



U-VALUE
MEASUREMENT
SYSTEM

U-Value Measurement System User Guide

Installation, Configuration
and Downloading Data

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1. Summary

The BTS U-Value Measurement System is a portable tool which is used to measure the thermal transmittance of building elements such as walls, floors and ceilings, helping to identify potential insulation upgrades and to reinforce investment decisions.

The system can record measurements over a number of days or weeks in order to deliver greater accuracy and quantify the in-situ U-value of a building envelope according to the ISO 9869 methodology.



ISO 9869 U-Value Measurement

Highly sensitive data logger and heat flux plates combined with RTD temperature sensors makes the system ISO 9869 compliant. The benefits of making the direct measurement of in-situ U-values more accessible include:

- Understand baseline performance and better target investment in insulation upgrades
- Measure during works and on early completions to check that desired outcomes are being achieved
- Quantify delivered actual performance, stating the true energy, running cost, CO₂ savings and fuel poverty impact delivered by energy efficiency programmes
- Conduct quality assurance testing and establish a culture of accountability
- Save time, costs and improve quality by identifying issues early and reducing late-stage remedial action

2. System Components

The U-Value Measurement System includes the following components:

	<p><u>Data Acquisition Logger</u></p> <p>1 x Novus FieldLogger 512K 1 x Mini-USB cable</p> <p>240V AC</p> <p>Supports up to 8 channels</p>	
	<p><u>Heat Flux Plates</u></p> <p>2 x Hukseflux HFP01</p> <p>5m lead</p>	<p>RED side facing out BLUE side on wall</p>
	<p><u>Internal Surface Temperature Sensors</u></p> <p>2 x RTD surface sensor including self-adhesive protective cap</p> <p>1/3 DIN (Class AA), 3-wire PT100</p> <p>5m PVC lead</p>	<p>WHITE cable</p>
	<p><u>External Surface Temperature Sensor</u></p> <p>1 x RTD surface sensor including self-adhesive protective cap</p> <p>1/3 DIN (Class AA), 3-wire PT100</p> <p>10m PVC lead</p>	<p>WHITE cable (optional extra)</p>
	<p><u>Internal Air Temperature Sensor</u></p> <p>1 x RTD probe sensor</p> <p>1/3 DIN (Class AA)</p> <p>5m Silicone lead</p>	<p>PINK cable</p>

	<p><u>External Air Temperature Sensor</u></p> <p>1 x RTD probe sensor 1/3 DIN (Class AA) 10m PVC lead</p>	<p>BLACK cable</p>
	<p><u>4G Modem</u></p> <p>1 x Teltonika TRB140 1 x Micro-USB cable 1 x Allen key for inserting SIM card</p> <p>24V DC</p> <p>* Requires SIM card and VPN for remote access</p>	
	<p><u>Power Cable</u></p> <p>1 x 5m UK power lead IEC C13 to UK plug</p>	

Wiring Diagram

Channel	1			2			3			4			5			6			7			8		
Sensor	Heat Flux 1			Surface 1			Heat Flux 2			Surface 2			-			Ext Surface *			Int Air Temp			Ext Air Temp		
Polarity	-	+	G	-	+	G	-	+	G	-	+	G	-	+	G	-	+	G	-	+	G	-	+	G
Port	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Wire																								

* If included with kit

3. Requirements & Limitations

The U-value Measurement System can be used to measure heat flow (Q) and U-values of suitable external walls, floors or ceilings subject to the following requirements and limitations:

- **Heated Envelope**
The system is designed to be installed in the heated envelope of a building. This means that the heat flux plates are attached to the internal surface of walls or ceilings.
- **Minimum 5°C Temperature Difference**
A minimum of 5°C (ideally 10°C) mean temperature difference between the internal and external ambient temperatures is required to produce an accurate U-value. The lower the temperature difference, the longer it will take to produce a valid U-value measurement.
- **Minimum 72 hrs Measurement**
The system must be left in-situ for a minimum of 72 hours. To produce a valid ISO 9869 U-value may take anywhere up to 2 weeks depending on conditions and the thermal mass of the building element being measured.
- **Wall Orientation**
Avoid measuring a surface that receives a lot of solar gains. Where possible, use a North facing, well sheltered or shaded wall.
- **Access to Outside**
The external air and surface temperature sensors need to be routed outside. Place the system within reach of an operable window that will allow the sensor cables to bypass the window seal.

4. Preparation & Installation

To enable a successful measurement, the following procedure **MUST** be adhered to:

4.1. Find suitable measurement location

Find a suitably large area of wall or ceiling that will not cause obstruction to others. A power outlet and operable window should be located within easy reach of where the system will be situated.

