

# SurveyTag User Guide



## Microclimate Logger MC-01 with 0.075mm K-type thermocouple

[www.surveyttag.co.uk](http://www.surveyttag.co.uk)

## Warning – to keep water out of the unit:

- Make sure the **cable gland** is tightly closed on the thermocouple tube.
- Ensure the **end cap** with o-ring is done up firmly by hand so it seals well (but not so tight that the o-ring is pushed out).
- Use the **silica gel** sachet provided inside the unit to absorb any moisture from the air entering when the unit is opened.
- Check the screen window has not been damaged or pierced by sharp items.

## Warning – fragile thermocouple

- By design, the thermocouple is extremely delicate and while the ultrafine wires are flexible, care needs to be taken in handling it – always fit the yellow protective tube unless it is actually logging.
- Think about how the unit will be protected in-situ from insects and animals and the impact of weather on it, including snow, ice and hail.
- If it does get broken, please get in touch as we can replace the thermocouple or supply one for you to fit.



**End cap**

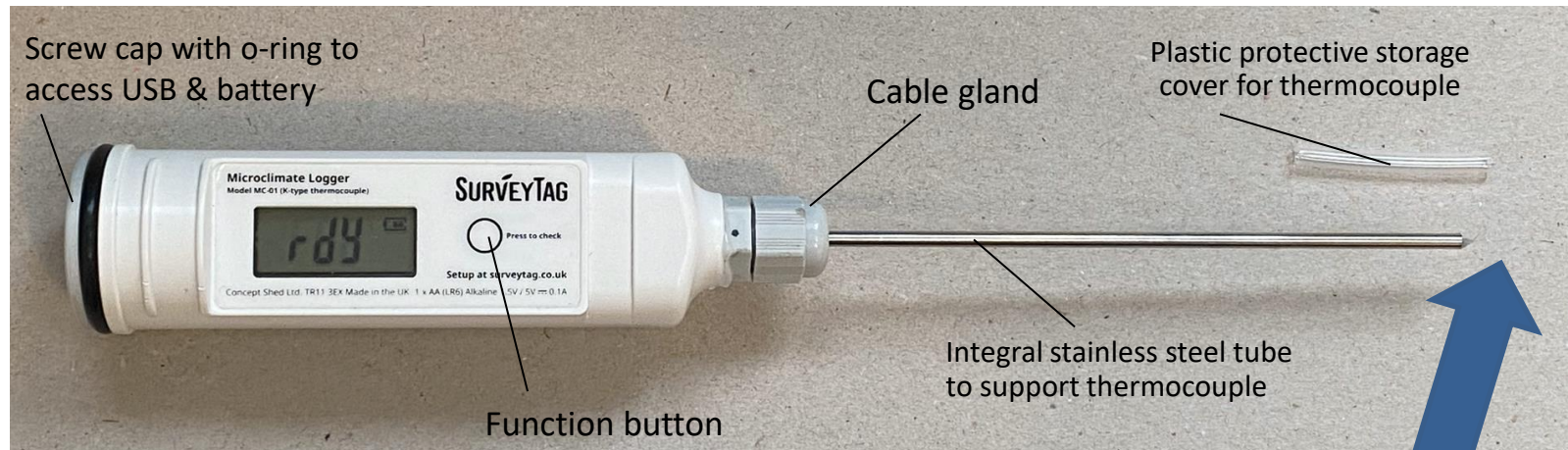


**Loose**

**Cable gland**

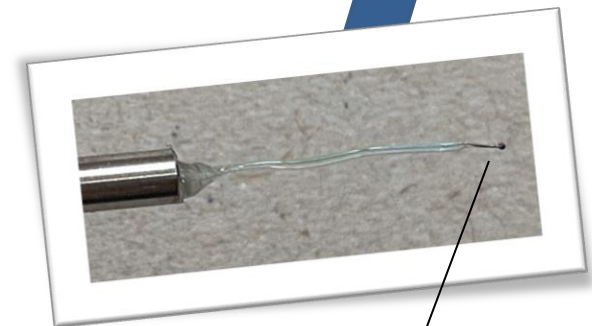


**Tight**



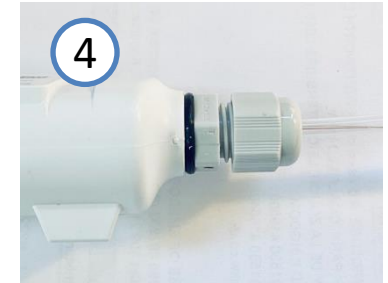
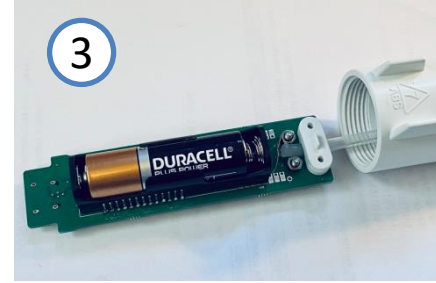
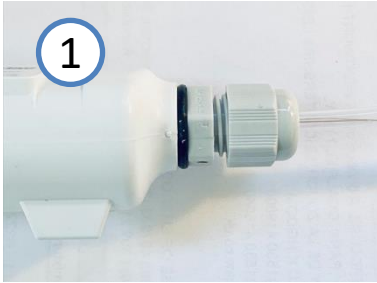
## To use the logger, you will need:

- 1 x AA (LR6) alkaline battery (please get in touch to discuss using rechargeable or lithium).
- A USB-C cable to connect it to your computer.
- A computer with a USB port.
- The [SurveyTag installer Windows application](#).



Fine wire 0.075mm thermocouple junction at end (lacquered)

# Changing the Battery



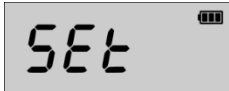
1. **IMPORTANT: Loosen the cable gland to allow the thermocouple tube to move freely,**
2. Unscrew the access cap.
3. **Gently** withdraw the circuit board ensuring the **thermocouple tube can freely pull through the cable gland.** Access the battery and replace with a new 1.5v AA battery. **CHECK POLARITY.** It may be useful to label the battery with the install date. Carefully slide the circuit board back on its rails into the enclosure while **gently** pulling the thermocouples tube through the cable gland.
