers and fiber-optic connectors, follow the general recommendations presented in this section.

There are no user serviceable parts inside the **evolution** Chassis, other than the ones specified in the ***Maintenance*** section. Adjusting parts inside the unit can affect the accuracy of the instrument. If you adjust parts, you will need to verify the accuracy of the measurements.

Troubleshooting

Solving Common Problems

The following troubleshooting guide was designed to help you solve technical problems. If you conclude that the unit has to be returned for repairs, or if you need assistance, please contact FISO Technical Support at support@fiso.com.

Symptom	Possible cause	Possible solution
LED no light	No power	Turn on the ON/OFF switch, located near the top left corner of the front panel.
LED no light	Main power	Try another power outlet.
LED no light	Power supply	Verify the power supply connection. If possible, try another 24 VDC power supply (with the same polarity), or test the voltage of the power supply. If the power supply is faulty, call FISO.

Table 1: Troubleshooting common problems

Depending on local parameters, the spreadsheet software may have some problems to interpret correctly the column separator and the decimal separator. In that case, save your .csv file in .txt, open the .txt file in the spreadsheet software and follow the instructions on the parameters' screen of the opened text file.

Contacting FISO Technical Support

To obtain after-sales service or technical support for this product, contact FISO at one of the following numbers. Technical Support is available from Monday to Friday, from 8:00 a.m. to 5:00 p.m. (Eastern Time in North America).

FISO Technologies Inc. 500, St-Jean-Baptiste Avenue, Suite 195 Québec (Québec) G2E 5R9 CANADA	Telephone: Fax: E-mail: URL:	(418) 688-8065 (418) 688-8067 support@fiso.com http://www.fiso.com

To accelerate the process, please have information such as the name and the serial number of your product as well as a description of your problem close at hand.

Warranty

General Information

FISO (FISO) warrants this equipment against defects in material and workmanship for a period of one year and its fiber optic transducers and sensors for ninety (90) days from the date of original shipment. FISO also warrants that this equipment will meet applicable specifications under normal use.

During the warranty period, FISO will, at its discretion, repair, replace, or issue credit for any defective product, as well as recalibrate the product free of charge should the equipment need to be repaired or if the original calibration is erroneous.

IMPORTANT

The warranty can become null and void if:

- The equipment has been tampered with, repaired, or worked upon by unauthorized individuals or non-FISO personnel.
- The warranty sticker has been removed.
- Case screws, other than those specified in this manual, have been removed.
- The case has been opened, other than as explained in this manual.
- The equipment serial number has been altered, erased, or removed.
- The equipment has been misused, neglected, or damaged by accident.

Liability

FISO shall not be liable for damages resulting from the use of the purchased product, nor shall be responsible for any failure in the performance of other items to which the purchased product is connected or the operation of any system of which the purchased product may be a part.

FISO shall not be liable for damages resulting from improper usage or unauthorized modification of the product, its accompanying accessories and software.

Exclusions

FISO reserves the right to make changes in the design or construction of any of its products at any time without incurring obligation to make any changes whatsoever on units purchased. Accessories, including but not limited to fuses, pilot lamps, and batteries used with FISO products are not covered by this warranty.

Certification

FISO certifies that this equipment has met its published specifications at the time of shipment from the factory.

Service and Repairs

FISO commits to provide product service and repair for five years following the date of purchase.

To send any equipment for service or repairs:
Call your local FISO products representative or FISO head office. Support personnel will determine if the equipment requires service, repair, or calibration.

If the equipment must be returned to FISO or to a local distributor, support personnel will issue a Return Merchandise Authorization (RMA) number, a detailed instruction sheet, and provide an address for return.

If the unit has an internal storage device, perform a data backup before sending the unit for repairs.

Pack the equipment in its original shipping material. Be sure to include a statement or report fully detailing the defect and the conditions under which it was observed.

Return the equipment, prepaid, to the address given to you by support personnel. Be sure to write the RMA number on the shipping slip. FISO will refuse and return any package that does not bear an RMA number.

Note: A test setup fee will apply to any returned unit that, after test, is found to meet the applicable specifications. Likewise, a fee will apply if the only trouble found is related to dirty connectors.

After repair, the equipment will be returned with a repair report. If the equipment is not under warranty, the customer will be invoiced for the cost appearing on this report. Return-to-customer shipping costs will only be paid by FISO for equipment under warranty. Shipping insurance is at the customer's expense.

Transportation

Maintain a temperature range within specifications when transporting the unit. Transportation damage can occur from improper handling. The following steps are recommended to minimize the possibility of damage:

- Pack the unit in its original packing material when shipping.
- Avoid high humidity or large temperature fluctuations.
- Keep the unit out of direct sunlight.

Avoid unnecessary shock and vibration.

FISO Customer Service

If you require service or need information about our products, contact your local representative or FISO head office (contact details below).

FISO Technologies (head office) 500 St-Jean-Baptiste Avenue, Suite 195 Québec City (Quebec) G2E 5R9 CANADA	Telephone: (418) 688-8065 Fax: (418) 688-8067 Email: support@fiso.com

A. Technical Specifications

Chassis Specifications

	evolution EVO-SD-2	evolution EVO-SD-5	evolution EVO-RM
Communication	• USB	• USB	• USB
Datalog memory	Computer	Computer	Computer
Number of slots	2	5	8
Power supply	• 24 VDC • 70 W	• 24 VDC • 70 W	• 24 VDC • 70 W

Table 2: Chassis specifications

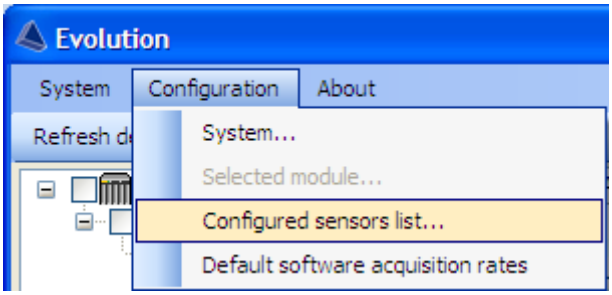
B. Refractive index transducers

The refractive index transducer is based on the variation of the optical Fabry-Perot cavity length that results from the refractive index properties of the liquid. The liquid filled cavity length, hereinafter called optical cavity length ($L_{optical}$), is given by the physical cavity length ($L_{physical}$) multiplied by the refractive index of the liquid (n_{liquid}):

$$L_{optical} = n_{liquid} \bullet L_{Physical}$$

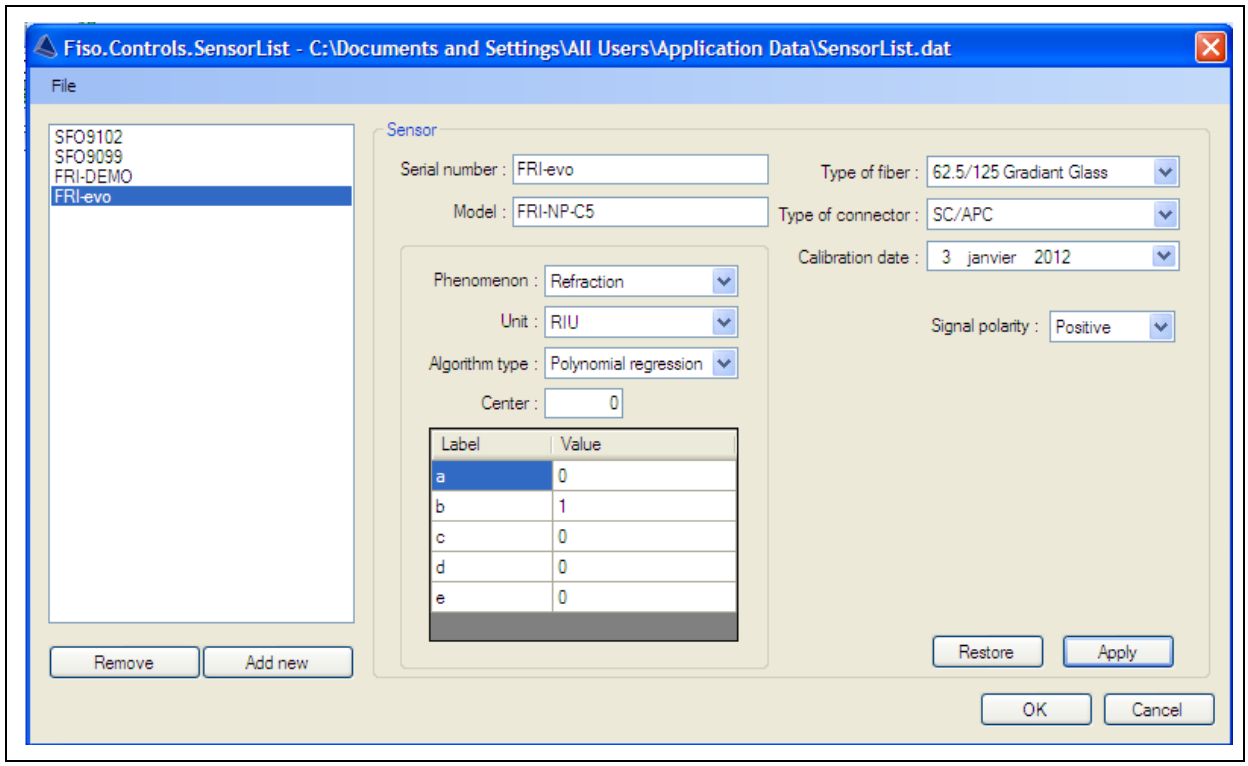
Since FISO signal conditioner has the capability to measure the absolute cavity length, there is no need for probe calibration.

The user must first create a sensor.
Access the "Configured sensors list". Simply click on the **Configured sensors list** button from the **Configuration** pull-down menu.



