Kulite DAQ

Data Acquisition Software

User Manual

# Version 3.5

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Kulite DAQ Overview

Kulite DAQ is a data-acquisition application designed to be used with Kulite pressure scanners. *Kulite DAQ* can acquire data from many RS485 or Ethernet devices simultaneously. Mixing RS485 and Ethernet devices is also supported. Acquired data can be saved to the PC and can also be plotted in real-time.

In addition to acquiring data, *Kulite DAQ* can assist in performing user calibration and leak tests on Kulite scanners. The application can be set up to directly communicate with a pressure controller, pressure meter, or barometer. Alternatively, pressure may be controlled manually by the user. For the calibration operation, the application will read the necessary values from the devices, perform all calculations, and write new values back to the devices based on calibration data. Calibration reports can be saved and printed, as well.

Main Window

The *Kulite DAQ* main window is divided into several parts as labeled in the figure below.
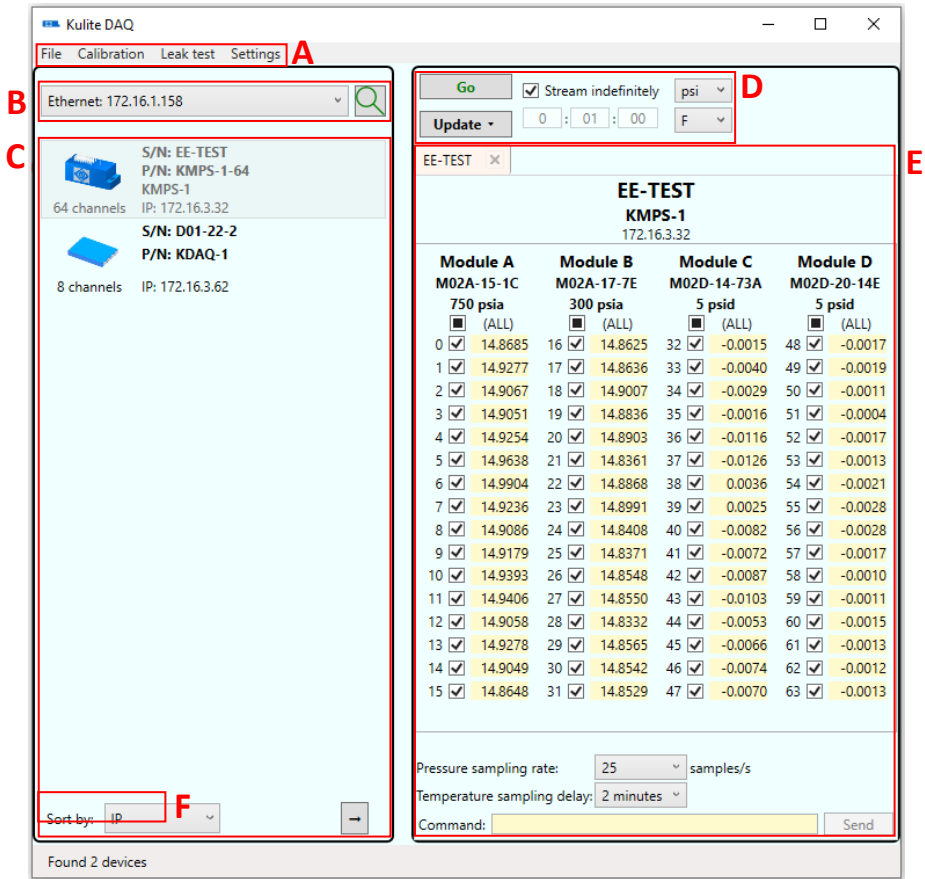
A. Menu Bar

The menus enable changing data-acquisition and hardware settings as well as calibrating scanners, performing leak checks, and viewing info about *Kulite DAQ.* These options are described in the subsequent sections of this document, see section Menus.

B. Interface Selection
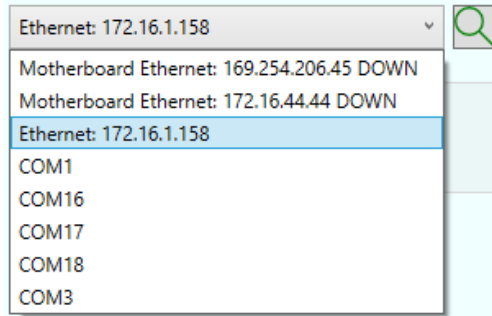
Kulite DAQ supports communicating with Kulite Ethernet and RS485 devices. The pull-down will list all IP and serial interfaces found on the host PC. To find devices, select an interface from the pull-down. While the program is searching the selected interface for devices, the search button (to the right of the pull-down) will change to show that the search is in progress. The search button may also be pressed at any time to look for additional devices.

Note that many devices may be on the same IP interface, but only a single device per serial interface is supported.

C. Found Devices

The program displays basic information on each device that is has found: serial number, part number, and communication parameters (IP address for an Ethernet device or baud rate for an RS485 device). Additionally, the number of channels of each scanner is shown.

The user should then select the device(s) from which the data are to be acquired from by double-clicking the device or by selecting the device and then clicking on the right-arrow button below the list.

Data may be acquired from multiple devices simultaneously, even if those devices are found on different interfaces. To access more than one interface, find devices on the first interface and select all desired devices, then, find devices on the next interface and select the rest of the desired devices.

D. DAQ Bar
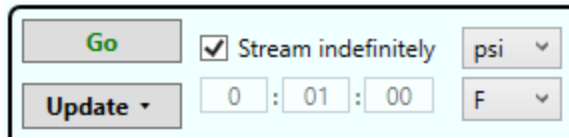
The DAQ bar allows the user to acquire data from the devices. The *Go* button can be pressed to begin the streaming of data. While streaming, the *Go* button will change to a *Stop* button and can be pressed to end the stream. The *Update* button will take one reading from all selected channels on a scanner and update the readings shown in the tab below. The triangle in the *Update* button can be selected to bring up the option of Updating repeatedly, which will constantly take readings and update the values shown. Updating repeatedly will take readings at a slower rate than streaming, and will not save or graph the data. While updating repeatedly, the button will become a *Stop* button, which can be pressed to end the updating.
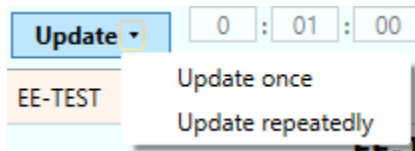
When the *Stream indefinitely* checkbox is checked, the streaming of data from a scanner will not end until the user presses the *Stop* button. When the *Stream indefinitely* checkbox in unchecked, the stream will go on for the amount of time specified in the text boxes below (hours : minutes : seconds) and then automatically stop.

The pressure and temperature units in which the data should be acquired in can be changed using the dropdown boxes.

E. Devices

Devices to be measured are shown in multiple tabs on the right-hand side of the window.

EE-TEST ✕	D01-22-2 ✕		

EE-TEST
KMPS-1
172.16.3.32

Module A	Module B	Module C	Module D
M02A-15-1C	M02A-17-7E	M02D-14-73A	M02D-20-14E
750 psia	300 psia	5 psid	5 psid
■ (ALL)	■ (ALL)	■ (ALL)	✓ (ALL)
0 ✓ 14.7166	16 ✓ 14.7593	32 ✓ 0.0008	48 ✓ -0.0011
1 ✓ 14.8339	17 ✓ 14.8097	33 ✓ 0.0016	49 ✓ 0.0004
2 ✓ 14.8451	18 ✓ 14.8440	34 ✓ 0.0006	50 ✓ 0.0010
3 ✓ 14.8017	19 ✓ 14.8048	35 ✓ 0.0004	51 ✓ 0.0012
4 ✓ 14.7931	20 ✓ 14.8317	36 ✓ 0.0039	52 ✓ -0.0016
5 ✓ 14.8700	21 ✓ 14.7675	37 ✓ 0.0127	53 ✓ -0.0008
6 ✓ 15.0009	22 ✓ 14.8524	38 ✓ -0.0015	54 ✓ -0.0026
7 ✓ 14.8312	23 ✓ 14.8309	39 ✓ -0.0090	55 ✓ -0.0011
8 ✓ 14.7288	24 ✓ 14.7782	40 ✓ 0.0031	56 ✓ -0.0017
9 ✓ 14.8147	25 ✓ 14.7655	41 ✓ 0.0004	57 ✓ -0.0006
10 ✓ 14.8003	26 ✓ 14.7768	42 ✓ 0.0020	58 ✓ -0.0013
11 ✓ 14.8825	27 ✓ 14.8076	43 ✓ 0.0026	59 ✓ -0.0017
12 ✓ 14.6752	28 ✓ 14.8442	44 ✓ 0.0022	60 ✓ 0.0006
13 ✓ 14.8107	29 ✓ 14.8412	45 ✓ 0.0025	61 ✓ -0.0010
14 ✓ 14.7540	30 ✓ 14.7812	46 ✓ 0.0019	62 ✓ -0.0008
15 ✓ 14.8415	31 ✓ 14.7434	47 ✓ 0.0015	63 ✓ 0.0004

Pressure sampling rate:	275 ⌄	samples/s
Temperature sampling delay:	2 minutes ⌄	
Command:	RE	Send
Response	Reset	

Information about the scanner is shown at the top, while information about the modules or sensors connected to the scanner are shown in the center. The full-scale pressure of each module is shown immediately below its serial number. The pressure readings for each channel within each module are displayed. Beside each channel is a checkbox, unchecking it will exclude that channel from data acquisition.

Below the channel data, the user can set the sampling rate of the pressure data to be used in the acquisition, as well as the time between temperature samples. If acquiring data from multiple scanners, they may each be set to different sampling rates if desired.

Below the sampling rates, any arbitrary command may be sent to the scanner by typing it in and clicking *Send*. The response from the scanner, if any, will be shown below. Please reference the manual of the specific device to see the list of commands that can be sent.

F. Status Bar

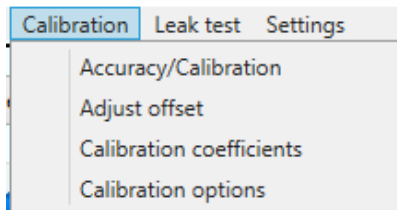The status bar shows the current status of any in-progress action.

Menus

File Menu

File	Calibration	Leak test	Set
About Kulite DAQ			
Exit			
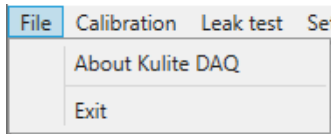
This menu allows the user to show the *About* dialog for the program or to exit the program.

Calibration Menu

Calibration	Leak test	Settings
Accuracy/Calibration		
Adjust offset		
Calibration coefficients		
Calibration options		

With this menu, the user may conduct a full-pressure calibration of one or more devices, adjusting both the zero-offset and gain of the devices or conduct a simpler offset-only adjustment. The user may also view the calibration settings of the channels on a scanner, and can edit the calibration or return to factory calibration settings. This menu also enables the user to configure options related to the calibration performed by *Kulite DAQ*.

Accuracy/Calibration

A full pressure calibration can be performed with this option. This operation will pressurize devices over their full pressure range and adjust the offsets and gains of each channel based on this calibration data. The control pressure may be operated automatically by the application or manually by the user. The scanner should be physically put into calibration mode to take calibration data, and pressure should be supplied to the appropriate calibration channel.

The initial window will show all devices that may be calibrated.

The devices are split by their pressure ranges with each pressure range in its own tab. Multiple devices may be calibrated simultaneously, provided they are the same pressure range and are all connected to the same pressure controller. The number of calibration points can be changed, and the program will automatically fill in default pressure values based on the full-scale pressure of the sensors and whether they are absolute, gauge, or differential. These values may be changed by the user if desired.

Before continuing, the user should make sure the checkboxes next to the sensors to be calibrated are checked. Also, the correct pressure source should be selected from the pull-down. If the controller has not yet been set up in *Kulite DAQ*, the user should click the *Set up* button and continue as described in the [Pressure Controllers](#) section.

Clicking the *Go* button will start the data collection. If *Kulite DAQ* is controlling the pressure source automatically, the operation will then proceed until finished. If the user is controlling the pressure source manually, the application will prompt the user to set the pressure to particular values. Readings will be taken at each calibration point, a report will then appear showing the initial readings along with the calibration coefficients. The user can then choose to start the calibration by selecting *Calibrate All Tabs* or *Calibrate Checked Tabs*. The calibration will then take place and a full report showing the results will appear.

Kulite DAQ Calibration — □ ×

5 psid

☑ EE-TEST
KMPS-1

EE-TEST
KMPS-1

Channel	As Found					As Left				
	0 psid	2.5 psid	5 psid	Offset	Gain	0 psid	2.5 psid	5 psid	Offset	Gain
32	−0.005	2.487	4.983	−16.2657	2.6699	−0.009	2.505	4.993	−16.3167	2.6763
33	−0.008	2.482	4.960	−14.4505	2.2194	−0.007	2.508	5.000	−14.5968	2.2338
34	−0.003	2.499	4.994	−13.0500	2.3872	−0.003	2.510	5.009	−13.0581	2.3888
35	−0.003	2.656	5.328	−16.8259	2.3403	−0.011	2.490	4.980	−15.2876	2.1952
36	−0.014	2.482	4.969	−17.5688	2.7034	−0.009	2.502	4.995	−17.6370	2.7125
37	−0.018	2.624	4.648	5.7999	3.6026	−0.006	2.829	4.976	5.6972	3.8613
38	−0.004	2.497	4.992	9.5018	0.8767	−0.005	2.507	5.003	9.4875	0.8774
39	−0.010	2.503	5.005	9.7204	0.8774	−0.006	2.501	4.994	9.7950	0.8749
40	−0.010	2.489	4.985	−15.1681	2.4170	−0.009	2.508	5.002	−15.1744	2.4193
41	−0.012	2.486	4.991	−16.3016	2.4222	−0.003	2.500	4.990	−16.2765	2.4209
42	−0.018	2.485	4.977	−16.2939	2.4241	−0.004	2.499	4.994	−16.3035	2.4267
43	−0.010	2.491	4.988	−15.9917	2.4232	−0.008	2.497	4.992	−15.9917	2.4241
44	−0.010	2.499	4.996	−15.8917	2.4237	−0.005	2.503	4.999	−15.8552	2.4211
45	−0.010	2.496	4.995	−15.6285	2.4284	−0.011	2.501	4.996	−15.5955	2.4259

Revert

The user may now select *Revert* to reset all calibration coefficients to the values they had before this calibration was performed, if desired. If the calibration is satisfactory, the user should return to the previous window. The *Test Report* button can be pressed to save a report to the PC, or the *Close* button may be pressed to exit the calibration windows.

Adjust Offset

Rezero — □ ×

◉ Offset Adjustment   ○ Auto-zero
(Absolute devices)   (Gauge/Differential devices)

Please select the devices to zero:

▲ ☑ Scanners
  ▲ ☑ EE-TEST - KMPS-1
    ▲ ☑ Module A: M02A-15-1C
      ☑ Channel 0
      ☑ Channel 1
      ☑ Channel 2
      ☑ Channel 3
      ☑ Channel 4
      ☑ Channel 5
      ☑ Channel 6
      ☑ Channel 7
      ☑ Channel 8
      ☑ Channel 9
      ☑ Channel 10
      ☑ Channel 11
      ☑ Channel 12
      ☑ Channel 13

Go   Cancel

If the user does not have the means to do a full-range calibration, a simple offset adjustment can be made instead. The offset adjustment works in a similar fashion to the full calibration, however for absolute sensors, a pressure source will be used only to take an ambient pressure reading, and for gauge/differential devices, no reading will need to be taken, and the sensors will be zeroed to the current ambient pressure.

A new window will appear with a report displaying the current readings of the device. The user may select *Zero All Tabs* or *Zero Checked Tabs* to begin the adjustment.

Rezero — □ ✕

☑ EE-TEST
KMPS-1

EE-TEST

KMPS-1

Channel	As Found		As Left	
	0 psig	Offset	0 psig	Offset
32	−0.015	−16.3167	0.003	−16.2970
33	−0.020	−14.5968	0.001	−14.5768
34	−0.011	−13.0581	0.001	−13.0497
35	−0.010	−15.2876	−0.003	−15.2768
36	−0.027	−17.6370	−0.004	−17.6121
37	−0.068	5.6972	0.007	5.7433
38	−0.018	9.4875	−0.004	9.5029
39	−0.017	9.7950	0.008	9.8134
40	−0.017	−15.1744	−0.003	−15.1578
41	−0.017	−16.2765	−0.002	−16.2553
42	−0.009	−16.3035	0.004	−16.2873
43	−0.023	−15.9917	0.004	−15.9679

Revert

OK

After the data are taken, the rest of the report will be filled out and the user can choose *Revert* to undo the offset adjustment, or accept it with *OK* and be given the option to save the report to the PC.

Calibration Coefficients

Calibration — □ ✕

☑ EE-TEST
KMPS-1

	Channel	As Found		As Left	
		Offset	Gain	Offset	Gain
☑	0	-6.0050	1.0000	-6.0050	1.0000
☑	1	-4.3754	1.0000	-4.3754	1.0000
☑	2	-3.3321	1.0000	-3.3321	1.0000
☑	3	-3.6564	1.0000	-3.6564	1.0000
☑	4	-3.4050	1.0000	-3.4050	1.0000
☑	5	-60.3551	1.0000	-60.3551	1.0000
☑	6	22.4743	1.0000	22.4743	1.0000
☑	7	-3.6555	1.0000	-3.6555	1.0000
☑	8	-3.4746	1.0000	-3.4746	1.0000
☑	9	-4.4134	1.0000	-4.4134	1.0000
☑	10	-2.6075	1.0000	-2.6075	1.0000

Reset to Default

Program

Create Report

OK

This window can be used to view a report of the current calibration coefficients present on a device. The coefficients can be edited in the *As Left* columns. The *Program* button can be

pressed to load the new *As Left* coefficients onto the device. The *Reset to Default* button can be pressed to set all *As Left* offsets to 0 and the gains to 1. A *Revert* button will appear if the *As Left* columns differ from the *As Found* columns, and can be used to set the columns to be equal. Any changes displayed on the report will not be reflected by the device until the *Program* button is pressed, so the user should always make sure to press it after making all adjustments to the values. The *Create Report* button can be pressed to save the report to the PC.

Calibration Options

This window gives the user the ability to change options relating to the behavior of the calibration process in *Kulite DAQ*, as well as the formatting, naming, and default location of saved calibration reports.

Leak Test Menu
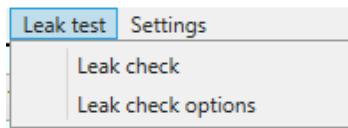
With this menu, the user may conduct a leak check and may configure the options for the leak checks performed by *Kulite DAQ*.

Leak Check
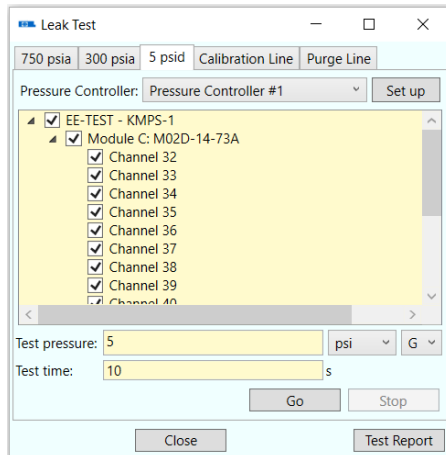
This window can be used to perform a leak check on any of the sensors on a scanner, in addition to the calibration and purge lines. A pressure controller should be selected at the top, or should be configures with the *Set up* button. The channels to be tested should have their checkbox checked, and the test pressure and test time should be set. The *Go* button should be pressed to begin the leak test. The user will be prompted to connect the pressure source to the appropriate channel, and afterwards the leak check may begin. After checking all desired channels, a report can be saved to the PC by clicking the *Test Report* button.

Leak Check Options

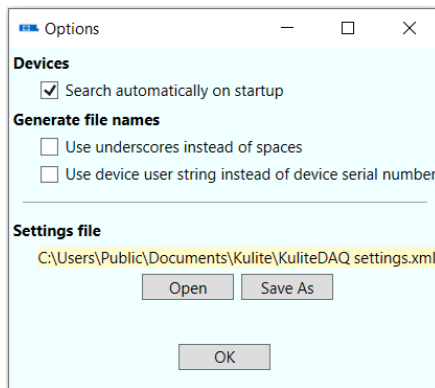This window can be used to configure settings related to leak test parameters, as well as the reports generated for the leak tests.

Settings Menu

With this menu, the user may adjust options about the behavior of *Kulite DAQ*, specific options about the behavior of the data acquisition, settings about the hardware of devices, or configure the pressure controllers to be used for calibration.

General Options

This window can be used to change general options like choosing whether or not *Kulite DAQ* will automatically search for devices when launched and choosing how files names of generated files are formatted. The path of the settings file that *Kulite DAQ* uses to remember all of the user-selected options is shown, and can be opened, or a new file can be generated with the *Save As* button.

Data Acquisition Options
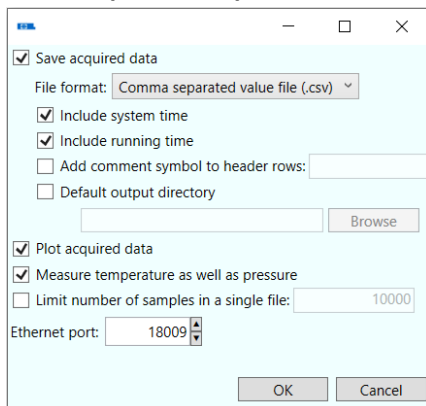
This window is used to set the behavior of the data acquisition performed by *Kulite DAQ*. Checking the *Save acquired data* box will have *Kulite DAQ* automatically save a data file when data are streamed. If this box is not checked, data can still be saved by the user after streaming, see section Plot. The file format of the saved data can be changed between *Comma separated value file (.csv)* or *Excel file (.xlsx)*. Access to .csv files is considerably faster than access to .xlsx files. If acquiring data at a very high sampling rate or from many devices simultaneously, the .csv format is preferred. The checkboxes below affect the formatting of the data output files.

The *Plot acquired data* checkbox determines whether *Kulite DAQ* will open up a plot window while data are being streamed.

Temperature data can be collected in addition to the pressure data, if the appropriate box is checked. The number of samples in a file may be limited, if desired. The Ethernet port of which the data collection should take place can be configured here as well.

Hardware Options

This window is used to monitor and control the hardware specific to certain scanners. The user should reference the manual pertaining to the device to learn more about the hardware.

Pressure Controllers

This window can be used to configure any pressure controllers that *Kulite DAQ* may need to communicate with for calibration or leak check purposes. The currently supported pressure controllers are the *Mensor CPC6000*, *Mensor CPG2500*, and the *TE Connectivity 903x*. The user may also add a *Manual* pressure controller, where in which during any tests or calibration, the user will be prompted to confirm the desired pressure is currently being supplied. The controllers can be communicated with through serial or Ethernet interface, and the parameters

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can be adjusted by the user. The *Test* button can be pressed to confirm *Kulite DAQ* is able to communicate with the controller. Additional pressure controllers may be added or removed by the user with the *Add* and *Remove* buttons.

Plot

Kulite DAQ can plot acquired data in real time. Real-time plotting may be turned on or off in the *Data acquisition options* menu. The data from all the sensors on a single scanner are plotted onto the same graph, but different scanners are plotted onto separate graphs. Data from all transducers are plotted onto the same graph. An example of a plot is shown below.
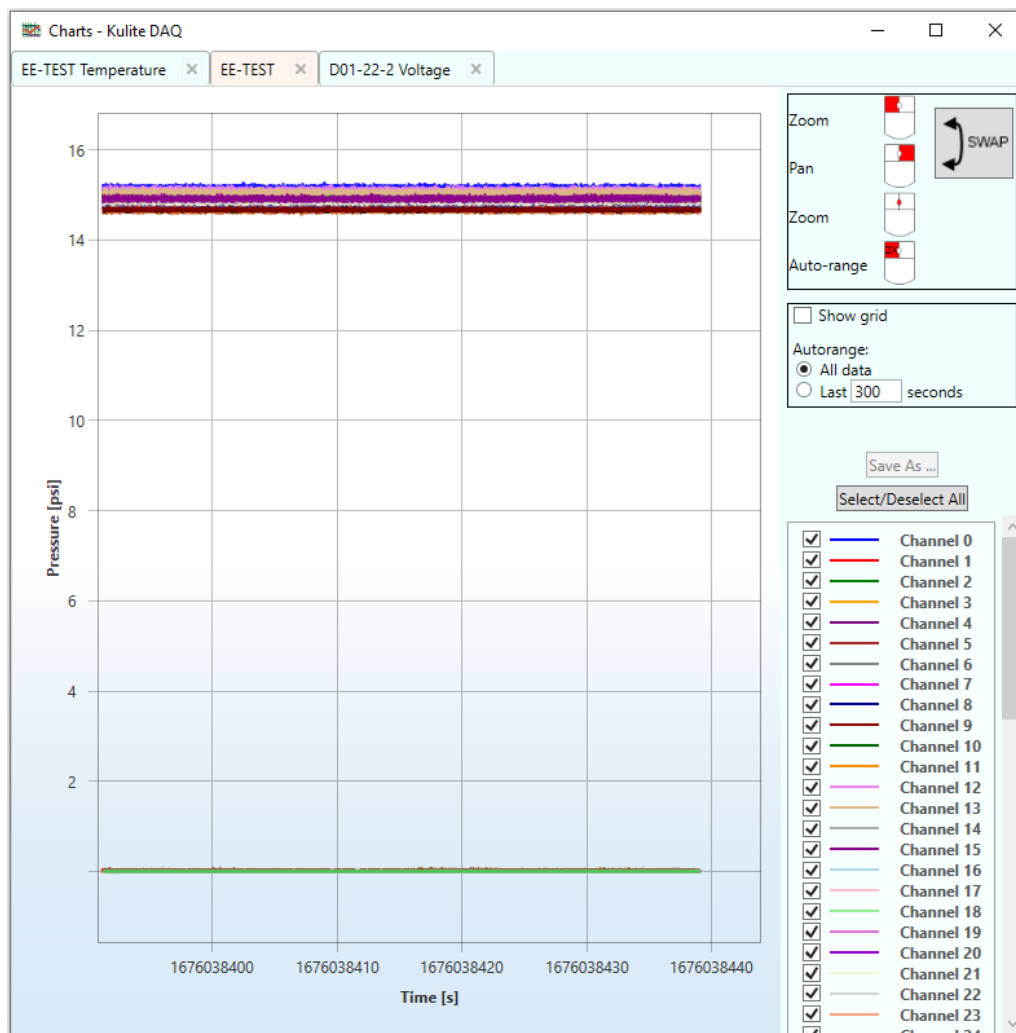
The list of sensors being plotted is shown in the legend to the right of the plot. Individual sensors can be shown or hidden by checking or unchecking them. The *Select/Deselect All* button can be used to automatically check or uncheck all channels.

The plot may be zoomed-in with the left mouse button or panned with the right mouse button. Optionally the zooming/panning functions of the left and right buttons can be reversed by clicking the *Swap* button. The user may also zoom in or out with by scrolling the mouse wheel. Double-clicking the left mouse will reset the x and y axes so as to show all the data. The x or y axis can be zoomed individually by clicking and dragging that axis.

If temperature data are also being acquired, pressure and temperature data are plotted on separate graphs.

If the user does not have the *Save acquired data* option enabled from the [Data acquisition options] menu, the acquired data may still be saved: after the streaming has been stopped by either the user pressing the *Stop* button on the main window, or from the streaming automatically ending, the user may press the *Save As…* button to save the data to the PC.