4. **Re-tighten the cable gland** firmly on the thermocouple tube to ensure a **watertight** seal.
5. Connect USB to a computer to reset the date and time and configuration.
6. Replace the silica gel desiccant sachet back inside the enclosure, if it came out with the circuit board.
7. Refit the access cap and **tighten firmly by hand.**

Note: Removing or replacing the battery when the unit is not connected to USB power will cause the real timeclock to reset and will require the logger to be set up again via USB.

## The SurveyTag Display



**Storage mode** – press the button to see / check the current temperature. Connect to USB to set-up time, date & logging mode or to send unit to sleep.



**Set mode** – shows when first powered up. Connect to USB to set-up time, date and logging parameters.



**USB mode** – shows the USB cable is plugged into the unit.



**Ready mode** – Waiting for a button press to start logging using the parameters set via USB. Note the time and date have to be set to enter this mode.



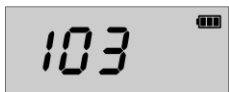
**Log mode** – shows the unit is logging. Each time it wakes and stores a reading, it will show the temperature on the display momentarily. If you wish to know / test the temperature reading during logging, press the button and it will display a reading, but without storing it or disrupting the logging.



**Temperature display** – Shows the temperature in degrees C. This may be a single measurement or the average of a number of samples in burst reading, depending on the configuration.



**Battery flat** (below approx 0.95 volts), logging was stopped to protect the data. Connect to USB power to clear the screen and replace the battery.



**Time (clock)** Displays time when in timed start mode. Note the display does not have enough digits to display 24hr format, so time may look a little odd. This shows 13:03 (or 01:03).



The battery symbol shows battery state (voltage) in three segments. The symbol shown with 3 black segments is a full battery. No segment shown indicates the battery is below a useable voltage. Note if using a rechargeable (NiMh) battery, it will only display a maximum of two segments.

