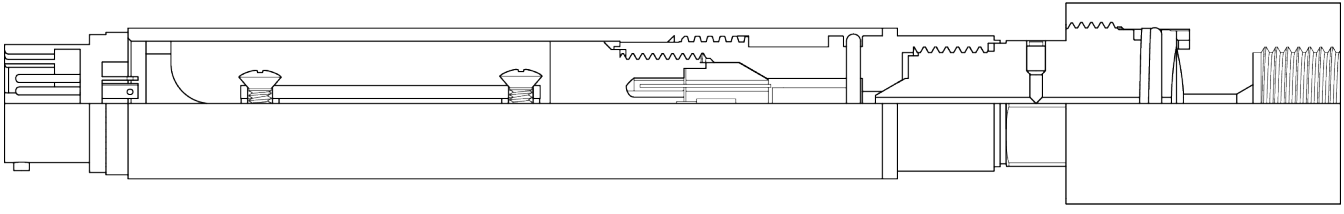
XtalX DSQS1 Quartz Pressure Sensor

Mechanical User Manual



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XtalX DSQS1 Quartz Pressure Sensor

Mechanical User Manual

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CONTENTS

SECTION 1
DSQS1 SET UP

1.1 DSQS1 INVENTORY

In each package received there are the following components:

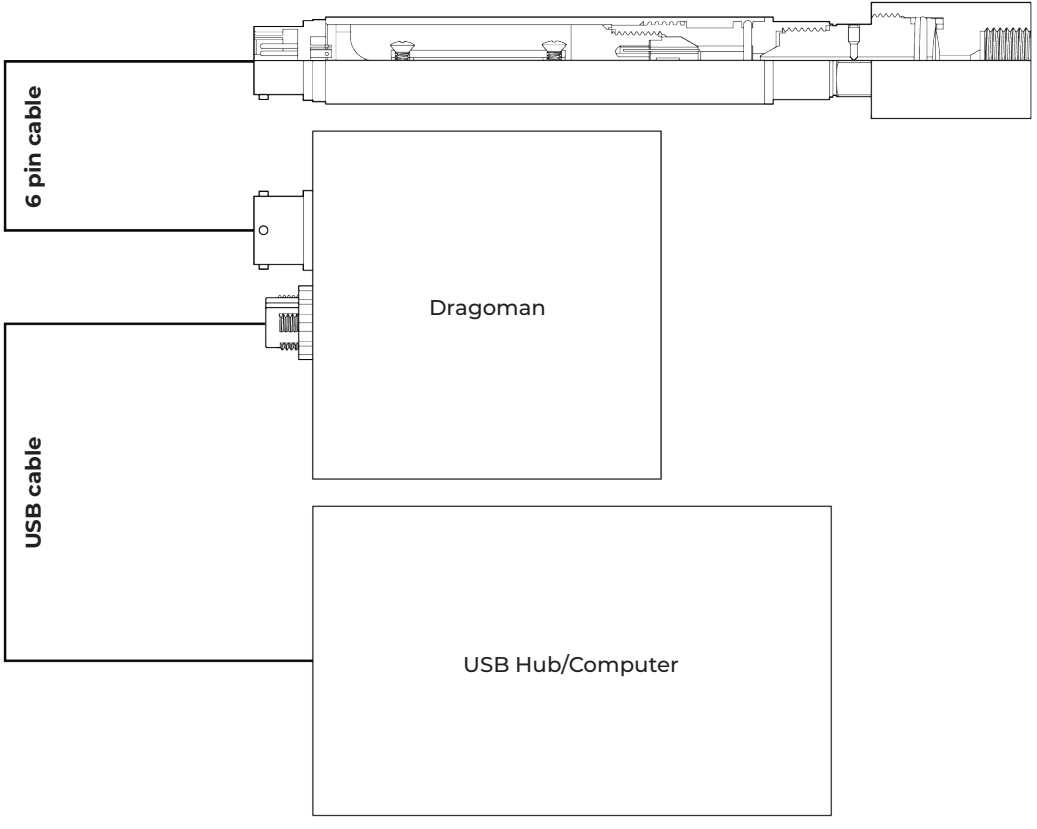
- 1 x DSQS1 Pressure Device
- 1 x Dragoman Partner USB Frequency Counter
- 1 x Mil-Spec High Temperature Cable
- 1 x Phoenix Contact Circular Mini USB Cable
- 1 x HF4 to Microcap Pressure Fitting
- 1 x Calibration Report
- 1 x Certificate of Traceability
- 1 x Product Manual

