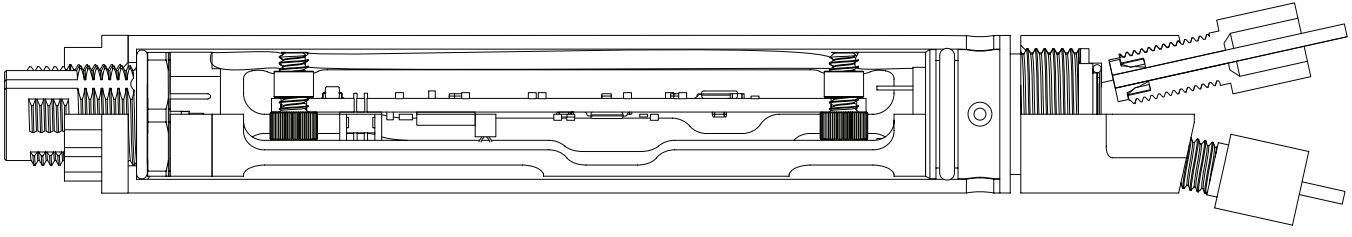
XtalX µLUQS Quartz Pressure Sensor

Mechanical User Manual



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Mechanical User Manual

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SECTION 1
MECHANICAL INSTRUCTIONS

1.1 CONNECTING USER FLUID SYSTEM TO PRESSURE SENSOR

When connecting the measured fluid to the sensor, the following connection parts are necessary:

Consumer Items	Description	Qty.	Material	Supplier	Part Number
PEEK Ferrule	PEEK Flat Bottom with SS 316 Ring	2	PEEK / Stainless Steel 316	IDEX	P-250X
Flangeless NUT	1/4” - 28 Flat Bottom	2	PEEK	IDEX	P-255X
Teflon Tubing	1/16” OD, .020” ID	1	PTFE	IDEX	1516

When installing the flangelss fittings, ensure that the PTFE tubing is cut flush and that the internal diameter in not obstructed. Place the PEEK nut behind the ferrule with the SS316 ring and slide the 1/16” tubing through both. Insert two tubing/cone/nut assemblies into the corresponding tapped holes of the microcap. Gently push the tubing to ensure that it has bottomed-out at the seat in the microcap. Hand tighten the screw until the cone ferrule bottoms out in the seat of the microcap. Refer to the diagram below:

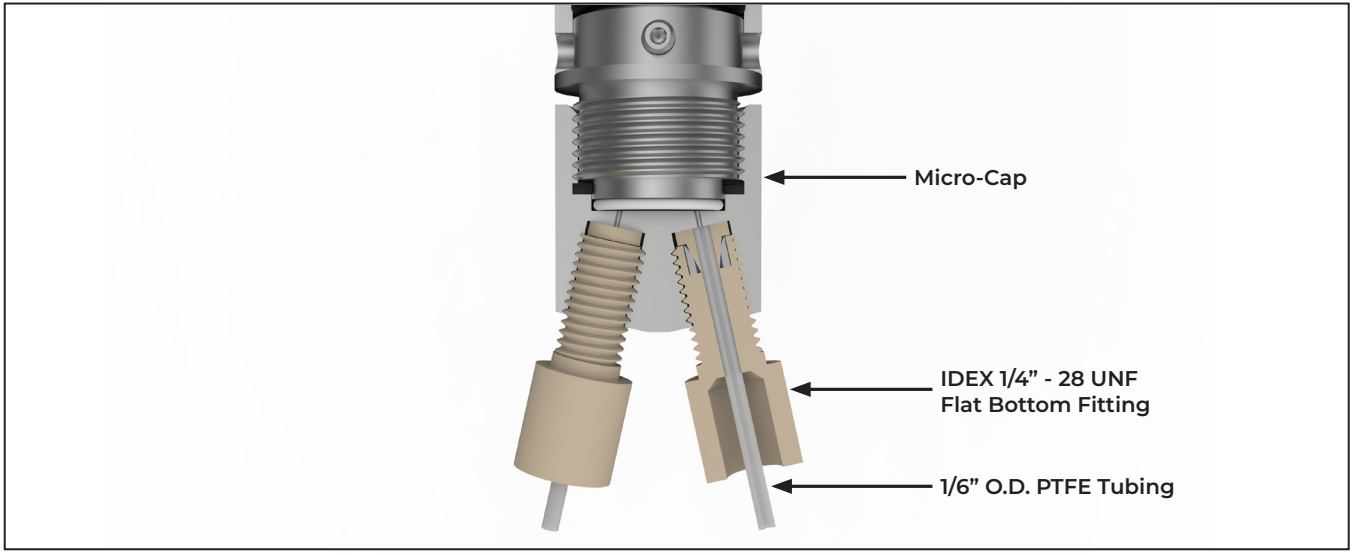

Figure 1-1. Installing Flangeless Fitting

1.2 CONSUMABLES

The following O-rings may need to be replaced during the life of the sensor:

Number	O-Rings	Size	Qty.	Material	Supplier	Part Number
1	Rear O-ring	DN-014	1	60A Viton Fluoroelastomer	McMaster Carr	1284N115
2	Bulkhead O-ring	DN-015	1	75D Viton Fluoroelastomer	McMaster Carr	9464K21
3-A	Pressure Sealing O-ring	10mm ID, 1mm wide	1	50D PTFE	McMaster Carr	1196N11
3-B	Pressure Sealing O-ring	10mm ID, 1mm wide	1	75D Viton Fluoroelastomer	McMaster Carr	1295N128

***Note:** O-rings 1 and 2 should not be changed unless necessary. They are intended to keep liquids out of the circuit board cavity, but do not protect against fully submerging the gauge. O-ring 3-A is compatible with acetone, toluene and other solvents. This O-ring is only functional after the first compression. Should the microcap be loosened off after compression of the O-ring, it must be replaced. O-ring 3-B is compatible with Isopropyl Alcohol, but not acetone or toluene. This O-ring is reusable after multiple compressions. Replace as desired.

The placement of the O-ring is shown below:

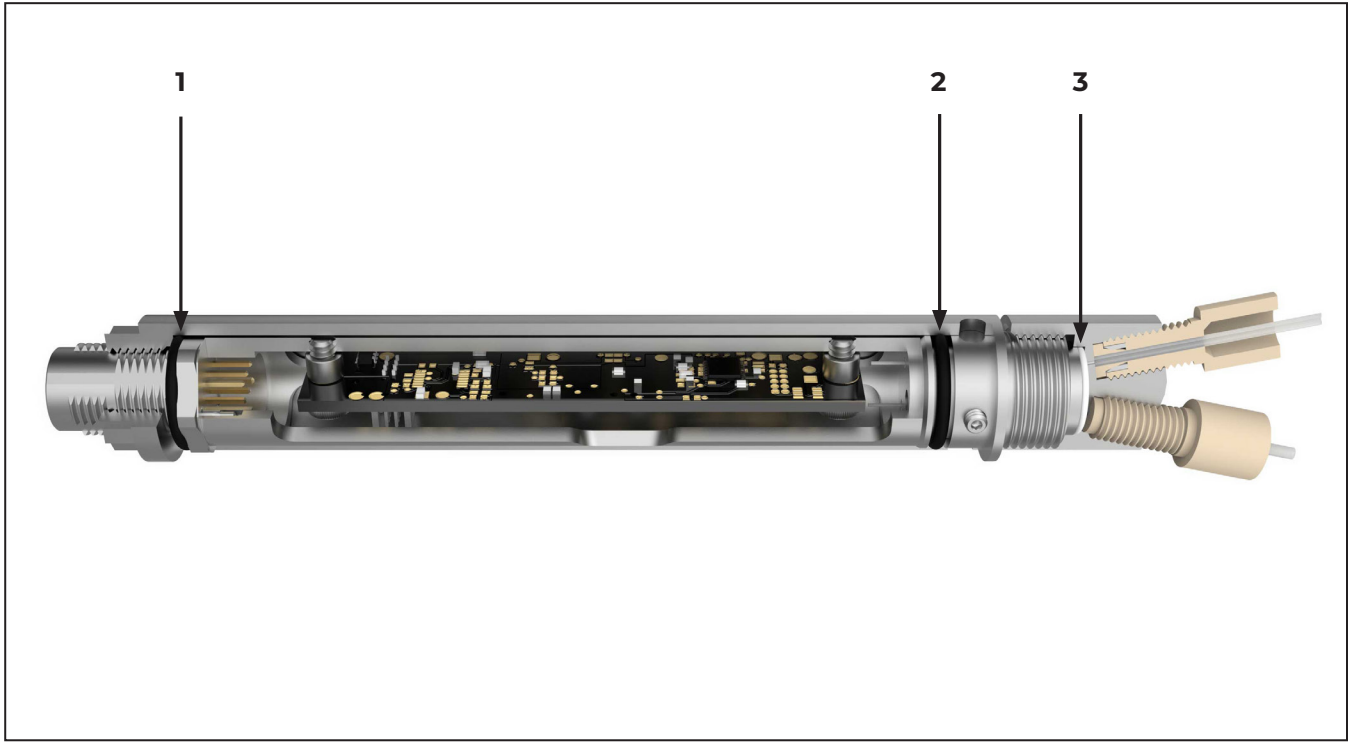

Figure 1-2. Placement of O-rings

1.3 MICROCAP ATTACHMENT

When removing or attaching the microcap to the pressure sensor, follow the procedures below:

Removal

1. Please ensure that the 2 set screws are fully inserted and flush with the housing body.
2. Use the provided clamshell spanners provided and insert each into the spanner holes through the housing.
3. Slide the provided thumb wrench over the microcap flats.
4. Take care to ensure that you do not touch the membrane as it is fragile.
5. With a non-metallic pick, carefully remove the O-ring 3 as it must be replaced.
6. If cleaning is necessary, use a solvent to rinse the membrane without contacting it.

***Note:** DO NOT USE AN ULTRASONIC BATH TO CLEAN THE SENSOR.

Attachment

1. Please ensure that the 2 set screws are fully inserted and flush with the housing body.
2. Use the provided clamshell spanners provided and insert each into the spanner holes through the housing.
3. Slide the provided thumb wrench over the microcap flats.
4. Place the O-ring inside the microcap face up so that it lays flush with the back surface (must be new if using O-ring 3-A).
5. With the microcap still facing up to ensure the o-ring position, thread the thumb wrench clockwise. Once the O-ring makes contact, full compression of the o-ring should happen ¼ turn after. There should be approximately a 1mm gap between the microcap and gauge shoulder.

***Note:** DO NOT OVERTIGHTEN THE MICROCAP. THIS MAY RESULT IN DAMAGE TO THE SENSOR AND/OR INCORRECT PRESSURE READINGS.

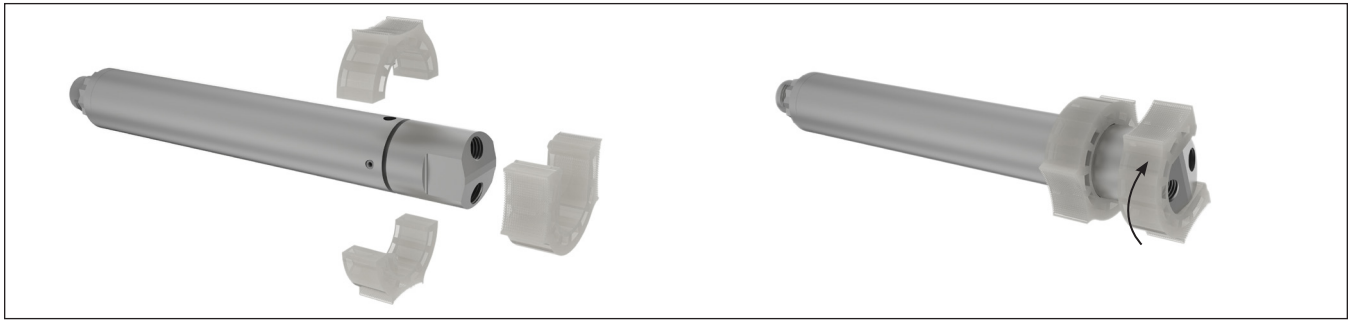

Figure 1-3. Microcap Attatchment

SECTION 2
XTALX µLUQS SPECIFICATION SHEET

2.1 SPECIFICATION HIGHLIGHTS

CALIBRATED RANGE	13.5 TO 100psi (1 TO 6.89 BAR)
CALIBRATED TEMPERATURE RANGE	15° TO 40°C
PRESSURE ACCURACY	0.1%F.S.
DRIFT @ MAX TEMPERATURE & PRESSURE	0.1%F.S./YEAR
TEMPERATURE ACCURACY	0.05°C
DRIFT @ MAX TEMPERATURE & PRESSURE	0.05°C/YEAR

2.2 MECHANICAL SPECIFICATIONS

WEIGHT:	150 grams
HEIGHT:	5.7 inches
MAXIMUM WIDTH:	0.75 inches
PROOF PRESSURE:	2,000psi (138 BAR)
DEADVOLUME:	16.5 µL

2.3 ELECTRICAL SPECIFICATIONS

MAXIMUM VOLTAGE RATINGS	0.3 TO 24V DC
VOLTAGE SUPPLY RANGE	3.5 TO 20V DC
CURRENT DRAW @ 25°C	24mA
CURRENT DRAW @ FS TEMP	25mA
OUTPUT	USB 2.0
ESD	IEC 61000-4-2 ±15 kV

2.4 OSCILLATOR SPECIFICATIONS

NOMINAL REFERENCE FREQUENCY	170 MHz ± 10 PPM
NOMINAL PRESSURE FREQUENCY	52 KHz ± 500 hZ
NOMINAL TEMPERATURE FREQUENCY	262 KHZ ± 200 hZ

2.5 ADDITIONAL SPECIFICATIONS

STORAGE TEMPERATURE	-25° TO 85°C
ACHIEVABLE RESOLUTION	0.002psi
REPEATABILITY	0.1%F.S.
NOMINAL SENSITIVITY	3psi/Hz
RESPONSE TIME	0.1 S
GRAVITATIONAL EFFECTS	NEGLIGIBLE
ORIENTATIONAL EFFECTS	NEGLIGIBLE
ACCELERATION SENSITIVITY	NEGLIGIBLE
STARTUP TIME @ 25°C	<1 S
PEAK INRUSH CURRENT @ 25°C	25 mA
STARTUP TIME @ FS TEMP	<1 S
PEAK INRUSH CURRENT @ FS TEMP	26 mA