NEW

**SURVEYTAG**<sup>TM</sup>

## Connecting the SurveyTag unit to a computer (Windows 10 / 11)



Unscrew the cap from the unit and insert the USB-C connector using a USB-C cable. Connect the other end of the cable to a USB port on your computer. The logger should show 'USB' on the display. IF THE LOGGER SCREEN DOES NOT SHOW ANYTHING, DISCONNECT & ENSURE BATTERY POLARITY IS CORRECT BEFORE RECONNECTING.

For Windows users:

Go to <https://surveytag.co.uk/setup/> and download the latest version of the SurveyTag Installer.

Downloaded the .exe file and run as an administrator to install it. Once installed, you will not need admin rights to run it.

We are working on a macOS version. Please get in touch if you need.

# Running the SurveyTag Windows Software

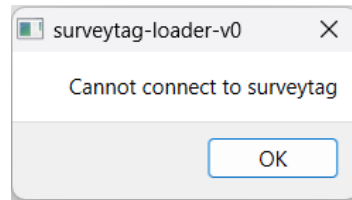


Run the SurveyTag software you have installed. It should open a window like the one shown here.

**Connect** a Surveytag unit to your computer via USB

Click **Find Surveytag**, a message will now be visible in the window showing **COMxx probably a Surveytag**, click on this message so it is highlighted and then click **Connect**.

**NOTE:** If you have connected to a survey tag, you should see the version and name of the Surveytag, if you have not connected you will be greeted by a warning as such:

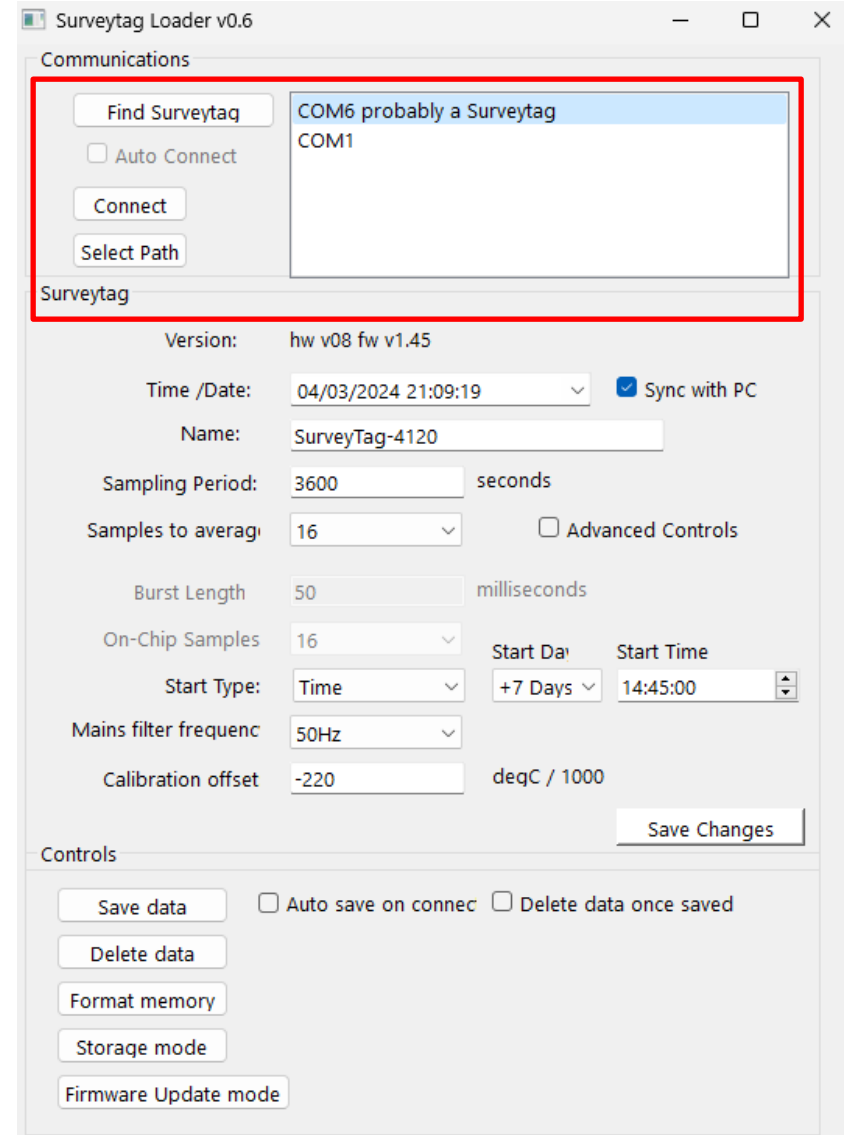


**Select Path** – if you are reading data off the unit, click **Select Path** to choose the folder that the results are saved in. If you don't, it will default to a system folder you may not have access to. You only need to do this once as long as the SurveyTag software window is open.

Once connected you can amend the settings of the surveyTag through the input boxes and drop-down lists.

After changing the settings, click **Save Changes** to put these changes into effect.

Do not unplug the SurveyTag unit immediately as it takes a few seconds for the settings to be downloaded.



# Time and sample setting - SurveyTag Software



Always click 'Save Changes' after changing settings.

**Set Time and Date** – Tick the **Sync with PC** check box. Alternatively it can be set manually.

**Name** – Shows the SurveyTag serial number. You can rename it with numbers and letters, but it is sensible to keep the serial number at the start of any new name as this matches the barcode on the case of the unit.

**Sampling Period (in seconds)** – How often the unit should wake up to take a reading or burst of readings. Typically this would be set to 3600 seconds, meaning the logger will wake every hour to take a reading. It can be set down to log every 10 seconds or so, but be aware this will use the battery up in only a few days and store a huge amount of data.

**Samples to Average** – This defines how many readings the unit should take when it wakes, 1 is a single reading, anything higher is a high speed burst of readings that are taken and then averaged together, with the result being stored as a single reading. Note, the more samples you take, the longer it takes and the more power is used, affecting battery life.

The screenshot shows the 'Surveytag Loader v0.6' software interface. The 'Communications' section includes buttons for 'Find Surveytag', 'Auto Connect', 'Connect', and 'Select Path', along with a list of COM ports where 'COM6 probably a Surveytag' is selected. The 'Surveytag' section, highlighted with a red box, contains the following settings: Version: hw v08 fw v1.45; Time /Date: 04/03/2024 21:09:19 (with a 'Sync with PC' checkbox checked); Name: SurveyTag-4120; Sampling Period: 3600 seconds; Samples to average: 16; Burst Length: 50 milliseconds; On-Chip Samples: 16; Start Type: Time; Start Date: +7 Days; Start Time: 14:45:00; Mains filter frequenc: 50Hz; Calibration offset: -220 degC / 1000. A 'Save Changes' button is located at the bottom right of this section. The 'Controls' section at the bottom includes buttons for 'Save data', 'Delete data', 'Format memory', 'Storage mode', and 'Firmware Update mode', along with checkboxes for 'Auto save on connect' and 'Delete data once saved'.



Always click 'Save Changes' after changing settings.

## Start Type –

- **Button** start allows you to manually start logging when you press the button on the SurveyTag once setup. This is useful to start a unit logging that you set up earlier on the computer.
- **Immediate** starts the unit logging as soon as you have set it up and unplugged it from USB.
- **Time** start allows you to specify the time the unit should start logging once set up and unplugged. You can also choose the day from a drop-down from today to +7 days. This is useful when you have a number of loggers that you wish to set logging at the same time.

**Mains filter frequency** – Allows you to set a filter to reduce potential noise / interference from mains electricity. Use 50Hz for UK and 60Hz for the USA, check your region specific mains frequency if needed.

**Calibration offset** – A single point calibration offset set when we first attached the thermocouple to the logger, taken at room temperature. If you do your own calibration in the temperature range of interest, you can update this value.