1.2 CUSTOMER SPECIFIC DEVICE PAIRS

Crystal Serial Number (X/N)	Dragoman Serial Number
X-TAL-1000062	Dragoman-1000077
X-TAL-1000072	Dragoman-1000078
X-TAL-1000073	Dragoman-1000081

1.3 CONNECTING DSQS1 DEVICES

1. Remove all components from enclosure case and ensure that the inventory is complete.
2. Using the Mil-Spec 6 Pin Cable connect each DSQS1 device to their respective partner Dragoman. The pressure device Serial Number and Serial Number of its partner are engraved along the length of the outer housing of the device. Each Dragoman has a unique Serial Number engraved along the outside of the housing for ease of identification. A Dragoman serves as a Frequency Counter, DC Power Supply, and USB interface for the Pressure Device. The Dragoman also stores Calibration Coefficients for its partner DSQS1 Pressure Sensor.
3. Using the Phoenix Contact Circular USB Cable, connect the Dragoman device to a USB Hub.
4. Connect USB Hub to NUC computer.
5. Connect NUC computer to internet via ethernet or wifi.
   NUC User: phase
   Password: D3clan2021
6. Point your web browser, on any device, to the following
   URL: https://influx.phasesensors.com:3000
   User: colin
   Pasword: gBmo6G!anqvE87
7. Navigate to the Dashboards section on the left-hand side of the webpage.
8. Select: Declan'sDashboard
9. Select the "Sensors" Drop down Menu
10. All connected Devices should appear in the dashboard.
11. If Data is not readily available on the Database: please wait for 5 minutes before reconfiguring the NUC or checking the Internet connection.
12. The sensor data is being stored on the NUC locally until the system connects to the Database (This also occurs during times of intermittent connection).


6 pin cable
Dragoman
USB cable
USB Hub/Computer

SECTION 2
MECHANICAL INSTRUCTIONS

2.1 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
HF4 Nipple	¼" diameter 60° coned and threaded tubing	1	Stainless Steel 316	High Pressure Equipment Company	HM4
HF4 Gland	Threaded Plug (9/16"-18)	1	Stainless Steel 316	High Pressure Equipment Company	60-2H4
HF4 Collar	Left-hand threaded collar	1	Stainless Steel 316	High Pressure Equipment Company	60-2HM4

When installing the HF4 fittings, ensure that the metal tubing is clean and free of scratches, specifically the coned tip. Slip the gland over the nipple (1/4" tube), and thread the collar onto the tube end fully exposing the 60° cone. Tighten the gland to a torque of 25 ft lb (39 Nm) in the microcap. Refer to the diagram below:

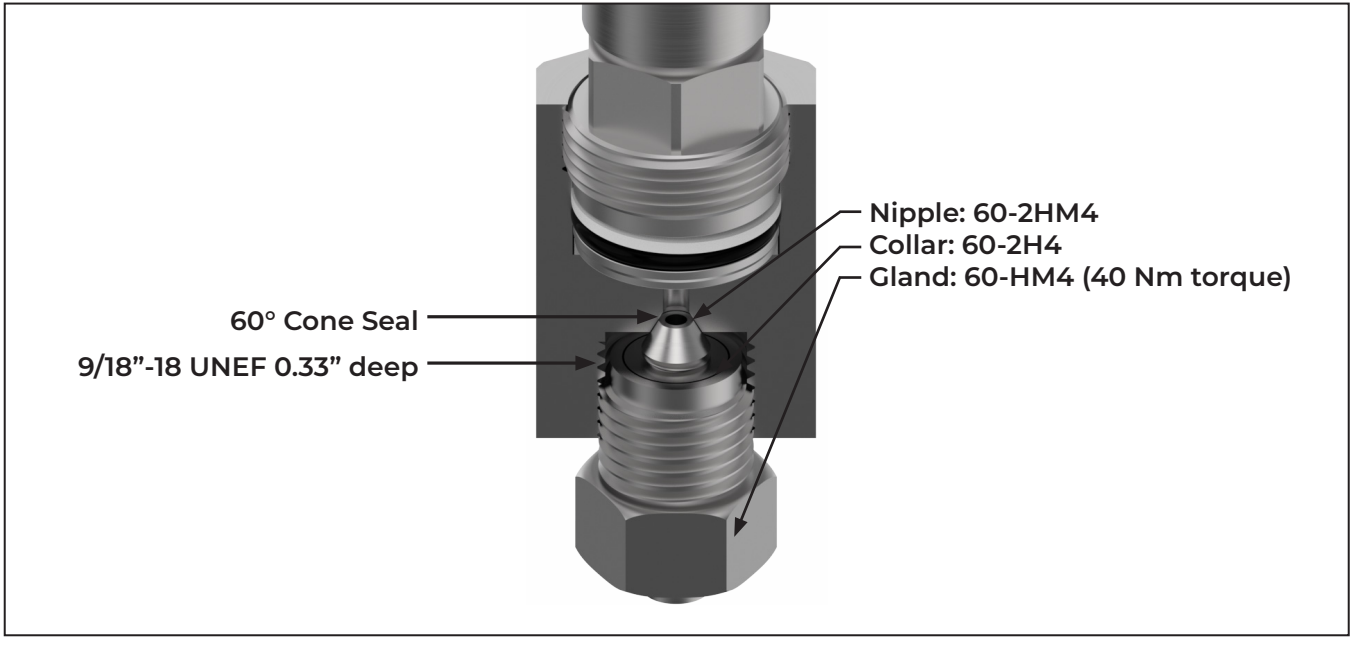


Figure 2-1. Industrial Microcap (1" across flats)

2.2 CONSUMABLES

The following O-rings are already installed on your transducer but may need to be replaced during the life of the sensor:

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

***Note:** At locations 1 and 2 the housing has been welded closed to seal and protect the transducer electronics.

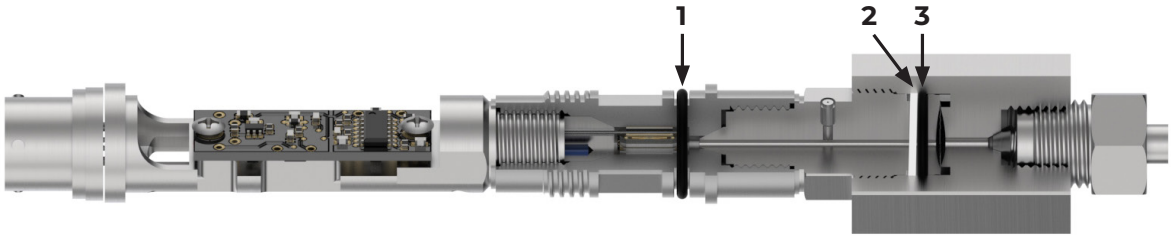


Figure 2-2. Placement of O-rings

O-Ring Replacement:

1. After each removal of the microcap, inspect the O-ring and backup ring for damage. If the O-ring or backup ring have been damaged, replace both seals.
2. Do not use metal tools on the O-ring seat or seal for any reason.
3. First, use gloved fingers or a thin plastic tool to lift the backup ring (one side of the split ring should lift).
4. With your thumb and index finger at 10 and 2 o'clock positions, squeeze (pinch) the O-ring together to lift the portion of the O-ring in between.
5. Using your other hand, or a plastic tool, grasp, or loop under the lifted portion of the O-ring and remove.
6. To install a new seal, first clean the male O-ring gland with Isopropyl alcohol and a clean cloth or tissue.
7. Ensure the new seals are the proper size and part number as in the table.
8. Ensure that the O-rings are not damaged, cracked, frayed, or misshapen in any way.
9. Take the backup ring (#3) and split the 2 sides slightly. Push one side into the groove, then slide the other side over, ensuring that the membrane is not touched. Push the backup ring to the back (thread side) of the groove.
10. Clean dust from O-ring with lint-free cloth or wipe.
11. Take the O-ring (#4) and lightly lubricate it with Super-O-Lube with gloved hand and slide it over the lip of the Weld ring. Do not roll the O-ring over. The O-ring should be on the front (membrane) side of the groove.

2.3 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 microcap for the O-rings to pass the threads.
4. Take care to ensure 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 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 microcap 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 microcap, 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.

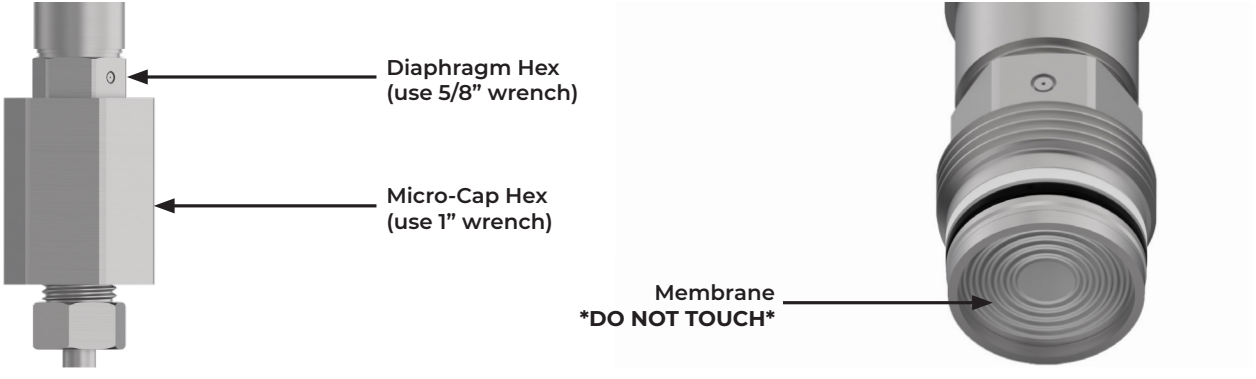


Figure 2-3. Microcap Attatchment

SECTION 3
XTALX DSQS1 SPECIFICATION SHEET

3.1 SPECIFICATION HIGHLIGHTS

CALIBRATED PRESSURE RANGE	0 TO 10,000psi (0 TO 690 BAR)
CALIBRATED TEMPERATURE RANGE	25° TO 170°C
PRESSURE ACCURACY	0.05 % F.S.
DRIFT @ MAX TEMPERATURE & PRESSURE	0.05%FS/YEAR
TEMPERATURE ACCURACY	0.1°C
DRIFT @ MAX TEMPERATURE & PRESSURE	0.02°C/YEAR

3.2 MECHANICAL SPECIFICATIONS

WEIGHT:	286 ±1 grams
HEIGHT:	147 mm (5.79”)
MAXIMUM WIDTH:	25.4 mm (1.0”)
PROOF PRESSURE:	103.4 MPa (15,000psi)

3.3 ELECTRICAL SPECIFICATIONS

MAXIMUM VOLTAGE RATINGS	-0.3 TO 13.5V DC
VOLTAGE SUPPLY RANGE	2.7 TO 12V DC
CURRENT DRAW @ 25°C	850 µA
CURRENT DRAW @ FS TEMP	1.6 mA
ESD	±2 KV

3.4 SIGNAL OUTPUT SPECIFICATIONS

PRESSURE FREQUENCY SIGNAL PIN	Pin F
PRESSURE FREQUENCY SIGNAL	2.5 Vpp Square Wave
PRESSURE FREQUENCY RANGE	45 kHz← →52 kHz
TEMPERATURE FREQUENCY SIGNAL PIN	Pin B
TEMPERATURE FREQUENCY SIGNAL	2.5 Vpp Square Wave
TEMPERATURE FREQUENCY RANGE	262 kHz ← →264 kHz

3.5 ADDITIONAL SPECIFICATIONS

STORAGE TEMPERATURE	-65° to 170°C
ACHIEVABLE RESOLUTION	0.002 psi
REPEATABILITY	0.05 % F.S.
NOMINAL SENSITIVITY	3 psi/Hz
RESPONSE TIME	0.1 S
GRAVITATIONAL EFFECTS	negligible
ORIENTATIONAL EFFECTS	negligible
ACCELERATION SENSITIVITY	negligible
STARTUP TIME @ 25°C	~220 ms
PEAK INRUSH CURRENT @ 25°C	1.3 mA
STARTUP TIME @ FS TEMP	~290 ms
PEAK INRUSH CURRENT @ FS TEMP	2.5 mA
AVERAGE LIFETIME EXPECTANCY @ 150°C	2 Years
AVERAGE LIFETIME EXPECTANCY @ 175°C	6 Months
AVERAGE LIFETIME EXPECTANCY @ 210°C	30 Days

3.6 LIFE TIME EXPECTANTCY NOTE:

Operating at extreme temperatures can and will dramatically reduce life expectancy. The expected lifetimes above were observed in a dry environment where both the electronics and pressure fittings were subject to atmosphere. XS-HTI-4 is not rated for operation beyond 175°C and 10000psi; accuracy and quality will not be guaranteed.

3.7 FREQUENCY RESPONSE NOTE:

An increase in pressure applied to the sensor will result in a decrease of the pressure oscillator frequency (approximately 3 PSI/Hz). Transient temperature effects will influence the pressure oscillator frequency. Therefore, the temperature oscillator is used in tandem. An increase in temperature of the sensor will result in an increase of the temperature oscillator frequency (approximately 0.1°C/Hz). Pressure readings during temperature stability will result in optimal performance.