4.2. Check surface using thermal camera

Prior to attaching sensors, the external surface being measured should be checked using an infrared thermal camera to make sure there are no heating pipes buried in the wall or other sources of heat which will adversely affect the measurement.

4.3. Attach internal sensors

Once a suitable location has been identified, select the best mounting option for the heat flux plates. For walls, we recommend using thermal paste and affixing the heat flux plates using masking tape. For ceilings, we recommend using double sided carpet tape. See Section 5 for more information.

4.4. Attach external sensors

Route external sensors via a window/door or other possible mechanism so that they are exposed to the external ambient conditions. See Section 5 for more information.

4.5. Tidy cables

Ensure all excess cable is mounted out of the way and will not cause a trip hazard or risk to others.

4.6. Padlock case

The system is powered by a 240V AC supply. The case **MUST** be padlocked when left on its own to prevent risk of electrical shock.

5. Mounting Sensors

Optimum Layout



- The sensors should be laid out such that the heat flux plate and surface temperature sensors are within close proximity of each other as per the image above.
- The internal air temperature sensor should be mounted as close to the measurement location as feasible. Its location must be representative of the ambient temperature in the room and around the heat flux plate.

The sensor probe should be attached to the wall or other object so that it is a minimum of 10cm away from the wall or ceiling and not being cooled by the surface.

Heat Flux Plates

Attach heat flux plates to the surface using one of the following recommended methods:

Walls	Ceilings
<div data-bbox="313 373 704 632" data-label="Image"> </div> <p data-bbox="313 667 704 699">Tesa 4334 Precision Masking Tape</p> <ul data-bbox="267 737 784 968" style="list-style-type: none"> • Smear thermal paste* on to the BLUE side of the heat flux plate. • Offer up to wall and affix masking tape to the edges of the heat flux plate only. • The masking tape should overlap the heat flux plate by a maximum of 1cm leaving the centre of the plate uncovered. 	<div data-bbox="980 373 1235 632" data-label="Image"> </div> <p data-bbox="873 667 1347 699">Tesa 4939 Removable Double-Sided Tape</p> <ul data-bbox="867 737 1383 968" style="list-style-type: none"> • Cut a length of double-sided tape and attach to the BLUE side of the heat flux plate. • Peel the backing off and affix the heat flux plate to the ceiling. • Use additional masking tape to hold securely if required.
<p data-bbox="427 1045 1195 1077">Ensure no air gaps exist between the heat flux plate and the surface!</p> <p data-bbox="407 1108 1214 1140">The RED side of the heat flux plate should always be facing towards you.</p>	

Care should be taken not to damage paintwork when removing the tape.

Pull tape away from surface slowly without excess force.

* If thermal paste is not available, basic white toothpaste offers similar thermal properties and can be used as an alternative.

Other Sensors



External Air Temperature

- Route the cable outside via a window or door threshold.
- Attach securely in a well sheltered location so that the sensor is protected from direct sunlight.

If necessary, mount the sensor inside a weather shield or Stevenson screen (not supplied).



External Surface Temperature

If not feasible, the external surface sensor can be omitted and not installed.

- Route the cable outside via a window or door threshold.
- Attach securely to the wall on the direct opposite side of where the heat flux plates are located.

The method of attaching the sensor to an exterior wall will vary depending on the external surface finish. Plumbers Putty or similar provides a secure means of attaching cables directly to brickwork.

6. Configuring the Data Logger

Download Software

If this is the first time connecting to the data logger, you must download the FieldLogger Configurator software using the following link:

https://www.novusautomation.com/site/default.asp?Idioma=1&TroncolD=608027&SecaolD=549361&SubsecaolD=504609&Template=../catalogos/layout_producto.asp&ProductoID=506190

Enabling Logging

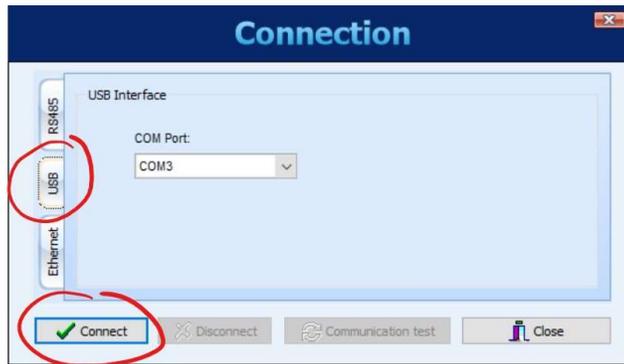
- 6.1. Connect your laptop to the data logger using the supplied Mini-USB cable.
- 6.2. Open the FieldLogger Configurator software.
- 6.3. Click 'Configuration' on the main menu:



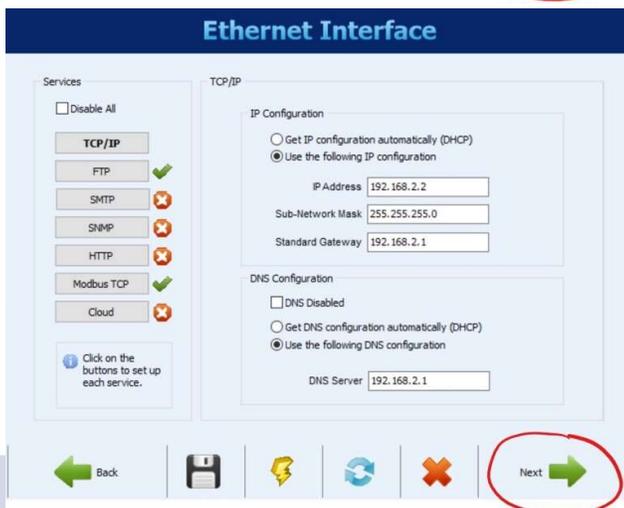
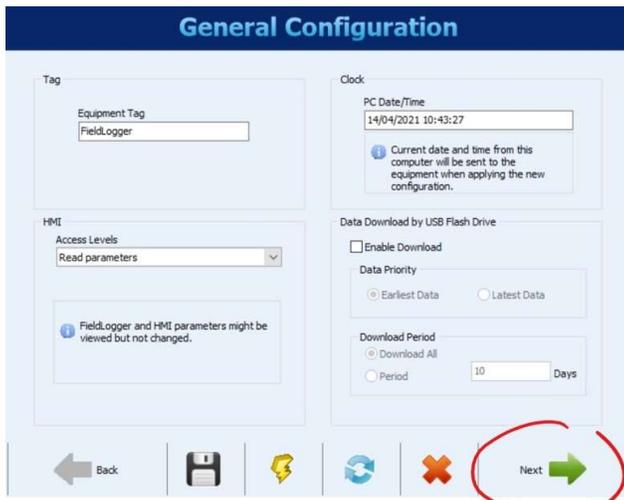
- 6.4. Click 'Read Configuration':



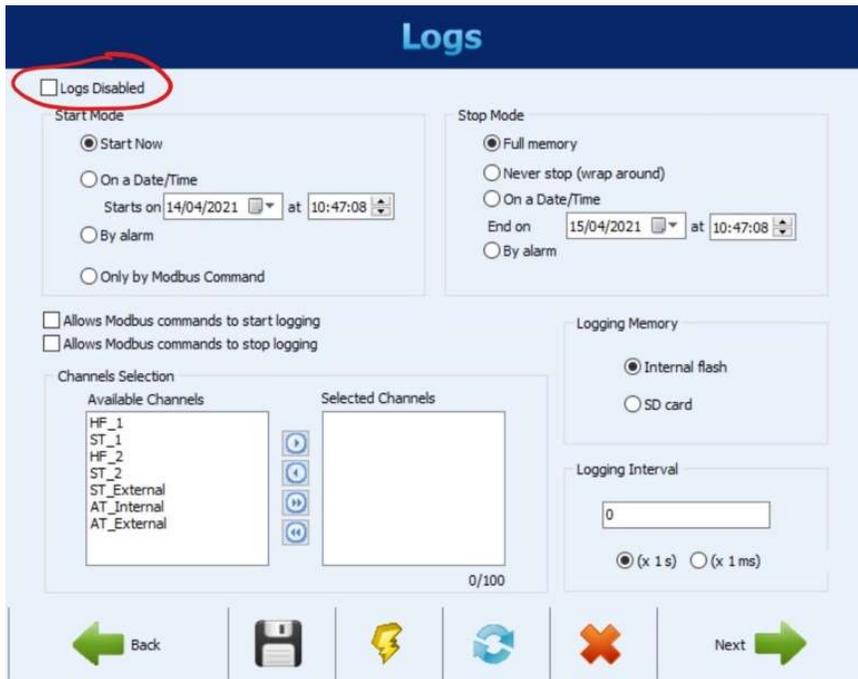
6.5. You will be prompted to connect to the data logger. Pick the 'USB' tab and select the relevant COM port (normally labelled 'FieldLogger') from the dropdown list. Click 'Connect':