**Save Changes** – Click this after updating any settings, for them to be applied to the logger. Note it can take 3 or 4 seconds for the settings to be transferred, so avoid disconnecting the USB immediately, the save changes turns green after a short delay as a reminder to wait.

Surveytag Loader v0.6

Communications

Find Surveytag  Auto Connect

Connect

Select Path

COM6 probably a Surveytag  
COM1

Surveytag

Version: hw v08 fw v1.45

Time /Date: 04/03/2024 21:09:19  Sync with PC

Name: SurveyTag-4120

Sampling Period: 3600 seconds

Samples to average: 16  Advanced Controls

Burst Length 50 milliseconds

On-Chip Samples 16 Start Date Start Time

Start Type: Time +7 Days 14:45:00

Mains filter frequency 50Hz

Calibration offset -220 degC / 1000

Save Changes

Controls

Save data  Auto save on connect  Delete data once saved

Delete data

Format memory

Storage mode

Firmware Update mode

## Reading data - SurveyTag Software



When reading data, always make sure you have clicked **Select Path** when opening the SurveyTag software to specific the folder results are to be saved to.

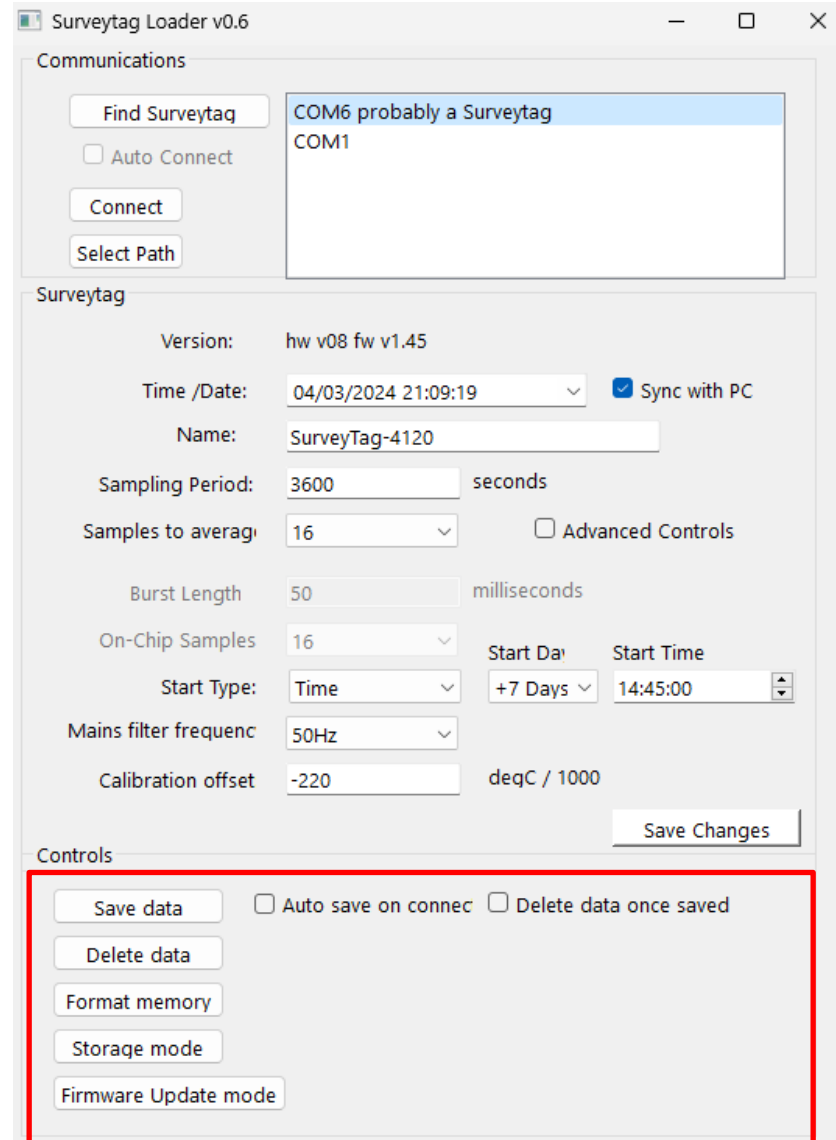
**Save Data** - To Save data stored on the SurveyTag logger, to your computer from the Survey tag, make sure you have previously clicked on **Select Path** to specify a path where the file will save to, then click on **Save data**. A csv file of the results will be saved to the selected folder. The file name will include the Name of the logger (typically its serial number).