3.8 DSQS1-10000-170 SPECIFICATION DRAWINGS

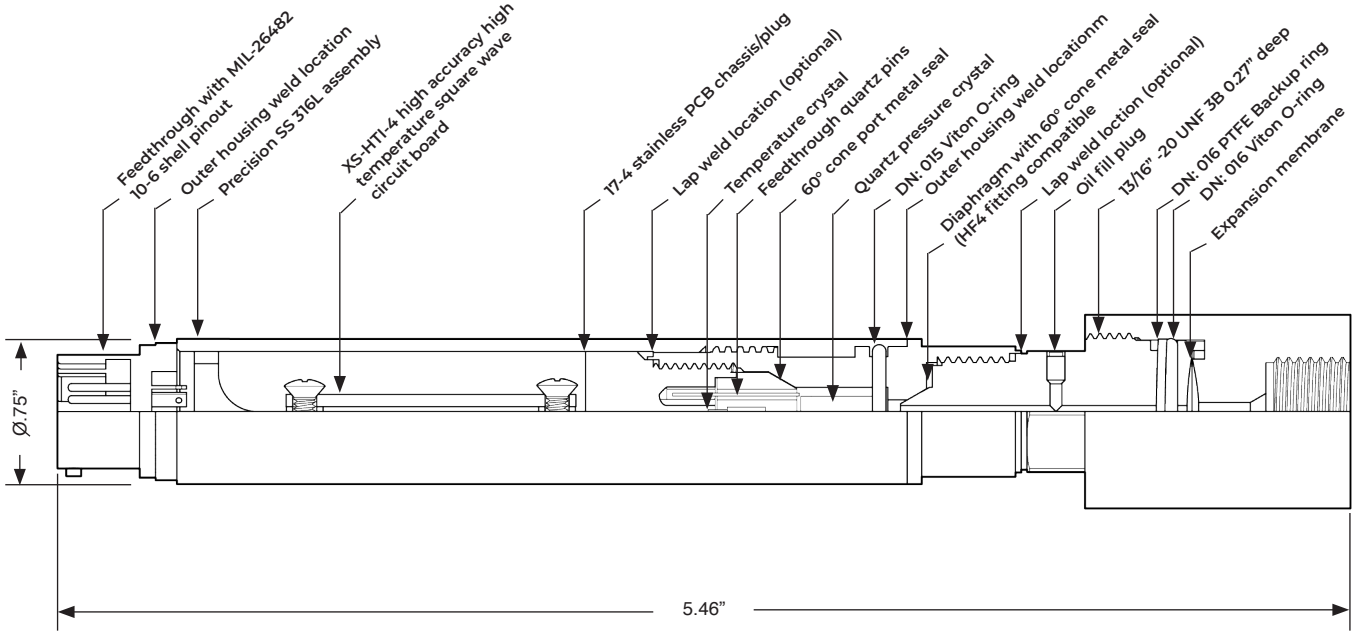


Figure 3-1. DSQS1 Pressure Sensor Specification Drawing

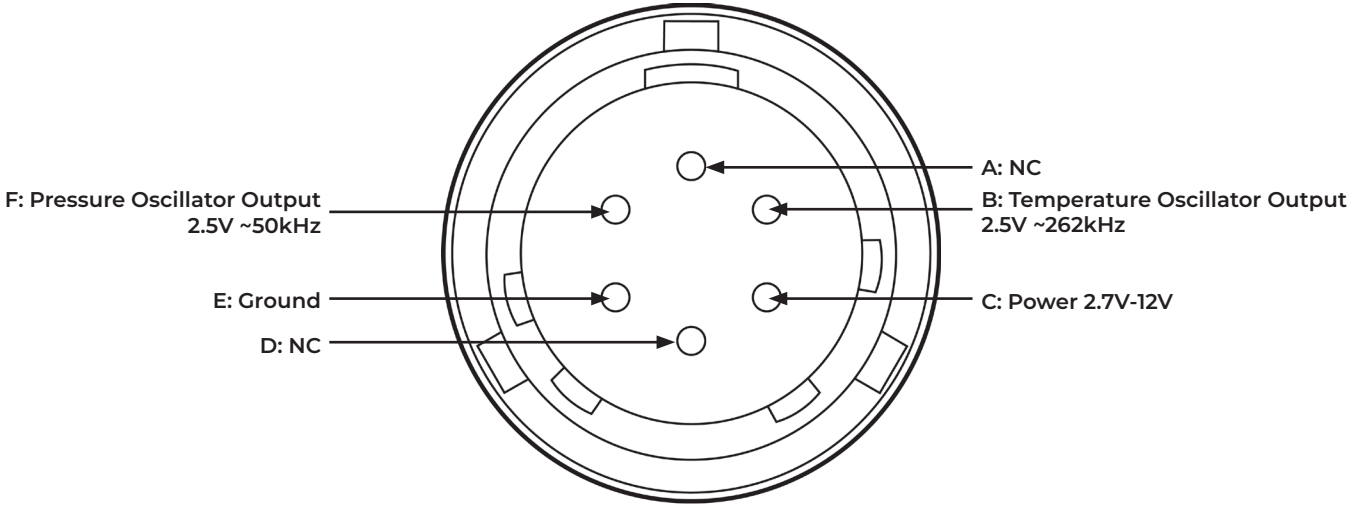


Figure 3-2. Electrical Pin-Out

SECTION 4
MacOS SOFTWARE/COMMUNICATIONS

4.1 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
```

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
```

4.3 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 5
WINDOWS SOFTWARE/COMMUNICATIONS

5.1 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:

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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.

5.2 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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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.

5.4 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 with 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.