Click on "Add new" to add a sensor to the sensors list.
To configure the sensor:

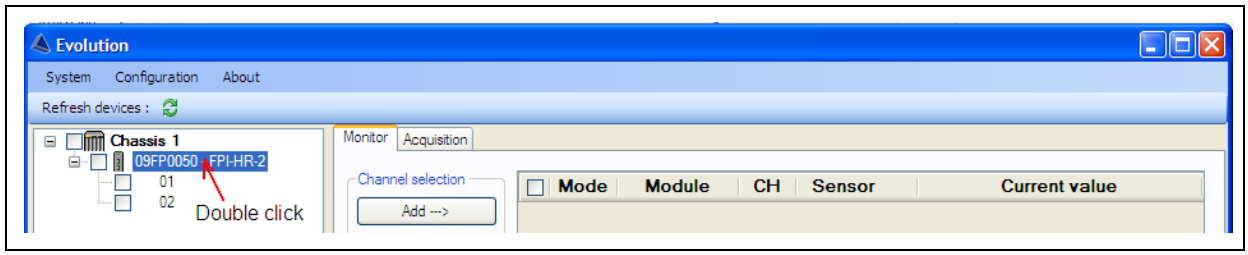
1- For informative purpose only. Type the serial number as indicated on the sensor box. The serial number will appear in the Sensor list.
2- For informative purpose only. Type the model as indicated on the sensor box.
3- Select the **Refraction** phenomenon.
4- Unit "**RIU"** is automatically displayed.
5- Value "**1"** for label b is also automatically displayed
6- **For informative purpose select the type of fiber**.
7- **For informative purpose select the type of connector**.
8- **For refractive index sensor when the internal units increases the refractive index increases so select "Positive" as signal polarity**.
9- Click on **Apply**.
10- Click on **OK**.



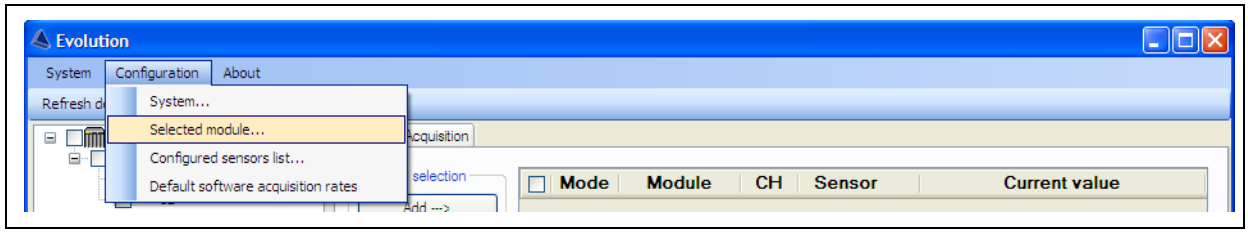
Refractive index sensors may not have an intelligent connector, so on sensor connection the module and channel does not get the information on sensor(s) that do not have an intelligent connector. So the user must assign the sensor with no intelligent connector to the channel on which the sensor is connected.

To assign a sensor with no intelligent connector to a specific channel, the user must drill down from the chassis to the channel and assign a sensor to this channel

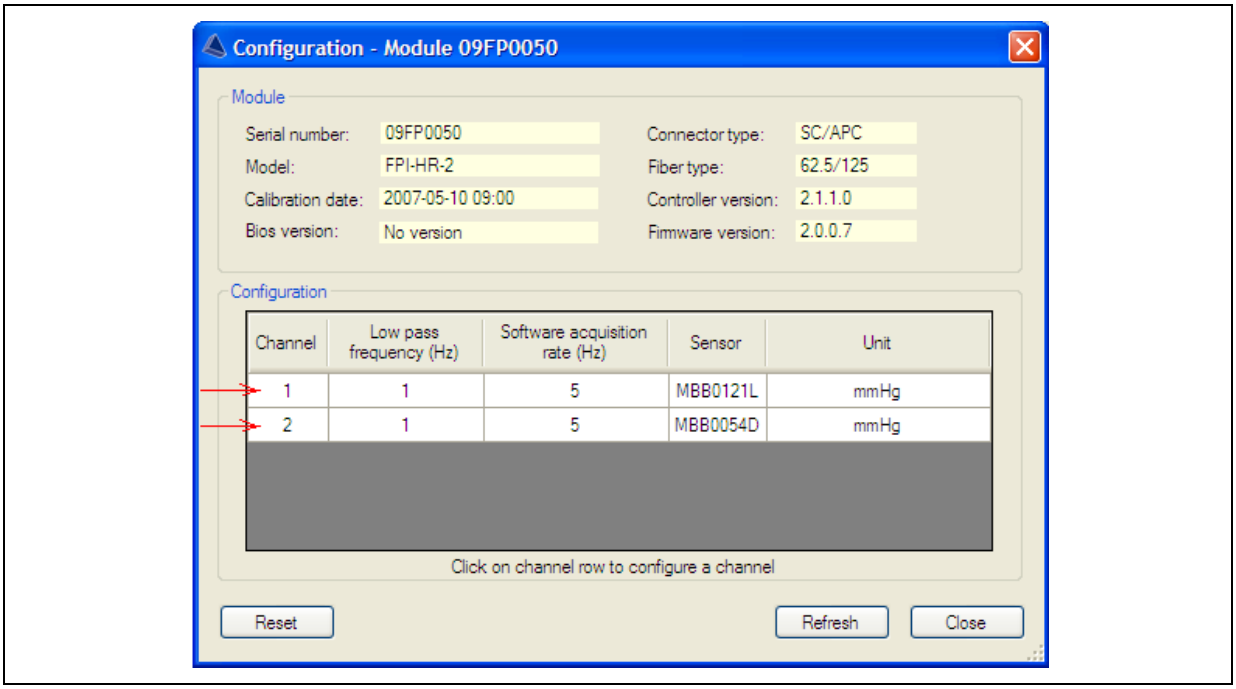
Double click on the module



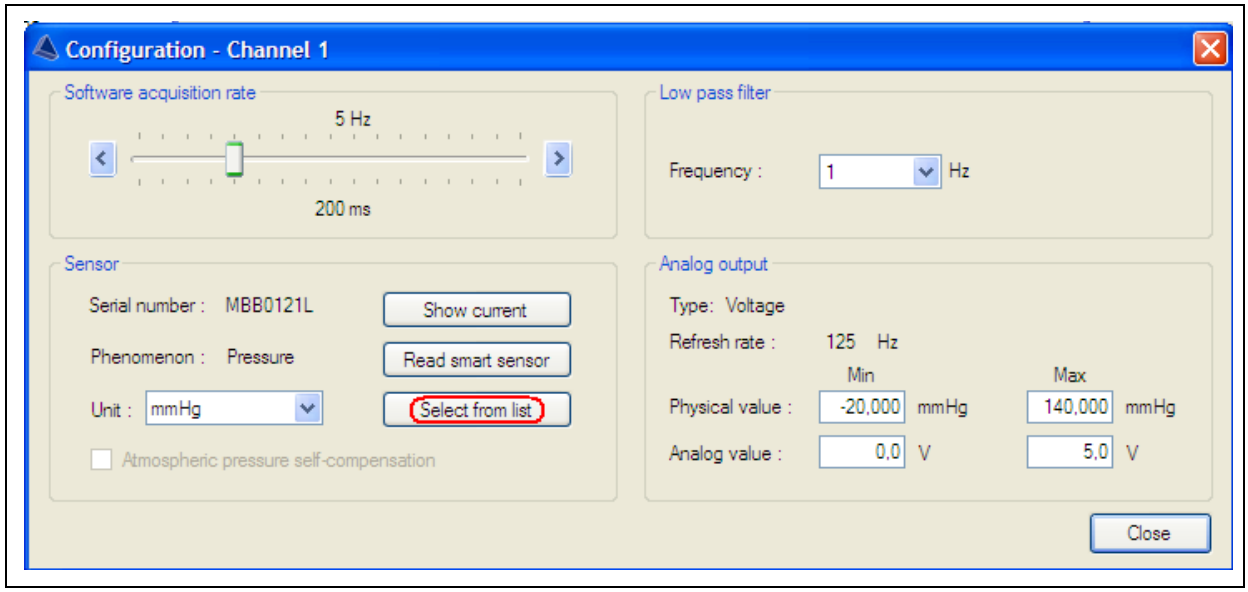
or click once on the module and from the Configuration menu, click on **Selected module**:



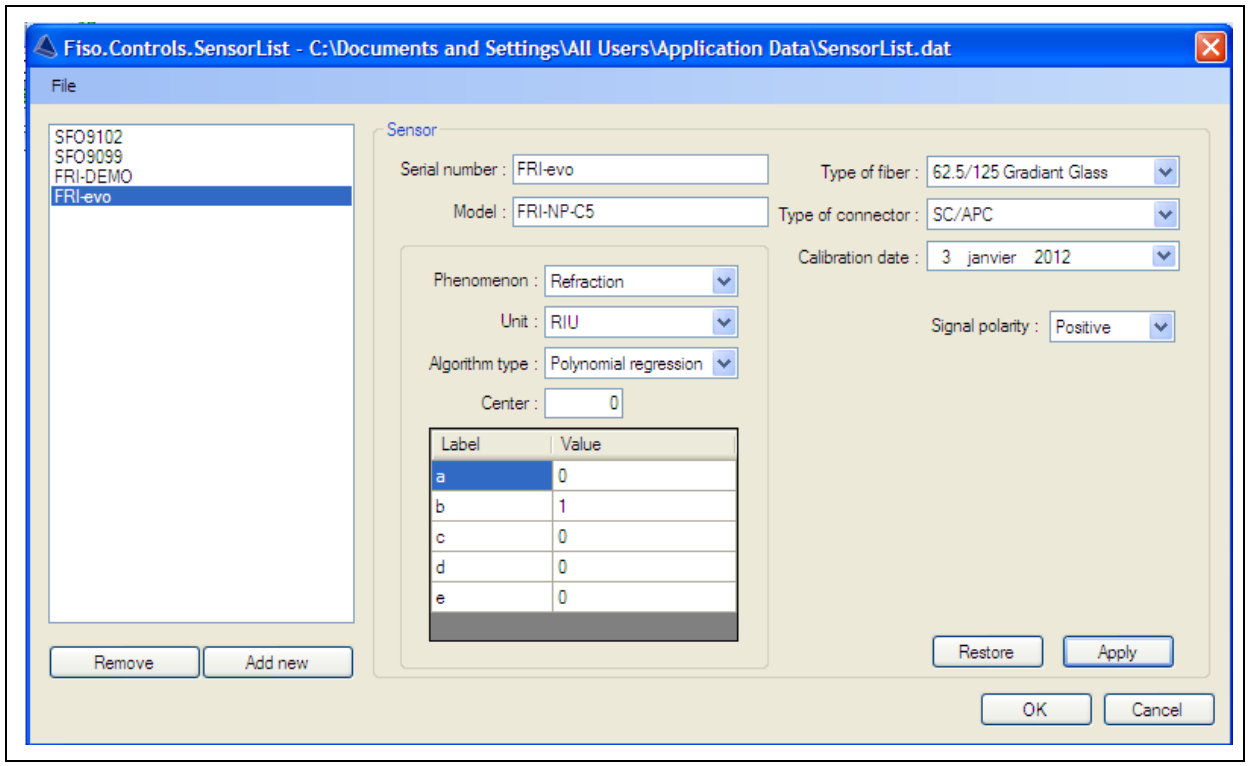
Now click anywhere on the channel line you want to configure.