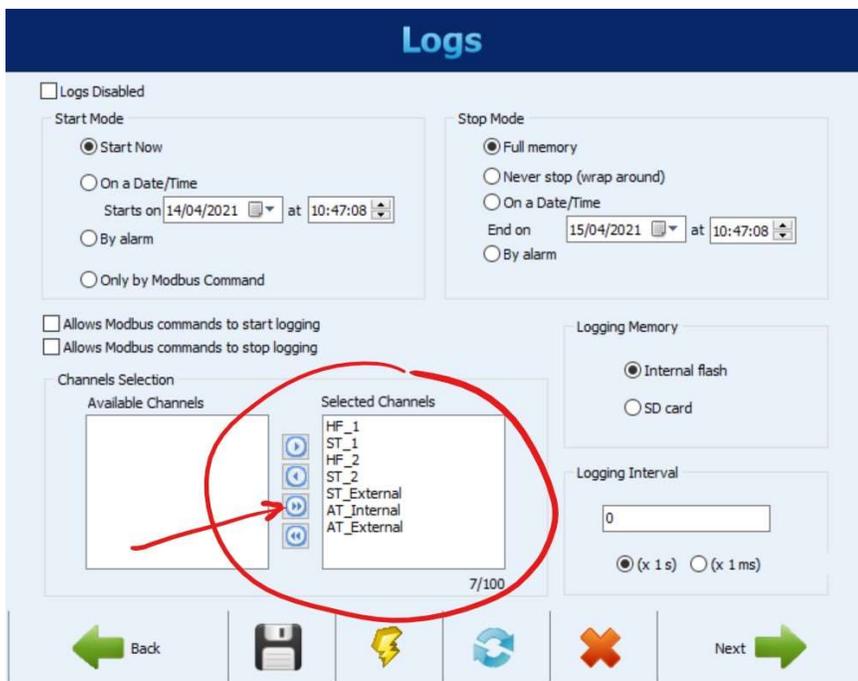
6.6. The software will present you with a series of configuration screens. Leave everything at the default value and click the 'Next' button:



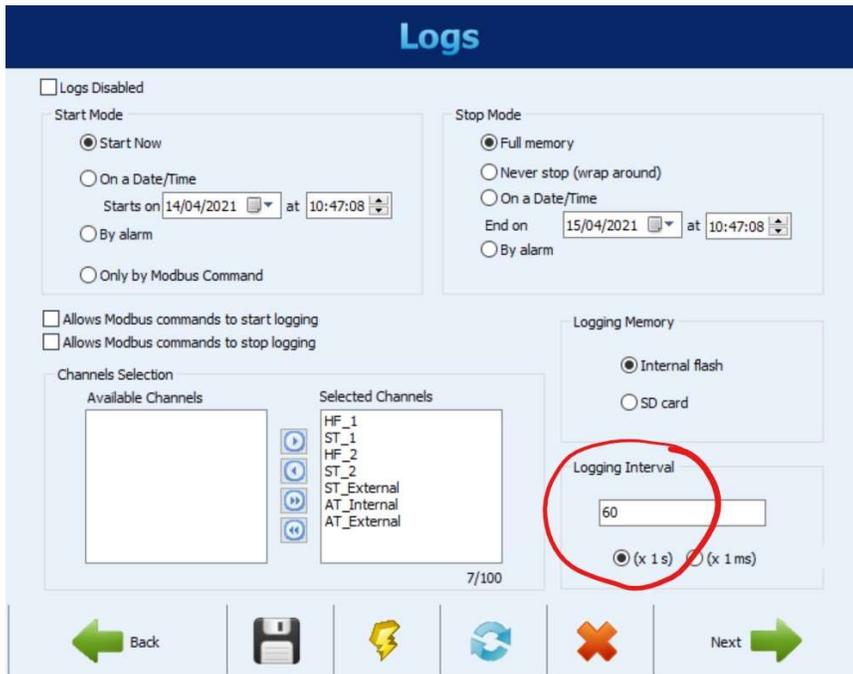
6.7. Continuing clicking 'Next' until you reach the **Logs** screen. To enable logging, untick 'Logs Disabled':



