



# GRAPHIC USER INTERFACE

DATA ACQUISITION SOFTWARE

**USER GUIDE**

# TERMS OF USE

The Graphic User Interface Data Acquisition Software (GUI DAQ) is specially designed to work only with Spectronik fuel cells. By using the software, user agrees and acknowledges that he/she has sufficient knowledge in operating a fuel cell system and strictly adheres to the operating instructions listed separately in the fuel cell user guide.

Software license is valid for multiple users within the buyer's organization, and solely for the purpose of usage with Spectronik fuel cells. Software is Spectronik proprietary and any duplication, dissemination and distribution is strictly prohibited.

***Note:*** *Software only runs on Windows. Please check for system compatibility.*

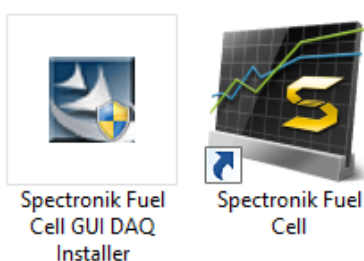
For technical support, contact: [support@spectronik.com](mailto:support@spectronik.com)

# 1 INTRODUCTION

The GUI DAQ software transmits live fuel cell performance and captures valuable operating parameters. User can record and analyze the information by connecting a PC/laptop to the fuel cell system via the RS-232 cable provided, and plot graphs in real time. The data log files saved can be exported to Excel for further analysis.

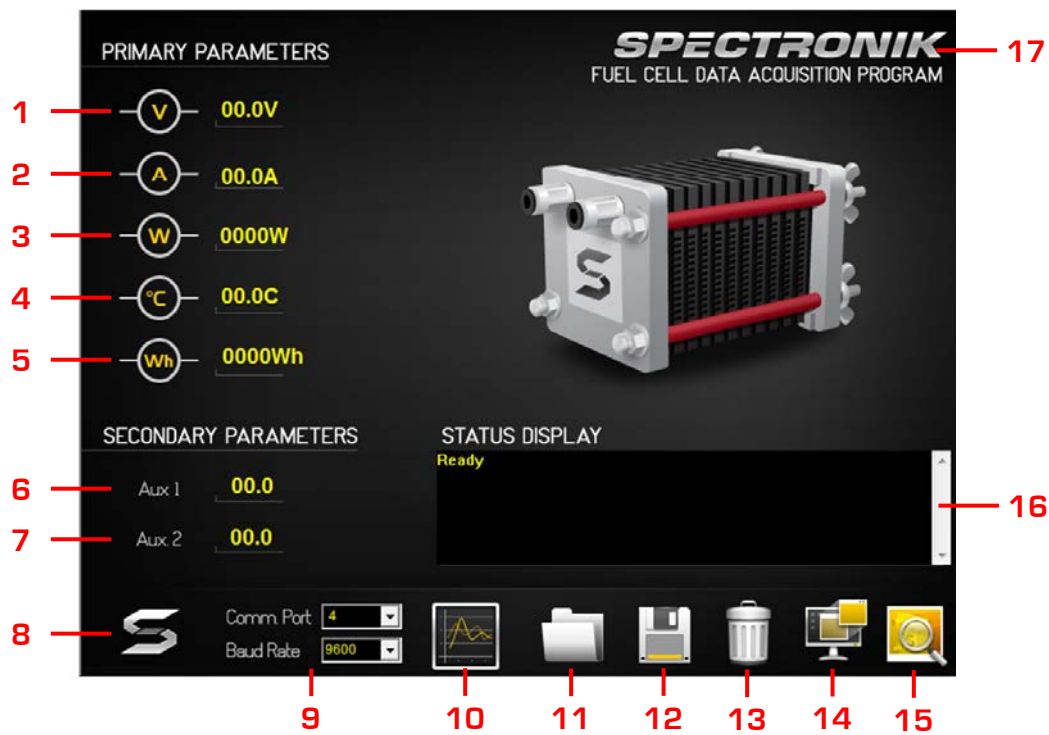
## Getting started – software installation & running the program

1. Double-click on the installer to install the software. Follow the on-screen procedure.
2. After the software is successfully installed, the 'Spectronik Fuel Cell' shortcut icon should appear on the desktop. Double-click on the icon to run the program. The interface page will appear.