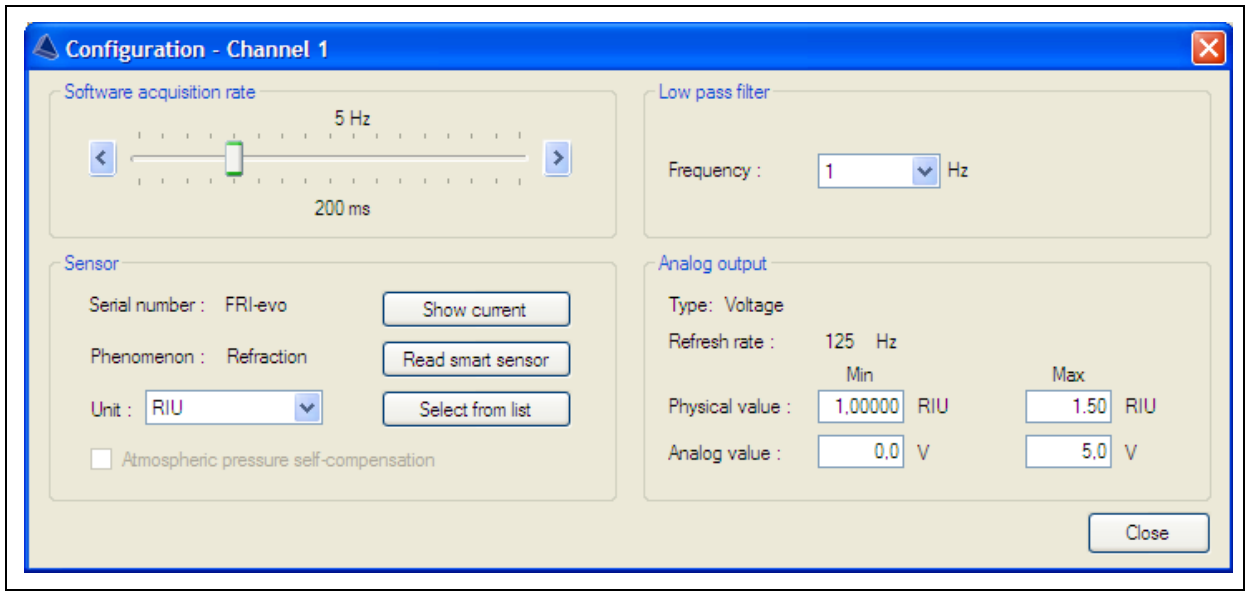
Now click on **Select from list**.



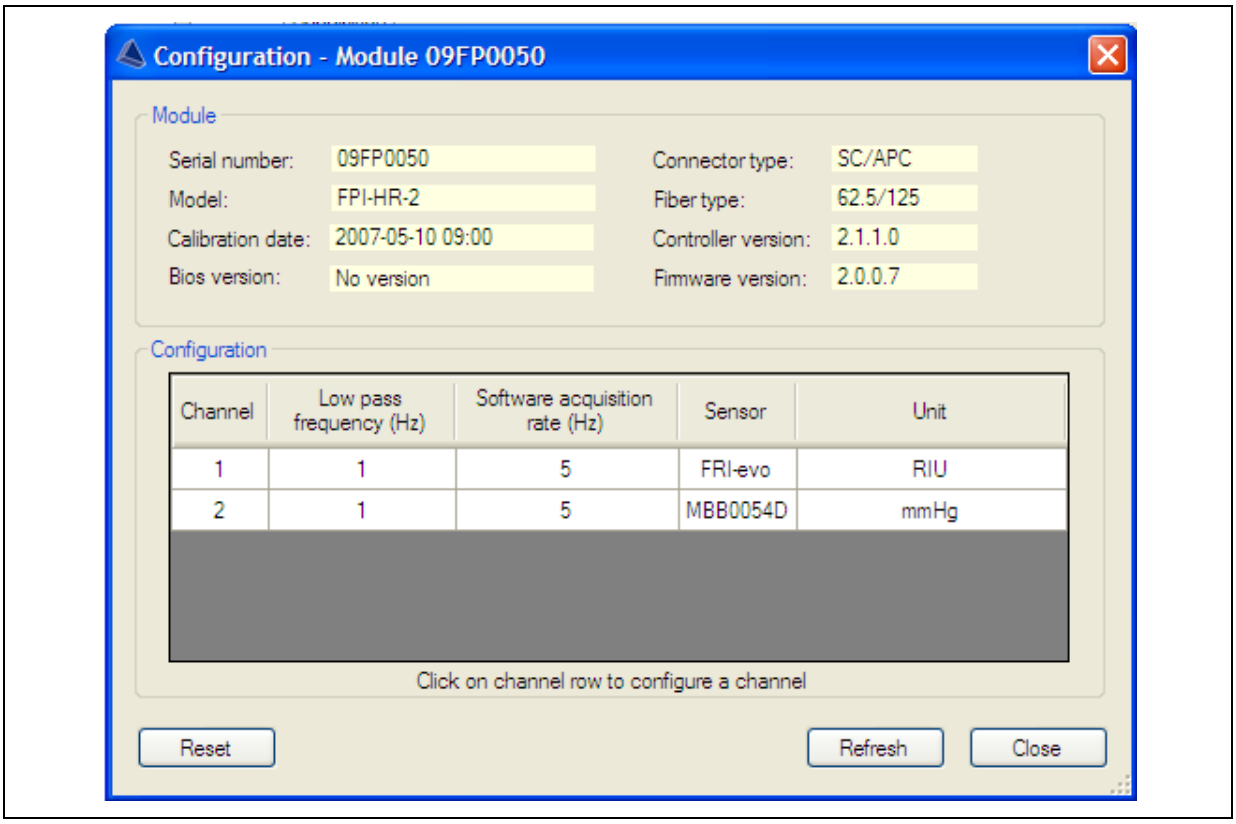
Choose the Refractive Index sensor in this example “FRI-evo” then click Apply and OK.



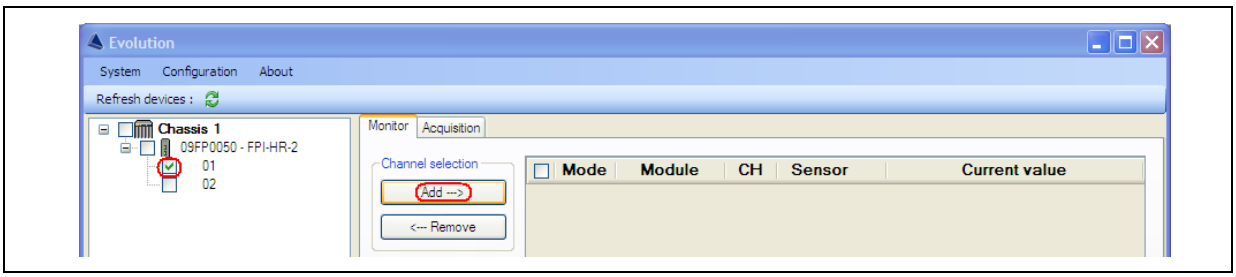
If your module has an analog output you may program the analog output respecting the minimum and maximum values that your FPI module can read.



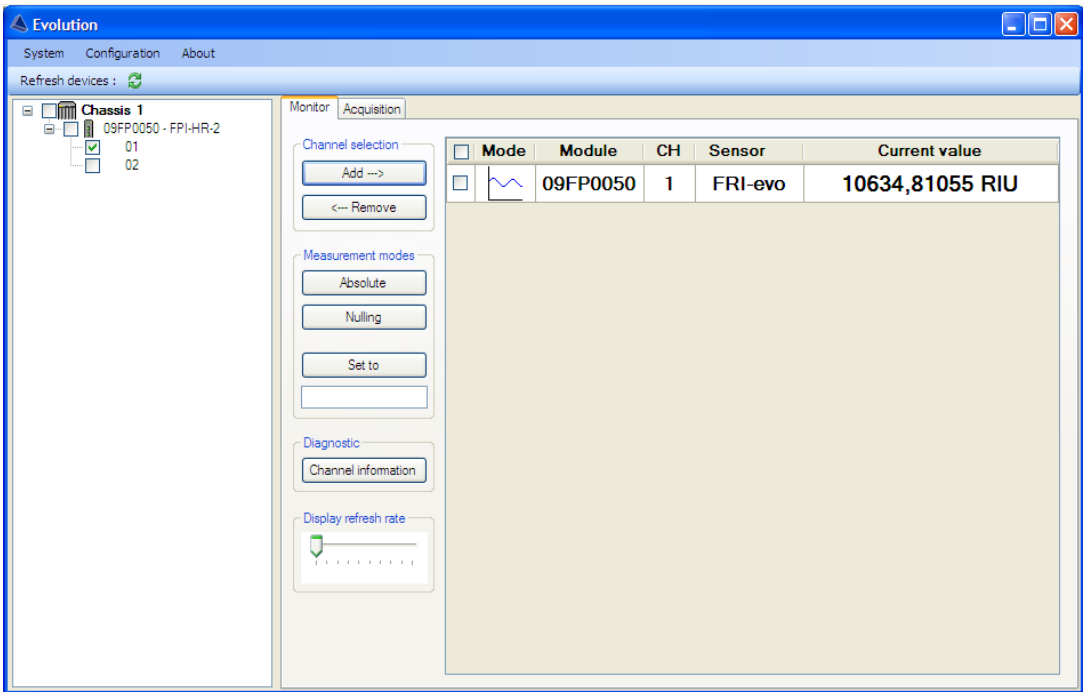
Close the Channel configuration window
And close the Module configuration window



In the Monitor window select and add the channel on which the refractive index is connected to the Monitor display.



First measure the cavity length of your sensor while keeping the sensor in the air.