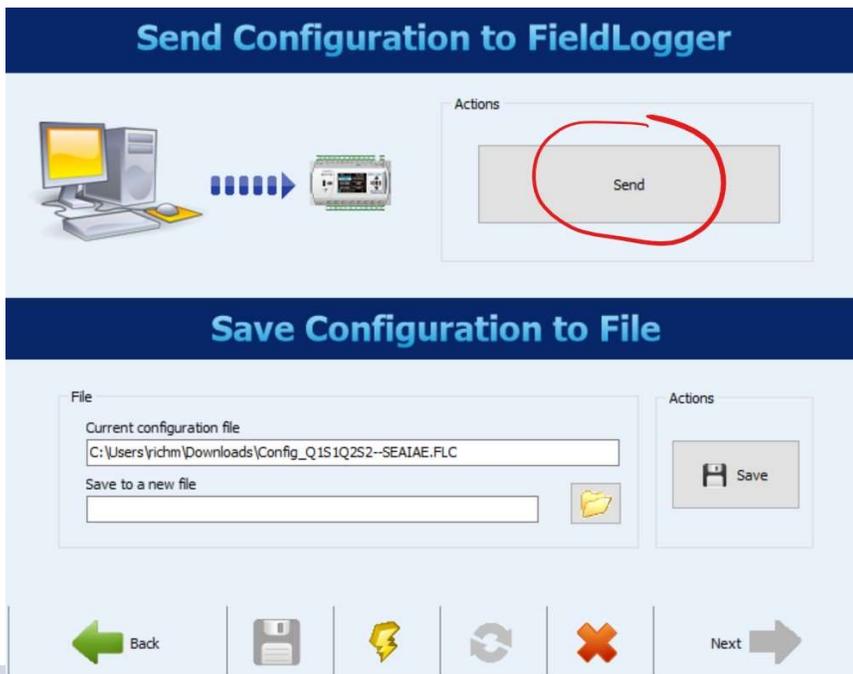
6.8. Use the double right arrow button to move all available channels to the 'Selected Channels' list:



6.9. Change the 'Logging Interval' to 60 and also tick "(x 1s)" so that the logger logs every **60 seconds** and click 'Next':



6.10. On the next screen, click the 'Send' button to transmit the settings to the data logger and enable logging:



If prompted to overwrite loggings, click 'Yes'.
 If prompted to save configuration to file, click 'No'.

6.11. The **Green** status light on top of the data logger should now be flashing.

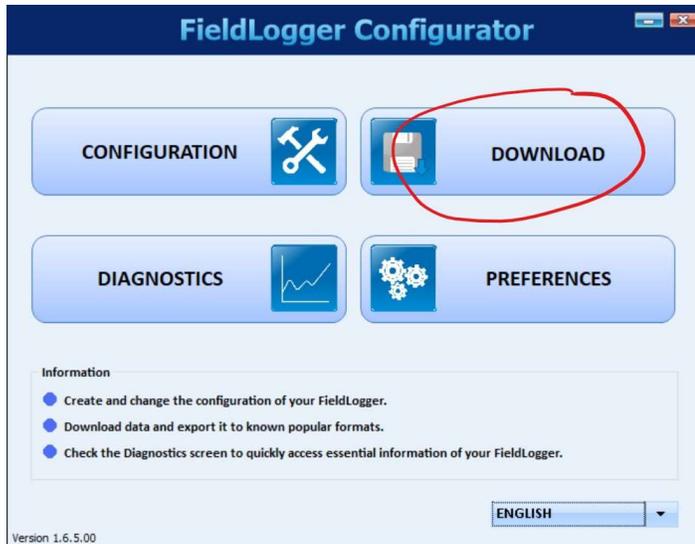
You can now disconnect the USB cable and close the software using the red X button.

Important:

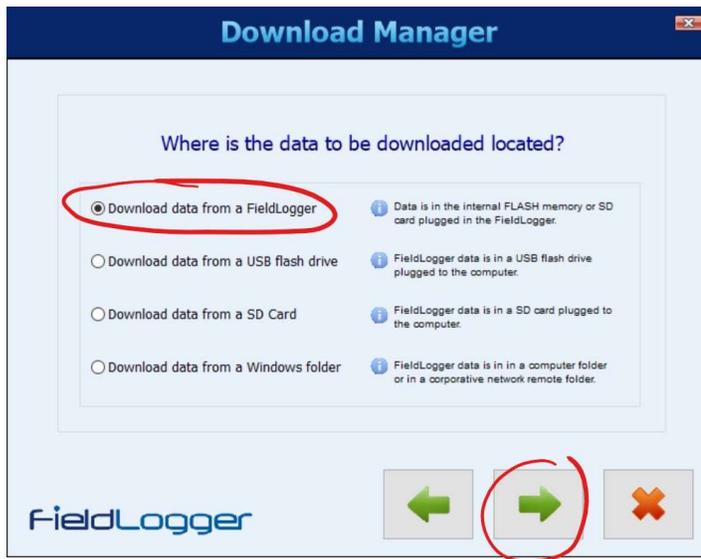
Make cables safe, padlock case and leave the system in-situ for a minimum of 72 hours.