**Delete Data** - To delete logged temperature data, click **Delete data**. This will not delete any settings or name.

**Format Memory** – WARNING, you generally don't need to do this, unless there is an issue. It will DELETE ALL LOGGED DATA AND ALL USER SETTINGS INCLUDING CALIBRATION OFFSET AND NAME / SERIAL NUMBER. The logger assigns itself a random, (but not unique) serial number on being formatted, so you will need to re-enter a name (typically SurveyTag-xxxx, where xxxx is the serial number shown on its case).

**Storage Mode** – To store device in low power mode (turns off the real time clock) when the device still has a battery inserted , click **Storage mode**. Typically this is not needed as it is recommended to remove the batteries from devices not being used for a long period.

**Firmware Update Mode** – If you need to update the logger firmware, this button will put it in update mode, ready for a new firmware version to be installed using STMCube via USB.



## Looking at the Logged Data CSV File results

Open the folder that you selected to save the data too and open the csv file in Excel or your chosen application. The header row will show the logger name and settings. Below that there is a data header and the data.

- **TC\_Reading** is the thermocouple reading in degrees C that you want.
- **CJ\_Reading** is taken from an internal temperature sensor on the circuit board (the cold junction temperature) and used to compensate for the thermocouple to circuit board connections. It can be useful as a reference to see the temperature inside the logger.
- **vBatt** is the voltage of the AA battery. Typically for a new battery it will read around 1600mV = 1.6V. Anything below 1.2V and you should consider replacing the battery. If setting up for a long duration of logging, a fresh battery is recommended.
- **Samples** shows how many samples the logger managed to take, average and store as a single reading when it woke. Often it manages to take more readings set, but should not take fewer.