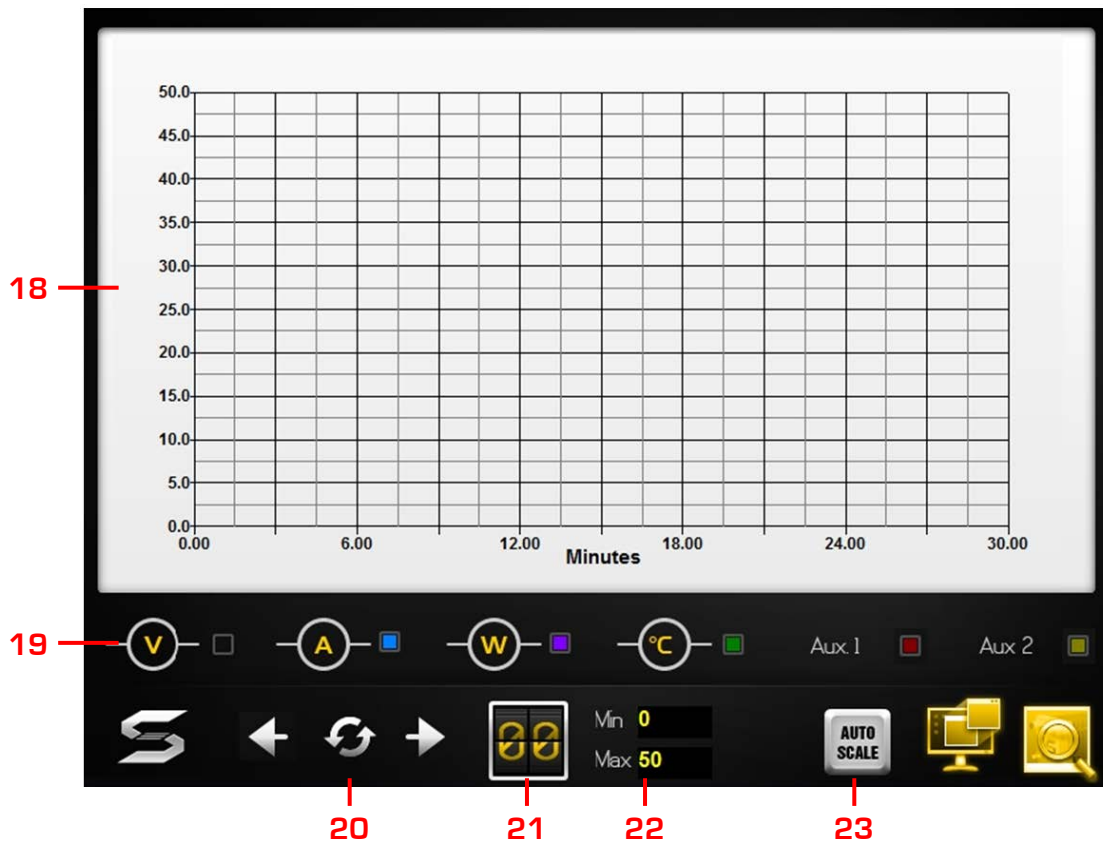
# 2 INTERFACE

## 2.1 Digital Display View



ITEM DESCRIPTION	
1.	Fuel cell voltage [V]
2.	Fuel cell current [A]
3.	Fuel cell power [W]
4.	Fuel cell temperature [°C]
5.	Fuel cell energy [Wh]
6.	Aux 1: external power supply voltage [V]
7.	Aux 2: H <sub>2</sub> supply pressure bar
8.	Connect/Disconnect: start/stop live transmission of data
9.	Communication port and baut rate selector: the comm port depends on the user's PC USB port; The default baud rate is set to 9600;
10.	Graph plotter view selector: toggles the interface page to graph plotter view
11.	Open file: open previously saved data file
12.	Log data: save data into either csv or txt format
13.	Delete file: delete a previous logged data file
14.	Print screen: print the current on-screen image
15.	View image: review printed screen image
16.	Status display box: display system messages from the fuel cell
17.	Spectronik logo: hyperlink to Spectronik website