Downloading Data

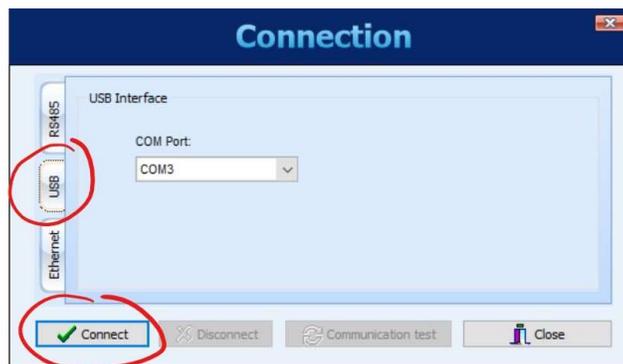
- 6.12. Connect your laptop to the data logger using the supplied Mini-USB cable.
- 6.13. Open the FieldLogger Configurator software.
- 6.14. Click 'Download' on the main menu followed by 'Download Data' on the next screen:



- 6.15. On the subsequent screen, select 'Download data from a FieldLogger' and click 'Next':



- 6.16. You will be prompted to connect to the data logger. Pick the 'USB' tab and select the relevant COM port (normally labelled 'FieldLogger') from the dropdown list. Click 'Connect':



Follow the process through and save the data to a destination folder of your choice.

Allow the software to download the data which may take a few minutes.

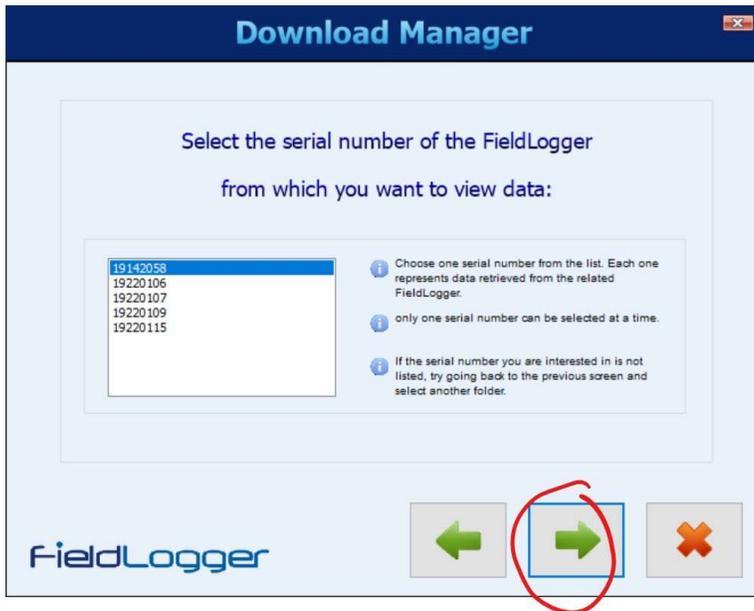
- 6.17. After the data has been downloaded, you will be taken to the **Download Manager** screen. Select 'EXPORT data to a file' and click 'Next':



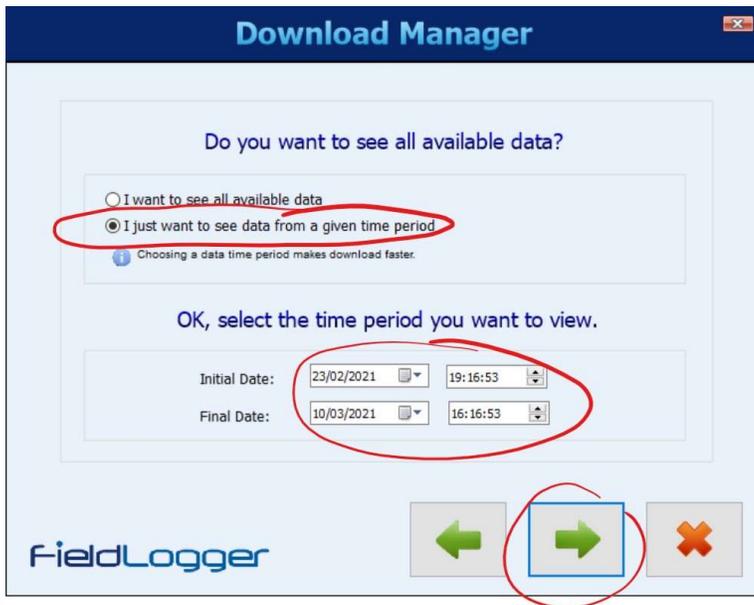
- 6.18. Make sure the database folder is set to the same folder where you saved the data to and click 'Next':