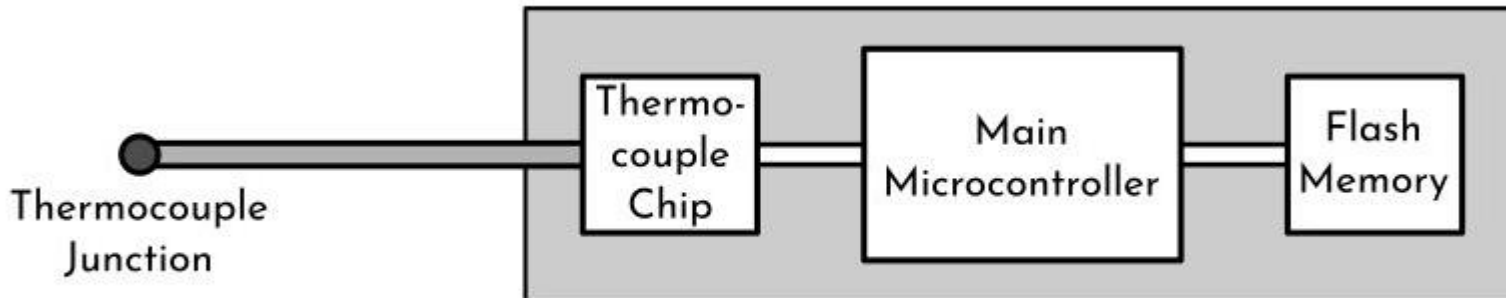
|    | A              | B                  | C             | D            | E               | F                  | G               | H                   | I     | J       | K          |
|----|----------------|--------------------|---------------|--------------|-----------------|--------------------|-----------------|---------------------|-------|---------|------------|
| 1  | Logger Name    | Samples to average | Sample Period | Burst Length | On-Chip Samples | Calibration Offset | Mains Frequency | Set Time            |       |         |            |
| 2  | SurveyTag-4120 | 16                 | 10            | 50           | 16              | -220               | 50              | 2024-03-04 21:59:11 |       |         |            |
| 3  |                |                    |               |              |                 |                    |                 |                     |       |         |            |
| 4  | Year           | Month              | Day           | Hour         | Minute          | Second             | TC_Reading      | CJ_Reading          | vBatt | Samples | Fault_Code |
| 5  | 2024           | 2                  | 7             | 15           | 12              | 59                 | 20.45312        | 25.01562            | 1609  | 16      | 0          |
| 6  | 2024           | 2                  | 7             | 15           | 13              | 4                  | 20.375          | 25.01562            | 1600  | 16      | 0          |
| 7  | 2024           | 2                  | 7             | 15           | 13              | 9                  | 20.42188        | 25.01562            | 1603  | 16      | 0          |
| 8  | 2024           | 2                  | 7             | 15           | 13              | 14                 | 20.59375        | 25.09375            | 1604  | 16      | 0          |
| 9  | 2024           | 2                  | 7             | 15           | 13              | 19                 | 20.00781        | 25.17188            | 1606  | 16      | 0          |
| 10 | 2024           | 2                  | 7             | 15           | 13              | 24                 | 19.96094        | 25.21875            | 1603  | 16      | 0          |
| 11 | 2024           | 2                  | 7             | 15           | 13              | 29                 | 19.88281        | 25.26562            | 1604  | 16      | 0          |
| 12 | 2024           | 2                  | 7             | 15           | 13              | 34                 | 19.83594        | 25.3125             | 1606  | 16      | 0          |
| 13 | 2024           | 2                  | 7             | 15           | 13              | 39                 | 19.71875        | 25.34375            | 1598  | 16      | 0          |
| 14 | 2024           | 2                  | 7             | 15           | 13              | 44                 | 19.55469        | 25.26562            | 1605  | 16      | 0          |
| 15 | 2024           | 2                  | 7             | 15           | 13              | 49                 | 19.55469        | 25.39062            | 1602  | 16      | 0          |
| 16 | 2024           | 2                  | 7             | 15           | 13              | 54                 | 19.5            | 25.42188            | 1595  | 16      | 0          |
| 17 | 2024           | 2                  | 7             | 15           | 13              | 59                 | 19.4375         | 25.46875            | 1603  | 16      | 0          |
| 18 | 2024           | 2                  | 7             | 15           | 14              | 4                  | 19.46875        | 25.54688            | 1599  | 16      | 0          |
| 19 | 2024           | 2                  | 7             | 15           | 14              | 9                  | 19.42188        | 25.54688            | 1606  | 16      | 0          |
| 20 | 2024           | 2                  | 7             | 15           | 14              | 14                 | 19.48438        | 25.65625            | 1599  | 16      | 0          |
| 21 | 2024           | 2                  | 7             | 15           | 14              | 19                 | 18.28906        | 25.73438            | 1597  | 16      | 0          |
| 22 | 2024           | 2                  | 7             | 15           | 14              | 24                 | 16.5625         | 25.65625            | 1603  | 16      | 0          |
| 23 | 2024           | 2                  | 7             | 15           | 14              | 29                 | 18.375          | 25.65625            | 1600  | 16      | 0          |
| 24 | 2024           | 2                  | 7             | 15           | 14              | 34                 | 18.17969        | 25.65625            | 1600  | 16      | 0          |
| 25 | 2024           | 2                  | 7             | 15           | 14              | 39                 | 18.3125         | 25.57812            | 1604  | 16      | 0          |
| 26 | 2024           | 2                  | 7             | 15           | 14              | 44                 | 18.25781        | 25.57812            | 1599  | 16      | 0          |
| 27 | 2024           | 2                  | 7             | 15           | 14              | 49                 | 18.23438        | 25.42188            | 1601  | 16      | 0          |
| -- | ---            | --                 | --            | --           | --              | --                 | ---             | ---                 | ---   | --      | --         |

## How the logger works

The voltage generated by the thermocouple junction (the temperature sensor) is measured by a dedicated thermocouple chip. This chip has high speed on-board averaging and can be set to take 1, 2, 4, 8 or 16 readings and then pass the resulting single averaged reading to the logger's software that runs on the main microcontroller.