Because the refractive index of the air is 1 calculate the “b” value:
Do 1 divided by the **Current value**.
Ex: 1 / 10 634,81055 = 0.000094030824084590

Go back to the Sensors List by:

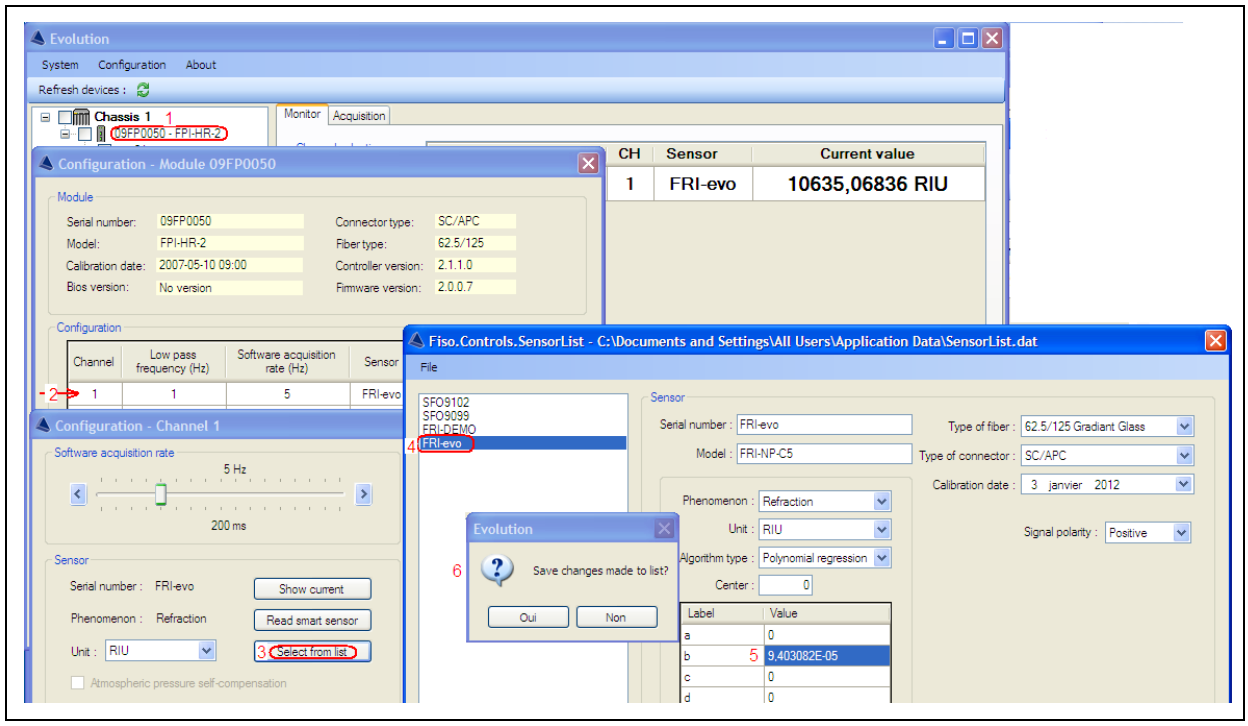
1 selecting the module to get the Configuration Module window then by

2 clicking once on the Channel line to get the Configuration Channel window then by

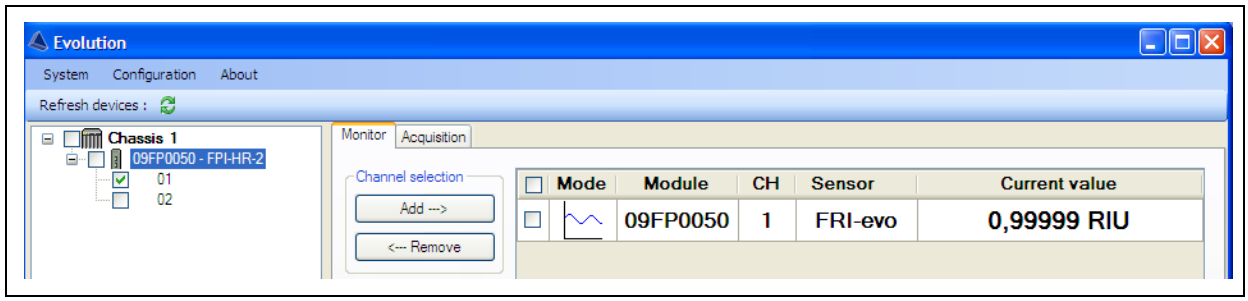
3 clicking on “Select from list” to get the sensor list then

4 select the Refractive index sensor which is connected to the channel being used.

5 Enter this result as a float number 9,403082E-05 in the “b” case, as shown below.



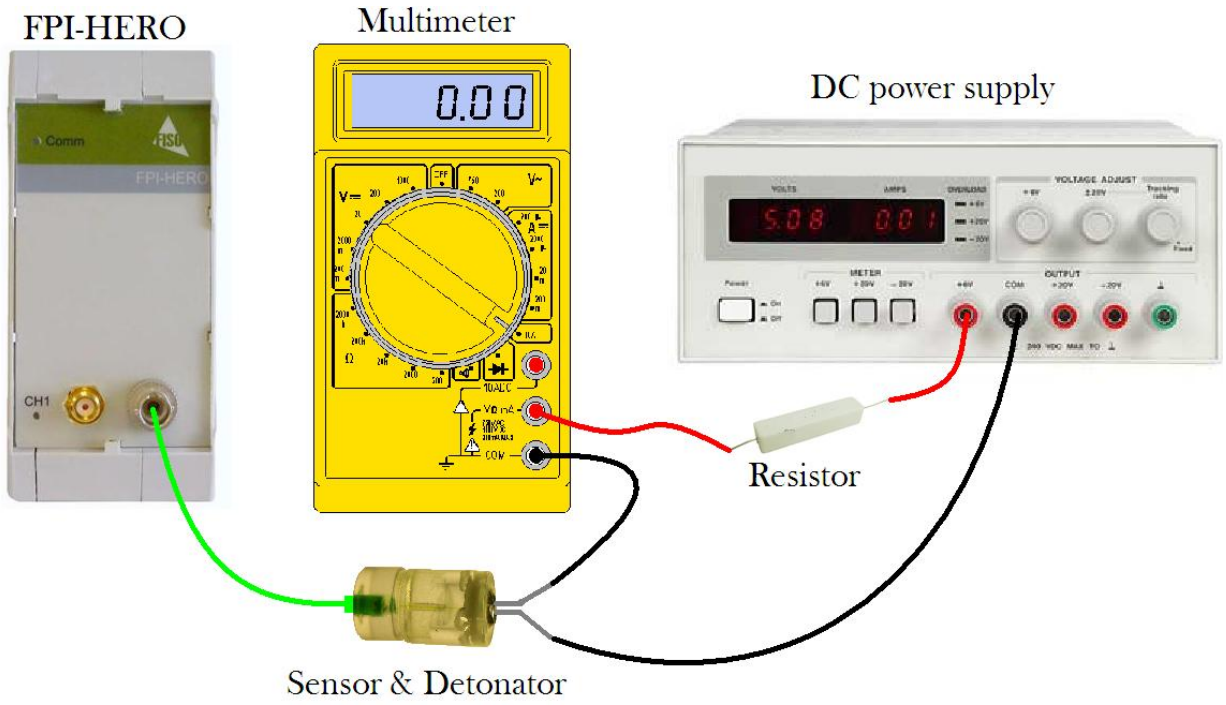
Click on “Apply”, “OK” and “Save changes made to list” and close the Channel configuration window and close the Configuration module window to see displayed the measurement in RI units.



It is important to note that the refractive index measured by the system is not for one single wavelength as it is usually reported in the literature, but is the refractive index averaged over the wavelength covered by the internal light source. The light source extends from 650nm to 1000nm. As a rule of thumb, it is generally acceptable to consider that the refractive index is measured for a central wavelength of 800nm.

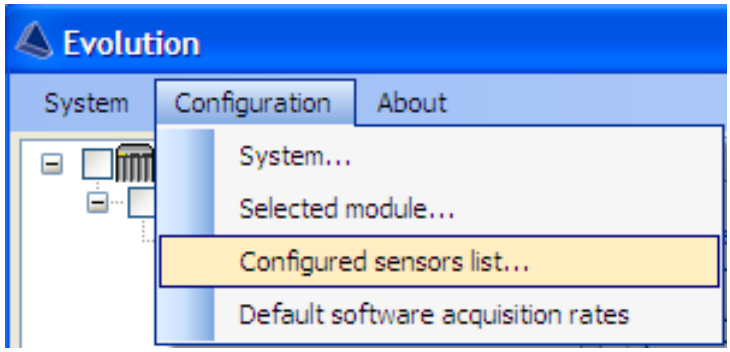
C. Configure FOT-HERO manually, and with Sensor calibration software

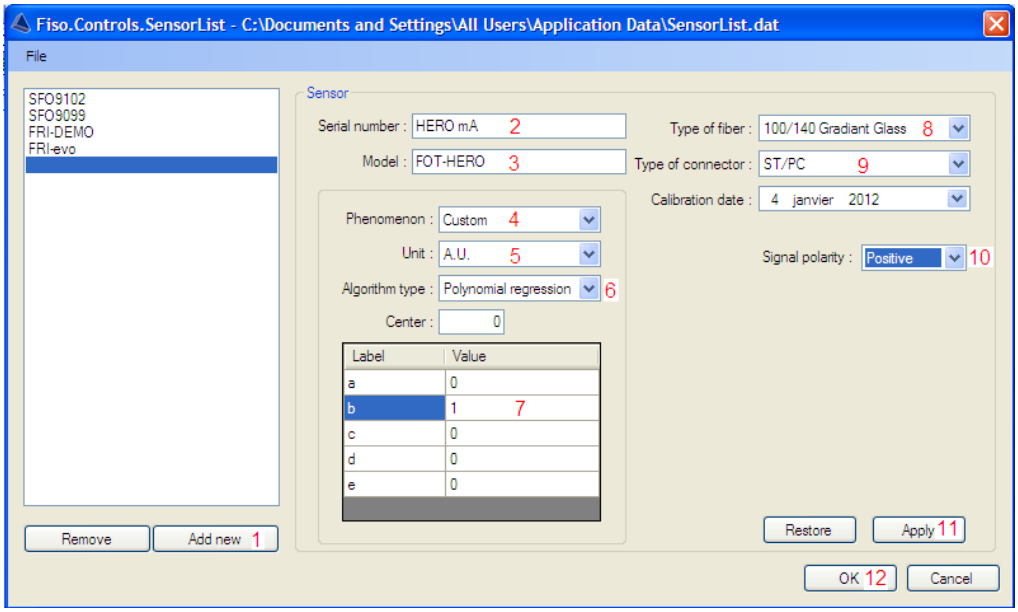
Set-up:



Sensor Configuration (manually):

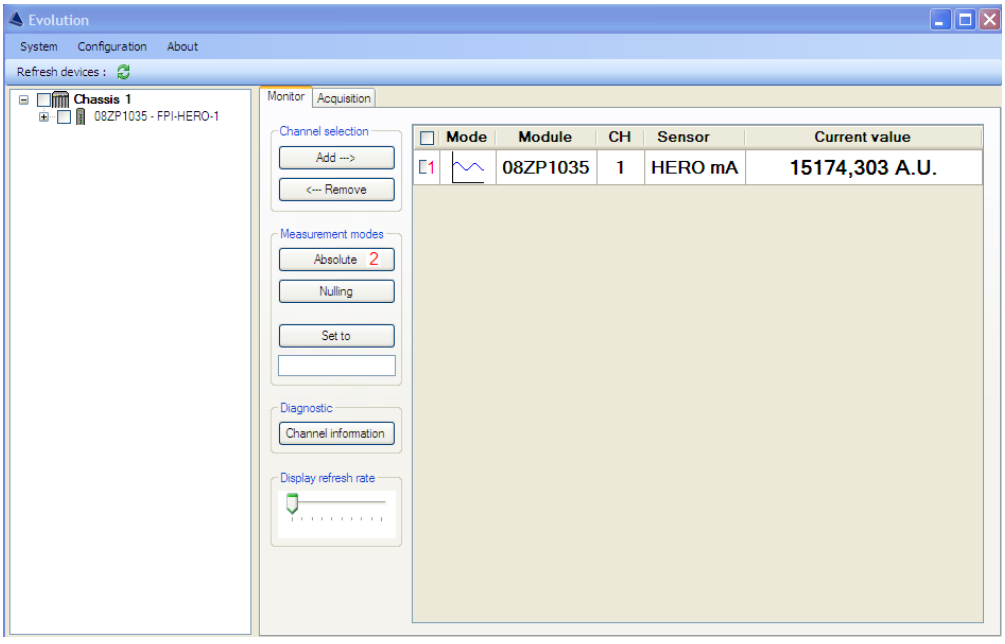
To access the **Configured sensors list** window, simply click on the **Configured sensors list** button from the **Configuration** pull-down menu.





1. Click on the **Add new** button
2. Enter the Serial number (ex: HERO mA)
3. Enter the Model (ex: FOT-HERO)
4. Enter the Phenomenon (**Custom**)
5. Let the Unit to A.U. (Arbitrary Unit)
6. Choose the Algorithm type (**Polynomial regression**)
7. Enter **1** in the case ''**b**'' (it's to read the measure in nm)
8. FOT-HERO sensors use 100µm core fiber
9. FOT-HERO sensors use ST connectors
10. Choose the Single polarity (**Positive**)
11. Click on **Apply**
12. Click on **OK**

1- You will see the measure in nm like below:



If you do not see a measurement of approximately 15500 A.U. (Arbitrary Unit) then, 1 select the channel and 2 clicks on Absolute.

Calibration:

To calibrate your sensor to measure in current (mA):

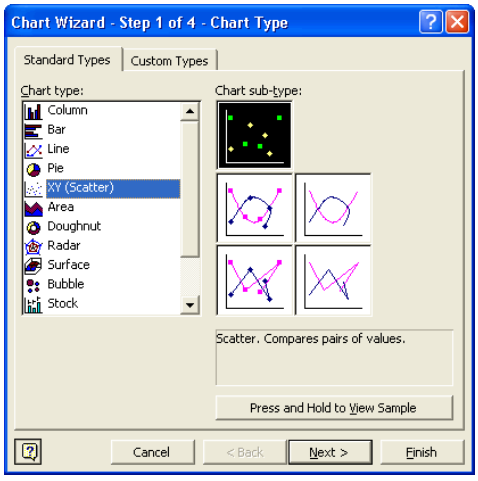
1- Create a file in Excel
2- Enter the information like below:

	A	B	C	D	E
1	Current		Response		
2	Target (mA)	Measured (mA)	nm	delta (nm)	mA*mA (mA²)
3	0			=C3-C3	=B3*B3
4	15			=C4-C3	=B4*B4
5	10			=C5-C3	=B5*B5
6	25			=C6-C3	=B6*B6
7	50			=C7-C3	=B7*B7
8	75			=C8-C3	=B8*B8
9	100			=C9-C3	=B9*B9
10	125			=C10-C3	=B10*B10
11	150			=C11-C3	=B11*B11
12	175			=C12-C3	=B12*B12
13	200			=C13-C3	=B13*B13

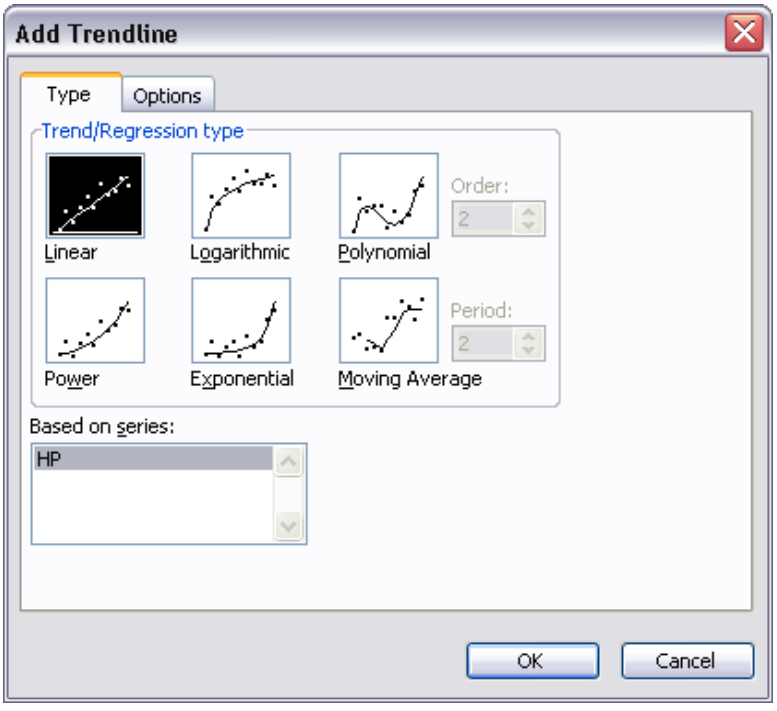
3- For each current you put, note the current measured with the multimeter and the response in nm give by the evolution software (example below):

	A	B	C	D	E
1	Current		Response		
2	Target (mA)	Measured (mA)	nm	delta (nm)	mA*mA (mA²)
3	0	0	15116,5	0,0	0
4	15	15	15117,4	0,9	225
5	10	10,9	15117,0	0,5	118,81
6	25	24,6	15119,1	2,6	605,16
7	50	51,8	15129,1	12,6	2683,24
8	75	79,6	15146,3	29,8	6336,16
9	100	100,5	15165,2	48,7	10100,25
10	125	126,8	15194,6	78,1	16078,24
11	150	151,6	15230,1	113,6	22982,56
12	175	176,4	15272,4	155,9	31116,96
13	200	191,5	15302,5	186,0	36672,25

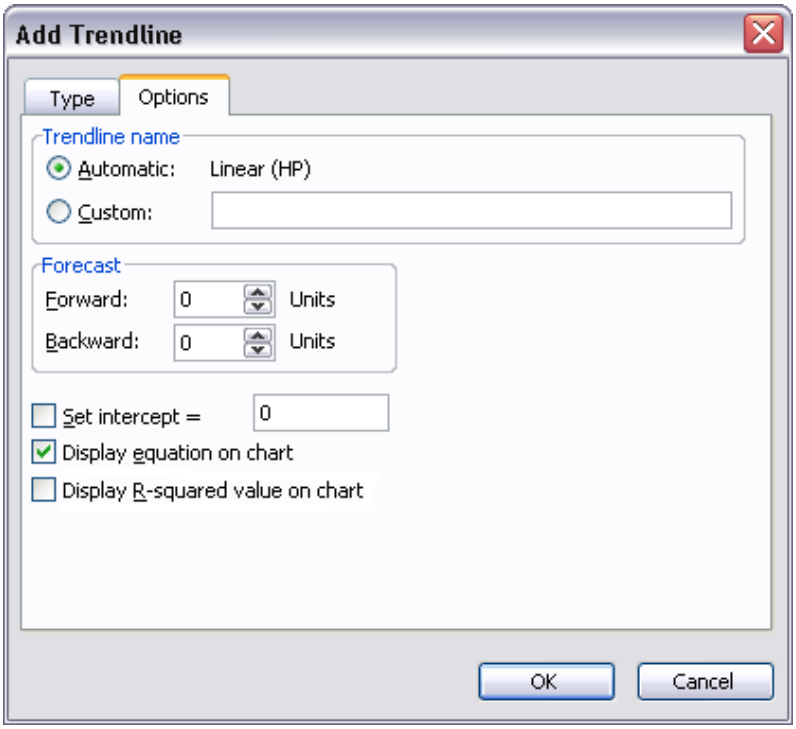
4- After all your measures, create a graphic in Excel.
5- Click on the tab ''Insert'' and in the pull-down menu, choose ''Chart''.
6- Select ''XY (Scatter)'' and on the right side, select ''Scatter. Compares pairs of values'' like below:



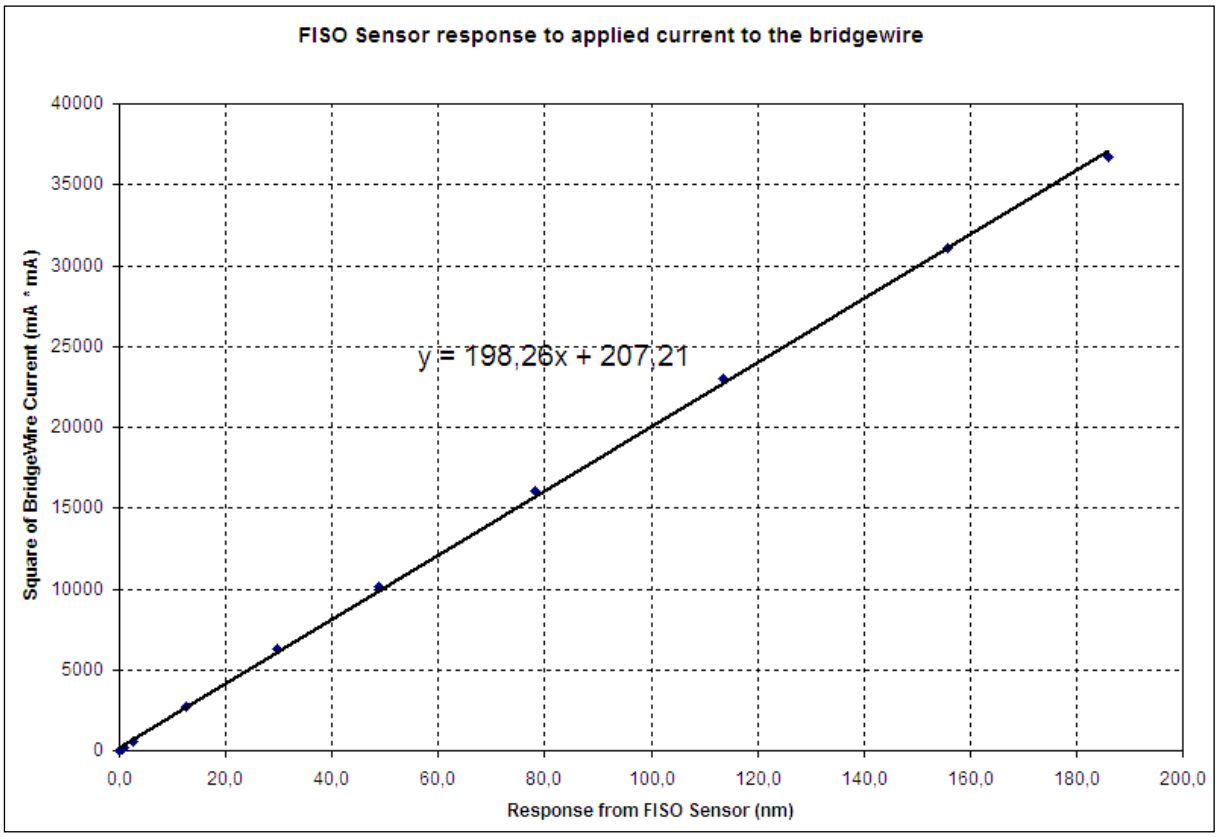
7- Then, click on ''Next''.
8- On the tab ''Series''.
9- For the ''X values'', select the column ''delta (nm).
10- For the ''Y values'', select the column ''mA*mA (mA²)'' and click on ''Next''.
11- In the tab ''Titles'', complete it with the ''Chart title'', the ''Category (X) axis'' and the ''Value (Y) axis'', then, click on ''Next'', choose where you put your chart and click on ''Finish''.
12- Do a right click on one point and select ''Add Trendline''.
13- On the ''Type'' tab, choose ''Linear''.



14- On the ''Options'' tab, check ''Display equation on chart'' and click OK.


Add Trendline
Type
Options
Trendline name
Automatic:
Linear (HP)
Custom:
Forecast
Forward:
0
Units
Backward:
0
Units
Set intercept =
0
Display equation on chart
Display R-squared value on chart
OK
Cancel

15- You will have something like the chart below:



16- Return in your Excel sheet and do a table like below:

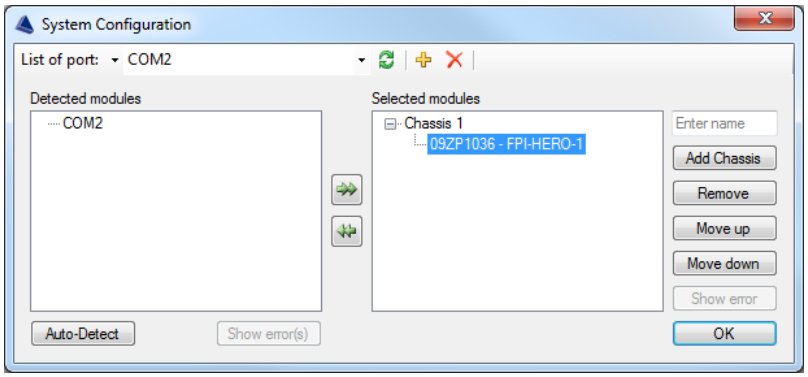
	A	*B*
1	Response (X)	Current (Y)
2	nm	mA
3	0	=SQRT(198,26*A3+207,21)

17- When you take a measure (nm), just put in the cell A3 (in this example) and you will obtain the current.

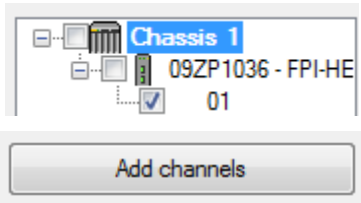
Sensor Configuration (with Sensor Calibration Software):

Please contact the technical support (support@fiso.com) to download this software

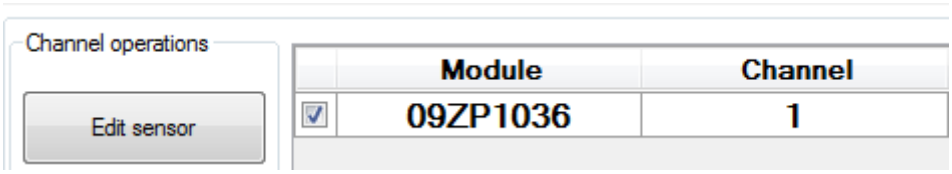
1- Like the evolution software, you need to connect your FPI-HERO into the ''System configuration'' menu.



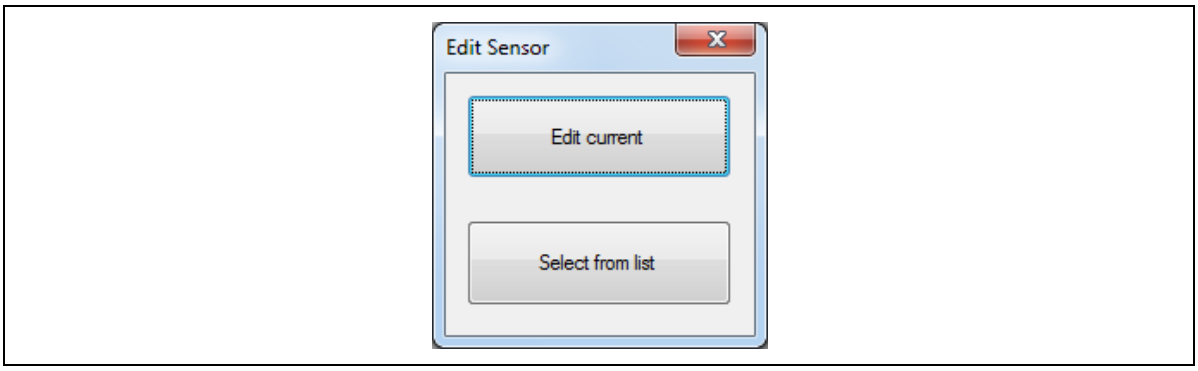
2- After, you select the channel and click on ''Add channel''.



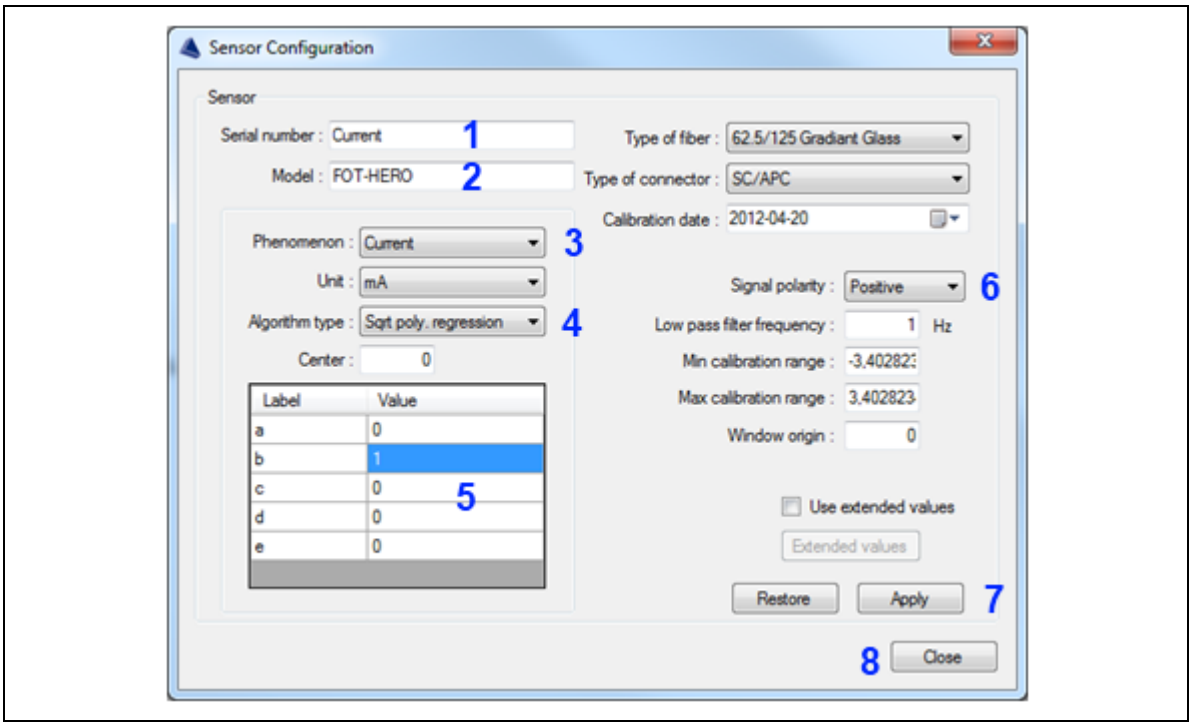
3- Select the module and click on ''Edit sensor''.



4- Click on ''Edit sensor'' in the window.