6.19. If not already selected, highlight the serial number of the FieldLogger that you are connected to and click 'Next':



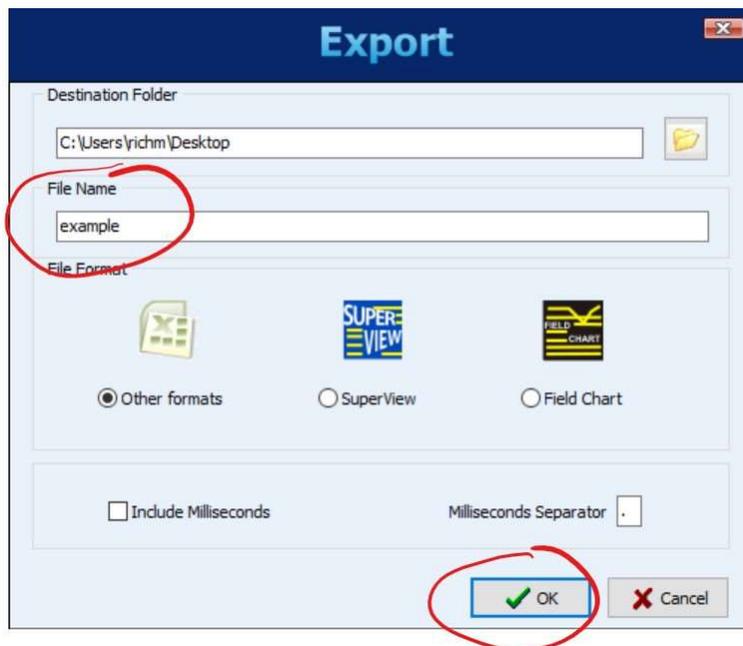
6.20. Either download all data or enter the time period that you would like to download data for:



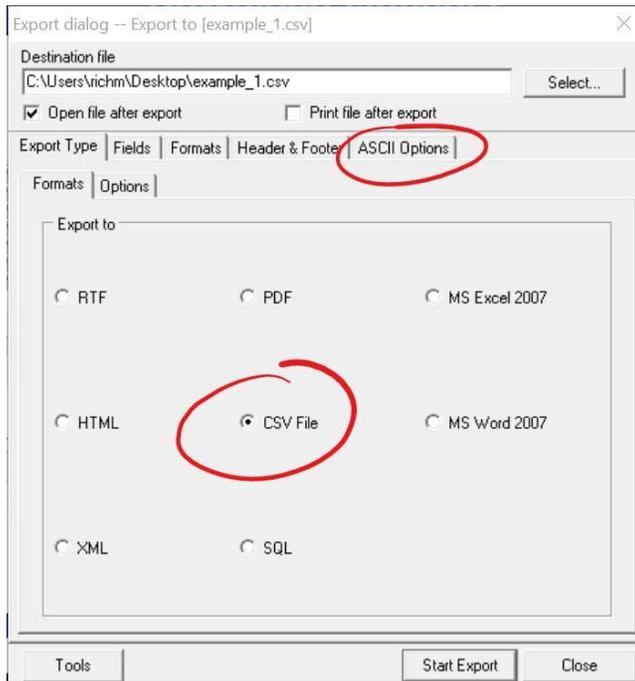
- 6.21. Make sure all channels are marked for export.
Important: change the number of decimal places to '06' before clicking 'Next':



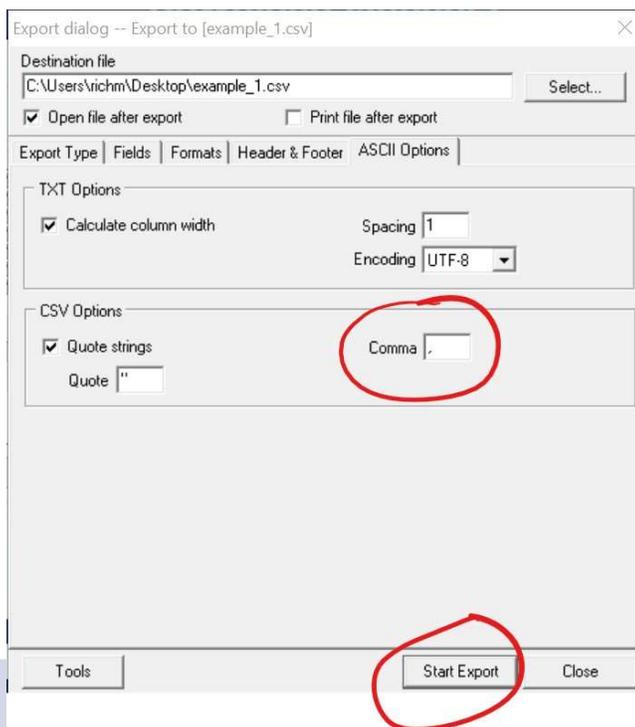
- 6.22. Choose a file name to export the data to and click 'OK':



- 6.23. After the data has been processed, the **Export dialog** will appear. Select 'CSV File' before moving to the 'ASCII Options' tab:



- 6.24. On the 'ASCII Options' tab, change the character used as a CSV separator to a comma ',' instead of the default semi-colon and click 'Start Export':



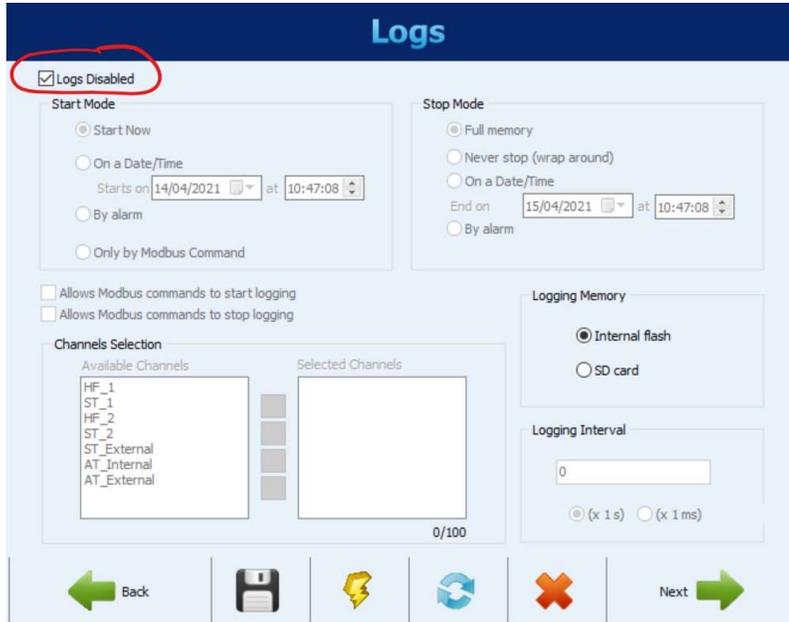
- 6.25. The export will now start and may take a while. Once complete, the CSV file will be automatically opened in Microsoft Excel (if installed).

At this point, you can close the software by clicking the 'Close' in the dialog box and the red X button on the download screen:

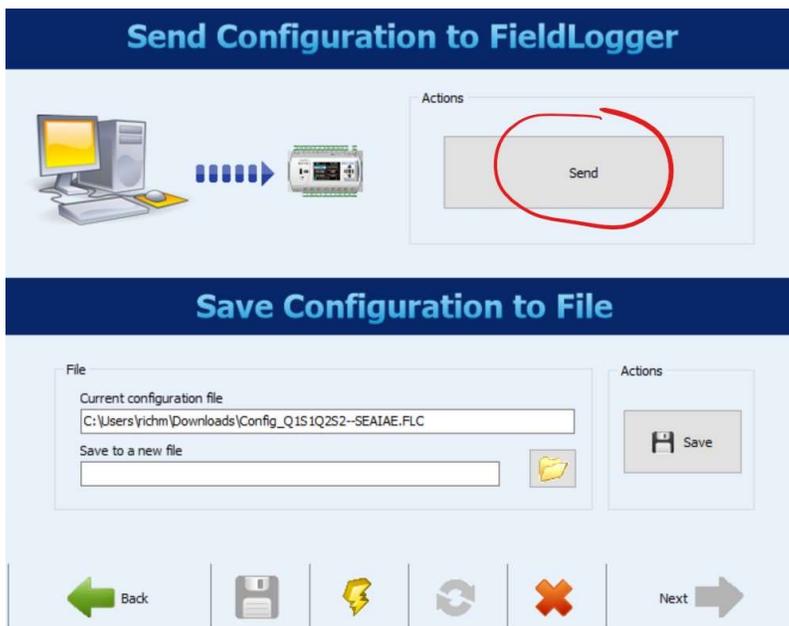


Disabling Logging

- 6.26. Once you have finished measuring U-value, you need to disable logging.
- 6.27. Follow steps 6.1 to 6.6 to connect to the data logger and reach the **Logs** screen.
- 6.28. On the **Logs** screen, tick 'Logs disabled':



- 6.29. Click 'Next' and then 'Send' the settings to the FieldLogger:



You can now safely turn off power to the U-value Measurement System and remove all sensors.



Contact

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