The logger sleeps most of the time to save power. It wakes up every **Sample Period** seconds and stays awake for **Burst Length** seconds, repeatedly requesting the averaged readings from the thermocouple chip. The longer it is awake for, the more of the averaged readings it takes. Finally before going back to sleep, the logger averages all the readings together into a single value and stores it in the flash memory chip along with the date and time.

Battery life is dependent on how long the logger is awake for, effectively set by **Burst Length**. Use our [Battery Life Estimator tool](#) to work out the number of samples you need and approximate battery life.



# Technical Specification

## Storage Capacity

The size of the on-board memory is 32 megabytes, with 16 megabytes accessible currently (a future firmware update will be available to access the full 32 megabytes). The 16 megabytes is enough for approx. 500,000 temperature readings.

## Output Data Format

The output data written to the terminal is in CSV format.

## vBatt (shown in logged data)

Battery voltage in millivolts. 1000 = 1v. Typically a new Alkaline battery is around 1600mV. The unit will operate down to 950mV. At this point the battery is considered exhausted and the unit will shut off to protect the data. The screen will display 'bAt' until you connect the USB cable. See the [Battery Life Estimator tool](#) on our website for more details.

## Samples (shown in logged data)

The number of readings that went into the sample.

## Fault Code (shown in logged data)

A number representing a bitfield of fault codes, as follows: (individual values are summed to create the fault code number)

- 1 = Thermocouple open circuit (note: currently this fault is reported as Thermocouple out of range, see below)
- 2 = Over or Under voltage on thermocouple input. This will happen if external voltage is applied to the thermocouple
- 6 = Thermocouple temperature out of range (this is reported when the thermocouple is not connected)
- 7 = Cold junction temperature out of range (-55°C to +125°C for types E, J, K, N, and T; -50°C to +125°C for types R and S; 0 to 125°C for type B).

## Battery Type & Life

1 x 1.5v AA (LR6) alkaline or AA lithium battery. Rechargeable NiMh cells will also work, but will initially show only two segments in the battery icon. **Battery Life:** Variable depending on logging frequency, but up to 1 year. The more often the units wakes to take readings and the more samples it takes in a burst, the more battery power is consumed. By taking a burst of readings every 5 seconds, you can use an AA battery in only a day. Get in touch if you would like to discuss the details. The intended use of the unit is to log a few times an hour over a few months. See the [Battery Life Estimator tool](#) on our website for more details.

**Weight:** approx. 100 grams including AA battery, cap, TC tube and TC cover. **Dimensions (approx)** Logger 140mm long plus 140mm for the thermocouple tube and junction (total length 280mm for stainless steel tube version). Approx 45mm diameter including feet.

## Thermocouple specification

The unit is currently fitted with a K type 0.075mm thermocouple with an exposed junction. The thermocouples are supplied by Labfacility. We apply a small amount of UV detectable lacquer to the exposed junction to reduce corrosion.

**Country of Origin: UK** Manufactured and assembled in Bristol & Cornwall.

## Repair & Disposal

Please return unwanted & faulty units to us at the address shown on the contact page, stating if you would like a repair or no longer require the unit. We are able to repair and recondition most units or reuse the components themselves.

## Hardware versions

June 2021 – Prototype version 01 (with microSD card)

Oct 2021 – Prototype version 02 (with internal flash)

Nov 2021 – added integral thermocouple support tube.

March 2022 – Prototype version 04 with full USB-C support and injection moulded enclosure.

May 2022 – Production version 05. (Sept 2022 upgraded o-rings).

2023 - Current version 08 hardware.

**Current firmware version:** Feb 2024 v1.45

UK  
CA

CE



## Support & Contact details

[www.surveytag.co.uk](http://www.surveytag.co.uk)

Concept Shed Ltd  
1 The Old Lemonade Factory  
Falmouth TR11 3EX  
United Kingdom  
+44 1326 316536