

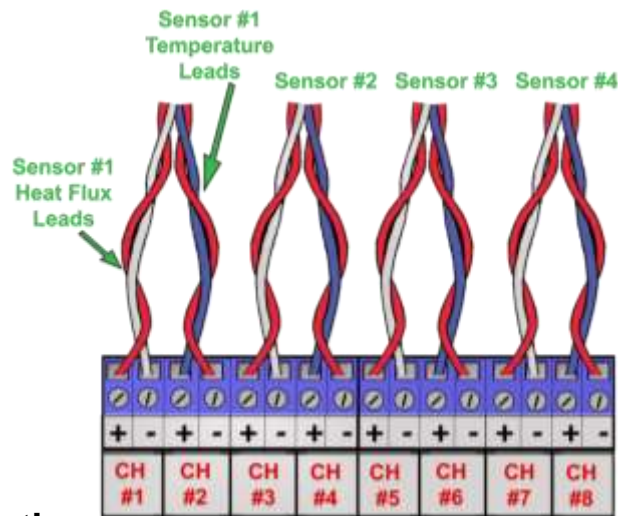
Introduction

The HFS DAQ is a data acquisition system intended to read and record measurements from HFS heat flux and integrated temperature sensors. The instrument has 8 differential channels in which 4 HFS complete sensors can be plugged in to record both heat flux and temperature from each sensor. The accompanying program allows the user the choice to start and stop recording the data from the sensors, toggle viewing the heat flux and temperature plots for the different channels, and save a data run to a .csv file.



Hardware Setup

The device has 8 differential channels to plug the sensors into. Each individual sensor requires 2 channels (one for measuring heat flux and one for temperature.) There are 4 wire leads coming out of each heat flux sensor. The red and white leads twisted together are the heat flux sensor leads and should be plugged into channels 1, 3, 5, and 7 with the red wire in the positive terminal of each channel and the white wire in the negative terminal. This should give a positive heat flux signal for heat flowing through the top of the sensor but positive and negative heat fluxes can be defined any way. The pale blue and red leads twisted together are the thermocouple leads for measuring temperature. They must be plugged into channels 2, 4, 6, and 8 with the blue wire in the positive terminal and red wire in the negative terminal. (This is standard for T-type thermocouples.) The picture below shows how the sensors should be plugged into the device.



Software Installation

Begin software installation by connecting the circuit to the computer via the USB cord included in the package. If the Arduino drivers do not automatically install onto the computer when plugging in the device, follow these instructions:

1. Plug the USB stick included in the package into your computer

2. On Windows, click start, and search for “Device Manager” and select it.
3. Look under “Ports” or “Other Devices” and find the “USB-SERIAL CH340” or “Unknown Device,” right click, and select “Update Driver Software” option.
This could potentially be located by right clicking on the device, select “Properties”, click the “Hardware” tab, click the properties button. Next click the “Driver” tab
4. Choose “Browse my computer for Driver software” option.
5. Navigate to the USB stick and select “Arduino Drivers.” You may have to select one of the specific drivers such as “arduino.inf” but selecting the folder should be sufficient.
6. Continue and allow windows to complete the installation.

Once the drivers are successfully installed, copy the folder “Data Reader Program” from the USB stick to your Desktop. Open the folder then open the “release” folder and find the file titled “HFS DAQ Program.exe” and open it.

Using the Software

Once the sensors have been plugged into the device, you may plug the device into your computer via the USB cord. Make sure to wait a few moments after plugging in the device for the computer to recognize it before opening the HFS DAQ software. Then load up the “HFS DAQ Program.exe” file located in the “HFS DAQ Program” directory then in the “release” folder. It may take several seconds for its initial boot. If you get an error, check to make sure the computer is recognizing the Arduino device and that the device is plugged in before loading the program.

If you encounter an error then close the software, unplug the device, then plug the device back in and reboot the software. Changing the physical USB port that you plug into may also remedy the error.

Once the program is loaded, a window will pop up with the user interface. It will prompt you to enter the number of sensors you would like to record data from. Enter the number of sensors (between 1 and 4) that you will be using.

NOTE: The channels are consecutive so if you choose to read only 1 sensor, it will automatically read the sensor plugged into channels 1 and 2; similarly if you choose to read 2 channels, it will read the first sensor in channels 1 and 2 as well as the second sensors plugged into channels 3 and 4 and so on.

Click the “Set Number of Channels” button to set this. **Be sure to have sensors plugged into each channel you wish to read from.**

Once the number of channels has been selected, type in the sensitivity of the sensor plugged into channel 1 and click the “Set s1” button for that sensor. The sensitivities for each sensor are included with the accompanying calibration certificates. **DO NOT** include units here. Only type the number, eg. 9.3 or 0.6 that s1 corresponds to the heat flux sensor in channel 1, s2 corresponds to the sensor in channel 2, and so on.

Once all of the sensitivities have been set, you may click the button “Graph Window.” This will bring you to a new window, on which the data will be displayed.

You now have a few options for how you would like to take the data. When the “Start Data” button is clicked, the program will begin recording data from the sensors in the background. At any time, you may pause the data and save it by going to the top and selecting Save Data. When the user saves the data, a file titled “test.csv” will be created under the same folder as the program. To prevent overwriting of this file, be sure to copy it to another location before a new data run. The program DOES NOT append to the next available file name when a new data run is collected.

You may also toggle the different channels to see the plots of heat flux and temperature from each sensor. You can make sure it’s working by placing your hand on one of the sensors and watching the plot from the corresponding channel to see the signal. Note: If you are running the program on an older computer, the data in the plots may be delayed.