## 2.2 Graph Plotter View



### ITEM DESCRIPTION

- |     |   |     |  |
|-----|---|-----|--|
| 18. | Graph background: display live plots  | 21  | Digital display view selector: toggle the interface page to digital display view |
| 19. | Parameter check-boxes: color-coded checkboxes for selection of parameters to be plotted | 22. | Min/Max input boxes: value input boxes for user to manually scale the y-axis     |
| 20. | Graph navigator: refresh plot and shift timeline  | 23. | Auto-scale: graph view auto-scaling based on values plotted                      |

# 3 OPERATING PROCEDURES

## 3.1 Setting Up The GUI

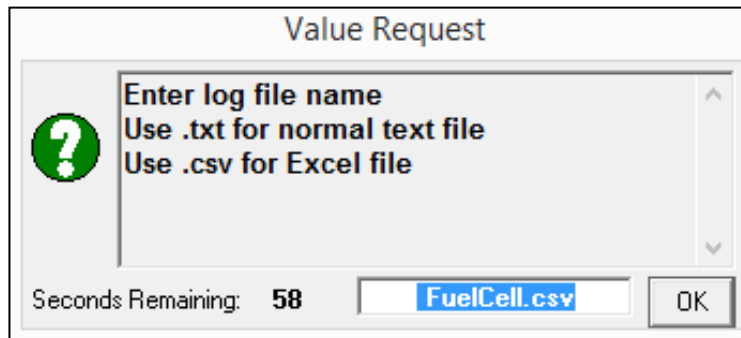
1. Connect the PC to the fuel cell system using the RS232-USB cable provided.
2. Run the software by clicking on the 'Spectronik Fuel Cell' icon on the desktop. The default digital display view should appear, and the comm port should be automatically detected. Note: If the comm port is not automatically detected, try using another USB port and restart the program.
3. Click on the connect button. The 'S' logo should turn gold. The software is now on and ready for incoming data.
4. Turn on the fuel cell system following its own set of instructions as per normal. If the software is connected properly, a status message should appear in the status display box, followed shortly by all the parameters values.
5. The software is now projecting live values of the fuel cell system and is ready to use for data collection and graph plotting.



### 3.2 Saving A Data File (Data Acquisition)

Even though the software is 'live', it does not record the values unless instructed to do so. To start saving data:

1. Click on the log data button, a pop-up window will appear. Key in the desired file name, otherwise the default name 'fuelcell' will be used. Identify whether you want to save the file in csv or txt format by attaching .csv or .txt to the file name respectively. Press enter. The log data button should now turn gold. The software starts recording data.
2. The software will continue recording data until the log data button is clicked again. The button color will turn off. The software is now no longer recording value.
3. If the log file is undesired, you can delete it by clicking the delete file button. Note that this only deletes the latest file.

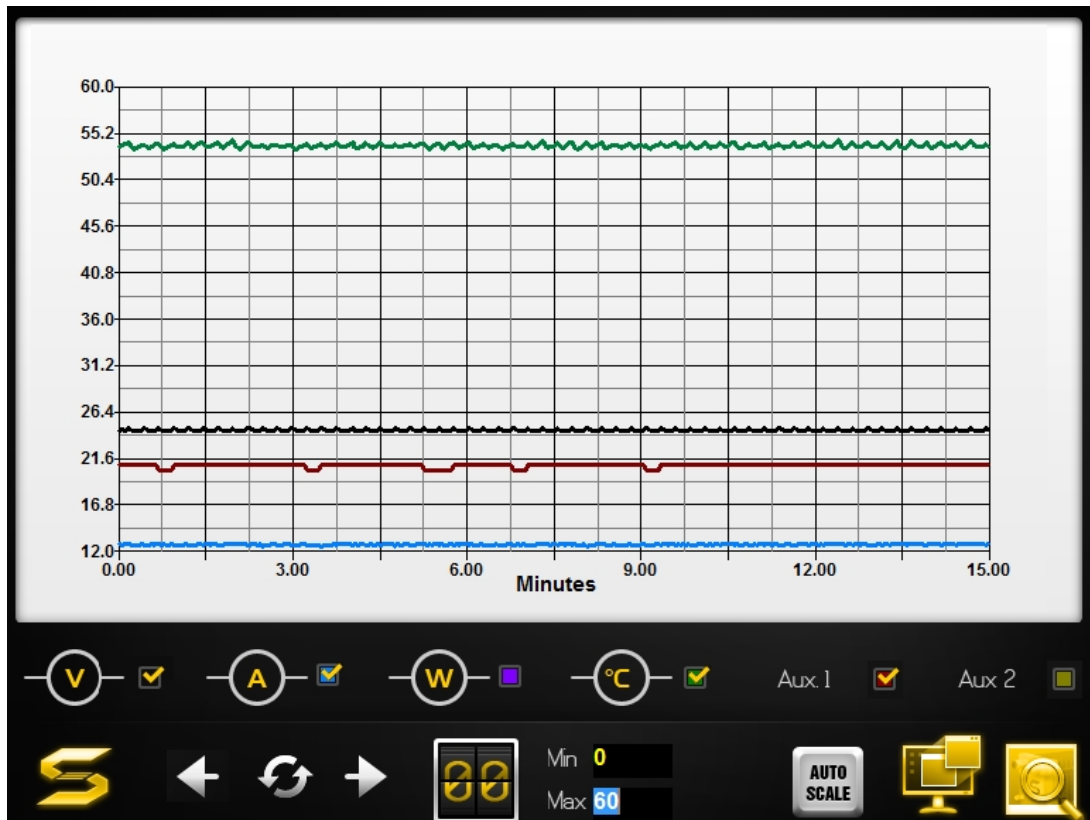


### 3.3 Live Graph Plotting

Graph plotting serves as a visual aid to observe power trend during fuel cell system operation.

1. Toggle to the graph plotter view by clicking on the graph plotter view selector.
2. The parameter check-boxes allow you to check the parameters you want to be plotted on the graph. They are color coded for easy reference. The software can only plot a maximum of 6 parameters simultaneously. Hence, the fuel cell energy parameter is omitted as it is fairly straightforward.
3. You can restart the plot by clicking the refresh button, or decrease/increase the x-axis (time) by clicking the left/right button.
4. Press the Auto-scale button to let the software automatically adjust the graph view for the best fit. Otherwise, you can manually adjust the y-axis by keying in the minimum and maximum values in the min-max input boxes. Tip: this is particularly useful to zoom in on a specific range for better visual representation of the graph pattern.
5. At any time, you can print-screen the graphs by clicking on the print screen button. Tip: print screen button can be used on the digital display view as well

### 3.3 Data Review and Analysis



After the fuel cell system is turned off, you can review the collected data and print-screens for further analysis.

1. Click on the open file button. Alternatively, go to 'my documents', 'spectronik fuel cell'.
2. Two folders can be found. All data are inside the 'data' folder while all the print-screens are collected in the 'snapshots' folder.
3. If you saved the data in csv format, open the file with Microsoft Excel. You should see the following:



	J1								
	A	B	C	D	E	F	G	H	I
1	07/13/16 16:29:11.89	Volts	Amps	Watts	Temp C	Watt-hour	Aux1	Aux2	
2	07/13/16 16:29:11.92	24.6	12.7	312	53.9	1752	21	0.58	
3	07/13/16 16:29:11.93	24.5	12.7	311	53.9	1752	21	0.58	
4	07/13/16 16:29:13.31	24.5	12.7	311	53.9	1752	21	0.58	
5	07/13/16 16:29:15.85	24.5	12.6	309	53.8	1752	21	0.58	
6	07/13/16 16:29:18.38	24.4	12.7	310	53.9	1753	21	0.58	
7	07/13/16 16:29:20.91	24.7	12.5	309	54	1753	21	0.58	
8	07/13/16 16:29:23.45	24.6	12.6	310	53.8	1753	21	0.58	
9	07/13/16 16:29:25.96	24.5	12.6	309	53.7	1753	21	0.58	
10	07/13/16 16:29:28.58	24.5	12.6	309	53.8	1753	21	0.58	
11	07/13/16 16:29:31.11	24.5	12.7	311	54	1754	21	0.58	
12	07/13/16 16:29:33.64	24.5	12.7	311	54	1754	21	0.58	
13	07/13/16 16:29:36.18	24.7	12.6	311	54	1754	21	0.58	
14	07/13/16 16:29:38.71	24.6	12.6	310	53.9	1754	21	0.58	
15	07/13/16 16:29:41.23	24.5	12.6	309	53.8	1755	21	0.58	
16	07/13/16 16:29:43.84	24.5	12.7	311	53.9	1755	21	0.58	
17	07/13/16 16:29:46.37	24.5	12.7	311	54	1755	21	0.58	
18	07/13/16 16:29:48.91	24.4	12.7	310	54	1755	21	0.58	
19	07/13/16 16:29:51.44	24.7	12.6	311	54	1755	21	0.58	
20	07/13/16 16:29:53.97	24.6	12.6	310	53.6	1756	21	0.58	
21	07/13/16 16:29:56.50	24.5	12.6	309	53.6	1756	21	0.58	
22	07/13/16 16:29:59.14	24.5	12.6	309	53.8	1756	21	0.58	
23	07/13/16 16:30:01.64	24.5	12.7	311	53.9	1756	21	0.58	
24	07/13/16 16:30:04.17	24.4	12.7	310	54	1756	21	0.58	
25	07/13/16 16:30:06.71	24.8	12.6	312	54.1	1757	20.4	0.58	
26	07/13/16 16:30:09.24	24.6	12.6	310	53.8	1757	20.4	0.58	
27	07/13/16 16:30:11.77	24.5	12.6	309	53.7	1757	20.4	0.58	
28	07/13/16 16:30:14.37	24.5	12.6	309	53.8	1757	20.4	0.58	
29	07/13/16 16:30:16.90	24.5	12.6	309	53.9	1758	20.4	0.58	
30	07/13/16 16:30:19.44	24.5	12.6	309	54	1758	20.4	0.58	
31	07/13/16 16:30:21.97	24.8	12.5	310	54.1	1758	21	0.58	

Column A is the date and time of a particular data point while columns B to H show the respective parameters' values that are recorded. Using this Excel spreadsheet, any graphs can be created for more in-depth analysis and data scrutiny.

If you saved the data in txt format, open the file with Wordpad. You should see the following:

```
07/13/16 16:30:55.05, Volts,Amps,Watts,Temp C, Watt-hour,
Aux1,Aux2
07/13/16 16:30:55.08, 24.7,12.6,311,54.2,1761,21,0.58
07/13/16 16:30:55.09, 24.5,12.6,309,53.9,1761,21,0.58
07/13/16 16:30:57.55, 24.5,12.7,311,53.7,1761,21,0.58
07/13/16 16:31:00.15, 24.5,12.6,309,53.7,1761,21,0.58
07/13/16 16:31:02.68, 24.4,12.7,310,53.8,1761,21,0.58
07/13/16 16:31:05.22, 24.4,12.7,310,53.9,1762,21,0.58
07/13/16 16:31:07.75, 24.8,12.6,312,54.2,1762,21,0.58
07/13/16 16:31:10.29, 24.6,12.6,310,54,1762,21,0.58
07/13/16 16:31:12.82, 24.5,12.7,311,53.8,1762,21,0.58
07/13/16 16:31:15.43, 24.5,12.6,309,53.7,1762,21,0.58
07/13/16 16:31:17.95, 24.4,12.6,307,53.8,1763,21,0.58
07/13/16 16:31:20.48, 24.4,12.7,310,54,1763,21,0.58
07/13/16 16:31:23.02, 24.7,12.6,311,54.3,1763,21,0.58
07/13/16 16:31:25.55, 24.5,12.7,311,54,1763,21,0.58
```

It is a string of data and each row consists of (date time), voltage, current, power, temperature, energy, Aux 1, Aux 2.

# 4 TROUBLESHOOTING

If the software does not work, perform the following checks:

1. Make sure the fuel cell system is running normally and check that the RS-232 cable connection is properly secured.
2. Plug the USB cable into the PC port before running the software. Otherwise, close the program and restart it.
3. Remember to click the connect button ('S' logo), it should turn gold when clicked on.
4. If the software still does not work, restart everything and try using another USB port. Note: only use RS232-USB cable with FTDI driver chip. The software does not work with Prolific cable.

If the error persists, contact Spectronik's technical support at [support@spectronik.com](mailto:support@spectronik.com).