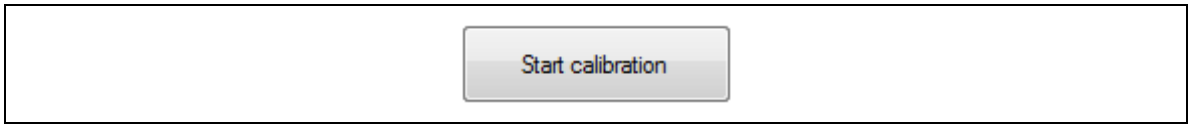


5- Create the sensor (current)

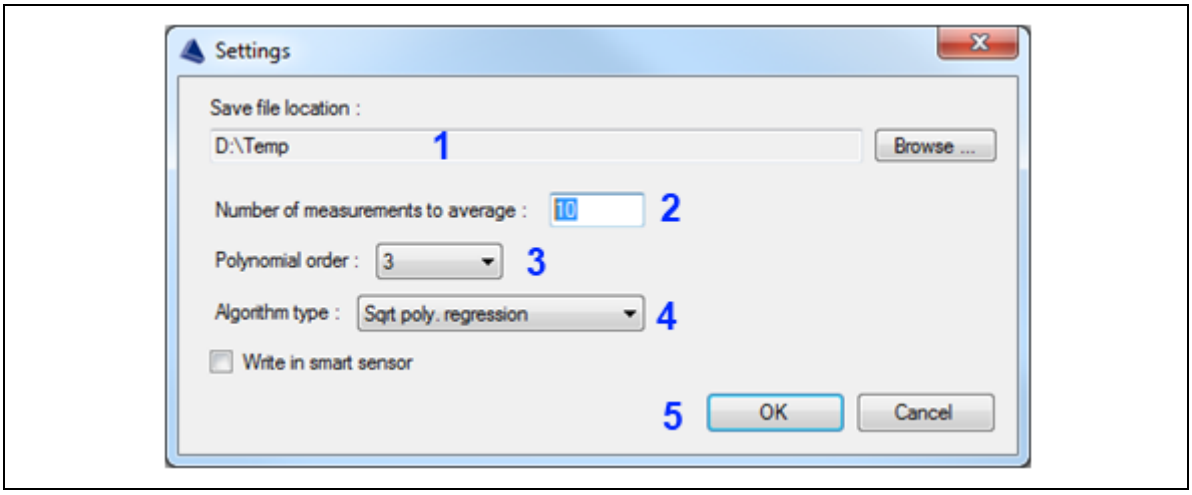


1. Enter the Serial number (ex: Current)
2. Enter the Model (ex: FOT-HERO)
3. Enter the Phenomenon (**Current**)
4. Choose the Algorithm type (**Sqrt poly. regression**)
5. Enter **1** in the case ‘’**b**’’ (it’s to read the measure in nm)
6. Choose the Single polarity (**Positive**)
7. Click on **Apply**
8. Click on **Close**

6- Click on ‘’Start calibration’’.



7- Configure the ‘’Settings’’.

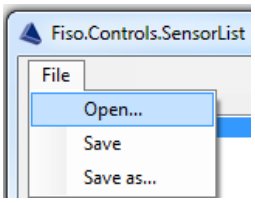


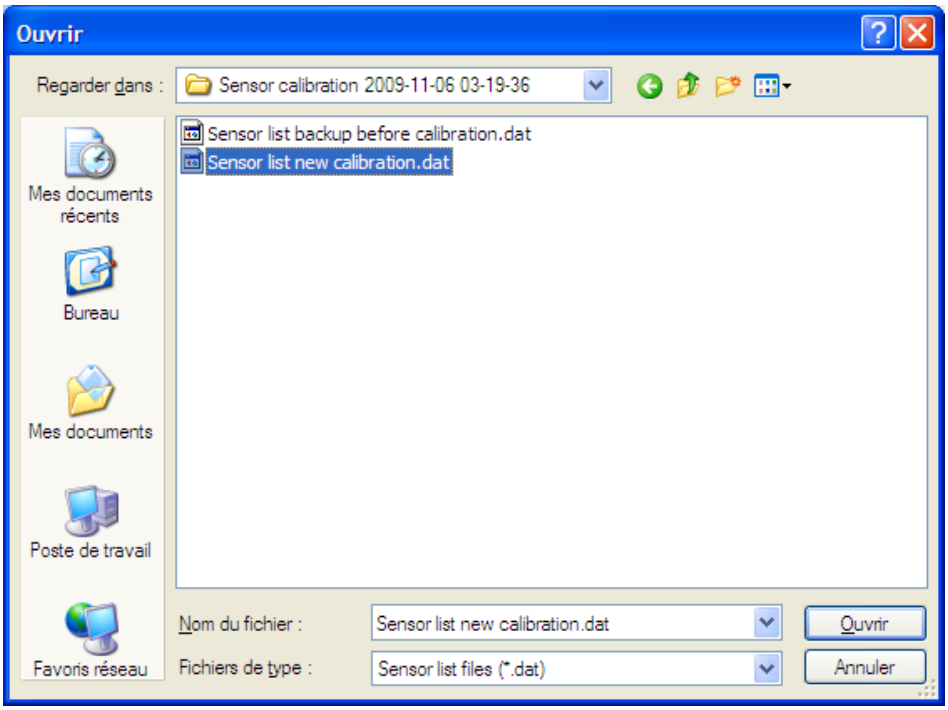
1. Choose the save file location.
2. Enter the ‘’Number of measurements to average’’.
3. Enter the ‘’Polynomial order’’.
4. Choose the ‘’Algorithm type’’: **Sqrt. Poly. Regression for Current**.
5. Click on OK.

8- Click on ‘’Proceed’’.

9- Put the sensor at the current that you want and click on ‘’Accept value’’ (wait for stabilization).
10- When you finished to take all your points, click on ‘’Stop calibration’’.
11- A window appears to confirm the success of the calibration, click on ‘’OK’’.

12- The new calibration is saved in the directory you chose before.
13- Close the Sensor calibration software and return in the evolution software.
14- Go to **Configured sensors list** window (simply click on the **Configured sensors list** button from the **Configuration** pull-down menu).
15- On the ''Configure sensors list'' window, click on ''File'', ''Open'' and open the calibration file you saved (**Sensor list new calibration.dat**).





16- It imports the new calibration.
17- After, you will measure directly in mA (current).

D. Remote control for evolution

The conditioners can be remotely controlled via a PC computer by using a RS-232 serial communication link. It can be done with the evolution™ software which provides an effective and simple tool for remotely controlling your conditioner as well as for downloading and viewing in real-time the data measurements directly from your PC computer.

1.1 PRINCIPLE OF REMOTE CONTROL COMMANDS

The *Remote Controls Commands* allow the user to emulate from a PC computer all the control panel functions of the conditioner and more. All the Remote Control Commands are made of ASCII type characters, which can be sent to through the RS-232 link by using simple communication software (such as HyperTerminal on Windows 95® or higher version). These commands can also be used with programs made with VISUAL BASIC, VISUAL C/C++ compilers, or with third party software such as LAB-VIEW® or LAB-WINDOWS®. With the aid of these commands, the user can create its own remote control software.

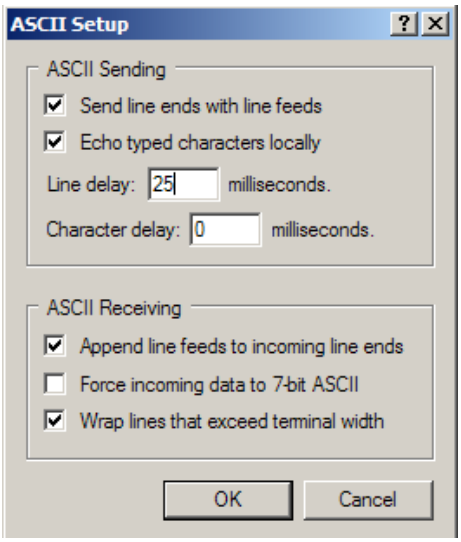
All *Remote Control Commands* begin with a two capital letter identifier referred to as the prefix of that command. Commands without argument are composed solely of their prefix. All commands must start with a left bracket ([ ) and end with a right bracket ( ]) to be interpreted correctly. These two characters are the delimiters of a command. Everything typed inside the brackets is considered part of the command. Whenever a command must be followed by an argument, the command prefix and the argument are strung together. A command is not interpreted by the conditioner until the right delimiter is encountered in the incoming flow of characters. Each line of characters returned to the computer by the conditioner terminates with carriage return (\r) and a line feed (\n) character. Note also that each string of characters on same line is normally separated by a tab (\t) character or sometime by a space character identified by the ⍰ character in this manual. Example: The command [SN] return the serial number of the conditioner. Upon reception of the command, the conditioner returns the following over the serial link:

Ex: 07ZA02201\r\n

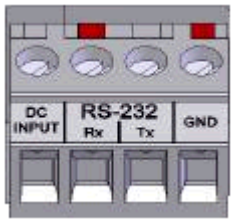
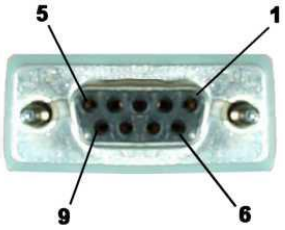
Done\r\n

1.2 SETTINGS

Before proceeding, you will need to change your HyperTerminal ACSII settings.
Set the ASCII settings, like the picture below:



The RS-232 connection to the conditioner is made with the terminal block connector located on the conditioner. If your computer is equipped with a DB-9 serial port connector, then use a standard RS-232 extension cable and connect as follow:

 **Terminal block**	 **DB-9**
Rx	3
Tx	2
GND	5

If your computer is equipped with a DB-25 connector, use a DB-25 to DB-9 converter module with a standard RS-232 extension cable. **NOTE: do not use a null modem cable or adapter.**

The serial link must be configured as follow:

RS-232 port settings

BAUD PER SECOND:	**115 200**
DATA BITS:	**8**
PARITY:	**Odd**
STOP BIT:	**1**
FLOW CONTROL:	**NONE**

RS-485 port settings

BAUD PER SECOND:	**921 600**
DATA BITS:	**8**
PARITY:	**NONE**
STOP BIT:	**1**
FLOW CONTROL:	**NONE**

E. Commands for the evolution for the FPI-HR and FPI-HERO

****For the other FPI products, see the DOC-00199 on the CD****

AS

Set or get the gage factor. (7 digits format only)	
[AS]	Return the gage factor if it's in the 7 digits format. Else, return *Bad Gage Factor type*.
[ASxxxxxxx]	Where xxxxxxx is the sensor calibration factor.

AV

Set or get the analog output span.	
[AV]	Return the analog output span.
[AVx.x]	Where x.x is the analog output span to set.

