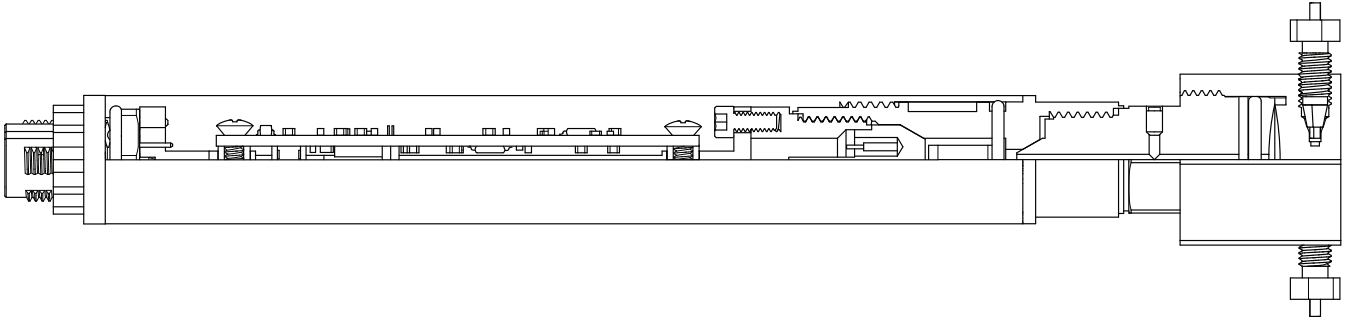
XtalX LUSQ1 Pressure Sensor

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
Cone Ferrule	40° metal cone 1/16”	2	Stainless Steel 316	Vici Valco	ZF1S6-10
Cone Nut	#10-32-1/2” Nut	2	Stainless Steel 316	Vici Valco	MZN1-10
Metal Tubing	1/16” OD, .022” ID	2	Stainless Steel 316	McMaster Carr	89785K911
Metal Tubing	1/6” OD, .006” ID	2	Stainless Steel 316	McMaster Carr	89785K912

***Note:** If flow through the .006” ID Tubing is difficult, use the .022” ID tubing instead.

When installing the cone fittings, ensure that the metal tubing is cut flush and there are no burs or blockages in the internal diameter. Place the nut behind the cone port and slide the 1/16” tubing through both. Insert two tubing/cone/nut assemblies into the corresponding tapped holes of the micro-cap. 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 micro-cap. Tighten the nut with a ¼” wrench one-quarter turn to seal. Refer to the diagram below:

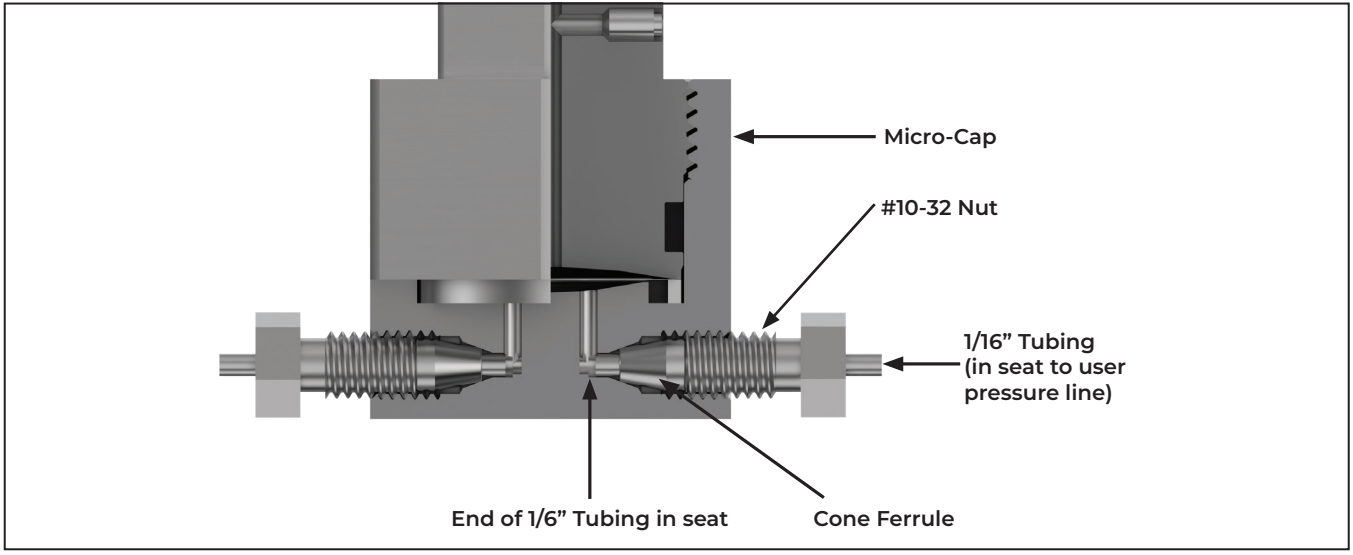

Figure 1-1. Installing Cone Fitting

1.2 CONSUMABLES

The following 0-rings may need to be replaced during the life of the sensor:

Number	O-Rings	Size	Qty.	Material	Supplier	Part Number
4	Diaphragm O-ring	DN-016	1	90D Viton Fluoroelastomer	McMaster Carr	8297T126
3	Diaphragm Backup Ring	DN-016	1	55D PTFE	McMaster Carr	9560K43
2	Bulkhead O-ring	DN-015	1	75D Viton Fluoroelastomer	McMaster Carr	9464K21
1	Rear O-ring	DN-014	1	60A Viton Fluoroelastomer	McMaster Carr	1284N115

***Note:** The O-rings in the above table are not compatible with acetone.

The placement of the O-ring is shown below:

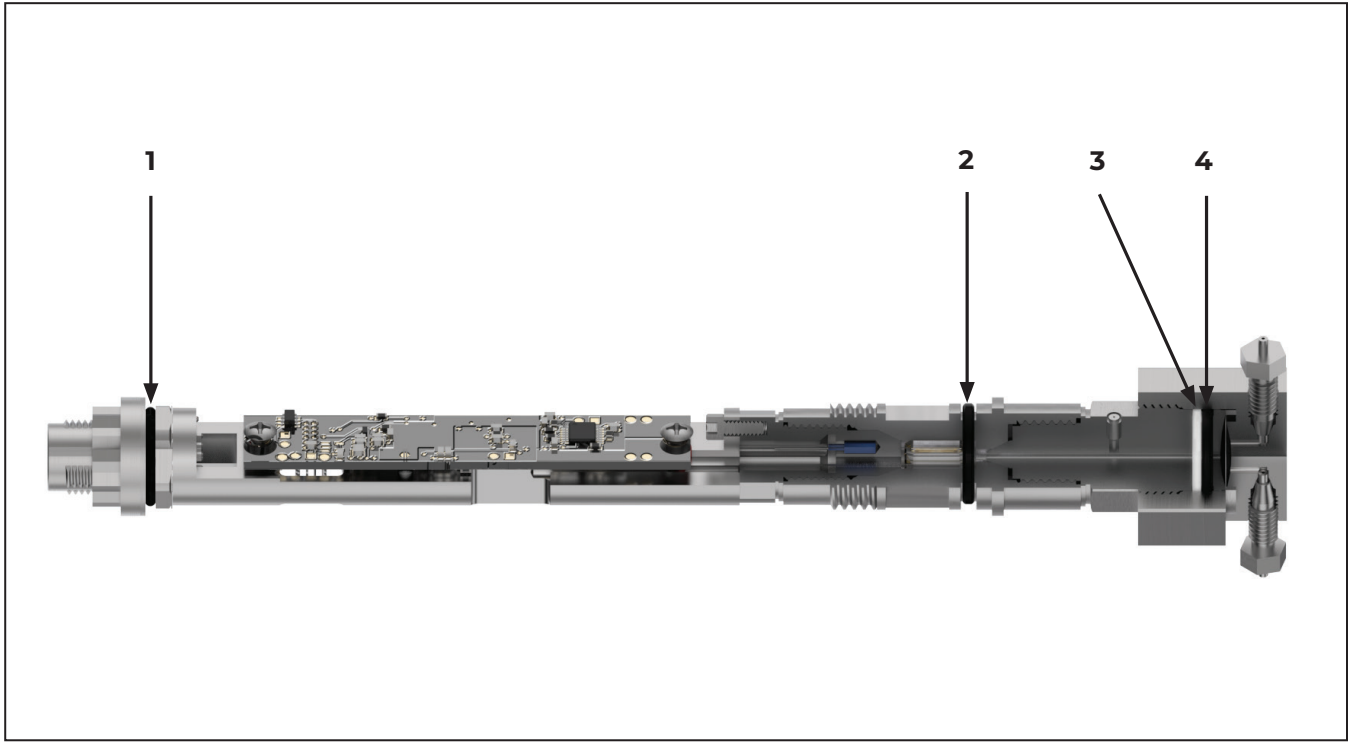

Figure 1-2. Placement of O-rings

1.3 MICROCAP ATTACHMENT

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

Removal

1. Use a 1” hex wrench on the microcap and a 5/8” hex wrench on the diaphragm.
2. Turn the 5/8” wrench counter-clockwise to loosen.
3. Once the threads are disengaged, hand turn the diaphragm hex while gently pulling the diaphragm away from the micro-cap for the O-rings to pass the threads.
4. Take care to ensure the you do not touch the membrane as it is fragile.
5. If cleaning is necessary, use Isopropanol or other solvent to rinse the membrane without contacting it. *Note: if using acetone, note that the 016 O-ring is not compatible with acetone and will be damaged.
6. Check all O-rings for damage and replace if necessary.

Attachment

1. Check all O-rings for damage and replace if necessary.
2. Take care to ensure the you do not touch the membrane as it is fragile.
3. Engage the threads by hand using the diaphragm hex while gently pushing the diaphragm towards micro-cap for the O-rings to pass the threads.
4. Use a 1” hex wrench on the microcap and a 5/8” hex wrench on the diaphragm.
5. Turn the 5/8” wrench clockwise. Tighten until the metal ring contacts the seat of the Micro-cap, then loosen off by less than 30° wrench angle. As this is an O-ring non tapered seal torque is not required to make it leak tight. High torque may shift calibration and should be avoided.

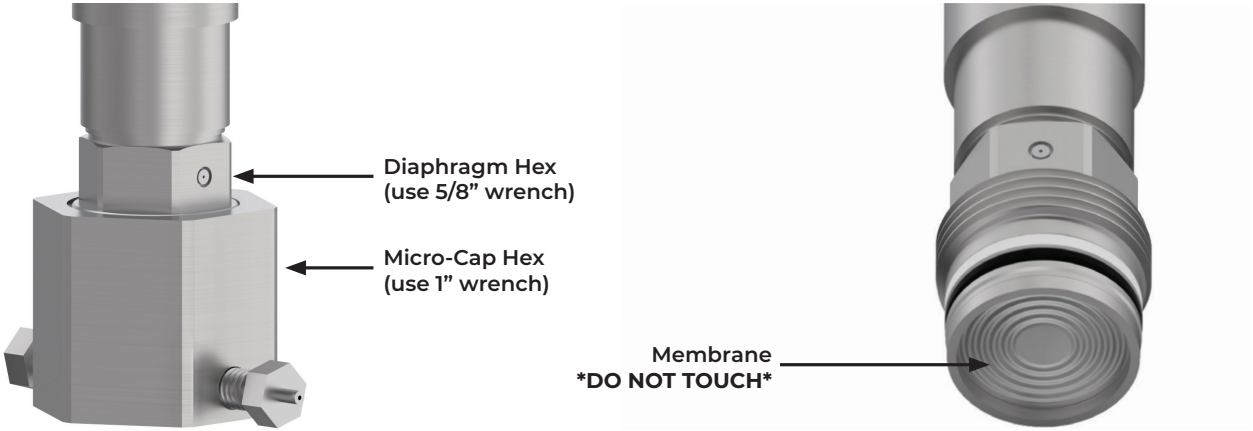

Figure 1-3. Microcap Attatchment

SECTION 2
XTALX LUQS1 SPECIFICATION SHEET

2.1 SPECIFICATION HIGHLIGHTS

CALIBRATED RANGE ..... 50 TO 10000 PSI(3.5 TO 690 BAR)
CALIBRATED TEMPERATURE RANGE ..... 10° TO 60°C
PRESSURE ACCURACY ..... 0.02 %FS
DRIFT @ MAX TEMPERATURE & PRESSURE 0.1%FS/YEAR
TEMPERATURE ACCURACY ..... 0.05°C
DRIFT @ MAX TEMPERATURE & PRESSURE ..... 0.01°C/YEAR

2.2 MECHANICAL SPECIFICATIONS

WEIGHT: 325 GRAMS
HEIGHT: 200MM (7.86”)
MAXIMUM WIDTH: 25.4MM (1.0”)
PROOF PRESSURE: 103MPA (15,000PSI)
DEADVOLUME: 0.1ML

2.3 ELECTRICAL SPECIFICATIONS

MAXIMUM VOLTAGE RATINGS ..... 0.3 TO 24V DC
VOLTAGE SUPPLY RANGE ..... 2.7 TO 20V DC
CURRENT DRAW @ 25°C 24MA
CURRENT DRAW @ FS TEMP 25MA
OUTPUT ..... USB 2.0
ESD ..... IEC 61000-4-2 ±15KV

2.4 OSCILLATOR SPECIFICATIONS

NOMINAL REFERENCE FREQUENCY ..... 170MHZ ± 10PPM
NOMINAL PRESSURE FREQUENCY ..... 52KHZ ± 500HZ
NOMINAL TEMPERATURE FREQUENCY ..... 262KHZ ± 200HZ

2.5 ADDITIONAL SPECIFICATIONS

STORAGE TEMPERATURE ..... -65° TO 85°C
ACHIEVABLE RESOLUTION ..... 0.002 PSI
REPEATABILITY ..... 0.01 %FS
NOMINAL SENSITIVITY ..... 3 PSI/HZ
RESPONSE TIME 0.1S
GRAVITATIONAL EFFECTS ..... NEGLIGIBLE
ORIENTATIONAL EFFECTS ..... NEGLIGIBLE
ACCELERATION SENSITIVITY ..... NEGLIGIBLE
STARTUP TIME @ 25°C ..... <1SECOND
PEAK INRUSH CURRENT @ 25°C 25MA
STARTUP TIME @ FS TEMP ..... <1S
PEAK INRUSH CURRENT @ FS TEMP 26MA

2.6 LUQS1-10000-85 SPECIFICATION DRAWINGS

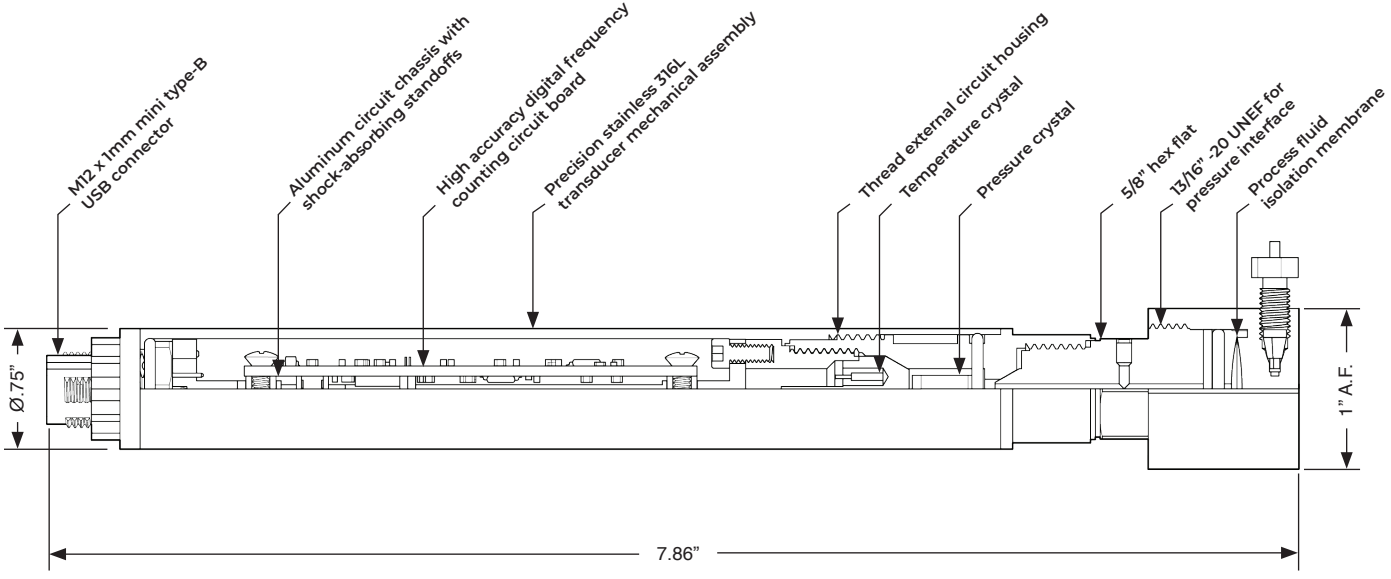

Figure 2-1. LUQS1 Pressure Sensor Specification Drawing

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:

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```

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
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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.

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 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.