2.6 µLUQS-100-40 SPECIFICATION DRAWINGS

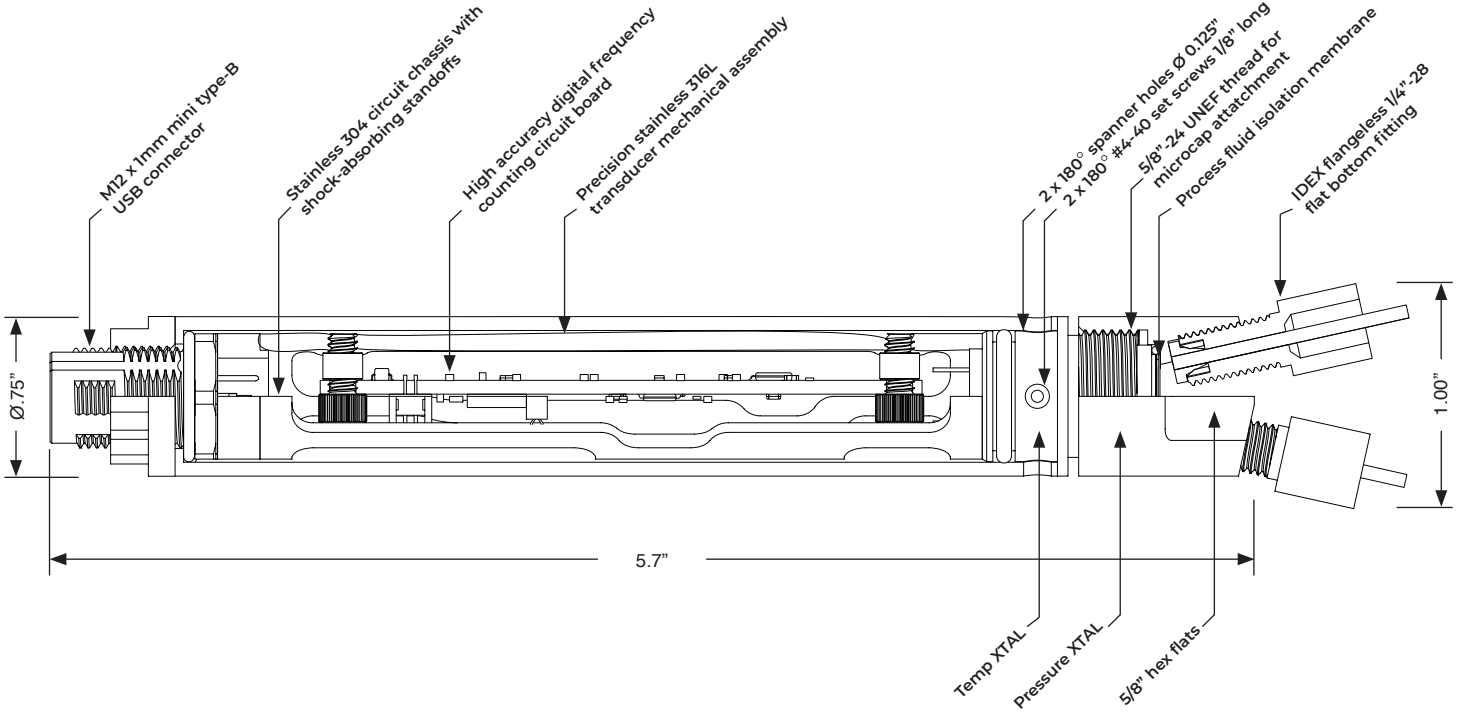

Figure 2-1. µLUQS Pressure Sensor Specification Drawing

SECTION 3
MacOS SOFTWARE/COMMUNICATIONS

3.1 XTLAX PACKAGE FOR MacOS

To start interfacing with the XtalX pressure sensor on MacOS begin by:

1. Opening “Finder.”
2. Go to “Applications.”
3. Next, open the “Utilities” folder.
4. Then open “Terminal.”

Next, follow the procedure outlined below or at https://github.com/phasesensors/xtalx_python for the most up-to-date instructions.

This package provides a library for interfacing with the XtalX pressure sensor. Python Verson 3 is required. The easiest way to install the XtalX library is using pip:

```
python3 -m pip install xtalx
```

Note that you may wish to use sudo to install XtalX for all users on your system:

```
sudo python3 –m pip install xtalx
```

You may also install the package from the source using:

```
make install
```

or:

```
sudo make install
```

The XtalX python libraries currently require the pyusb package to be installed for communicating with the sensor; this requires the libusb back-end to be installed on the target system.
On Linux-based systems libusb typically comes pre-installed. On MacOS-based systems it can be installed via HomeBrew:

```
brew install libusb
```

3.2 XTALX_DISCOVER

The XtalX package includes the xtalx_discover binary which can be used to list all XtalX sensors that are attached to the system and their corresponding firmware versions:

```
~$ xtalx_discover
******************
Sensor SN: XTI-7-1000035
 git SHA1: 61be0469c1162b755d02fd9156a2754bebf24f59.dirty
   Version: 0x0107
```

3.3 XTALX_TEST

The XtalX package includes a simple test binary that will connect to an XtalX sensor and continuously print the current pressure and temperature reading:

```
~$ xtalx_test
XtalX(XTI-7-1000035): 23.973375 PSI, 23.947930 C
XtalX(XTI-7-1000035): 23.973375 PSI, 23.947930 C
XtalX(XTI-7-1000035): 23.973375 PSI, 23.947930 C
XtalX(XTI-7-1000035): 23.963872 PSI, 23.947930 C
XtalX(XTI-7-1000035): 23.963872 PSI, 23.947930 C
XtalX(XTI-7-1000035): 23.954370 PSI, 23.947930 C
XtalX(XTI-7-1000035): 23.954370 PSI, 23.947930 C
XtalX(XTI-7-1000035): 23.973375 PSI, 23.947930 C
...
```

Terminate the program by pressing Ctrl-C.

SECTION 4
WINDOWS SOFTWARE/COMMUNICATIONS

4.1 XTLAX PACKAGE FOR WINDOWS

To start interfacing with the XtalX pressure sensor, begin by installing Python for Windows:

1. Go to https://github.com/libusb/libusb/releases.
2. Double-click on “libusb-1.0.24.7z” from the releases page.
3. Once downloaded, extract the compressed files using “WinRAR.”
4. From the extracted files, open the following folders “VS2019” > “MS32” > “dll.”
5. In the “dll” folder, right-click on “libusb-1.0.dll” to copy the file.
6. Next, go to your C-Drive, open “Windows”, then “SysWOW64.”
7. Then, paste the file “libusb-1.0.dll” into the SysWOW64 folder.
8. You will then need to copy and paste the “libusb-1.0.dll” file again, this time into the “Systems32” folder. You can find this folder by going to the C-Drive > “Windows”>“Systems32.”
9. Next, open “Anaconda Prompt (Anaconda3).”

Next, follow the procedure outlined below or at https://github.com/phasesensors/xtalx_python for the most up-to-date instructions.

This package provides a library for interfacing with the XtalX pressure sensor. Python Verson 3 is required. The easiest way to install the XtalX library is using pip:

```
python3 -m pip install xtalx
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Note that you may wish to use sudo to install XtalX for all users on your system:

```
sudo python3 -m pip install xtalx
```

You may also install the package from the source using:

```
make install
```

or:

```
sudo make install
```

The XtalX python libraries currently require the pyusb package to be installed for communicating with the sensor; this requires the libusb back-end to be installed on the target system.

On Windows-based systems, libusb releases are available at:

https://github.com/libusb/libusb/releases

with more information available here:

https://github.com/libusb/libusb/wiki/Windows#How_to_use_libusb_on_Windows

Since the XtalX sensor is plug-and-play compatible with the WinUSB driver, no other special driver should be required for Windows compatibility.

4.2 XTALX_DISCOVER

The XtalX package includes the xtalx_discover binary which can be used to list all XtalX sensors that are attached to the system and their corresponding firmware versions:

```
~$ xtalx_discover
******************
Sensor SN: XTI-7-1000035
 git SHA1: 61be0469c1162b755d02fd9156a2754bebf24f59.dirty
   Version: 0x0107
```

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The XtalX package includes a simple test binary that will connect to an XtalX sensor and continuously print the current pressure and temperature reading:

```
~$ xtalx_test
XtalX(XTI-7-1000035): 23.973375 PSI, 23.947930 C
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XtalX(XTI-7-1000035): 23.954370 PSI, 23.947930 C
XtalX(XTI-7-1000035): 23.954370 PSI, 23.947930 C
XtalX(XTI-7-1000035): 23.973375 PSI, 23.947930 C
...
```

Terminate the program by pressing Ctrl-C.

4.4 LABVIEW DRIVER INSTALLATION INSTRUCTIONS FOR WINDOWS 10

Driver Install

1. Begin downloading the install files by going to https://www.phasesensors.com/support.
2. When you arrive at the Phase Sensors Support page, click “XtalX LabVIEW Driver” to open a link to Dropbox.
3. In Dropbox, click the “Download” button in the top right corner.
4. When the download is complete, open the zip file from the downloads folder and extract the files from the zip file. To extract files right click on the folder and click “Extract All...”
5. Once the zip file is extracted open the new folder.
6. To begin installing the driver, right-click on the “xtalx.inf” file (filetype: Setup Information) and select “Install.”
7. Select “Open” from the pop-up window.
8. Then select “Yes” to allow the driver to make changes to your device and begin to install.
9. Click “Install.”
10. To check to see if the driver was installed, plug the sensor into the computer using the USB Hub.
11. Next, use the search feature on your computer to search “Device Manager.”
12. Select “Open” to open the Device Manager.
13. Then, click “NI_VISA USB Devices.”
14. After clicking on “NI_VISA USB Devices”, “XtalX” should appear below which indicates the driver has been installed.

Install LabVIEW 2019 SP1 or Later with NI-VISA Packages

1. To install LabVIEW, open your browser and go to www.ni.com.
2. Search “Download LabVIEW” into the search bar.
3. Next, click the first option – “LabVIEW Download.”
4. LabVIEW Download will then allow you to select the “Supported OS” and “Version” – select “Version 2019 SP1” or later. Note: You will require a valid LabVIEW License.
5. To begin the Install, select “Install Offline.”
6. Select “Download” to download the LabVIEW installer.
7. Select “Yes” to allow the driver to make changes to your device.
8. When installing LabVIEW, please be sure that “NI-VISA” is selected during install. If NI_VISA is not selected during download, NI_VISA can be installed separately by searching “Download NI-VISA” in the search on www.ni.com. ***Note:** Both LabVIEW and NI_VISA are required to run the Demo Program.
9. Click “Next” and follow the following prompts until “Finish.”
10. LabVIEW and Drivers will then begin to install.
11. To activate the software, login into your NI User Account or use a Serial Number.
12. After activating, select “Reboot Now.”

Demo LabVIEW VI Install

1. To download the LabVIEW VI demo, go to https://www.phasesensors.com/support.
2. When you arrive at the Phase Sensors Support page, click “XtalX LabVIEW Driver” to open a link to Dropbox.
3. In Dropbox, click the “Download” button in the top right corner.
4. When the download is complete, open the zip file from the downloads folder and extract the files from the zip file. To extract files right click on the folder and click “Extract All...”
5. Once the zip file is extracted open the new folder.
6. Double click on “Demo.vi” to launch the demo program.
7. Plugin the XtalX pressure sensor into the USB Hub and then plug the USB Hub into the computer.
8. Select the XtalX sensor from the “VISA resource name” drop-down menu – the sensor name should start with USB:: and end with the serial number 1000057::RAW.
9. Click the white arrow in the top left corner to start the program.
10. The data will then appear in the two live graphs in the VI.

Demo.vi

This VI is a demo of the sensor api. It opens a connection to the sensor given by the name selected on the front panel. If the sensor is valid it will then run in a loop, reading the temperature and sensor data. If the corresponding data is valid it will add both the datapoint, and a moving average of the data to the chart. If the device name on the front panel changes, it will close the

current connection and open a new one to the new sensor, then continue. If an error occurs or the stop button on the front panel is pressed, it will close the connection to the open sensor, display the error if there is one, and then finish.

open_sensor.vi
Will attempt to open a connection to the sensor given by the “VISA resource name” terminal. If the device is not valid it will return an error message explaining why. The opened connection will be returned on the “sensor connection out” terminal.

read_sensor.vi
Will attempt to read the sensor given on the “sensor connection in” terminal. The temperature and pressure will be output on the corresponding terminals. The data should only be considered valid if the respective boolean terminal indicates so. This is because the sensor may not have collected a new datapoint since the last read.

close_sensor.vi
Will safely close the sensor connection given on the “sensor connection in” terminal.