AZ

Set or get the analog output zero.	
[AZ]	Return the analog output zero.
[AZx.x]	Where x.x is the analog output zero to set.

CS

Set active channel(s) for remote commands execution.	
[CS x]	Channel(s) selection. Where: x = 0 : Both channels, x = 1 : Channel 1 only, x = 2 : Channel 2 only.
[CS E]	Enable the display of the channel identification at the beginning of each command output. (Example. "*Channel 1:"*)
[CS D]	Disable the display of the channel at the beginning of each command output.

DR

Get sensor diagnostic.	
[DR]	Return the sensor diagnostic.

GR

Get sensor readings.	
[GR 2 x]	Return the x next sensor readings. If x is 0, the module returns infinitely the sensor readings. [XX] Shall be used to stop the command.

RS

Hardware reset.	
[RS]	Issued a hardware reset.

SN

Get the module serial number.	
[SN]	Return the module serial number.

SP

Sensor configuration.	
[SP N]	Return the sensor serial number.
[SP y]	Get the calibration coefficient y. Valid values for y are A to E.
[SP y xx.xx]	Set the y coefficient with xx.xx value. Valid y values are A to E.
[SP S]	Get the EEPROM model if available.

VB

Get the board version.	
[SN]	Return the board version.

VR

Get the firmware version.	
[VR1]	Return the firmware version.

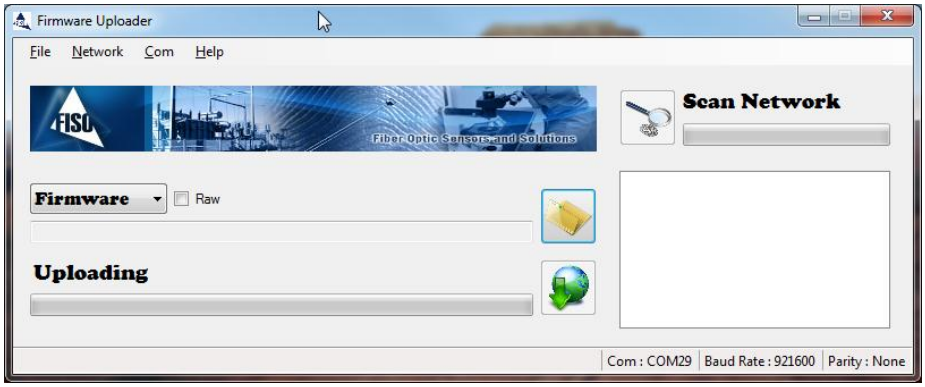
XX

Stop acquisition.	
[XX]	This function stops all acquisition.

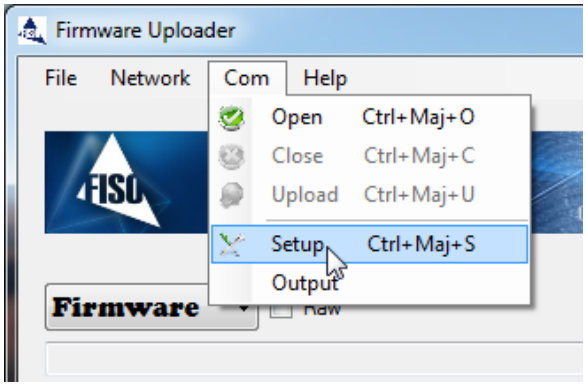
F. Update firmware all FPI modules

****To obtain the Firmware Uploader software and the latest version of the firmware, please contact the FISO technical support****

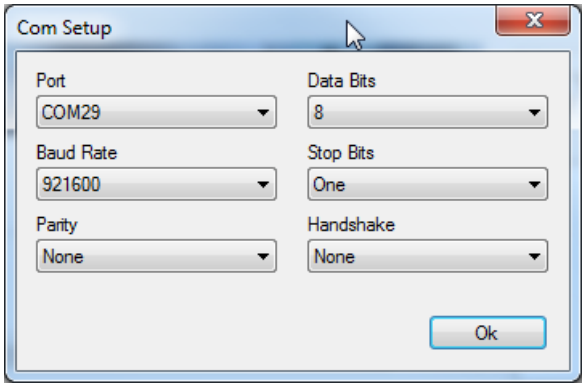
1- Install Firmware Uploader
2- When it installed, open it.



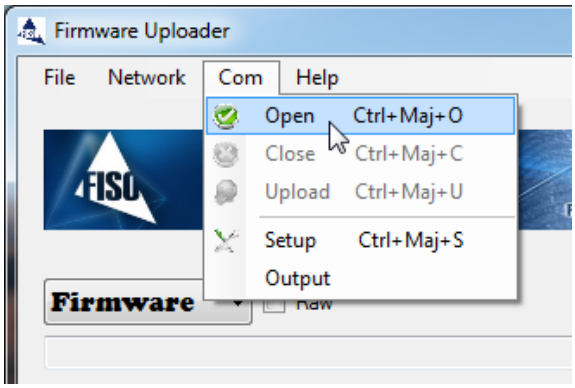
3- Go to the Com tab and select Setup.



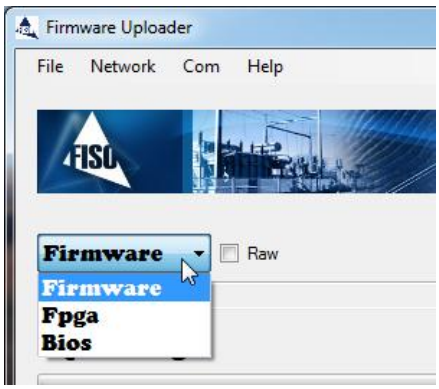
4- Choose your COM port and configure the properties of the COM like below and click OK:



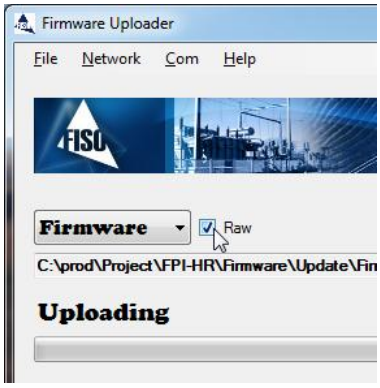
5- Return in the COM tab and click on Open.



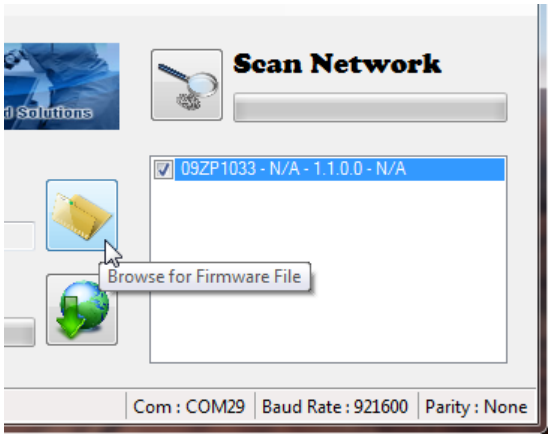
6- Select Firmware.



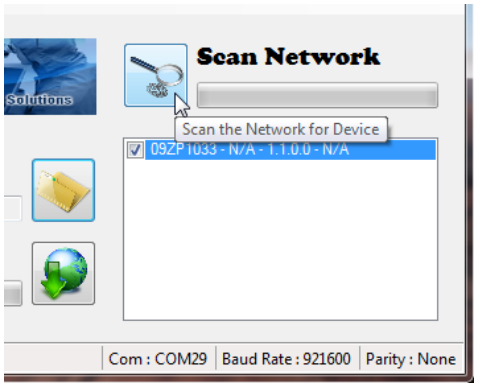
7- **For FPI-HR/HERO ONLY, CHECK "Raw" option and for other type of FPI modules, do not check "Raw" option.**



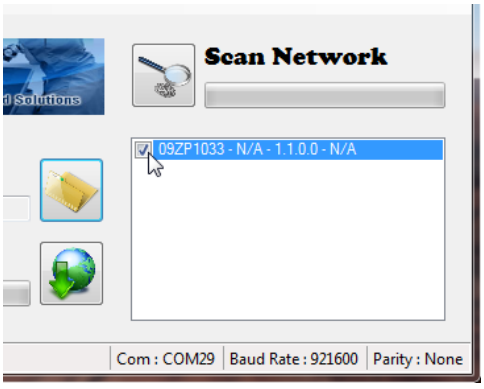
8- Click on the folder icon and open the *.he3 file that we sent you.



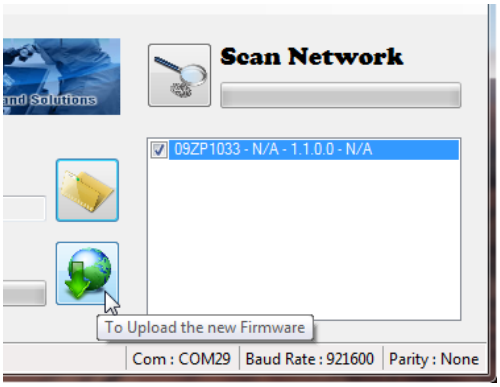
9- Click on the magnifying glass icon to scan the network for module(s).



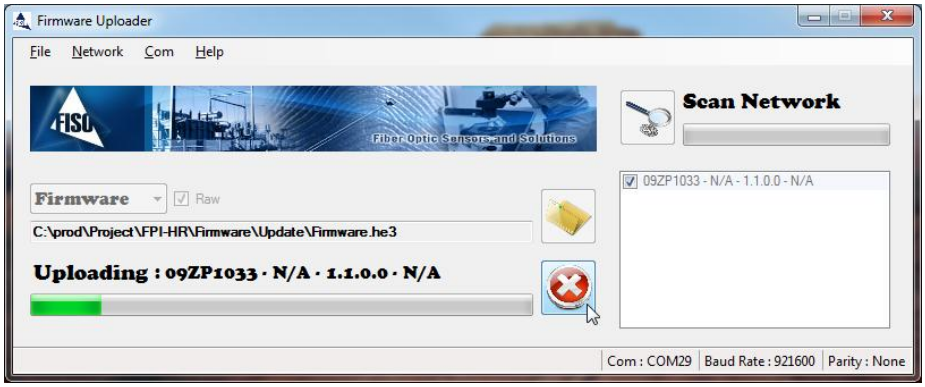
10- When the software finds your module, check it.



11- Then, click on the earth icon to update firmware.



12- The software starts to update firmware.



13- When it's finished, your receive the message below: