
TuberLog

INSTRUCTION MANUAL and USER GUIDE



Version 1.1

Distributed worldwide by

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Introduction to *TuberLog*

TuberLog is a powerful quality control tool which assists in the drive towards high quality bruise-free potato production. It identifies damage and bruise-causing areas in all types of potato handling machinery from the harvester to the packing line.

TuberLog is an acceleration measurement device which records impact forces received while moving with real potatoes during harvesting and processing and locates damage and bruise-causing parts of machinery (including washers). It comprises a data logger embedded in a synthetic shape designed to mimic the size, shape and density of a ware potato.

The *TuberLog* data logger records impacts and temperature values during each measurement. The data can be stored in the logger itself or transferred by USB connection or Bluetooth to a PC or laptop where it can be stored and analysed using the software supplied.

TuberLog is powered by a rechargeable battery which is charged by connecting to the USB interface of a computer or with the USB charging kit supplied.

TuberLog should be used regularly so that bruising problems caused by poor machine maintenance or incorrect settings can be detected quickly. Machine settings are often changed, but the effects on bruising may not be realised. A quick check with *TuberLog* can make sure. Different varieties or the same variety at different temperatures can bruise at different impact levels. In conjunction with bruise testing *TuberLog* can help to ensure bruise-free working and provide peace of mind that quality standards are being maintained.

TuberLog will not indicate bruise levels in real potatoes and may not always discover all the sources of damage and bruising in potato handling machinery. But with experience the user can interpret information given by *TuberLog* which will go a long way towards eliminating quality problems in potato production.

The *TuberLog* allows data to be viewed in real-time via Bluetooth interface on Android tablet or smartphone.

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IMPORTANT

To use the *TuberLog* with the PC software, please follow the instructions in Section A, page 4.

If you have purchased the *TuberLog^{PLUS}* (PTR400), please follow the instructions in Section B, page 18.

If you have purchased the *TuberLog^{EXTRA}* (PTR500), the Android App will arrive pre-loaded on to your Samsung tablet. Please follow the instructions in Section C, page 34.



This instruction manual is available in the following languages on the USB/memory drive supplied:



Ce manuel est disponible dans les langues suivantes sur la Lecteur / mémoire USB fourni:



Diese Bedienungsanleitung ist in folgenden Sprachen verfügbar auf der USB / Speicherlaufwerk geliefert:



Este manual de instrucciones está disponible en los siguientes idiomas en la Unidad USB / tarjeta de memoria suministrada:

English

Deutsch

Français

Español

Section A

TuberLog

PC Software

Section A

***TuberLog* Instruction Manual Contents**

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A.1. Initial set-up of **TuberLog**

A.1.1 Equipment supplied

- Potato shape data logger including two sealing caps
- USB Memory Stick containing this manual and the data logger software
- USB connection and charging cable
- Bluetooth USB adapter
- USB charging kit

A.1.2 Install the software before connecting the data logger

Insert the USB Memory Stick into a USB port on the PC or laptop. A window should automatically appear on the screen with several options. Click on **Open folder to view files using Windows Explorer**. Click on the file **PTR300** and then select **PC Software**. Click on the file **setup.exe** and follow the installation instructions displayed for the software and the USB driver installation. After installation of the software, you may find it useful to create a shortcut on the PC desktop. Drag the **TuberLog** potato symbol directly onto your desktop from the program list attached to the Start menu of your PC or laptop.

A.1.3 Communication between the data logger and the computer

The data logger can communicate with the PC to start measurements and download data via a USB interface, using the connection cable supplied, or via a Bluetooth connection, using either the built-in Bluetooth interface (present in most modern PC, laptop or notebook computers) or the Bluetooth USB adapter supplied.

Connect the data logger to the PC using the USB cable. The first time the connection is made the USB driver supplied will be installed automatically.

If Bluetooth functionality is already present this will be switched on automatically when the data logger is connected using the USB cable. For existing or internal Bluetooth adapters, the installed driver software must be able to support *Microsoft Bluetooth Stack*. If the Bluetooth adapter is required it should be installed in a USB port. It will be installed automatically with the Windows embedded drivers. The Bluetooth icon should appear in the task tray. Right click on the icon and select **Add device**. A list of available Bluetooth-enabled devices will appear. Select **TuberLog** and enter the pairing code (default: 1234) so that the data logger is recognised.

A.1.4 Charging the data logger battery

The data logger operates using an inbuilt rechargeable battery which can be charged via the USB interface of a computer using the connection cable or with the charging kit supplied. Data that has been saved in the data logger is not lost when the battery is empty but care should be taken that the battery has adequate charge for measurement and data download. The charge level is indicated on the screen whenever the data logger is selected for use (see A.2.1).

Battery life is determined by how the data logger is started. After fully charging the battery it will last for about one month if the *Vibration Sensor Mode* in *Bluetooth Settings* (see A.2.2) is set to *Activation by Shake* or *Always Off*. If the mode is set to *Always On* the battery will last for about 4 days without use or about 10 hours if **TuberLog** is used continuously.

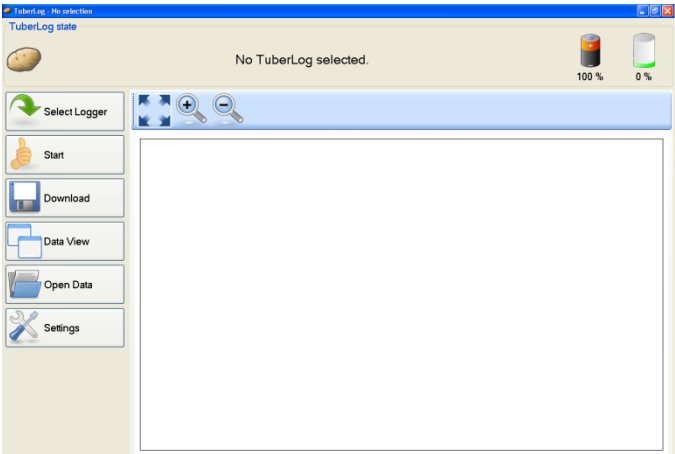
A.1.5 Software settings

The operating and download settings of the data logger are set by the user. If repeated measurements are being made on the same machinery with the same potato variety in the same growing season it is not likely that these settings will need to be changed very often. The settings can only be changed once the data logger has been selected (see A.2.1).

A.2. Taking measurements with *TuberLog*

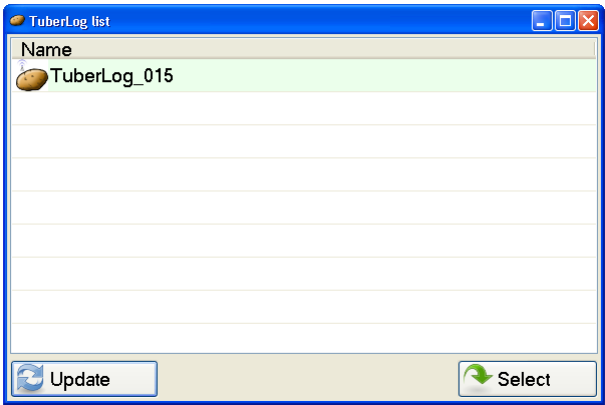
A.2.1 First steps

When the *TuberLog* software is started the following screen will appear:



Ensure that the data logger is connected to the computer by the USB cable or is able to communicate over the Bluetooth interface. If you are using the Bluetooth interface, gently knock the data logger on a hard surface or shake it in your hand. This process activates the data logger by stimulating its vibration sensor.

Click the **Select Logger** button to display a list of all connected data loggers (USB and Bluetooth). Their connection type is indicated by a standard USB or Bluetooth symbol on the top left of the potato icon, as shown in the *TuberLog list* window below:

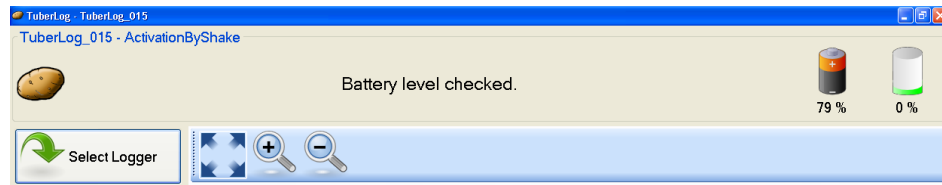


The rows are coloured using 3 different colours, depending on the communication status. These have the following meanings:

- | | |
|------------------|---|
| Tuber-001 | The communication status between data logger and computer is unknown. |
| Tuber-001 | The last communication with the data logger was successful. |
| Tuber-001 | The last communication attempt was not successful. |

Select a data logger from the list by double clicking on the name in the list or by highlighting the name with a single click and then clicking **Select** in the bottom right corner of the *TuberLog list* window.

After selecting a data logger from the list a window with the *TuberLog* number shown at the top is displayed. The software then runs through a sequence of checks in which the battery charge and data logger memory levels are checked and then displayed at the top of the screen, as shown below:



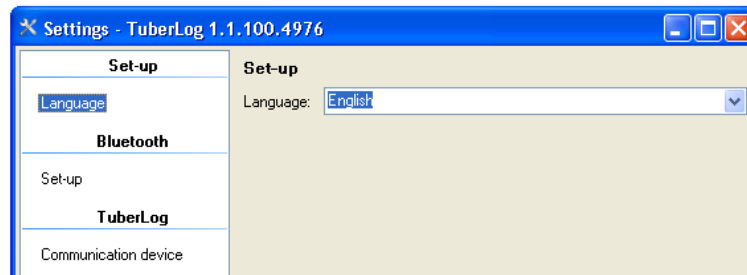
A.2.2 Data logger settings

The data logger has a number of settings that can be viewed after it has been selected. Click on **Settings** to enter the settings menu. Once they have been set up there should be no need to change them for repeated measurements in the same situation. Several settings have already been created using typical values. If required, the selected settings can be saved to a folder in the computer and recalled later using **Import** and **Export** at the bottom of the *Settings* window.

The setting options and explanations for each page are mostly self-explanatory. Tooltips are shown when the cursor hovers over each category. The different setting pages are as follows:

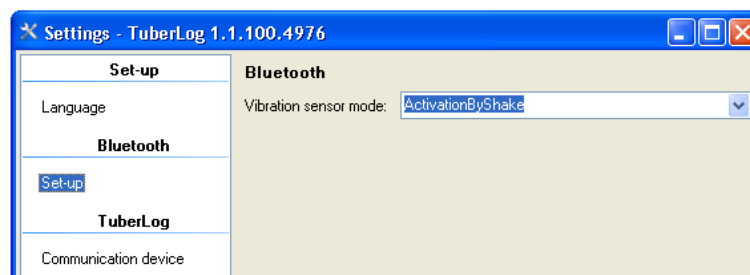
Set-up

Enables the display language to be selected



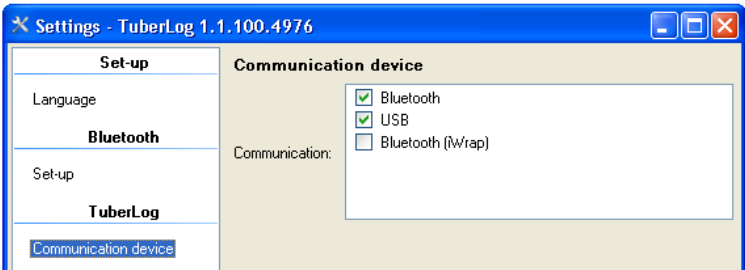
Bluetooth

Enables the Bluetooth settings to be changed. Setting the data logger to start by shaking will use battery power in the most efficient way. Alternatively, the interface can be permanently turned off or on.



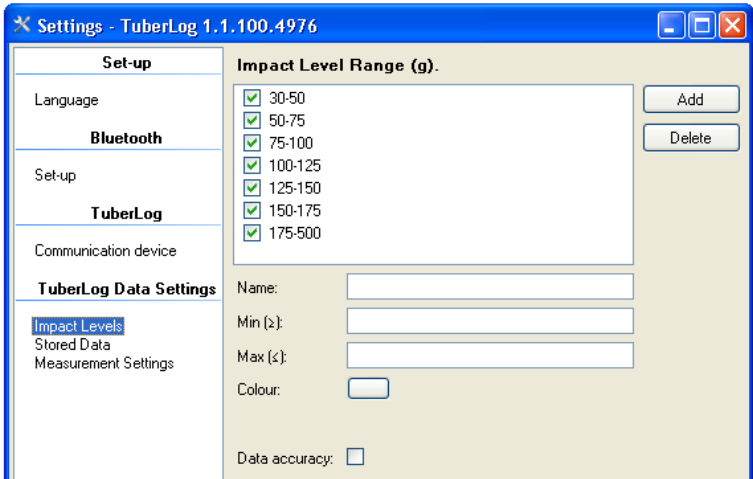
TuberLog

Enables the communication devices that are available to transmit data from *TuberLog* to the computer. If both Bluetooth and USB are available they should both be selected.

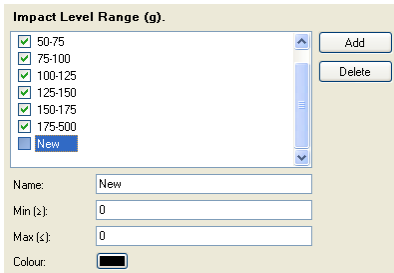
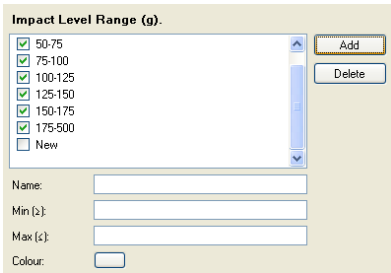


TuberLog Data Settings
Impact Levels

- Allows pre-set impact level ranges to be selected for measurements. To improve the accuracy of the calculation of the number and percentage of impacts in the selected ranges, impacts outside these ranges can be excluded by removing the tick from the relevant boxes and ticking the **Data accuracy** box.



- A user-defined *Impact Level Range* can also be created and named by following the stages as below:
 - Click on **Add**. A line with an un-ticked box and **New** will appear. Left click on **New** to highlight it. Default settings will appear in the fields below.



- Enter the values required and a colour that differs from the display colours used for the other *Impact Level Ranges*. To save these settings, left click on **Apply**. To select the new range tick its box, clear the ticks from the ranges that are not needed and left click **Apply** again.

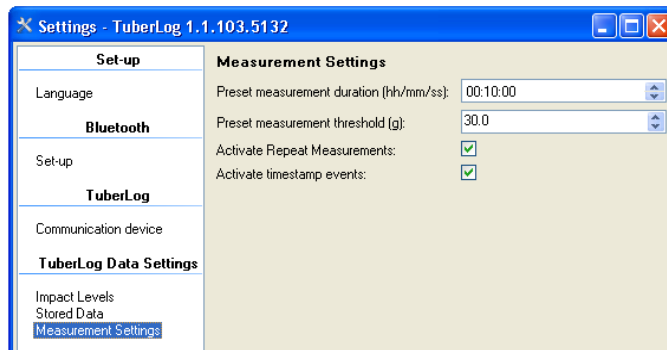
- To delete an *Impact Level Range*, left click to highlight the name, left click **Delete** and left click **Apply**.

Stored Data

- Allows the user to define the parameters of the data stored in the data logger and the file location when downloaded for storage in the computer.

Measurement Settings

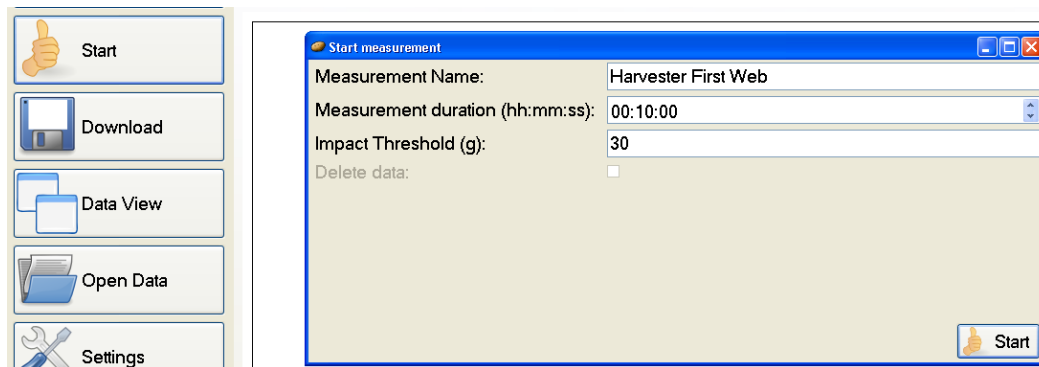
- The **Measurement duration** is pre-set at 10 minutes, which would normally be sufficient for testing a typical machine section, but can be changed to suit the situation.
- Setting a lower **Measurement threshold** prevents a lot of small insignificant impacts from being included in the recorded data.
- The option to set **Timestamps** and **Repeat Measurements** in the same section of a machine can be activated. See section A.2.5 for more details.
- To ensure an accurate *Timestamp*, check the time setting of the computer and correct it if necessary.



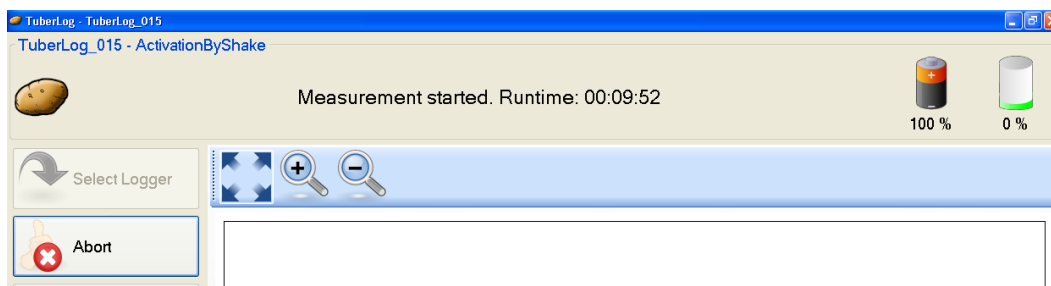
A.2.3 Starting the data logger

When clicking on the **Start** button a window appears, as below, where the **Measurement duration** and lower **Impact Threshold** (minimum of 10g) can be entered (this can also be changed in **Settings**). A **Measurement Name** can also be entered at this stage. This can be useful when testing different machines or sections of a machine.

After making any changes click **Start** in the bottom right corner of the window.



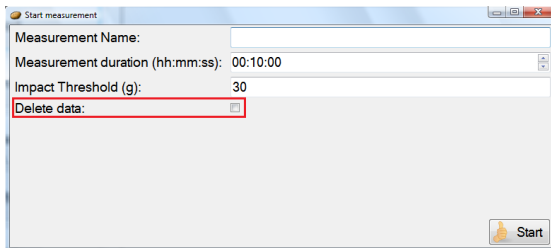
The remaining runtime of the measurement is displayed at the top of the window, as below, which indicates that the measurement has started successfully.



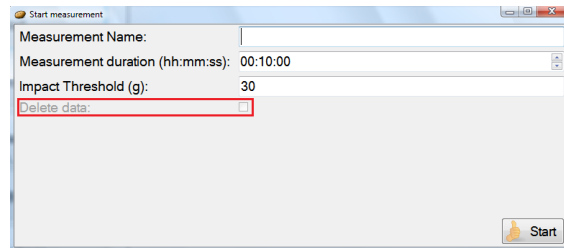
The data logger can now be placed into the machine being tested. **The use of the sealing-cap is strongly recommended.** This allows the unit to be used to measure impacts in potato washers and other wet conditions. *However, do not use the TuberLog in conditions where high heat levels may exist, such as steam peelers.*

A.2.4 Data logger memory and data deletion

If the **Start** button in the main window is clicked at the same time as the **CTRL**-key the *Start Measurement* window will enable the option to clear the data logger memory before starting a new measurement. This is done by ticking the **Delete data** option before clicking **Start** in the bottom right corner of the window. You will always be asked to confirm if you want to delete the data before the measurement run begins. If **CTRL+ Start** is not clicked in the main window the *Delete data* option is not enabled and remains grayed out.



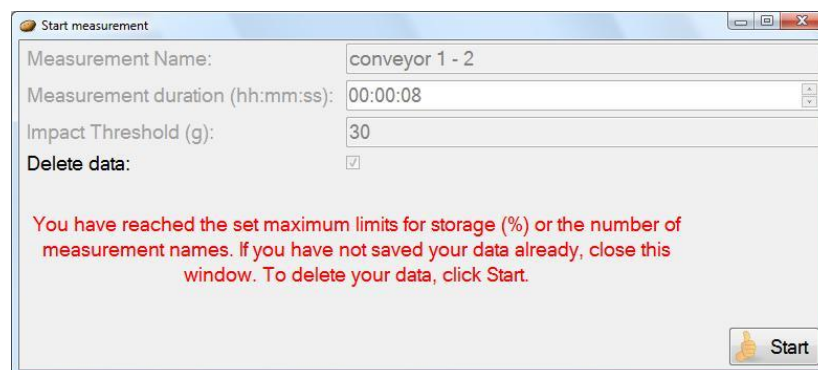
Clicking CTRL+Start enables the option to Delete Data



CTRL+Start was not clicked so there is no option to Delete Data

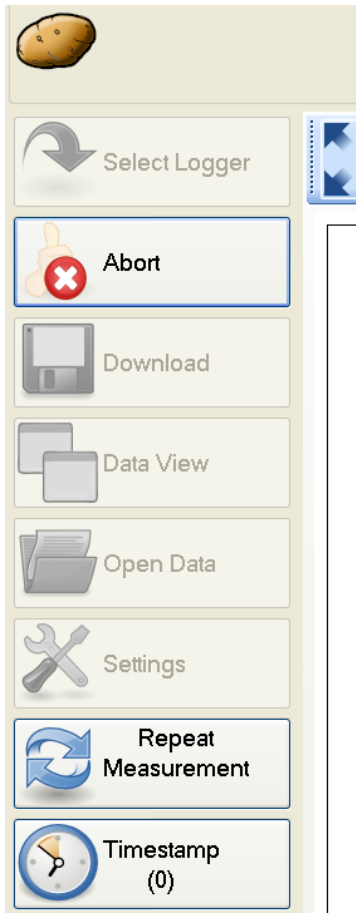
If the data logger memory is full the newest measurement values will automatically overwrite the oldest entries. Impacts below the set threshold will not enter the memory, so the time before the memory is filled can be extended by setting a higher threshold. Measurements that must be kept for quality assurance purposes should always be downloaded to a computer before the memory is full. The memory level is indicated at the top of the screen every time the data logger is selected before starting a measurement.

If *Automatic Data Deletion* is ticked in *Stored Data Settings* the software will monitor the data logger's memory in relation to the two set limits (*Max. storage limit (%)* and *Max. measurement names*) and warn you about the possibility of data deletion.



If one of the limits has been reached, **Delete Data** will automatically be ticked in the *Start Measurement* window. You will not be able to untick this option unless space is created in the memory. If you have not been saving your measurements to the computer so far simply close the window and download them. To continue without saving any data, click **Start**.

A.2.5 Adding a timestamp to a measurement and repeating a measurement



After clicking on *Start*, two additional buttons will appear on the bottom of the menu bar. These can be ignored or used as follows:

Timestamp

Clicking this button during a measurement registers in the data record the time at which it was pressed. This allows, for example, the moment just before the data logger drops from one conveyor to another, to be noted in the record. The timestamps are visible in the graphical display of the measurement results, so it is easy to see if there was a significant impact when the data logger dropped.

Repeat Measurement

Clicking this button marks a new beginning of a run through a machine without having to start the logger again. This can be useful when investigating a specific part of a machine. Repeating just the drop from, for example, one conveyor to another can be used to check if a large impact occurs on every drop or if it is only occasionally large. Each repeated run is distinguished by colour in the graphical display of measured values.

A.2.6 Typical measurement procedure and interpretation of results

An initial run through a machine will give an impression of where the problem areas are. Each area can be dealt with in more detail by doing shorter measurement runs. The length of run will often be determined by safe access to the machine, but it is best to concentrate on individual sections, such as the drop from one web to another, and carry out repeat measurements in each section.

Repeat measurements give an average figure for an impact at a particular point. This can be compared to bruise test results from real potatoes passing through the same section of the machine. This relationship indicates how *TuberLog* impact levels correspond to bruising levels in real potatoes. Making this comparison in a number of different situations will provide the experience necessary to interpret the results from machines very quickly. It will become possible to know, for example, whether a particular variety can safely be passed through a machine with a known low level of sources of bruising. Experience may have shown that such a variety only starts bruising at a level corresponding to 150g in *TuberLog*, whereas *TuberLog* may only have recorded impacts up to 50g.

The initial measurement run can immediately highlight major sources of bruising. Very high readings obviously indicate high levels of bruising in all varieties and in all conditions. In such situations no comparison with bruise test results is really necessary - the source of bruising must be removed before more potatoes pass through the machine. *TuberLog* can then be passed through the machine again to check that the major problem has been eliminated and to continue the search for more problem areas.

As a guide to the levels of impact that can be generated from a specific drop onto a specific surface, some tests have been carried out using *TuberLog*, with the following results:

<i>Fall from a height of</i>	<i>onto PVC surface</i>	<i>onto steel surface</i>
10cm	~ 55g	~ 175g
25cm	~ 155g	~ 275g
50cm	~ 285g	~ 330g

A.2.7 Examples of uses for *TuberLog*

The primary use for *TuberLog* is reducing damage and bruising in potato handling machinery. As such, potato growers, producers and processors can clearly benefit from using the device. Other related uses for different groups involved in potato production might include the following:

Agronomists and Crop Consultants could use TuberLog to:

- Advise on ideal machine settings for bruise-free production
- Investigate the reasons for product damage by impact forces in machinery
- Carry out objective comparisons of production facilities
- Provide documentary evidence for adherence to quality control procedures

Manufacturers of harvesting and post-harvesting machinery could:

- Document the impact levels for use in the sale of their new and used machines
- Demonstrate the quality levels of potatoes passing through their machines
- Improve their machine design by identifying high impact levels
- Assist users to set-up their machines to avoid high impact levels

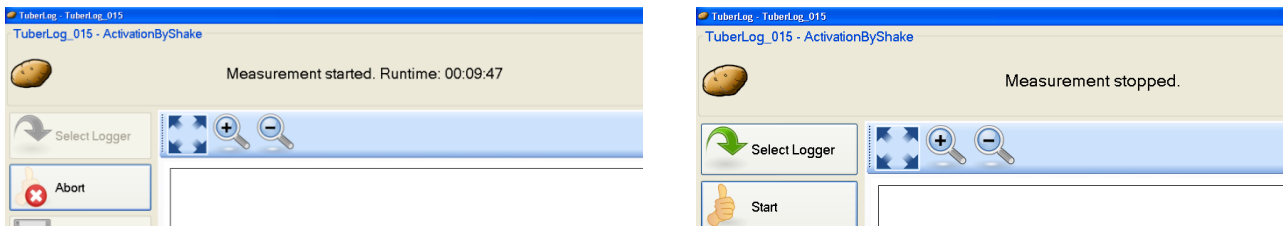
Research and development technicians could use TuberLog to:

- Investigate technical handling approaches that minimise impact levels on potatoes
- Determine thresholds for the risk of damage to potatoes due to impact force
- Investigate different materials that would reduce the risk of damage to potatoes

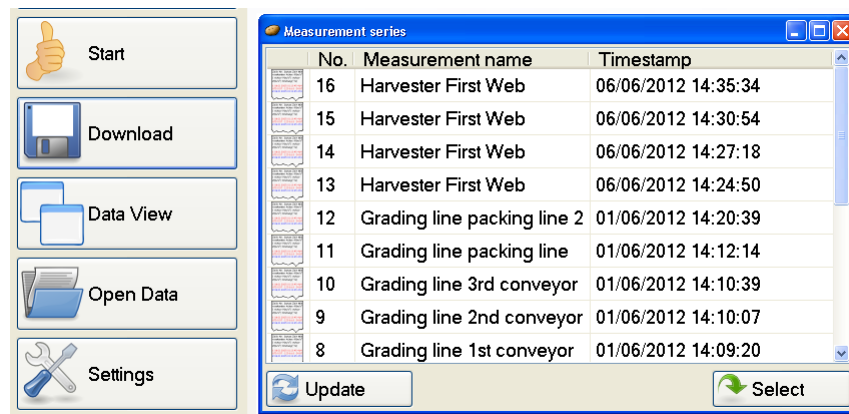
A.3. Displaying *TuberLog* data

A.3.1 Selecting data for display

To display measurements from the data logger while a measurement run is still in progress, click on the **Abort** button which is visible during a measurement.



Click the **Download** button to open a new window showing the list of measurement runs and their recording date that are stored in the data logger. Click on the measurement you wish to view and then click **Select** in the bottom right corner of the window.

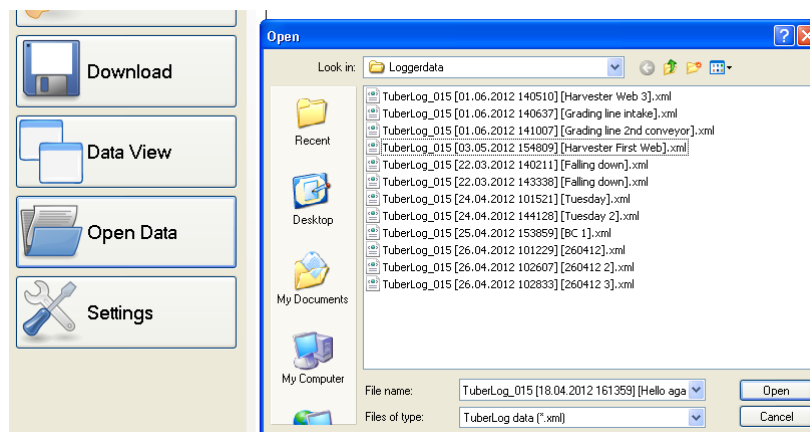


The data will be displayed more quickly via the USB interface than the wireless Bluetooth interface.

If the option to *Save TuberLog Data* has been ticked under *Settings/Stored Data*, the measurement run will be saved as a file in the Loggerdata folder that was set up during the software installation. The filename is formatted as:

TuberLog serial number [Date and time of measurement][Measurement name].xml

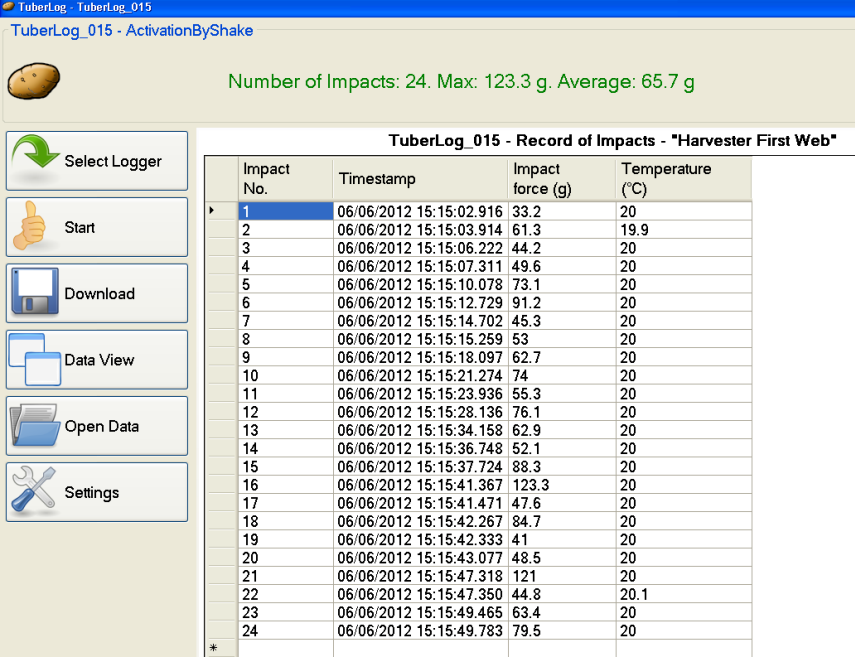
Click **Open Data** to display the measurement runs which have already been saved to the Loggerdata folder (see below). Highlight the file to be viewed and click **Open**.



A.3.2 Viewing the data

To change the data display of the measurement run that has been selected, click on **Data View**. There is a choice of 3 ways to view the data. Click **Data View** again to change between them.

A.3.2.1 Data table of the impacts during a measurement



TuberLog_015 - ActivationByShake

Number of Impacts: 24. Max: 123.3 g. Average: 65.7 g

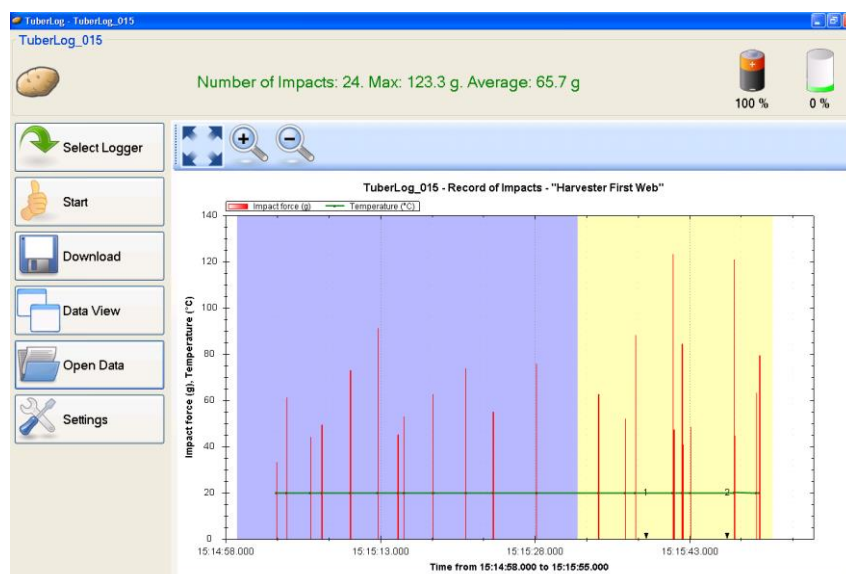
TuberLog_015 - Record of Impacts - "Harvester First Web"

Impact No.	Timestamp	Impact force (g)	Temperature (°C)
1	06/06/2012 15:15:02.916	33.2	20
2	06/06/2012 15:15:03.914	61.3	19.9
3	06/06/2012 15:15:06.222	44.2	20
4	06/06/2012 15:15:07.311	49.6	20
5	06/06/2012 15:15:10.078	73.1	20
6	06/06/2012 15:15:12.729	91.2	20
7	06/06/2012 15:15:14.702	45.3	20
8	06/06/2012 15:15:15.259	53	20
9	06/06/2012 15:15:18.097	62.7	20
10	06/06/2012 15:15:21.274	74	20
11	06/06/2012 15:15:23.936	55.3	20
12	06/06/2012 15:15:28.136	76.1	20
13	06/06/2012 15:15:34.158	62.9	20
14	06/06/2012 15:15:36.748	52.1	20
15	06/06/2012 15:15:37.724	88.3	20
16	06/06/2012 15:15:41.367	123.3	20
17	06/06/2012 15:15:41.471	47.6	20
18	06/06/2012 15:15:42.267	84.7	20
19	06/06/2012 15:15:42.333	41	20
20	06/06/2012 15:15:43.077	48.5	20
21	06/06/2012 15:15:47.318	121	20
22	06/06/2012 15:15:47.350	44.8	20.1
23	06/06/2012 15:15:49.465	63.4	20
24	06/06/2012 15:15:49.783	79.5	20

Transferring Data to Microsoft Excel

To transfer data from the *TuberLog* software to Microsoft Excel, select a record in the table by left clicking in the grey column to the left of the impact row. The whole row will then be highlighted. To copy the data, hold down the **Ctrl** key and press the **C** key on your keyboard, then release the **C** key first and the **Ctrl** key afterwards. The impact record is now copied. To paste the data in to Microsoft Excel, open a new spreadsheet and left click in to a cell so the cursor is flashing in the cell. Hold down the **Ctrl** key and press the **V** key on your keyboard. The data should now be pasted in to the spreadsheet. To select a sequence of records or several non-sequential records, hold down **Ctrl** and left click in the empty box parallel to the number of impact and copy and paste as instructed above.

A.3.2.2 Data graph of the impacts during a measurement

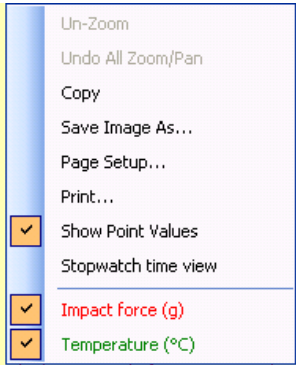


In the example a series of repeat measurement runs (blue and yellow) with two time stamps (1, 2) is shown. The horizontal green line is the temperature recorded by the data logger.

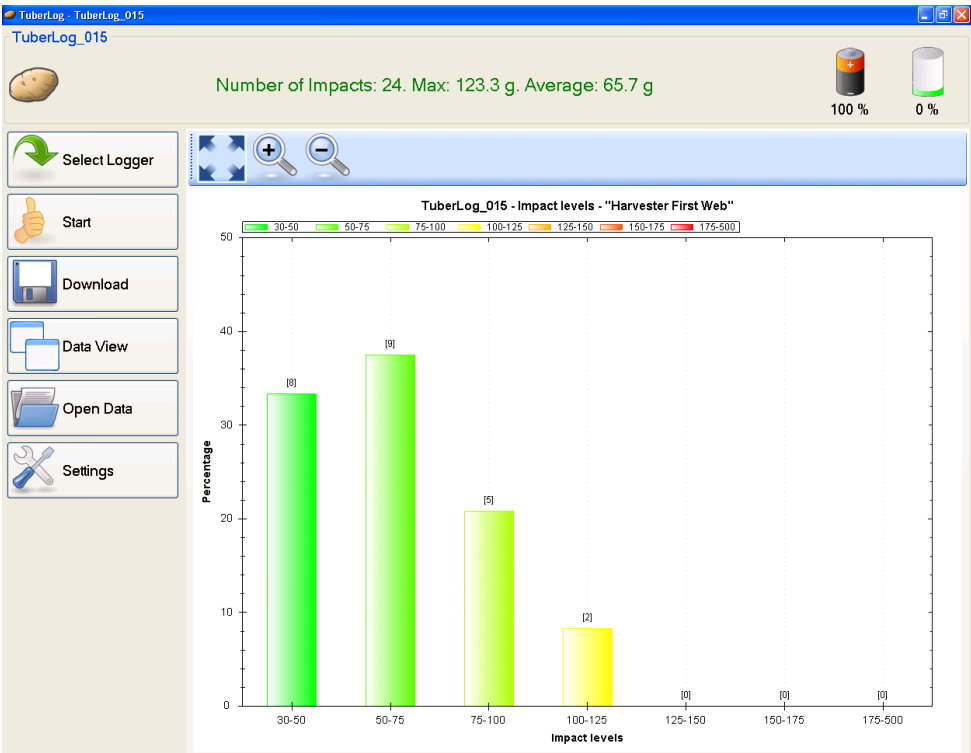
There are buttons above the graph for zooming in and out and for resetting to the original state. It is also possible to reduce the time period displayed by drawing a rectangle onto the graph while holding down the left mouse key.

Right click on the graph to open a menu with further adjustable settings for visual display and printout.

The result can be saved to the clipboard (*Copy*) or as an image file. This can be useful for report generation.



A.3.2.3 Data graph of the percentage distribution of the impacts from a measurement



In addition to the percentage distribution, this graph also shows the number recorded in each group of impact levels. If the *Data accuracy* option is ticked in *TuberLog Data Settings/Impact levels*, only the records which fit into the preset groups of impact levels will be included in the percentage calculation. This graph type can be manipulated, printed and saved in the same ways as in A.3.2.2 above.

Section B

TuberLog^{PLUS}

PTR400

App for Android

Section B

TuberLog^{PLUS} Instruction Manual Contents

B.1. Initial set-up

Using the TuberLog with an Android device

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B.1. Initial Set-up

Using the TuberLog with an Android device

- B.1.1. IMPORTANT: Before using the TuberLog^{PLUS} Android App on your Android device, you must first install the PC software on your PC or laptop and then connect the data logger to the computer by following these steps:**

Install the PC software before connecting the data logger

Insert the USB Memory Stick into a USB port on the PC or laptop. A window should automatically appear on the screen with several options. Click on the file **PTR400** and then select **PC Software**. Click on **Open folder to view files using Windows Explorer**. Click on the file **setup.exe** and follow the installation instructions displayed for the software and the USB driver installation. After installation of the software, you may find it useful to create a shortcut on the PC desktop. Drag the **TuberLog** potato symbol directly onto your desktop from the program list attached to the Start menu of your PC or laptop.

Communication between the data logger and the computer

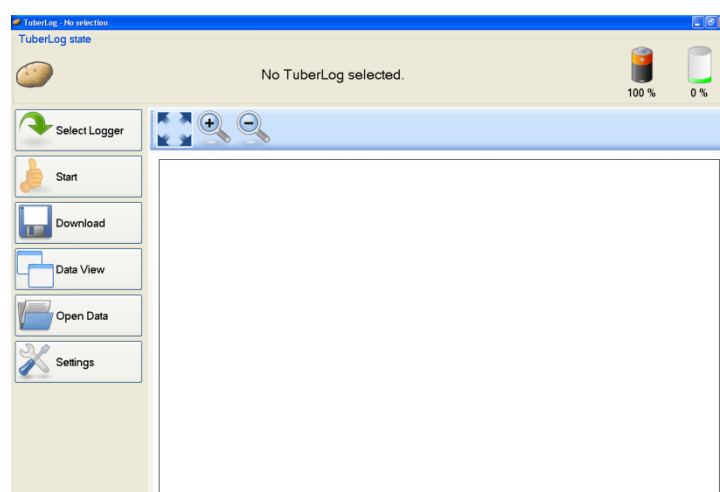
Connect the data logger to the PC using the USB cable. The first time the connection is made the USB driver supplied will be installed automatically.

If Bluetooth functionality is already present this will be switched on automatically when the data logger is connected using the USB cable. For existing or internal Bluetooth adapters, the installed driver software must be able to support *Microsoft Bluetooth Stack*. If the Bluetooth adapter is required it should be installed in a USB port. It will be installed automatically with the Windows embedded drivers. The Bluetooth icon should appear in the task tray. Right click on the icon and select **Add device**. A list of available Bluetooth-enabled devices will appear. Select **TuberLog** and enter the pairing code (default: 1234) so that the data logger is recognised.

Taking measurements with TuberLog

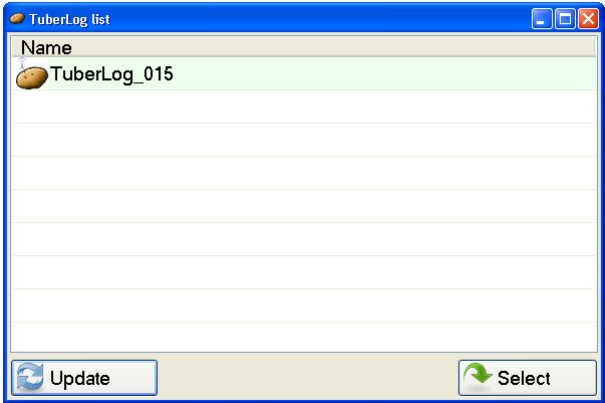
First steps

When the TuberLog PC software is started the following screen will appear:



Ensure that the data logger is connected to the computer in order to communicate via Bluetooth interface. Gently knock the data logger on a hard surface or shake it in your hand. This process activates the data logger by stimulating its vibration sensor.

Click the **Select Logger** button to display a list of all connected data loggers (USB and Bluetooth). Their connection type is indicated by a standard USB or Bluetooth symbol on the top left of the potato icon, as shown in the *TuberLog list* window below:

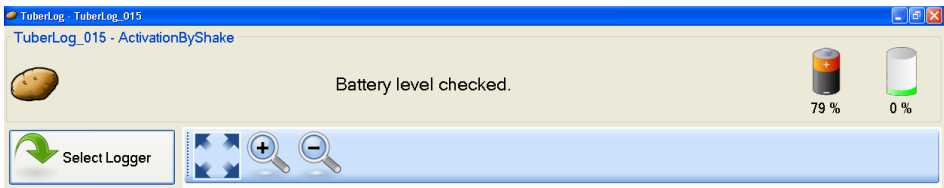


The rows are coloured using 3 different colours, depending on the communication status. These have the following meanings:

- Tuber-001** The communication status between data logger and computer is unknown.
- Tuber-001** The last communication with the data logger was successful.
- Tuber-001** The last communication attempt was not successful.

Select a data logger from the list by double clicking on the name in the list or by highlighting the name with a single click and then clicking **Select** in the bottom right corner of the *TuberLog list* window.

After selecting a data logger from the list a window with the *TuberLog* number shown at the top is displayed. The software then runs through a sequence of checks in which the battery charge and data logger memory levels are checked and then displayed at the top of the screen, as shown below:



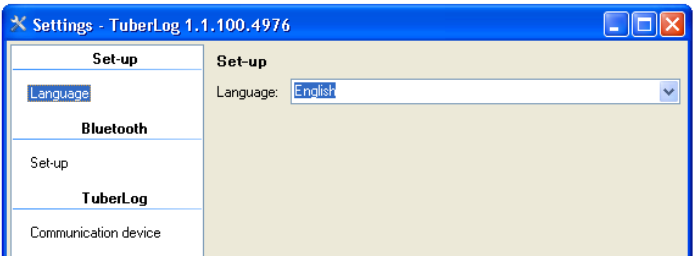
Data logger settings

The data logger has a number of settings that can be viewed after it has been selected. Click on **Settings** to enter the settings menu. Once they have been set up there should be no need to change them for repeated measurements in the same situation. Several settings have already been created using typical values. If required, the selected settings can be saved to a folder in the computer and recalled later using **Import** and **Export** at the bottom of the *Settings* window.

The setting options and explanations for each page are mostly self-explanatory. Tooltips are shown when the cursor hovers over each category. The different setting pages are as follows:

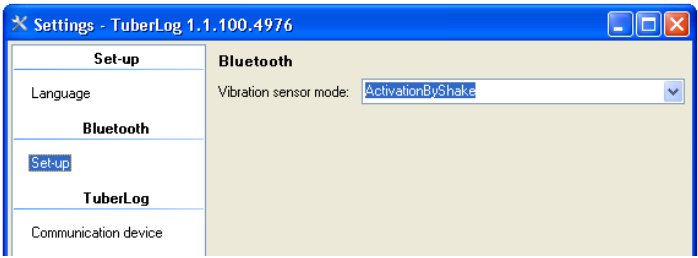
Set-up

Enables the display language to be selected



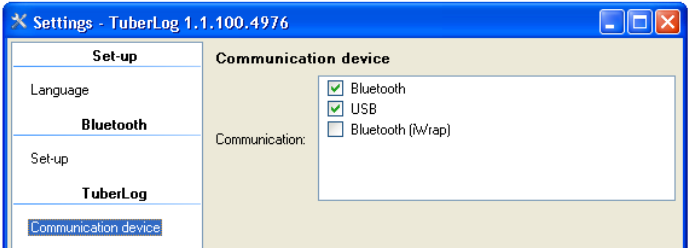
Bluetooth

Enables the Bluetooth settings to be changed. Setting the data logger to start by shaking will use battery power in the most efficient way. Alternatively, the interface can be permanently turned off or on.



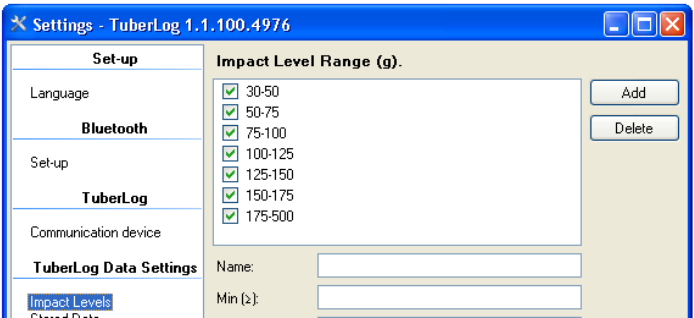
TuberLog

Enables the communication devices that are available to transmit data from *TuberLog* to the computer. If both Bluetooth and USB are available they should both be selected.



TuberLog Data Settings
Impact Levels

- Allows pre-set impact level ranges to be selected for measurements. To improve the accuracy of the calculation of the number and percentage of impacts in the selected ranges, impacts outside these ranges can be excluded by removing the tick from the relevant boxes and ticking the **Data accuracy** box.



- A user-defined *Impact Level Range* can also be created and named by following the stages as below:

- Click on **Add**. A line with an un-ticked box and **New** will appear. Left click on **New** to highlight it. Default settings will appear in the fields below.

- Enter the values required and a colour that differs from the display colours used for the other *Impact Level Ranges*. To save these settings, left click on **Apply**. To select the new range tick its box, clear the ticks from the ranges that are not needed and left click **Apply** again.

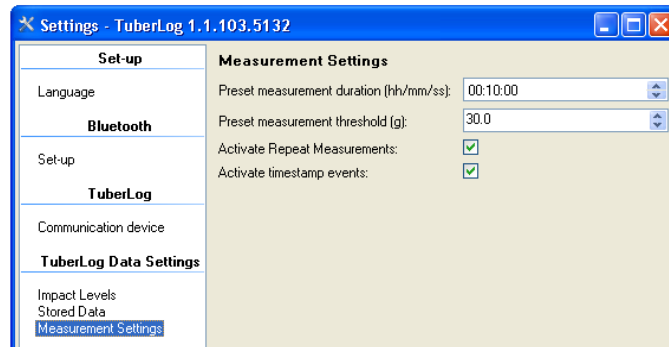
- To delete an *Impact Level Range*, left click to highlight the name, left click **Delete** and left click **Apply**.

Stored Data

- Allows the user to define the parameters of the data stored in the data logger and the file location when downloaded for storage in the computer.

Measurement Settings

- The **Measurement duration** is pre-set at 10 minutes, which would normally be sufficient for testing a typical machine section, but can be changed to suit the situation.
- Setting a lower **Measurement threshold** prevents a lot of small insignificant impacts from being included in the recorded data.
- The option to set **Timestamps** and **Repeat Measurements** in the same section of a machine can be activated. See section A.2.5 for more details.
- To ensure an accurate *Timestamp*, check the time setting of the computer and correct it if necessary.



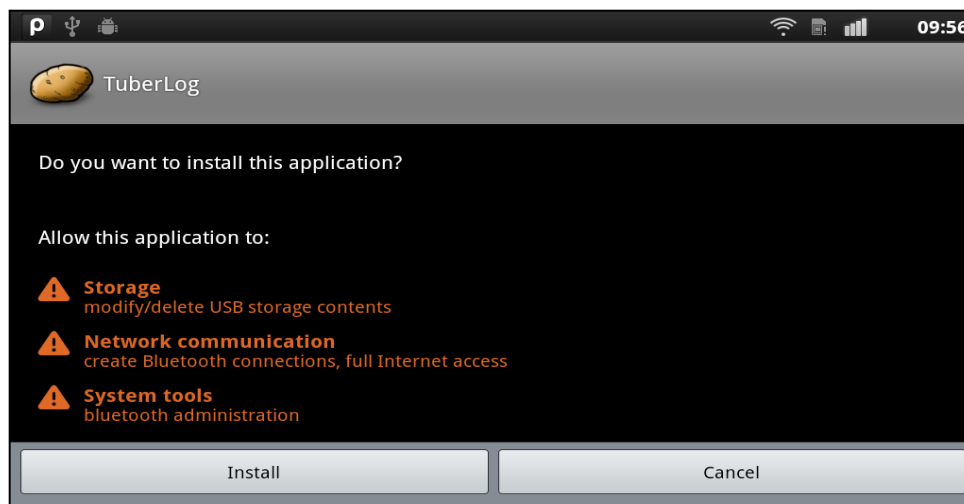
B.1.2. Before installing the **TuberLog^{PLUS} Android App**

Go into the main settings menu of the Android device. *Not all Android devices have the same menus, so the instructions below should be used as a guide.*

- i. In Bluetooth, ensure that Bluetooth is enabled. To avoid communication breakdown during measurement, select a long *Visible time-out period* (or *Never time out*) for the Android device.
 - ii. In Security – select Screen lock and choose *None*. Select Device Administration – Unknown Sources and choose *Enable*.
 - iii. In Power Saving – select the custom power saving mode settings. Select Screen timeout and select a time period that matches the duration of the measurement you will be carrying out. Alternatively, turn off power saving altogether.
- Using the PC software, go into the data logger settings.
- i. In Bluetooth Set-up - ensure Bluetooth is turned on permanently or activated by shake.
 - ii. In Communication Device - ensure the Bluetooth box is ticked.

B.1.3. Installing the **TuberLog^{PLUS}** Android App

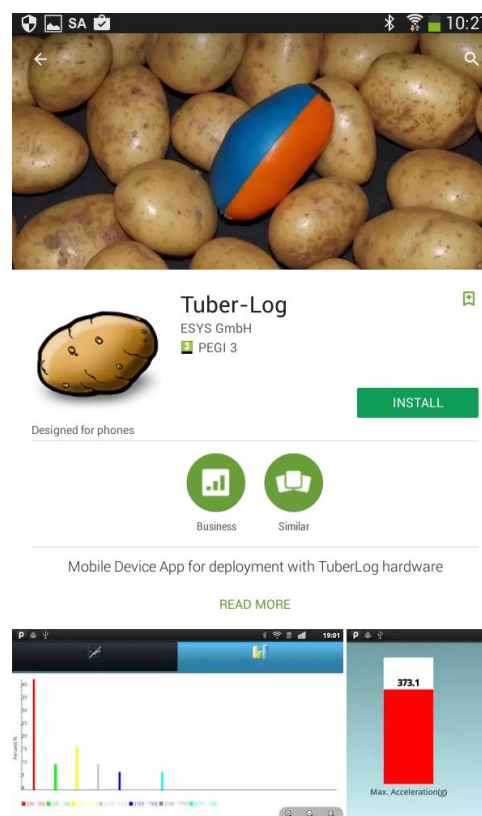
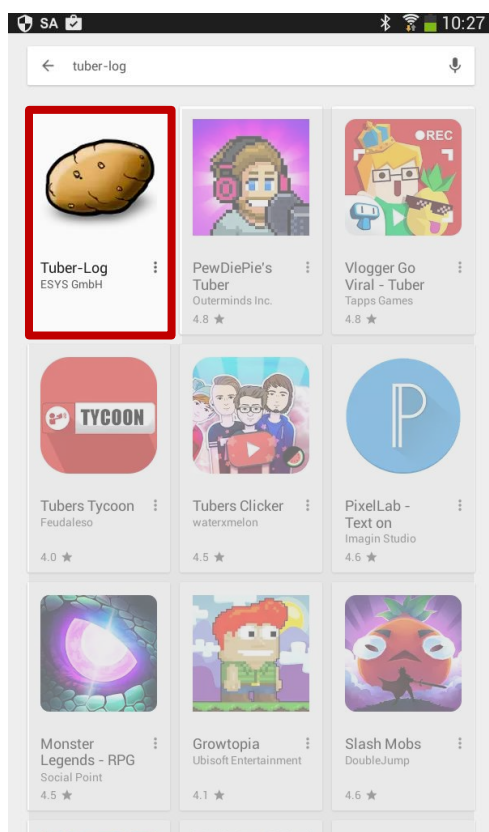
Connect the Android device to your PC, download the file TuberLog.apk (located in the folder PTR400 – App for Android) from the USB memory stick supplied and start the installation process with a single touch (as shown below). Follow the installation instructions on the screen. A TuberLog icon should appear on your Applications screen after installation is complete.



Installing the **TuberLog^{PLUS}** Android App from the Google Play Store

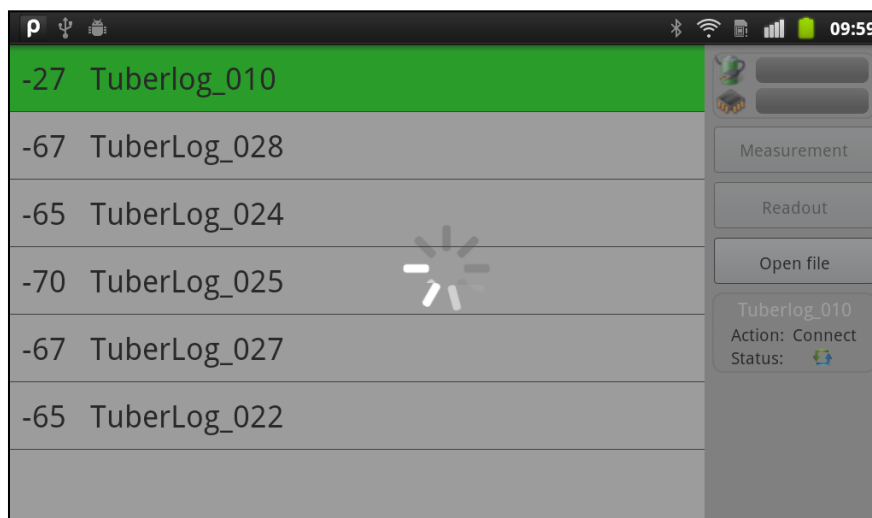
Go to the Google Play Store on your Android device. Using the search field at the top of the page, search for 'tuber-log'. Click on the App in the search results (highlighted in red below).

To install the *Tuber-Log* App, simply click install. You may need to enter your Google Account details. A TuberLog icon should appear on your Applications screen after installation is complete.

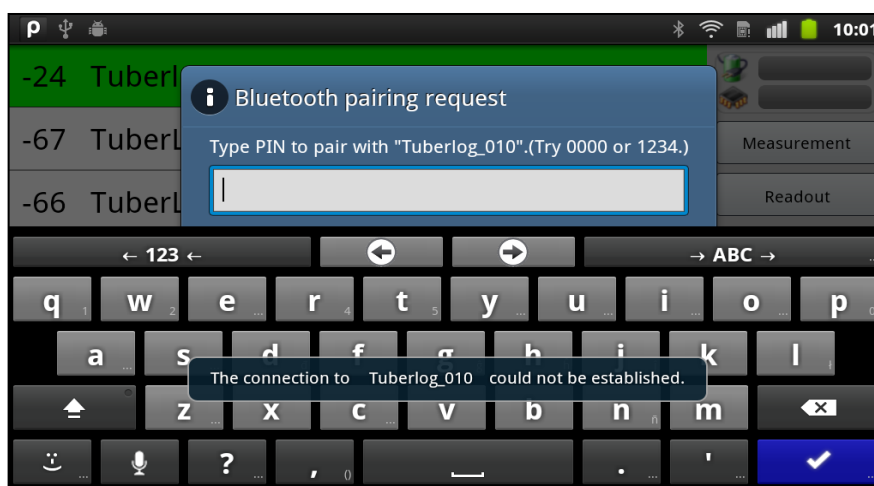


B.1.4. Communication between *TuberLog^{PLUS}* and Android device

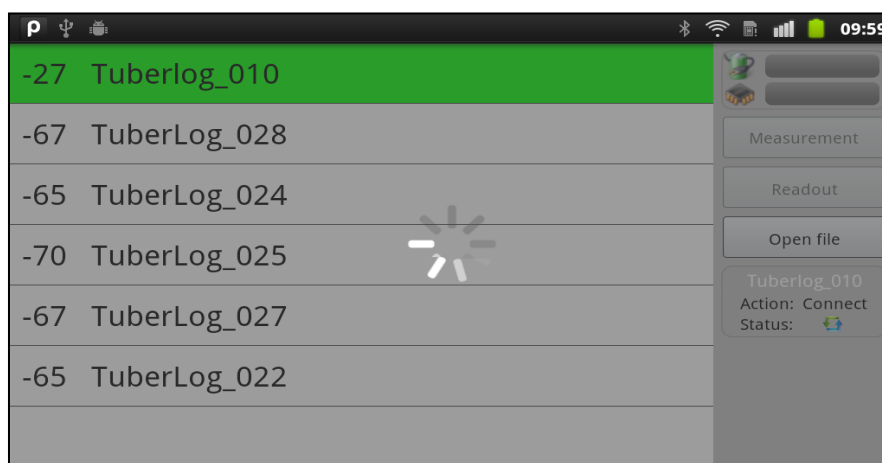
Any *TuberLog* data logger that is switched on and within Bluetooth range of the Android device will be detected and its Serial Number will appear on the screen. Select the *TuberLog* data logger you wish to use by touching the screen.



At the first connection you are prompted to enter the Bluetooth pairing code (default 1234) so that the data logger is recognised. Ignore the message on the screen that the connection could not be established.

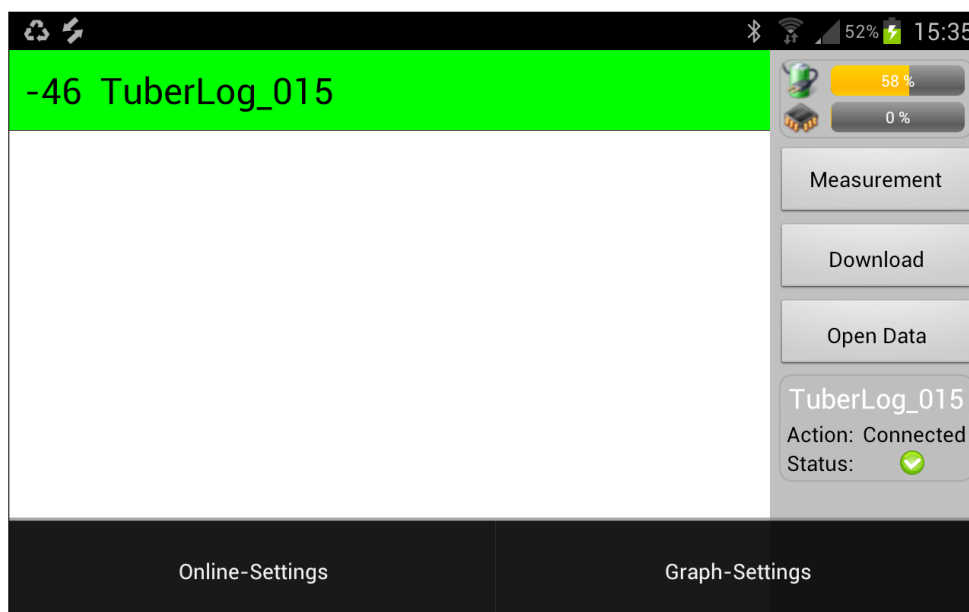


After entering the pairing code, touch the data logger Serial Number again to finish pairing the device.

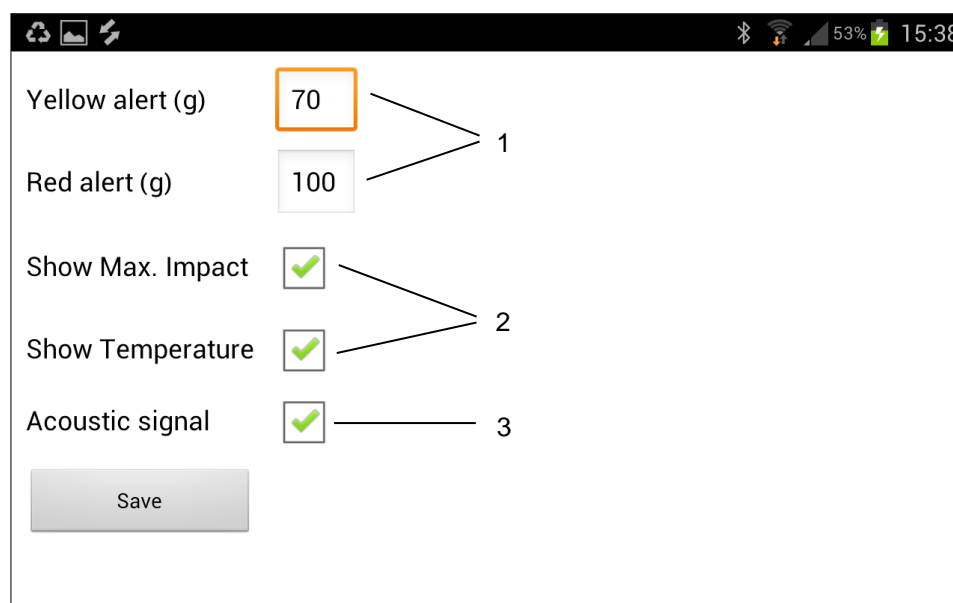


B.1.5 TuberLog^{PLUS} screen settings

Touch the menu button of the Android device to display the two settings buttons at the bottom of the horizontal screen.



Online-Settings



- 1 Determines the levels at which an impact displays as red or yellow in the bar graph – can be used during a measurement to immediately highlight areas where high levels of bruising might be taking place
- 2 Selects the information in the display – the Maximum Impact bar graph and the Temperature of the data logger.
- 3 Turns the acoustic signal on or off – causes a sound to be generated by the Android device whenever an impact is recorded by the data logger. If they are connected, the sound will also be heard in the device earphones.

Graph-Settings

Allows 7 preset impact level ranges to be selected for display of the percentage distribution of the impacts from a measurement. It is important to ensure that there are no gaps (the lower value of each level range must be the same as the higher value of the previous level range). This avoids possible distortion of the displayed results.

Load class 1	
30	
50	
Load class 2	
50	
75	
Load class 3	

B.2. Using the *TuberLog^{PLUS}* Android App

B.2.1. Open the Android App

Select the *TuberLog* icon on the screen.

B.2.2. Select the data logger

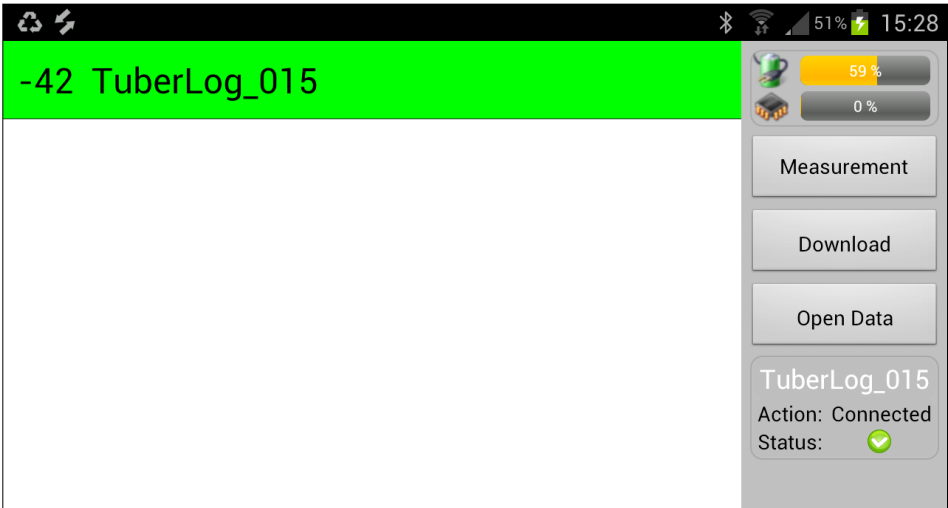
On the initial screen after opening the App you will see a list (if you own more than one TuberLog) of paired devices that have an active Bluetooth connection. If the data logger you wish to use is not shown, but is within range of the Android device, activate it by shaking it. Select the desired logger by touching the screen. The data logger should now be connected. If not set to Always On, you will be prompted to activate the Bluetooth function in the device.

The following information will show on the screen (as below):

Battery status (%)

Memory status (%)

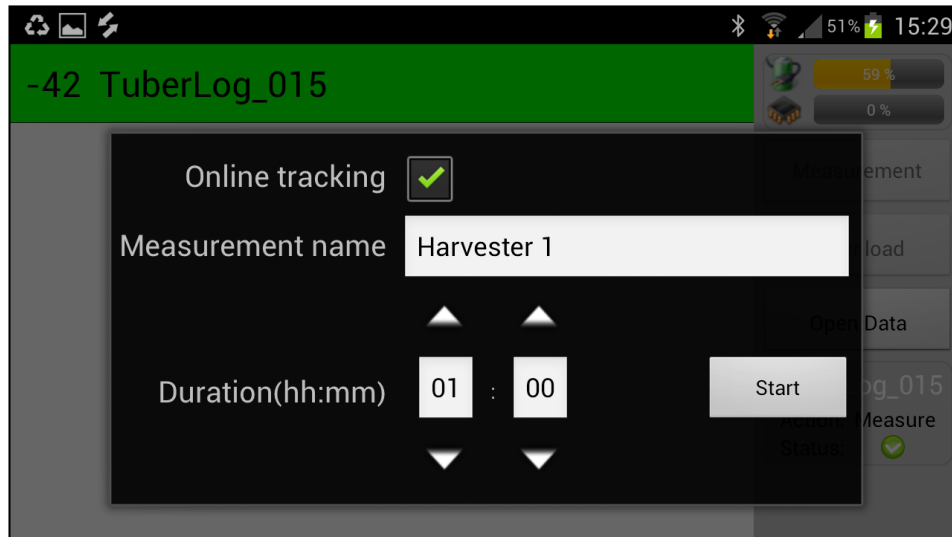
Remaining time (if a measurement is already running)



B.2.3. Start the data logger

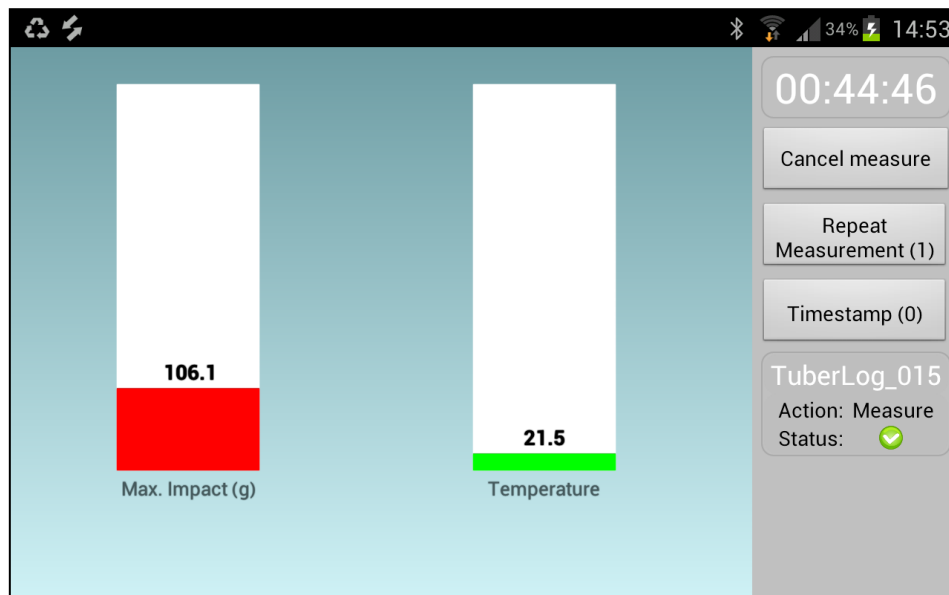
Touch **Measurement** in the right menu bar to display the *Start Measurement* window. Enter a Measurement Name and Measurement duration. To follow the measurement on the screen live and as it happens, select **Online Tracking**. Touch **Start** in the bottom right of the window.

Important: Make sure that the data logger battery is adequately charged.



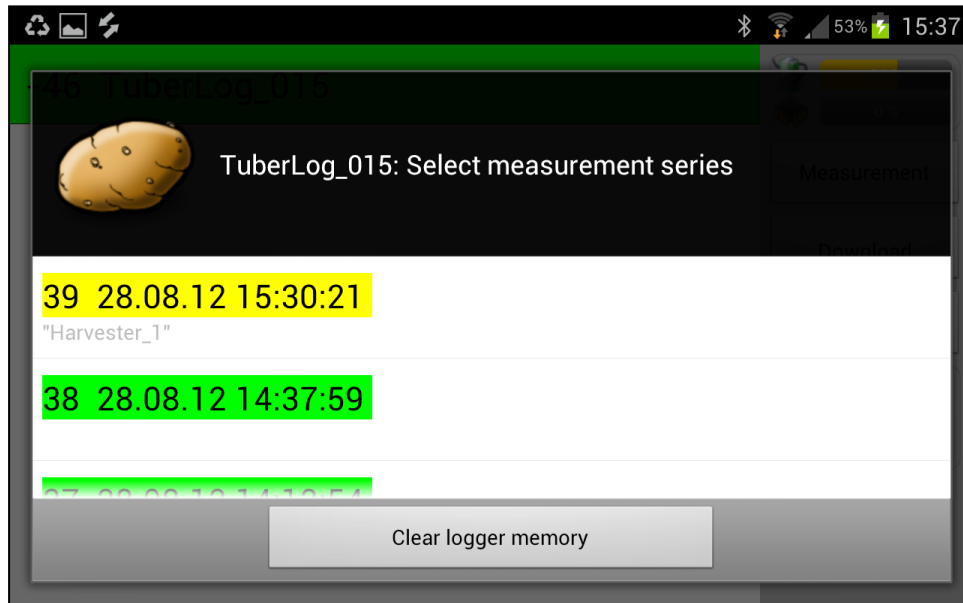
B.2.4. Place the data logger in the machine to be tested

The remaining measurement duration will count down at the top of the screen. In Online Tracking mode each impact will be indicated, as it happens, on the screen and also by an audible tone (if selected in Settings).



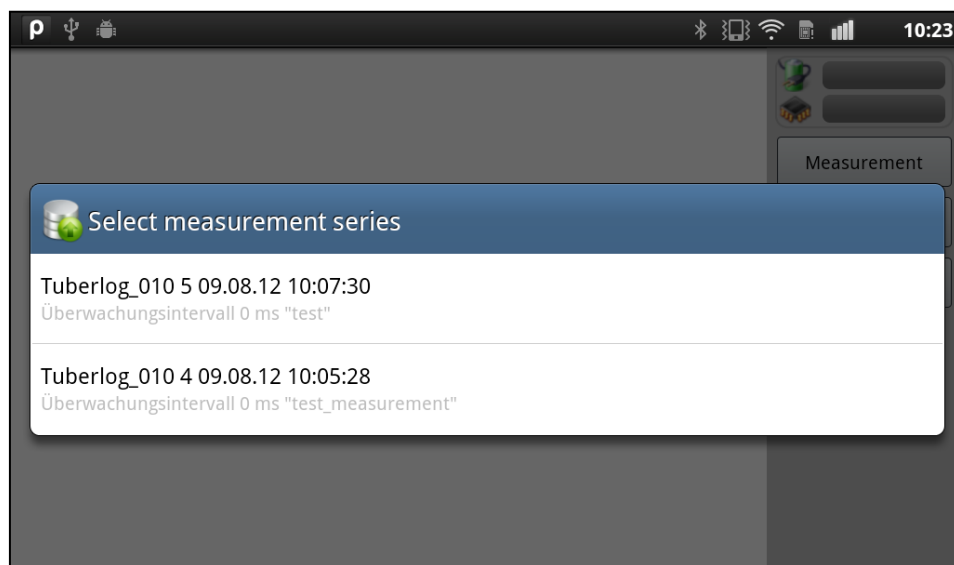
B.2.5. Display *TuberLog* data

If the measurement timer is still running, click [Cancel measure](#) in the right menu bar (see above). Touch [Download](#) to display the list of measurement names; touch to highlight the required measurement. The data will be displayed.



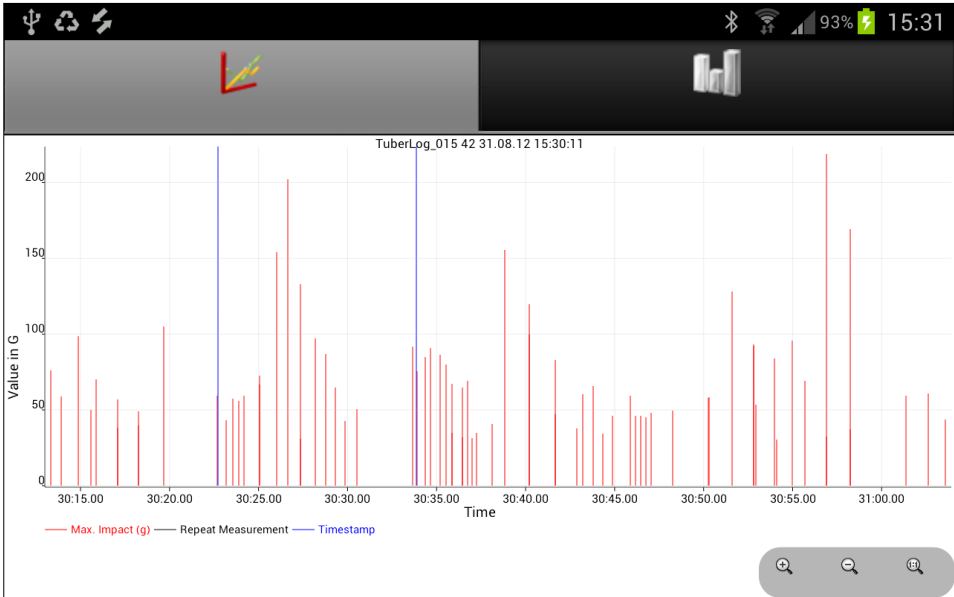
Note: Measurements marked Green are already stored on the Android device. Measurements marked Yellow have no data.

Touch the button [Open Data](#) to download measurements which are stored on the Android device.

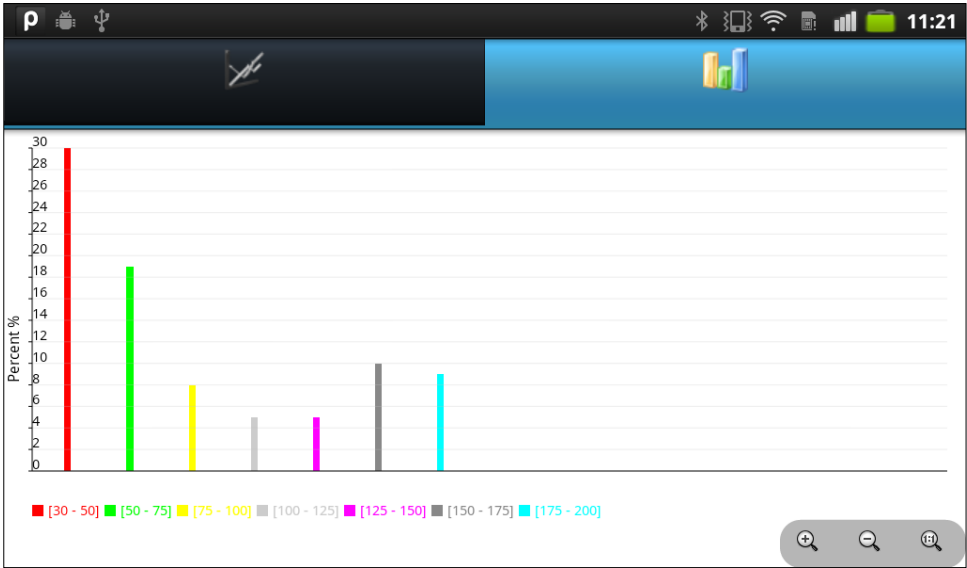


B.2.6. Change the data display

Touch the graph icons above the data to change the display mode between a graph of the impacts during a measurement and a graph of the percentage distribution of the impacts.



Graph of impacts during a measurement

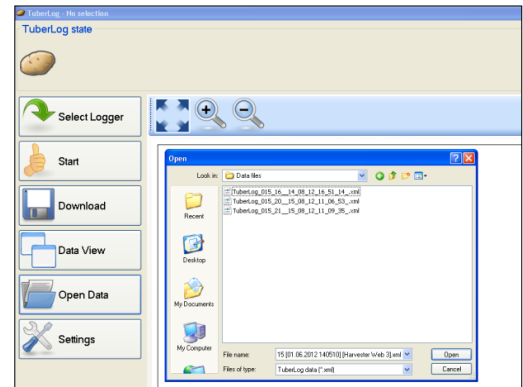
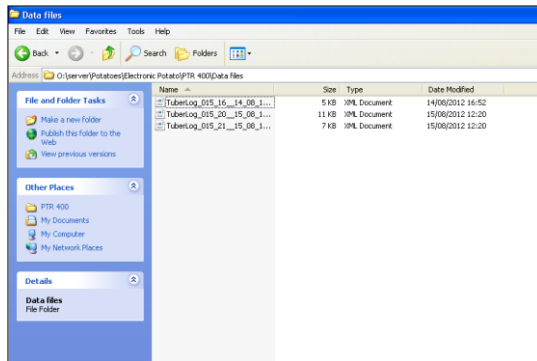


Graph of the percentage distribution of impacts

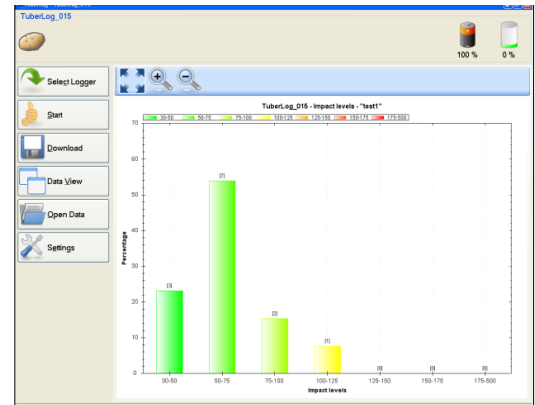
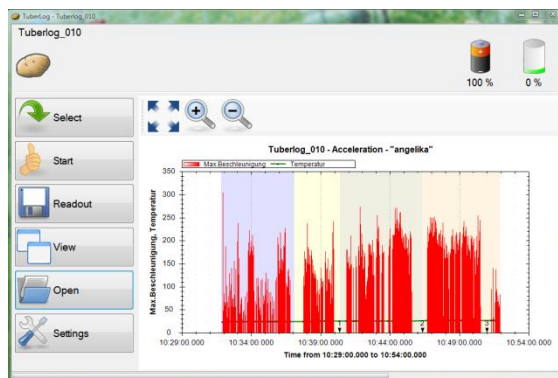
B.2.7. Export of data to the PC

Downloaded measurement files from the data logger are automatically stored in XML format in the TuberLog directory on the Android device SD card. This is accessed via My Files/TuberLog (folder names may differ on some devices). The data can be copied to the computer and processed using the *TuberLog* PC software.

Note: Readings in the list of measurement series will be deleted from the database after one month, so make sure that required data has been downloaded to the TuberLog directory. The XML files will remain in the directory unless deliberately deleted by the user.



*Typical stages of data presentation using the PC version of TuberLog
– see the User Guide for more details*



Section C

***TuberLog*^{EXTRA}**

PTR500

***App for Android
&
Samsung Tablet***

Section C

TuberLog^{EXTRA} Instruction Manual Contents

C.1. Initial set-up

Using the TuberLog with the Samsung Android Tablet

- C.1.1 IMPORTANT: Before using the TuberLog^{EXTRA} Android App on your Android device, you must first install the PC software on your PC or laptop and then connect the data logger to the computer.** **36**

NOTE: If you have purchased the TuberLog^{EXTRA} with the Samsung tablet (PTR500), the Android App will be pre-loaded. Please go to section C.2. 'Using the TuberLog^{EXTRA} Android App'. Otherwise continue as below.

- C.1.2. Before installing the TuberLog^{EXTRA} Android App** **40**
- C.1.3. Installing the TuberLog^{EXTRA} Android App** **42**
- C.1.4. TuberLog^{EXTRA} Android App activation** **45**
- C.1.5. Exporting the data to the PC** **45**

C.2. Using the TuberLog^{EXTRA} Android App

- C.2.1. Open the App** **46**
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- C.2.5. Display TuberLog data** **48**
- C.2.6. Change the data display** **49**
- C.2.7. Export of data to the PC** **50**

C.1. Initial Set-up

Using the TuberLog with the Samsung Android tablet

- C.1.1. **IMPORTANT:** Before using the *TuberLog^{EXTRA}* Android App on your Android device, you must first install the PC software on your PC or laptop and then connect the data logger the computer by following these steps:

Install the PC software before connecting the data logger

Insert the USB Memory Stick into a USB port on the PC or laptop. A window should automatically appear on the screen with several options. Click on **Open folder to view files using Windows Explorer**. Click on the file **PTR500** and then select **PC Software**. Click on the file **setup.exe** and follow the installation instructions displayed for the software and the USB driver installation. After installation of the software, you may find it useful to create a shortcut on the PC desktop. Drag the **TuberLog** potato symbol directly onto your desktop from the program list attached to the Start menu of your PC or laptop.

Communication between the data logger and the computer

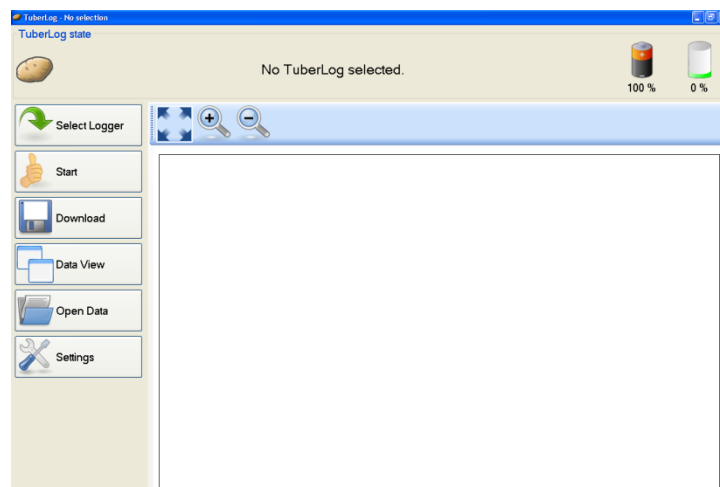
Connect the data logger to the PC using the USB cable. The first time the connection is made the USB driver supplied will be installed automatically.

If Bluetooth functionality is already present this will be switched on automatically when the data logger is connected using the USB cable. For existing or internal Bluetooth adapters, the installed driver software must be able to support *Microsoft Bluetooth Stack*. If the Bluetooth adapter is required it should be installed in a USB port. It will be installed automatically with the Windows embedded drivers. The Bluetooth icon should appear in the task tray. Right click on the icon and select **Add device**. A list of available Bluetooth-enabled devices will appear. Select **TuberLog** and enter the pairing code (default: 1234) so that the data logger is recognised.

Taking measurements with *TuberLog*

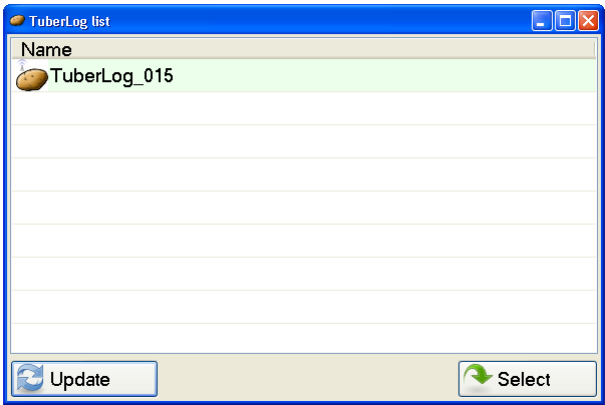
First steps

When the *TuberLog* PC software is started the following screen will appear:



Ensure that the data logger is connected to the computer in order to communicate via Bluetooth interface. Gently knock the data logger on a hard surface or shake it in your hand. This process activates the data logger by stimulating its vibration sensor.

Click the **Select Logger** button to display a list of all connected data loggers (USB and Bluetooth). Their connection type is indicated by a standard USB or Bluetooth symbol on the top left of the potato icon, as shown in the *TuberLog list* window below:

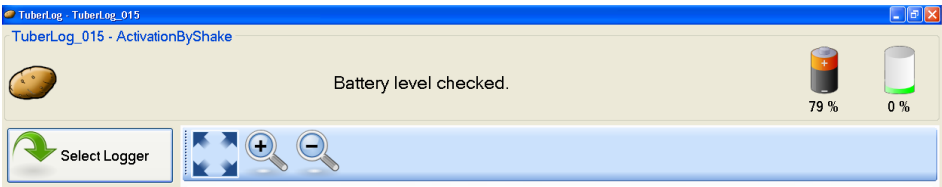


The rows are coloured using 3 different colours, depending on the communication status. These have the following meanings:

- | | |
|------------------|---|
| Tuber-001 | The communication status between data logger and computer is unknown. |
| Tuber-001 | The last communication with the data logger was successful. |
| Tuber-001 | The last communication attempt was not successful. |

Select a data logger from the list by double clicking on the name in the list or by highlighting the name with a single click and then clicking **Select** in the bottom right corner of the *TuberLog list* window.

After selecting a data logger from the list a window with the *TuberLog* number shown at the top is displayed. The software then runs through a sequence of checks in which the battery charge and data logger memory levels are checked and then displayed at the top of the screen, as shown below:



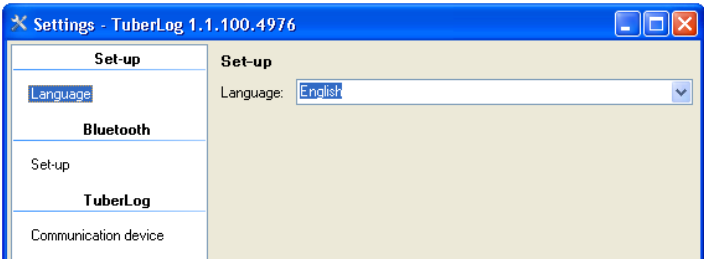
Data logger settings

The data logger has a number of settings that can be viewed after it has been selected. Click on **Settings** to enter the settings menu. Once they have been set up there should be no need to change them for repeated measurements in the same situation. Several settings have already been created using typical values. If required, the selected settings can be saved to a folder in the computer and recalled later using **Import** and **Export** at the bottom of the *Settings* window.

The setting options and explanations for each page are mostly self-explanatory. Tooltips are shown when the cursor hovers over each category. The different setting pages are as follows:

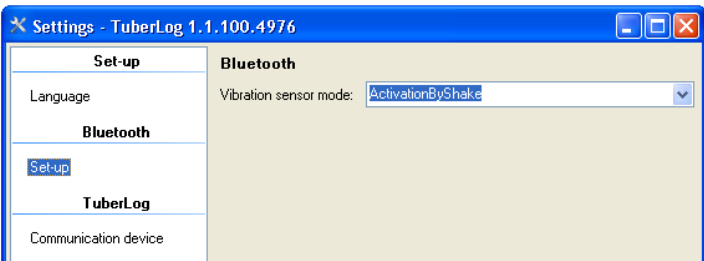
Set-up

Enables the display language to be selected



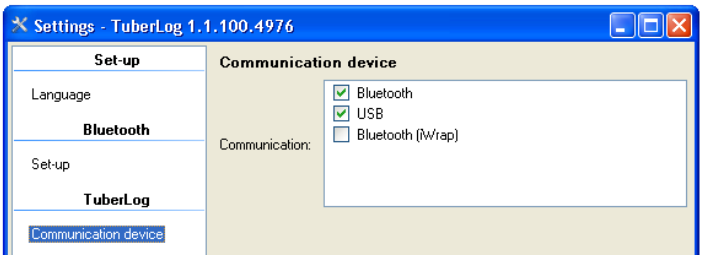
Bluetooth

Enables the Bluetooth settings to be changed. Setting the data logger to start by shaking will use battery power in the most efficient way. Alternatively, the interface can be permanently turned off or on.



TuberLog

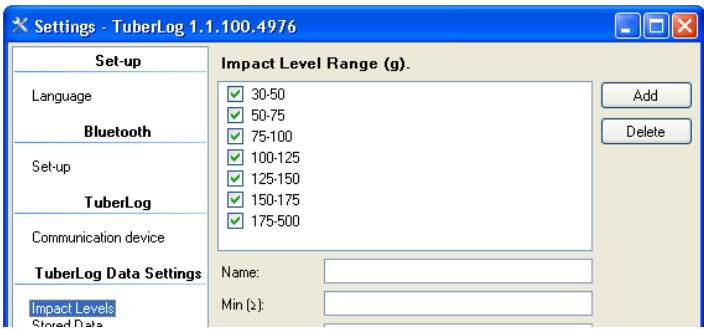
Enables the communication devices that are available to transmit data from *TuberLog* to the computer. If both Bluetooth and USB are available they should both be selected.



TuberLog Data Settings

Impact Levels

- Allows pre-set impact level ranges to be selected for measurements. To improve the accuracy of the calculation of the number and percentage of impacts in the selected ranges, impacts outside these ranges can be excluded by removing the tick from the relevant boxes and ticking the **Data accuracy** box.



- A user-defined *Impact Level Range* can also be created and named by following the stages as below:
 - Click on **Add**. A line with an un-ticked box and **New** will appear. Left click on **New** to highlight it. Default settings will appear in the fields below.

Impact Level Range (g).

☒ 50-75
☒ 75-100
☒ 100-125
☒ 125-150
☒ 150-175
☒ 175-500
☐ New

Add

Delete

Name:

Min (z):

Max (z):

Colour:

Impact Level Range (g).

☒ 50-75
☒ 75-100
☒ 100-125
☒ 125-150
☒ 150-175
☒ 175-500
☒ New

Add

Delete

Name:

Min (z):

Max (z):

Colour:

- Enter the values required and a colour that differs from the display colours used for the other *Impact Level Ranges*. To save these settings, left click on **Apply**. To select the new range tick its box, clear the ticks from the ranges that are not needed and left click **Apply** again.

Impact Level Range (g).

☒ 50-75
☒ 75-100
☒ 100-125
☒ 125-150
☒ 150-175
☒ 175-500
☐ New

Add

Delete

Name:

Min (z):

Max (z):

Colour:

Data accuracy: ☒

OK

Apply

Cancel

Impact Level Range (g).

☐ 50-75
☐ 75-100
☐ 100-125
☐ 125-150
☐ 150-175
☐ 175-500
☒ Bruise 1

Add

Delete

Name:

Min (z):

Max (z):

Colour:

Data accuracy: ☒

OK

Apply

Cancel

- To delete an *Impact Level Range*, left click to highlight the name, left click **Delete** and left click **Apply**.

Stored Data

- Allows the user to define the parameters of the data stored in the data logger and the file location when downloaded for storage in the computer.

Settings - TuberLog 1.1.103.5132

Set-up

Language

Bluetooth

Set-up

TuberLog

Communication device

TuberLog Data Settings

Impact Levels

Stored Data

Measurement Settings

Stored Data Settings

Save TuberLog data: ☒

Data saved to: ...

Automatic data deletion: ☒

Max. storage limit (%):

Max. measurement names:

Measurement Settings

- The **Measurement duration** is pre-set at 10 minutes, which would normally be sufficient for testing a typical machine section, but can be changed to suit the situation.
- Setting a lower **Measurement threshold** prevents a lot of small insignificant impacts from being included in the recorded data.
- The option to set **Timestamps** and **Repeat Measurements** in the same section of a machine can be activated. See section A.2.5 for more details.
- To ensure an accurate *Timestamp*, check the time setting of the computer and correct it if necessary.

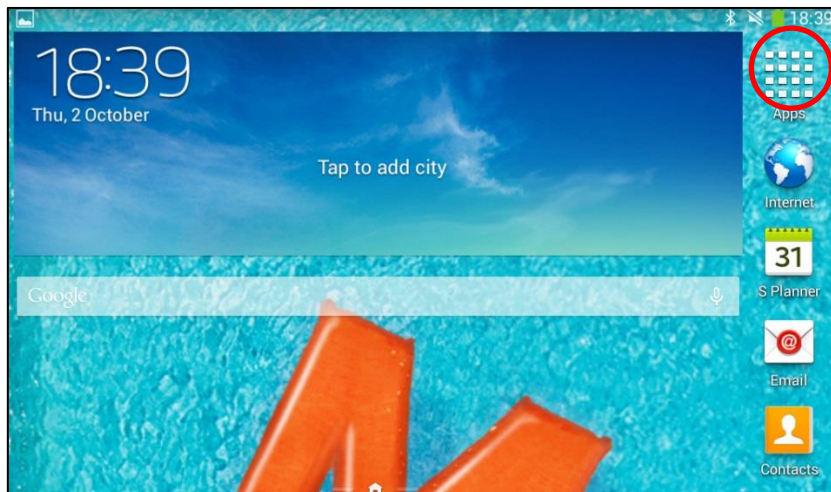
NOTE: If you have purchased the TuberLog^{EXTRA} with the Samsung tablet (PTR500), the Android App will be pre-loaded. Please go to section C.2. 'Using the TuberLog^{EXTRA} Android App'. Otherwise continue as below.

C.1.2. Before installing the TuberLog^{EXTRA} Android App

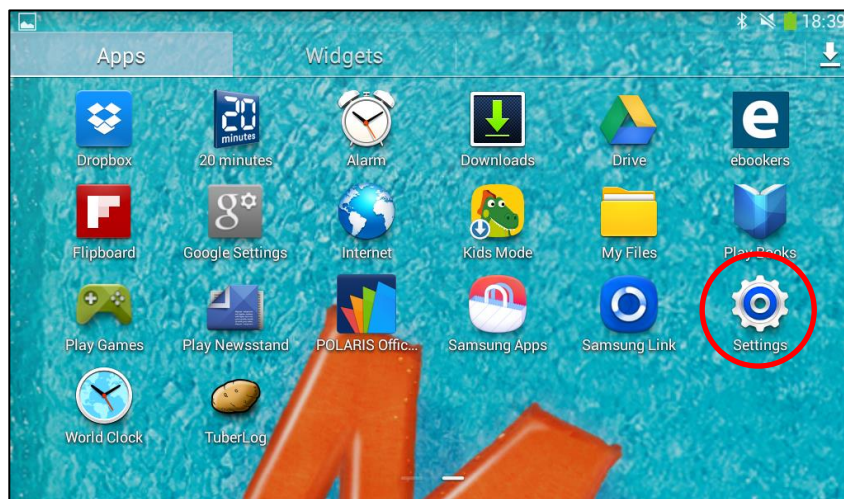
Switch the tablet 'On'.

Place your finger on the screen and swipe to unlock the handset.

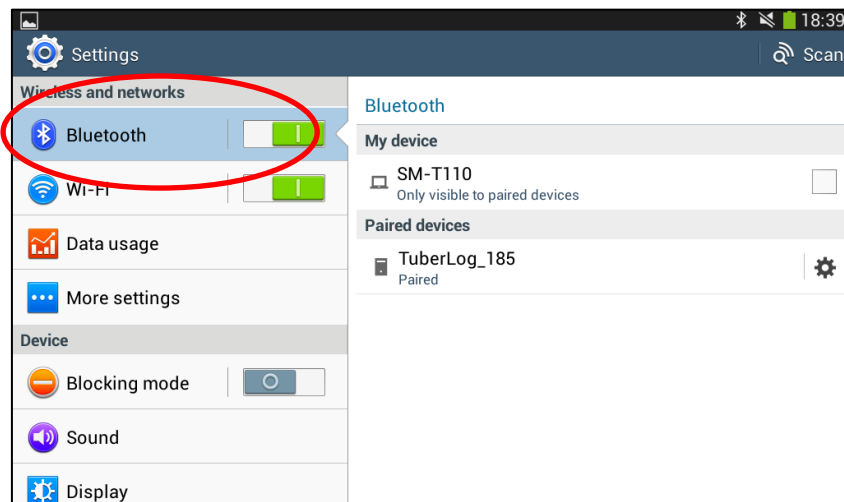
Press the 'App' symbol.



You will then be directed to the screen shown below.
Press 'Settings'.

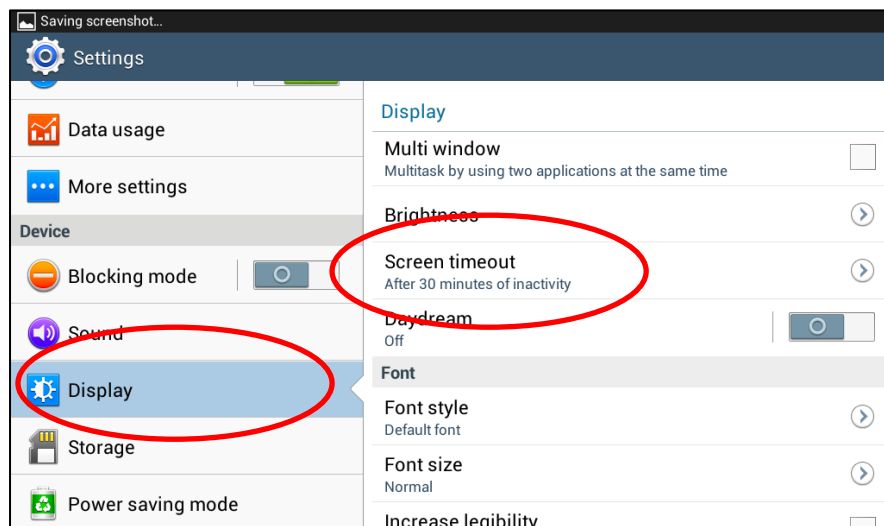


Slide *Bluetooth* from 'Off' to 'On'. The TuberLog should be displayed under 'Available devices'. Select the device to pair it.

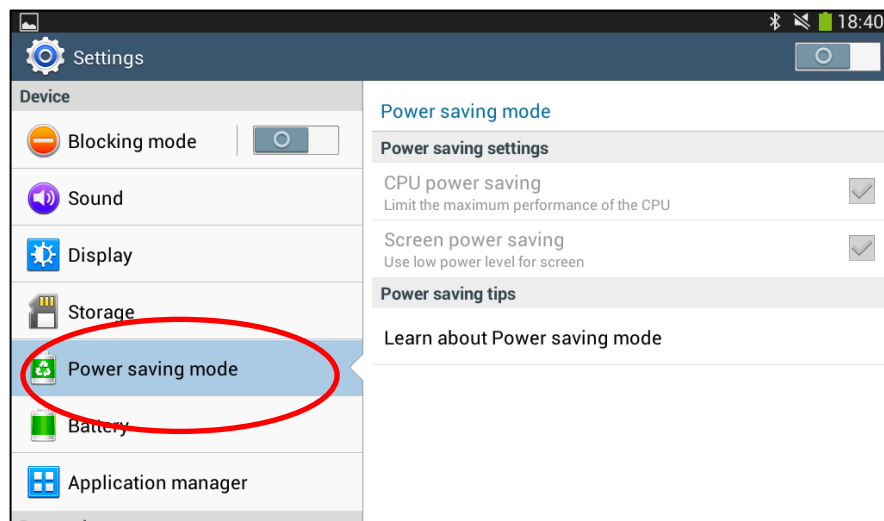


Scroll down over the left hand menu to *Display*. Press 'Display'.

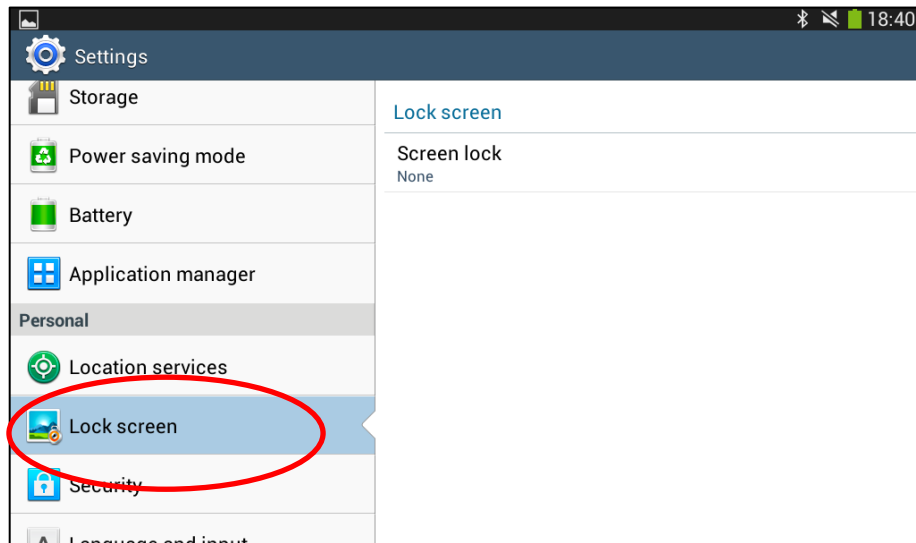
Select 'Screen Timeout' and change to 30 minutes (maximum setting available).



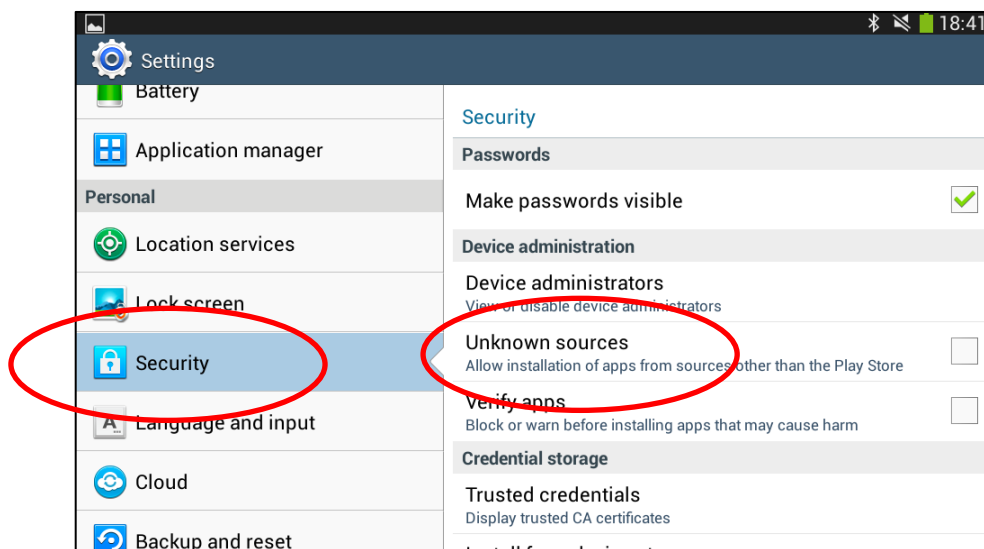
Select 'Power Saving Mode'. In the top right-hand corner, turn power saving 'Off'.



Select '*Lock Screen*'. Change the option to '*None*'.



Select '*Security*'. Tick the box for '*Unknown sources*' to allow installation of apps from sources other than Play Store.



A warning box will then appear. Select OK.

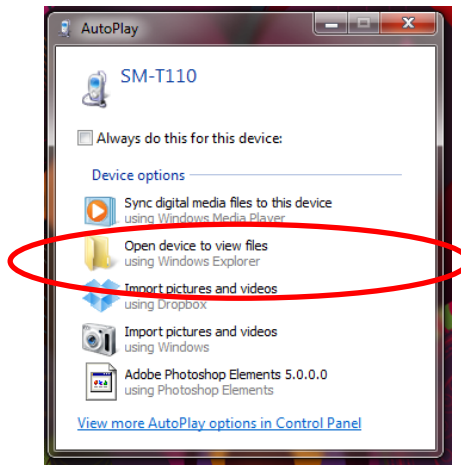
Press the  button.

C.1.3. Installing the *TuberLog^{EXTRA}* Android App

Connect the tablet to the PC using the USB cable supplied.

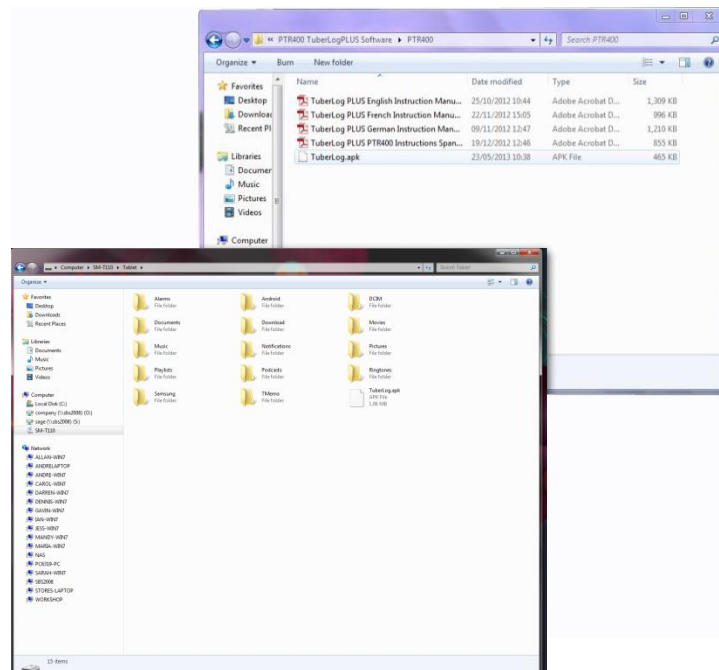
After a short time, a message line will appear in the top left hand corner saying that the USB has connected, and will then disappear.

Your tablet is now connected to your PC. '*Auto-Play*' should now appear on your PC screen with the option to '*Open device to view files*'.

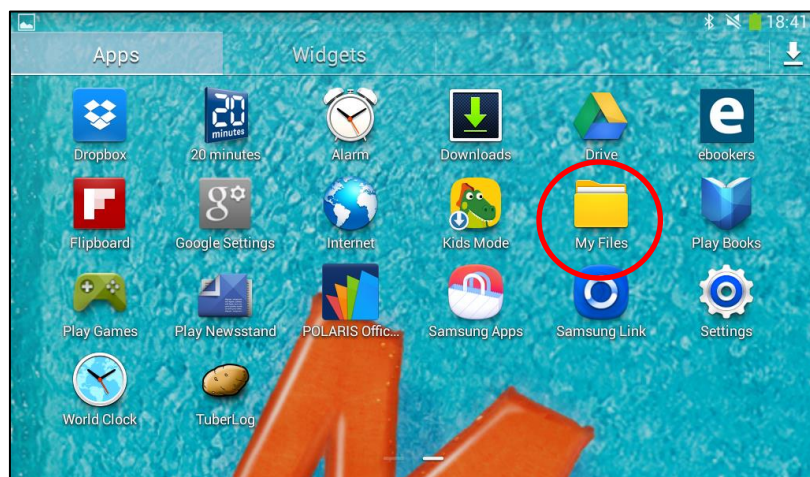


If this does not happen, go to the 'Start' menu and select 'My Computer'. The tablet should be listed as 'SM-T110'. Double click on this and the folder should open for you.

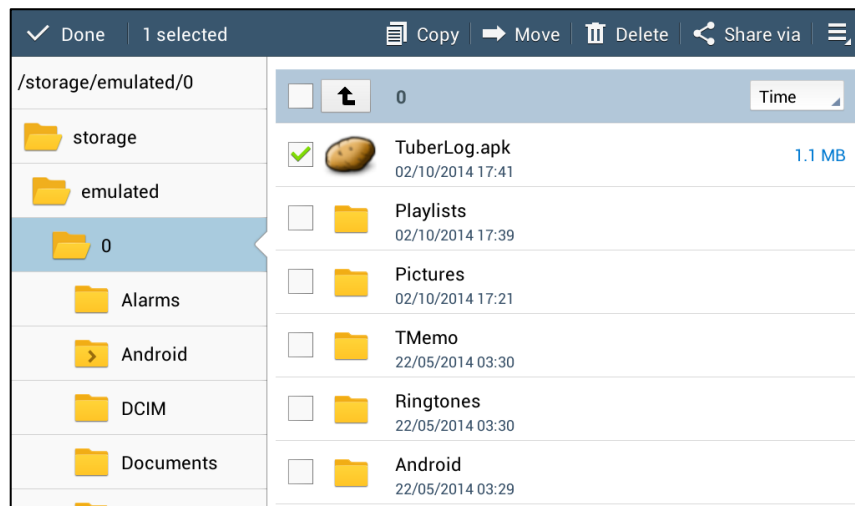
If you have not already done so, insert the memory stick provided with the TuberLog and open the PTR 500 file. Click on the file App for Android. Drag the 'Tuberlog.apk' file into the 'SM-T110' file.



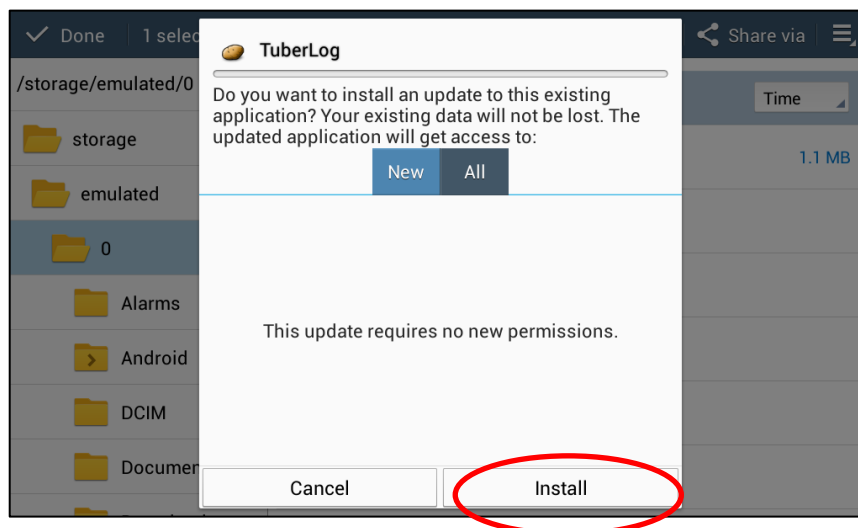
Select the 'Apps'. This time select 'My Files'.



This will bring up a list of apps that are available to you. Search the list until you find the *TuberLog* app. Select this app.



A warning box will appear asking if you want to install, select '*Install*'.



Once the app has been installed, select '*Open*'.

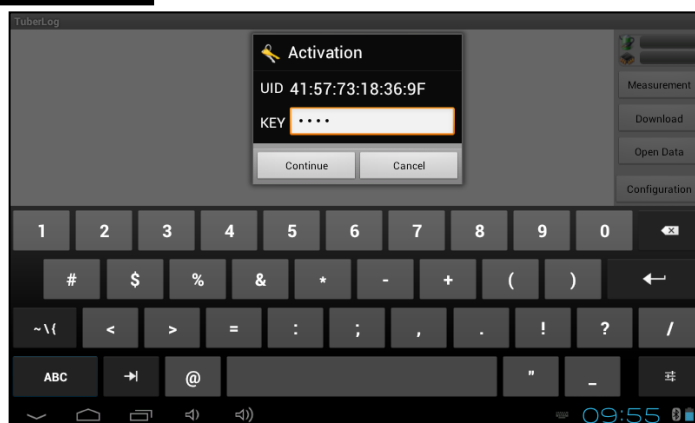
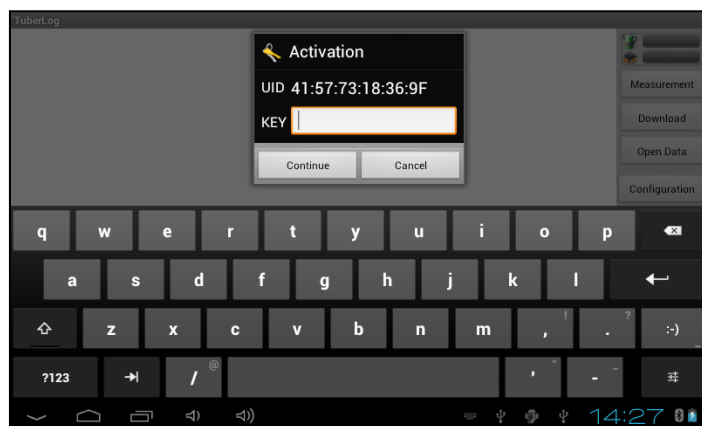
C.1.4. **TuberLog^{EXTRA} Android App activation**

When you open the app for the first time an activation box will appear and give you a UID code which is a unique identification number for your tablet.

You will need to email sales@martinlishman.com with the 12 digit code shown on your tablet.

You will also need to provide your 3 digital serial number from your data logger.

We will reply with the four digit key that you need to enter at this stage. You will usually receive your unique activation key within one working day.



Once you have received your four digit key, enter it into the activation box and press 'Continue'.

You can now follow the instructions for C.2. 'Using the TuberLog^{EXTRA} Android App up to point 7, 'Export of data to PC' (C.2.7).

C.1.5. Exporting the data to the PC

Exporting the data from the Samsung tablet to the PC

To retrieve data from the tablet, repeat steps in 'C.1.3. Installing the TuberLog^{EXTRA} Android App' until the screen shot displays the 'Auto-Play' message box that will appear on your PC.

Now open the TuberLog folder. This is where your measurements have been stored.

To view the data on your PC, open the TuberLog programme on your computer, select '*Open Data*' and copy and paste from the '*SM-T110(F:)*' file to the '*Open Data*' file. You should then be able to open the data and view it on screen.

Note: Readings in the list of measurement series will be deleted from the database after one month, so make sure that required data has been downloaded to the TuberLog directory. The XML files will remain in the directory unless deliberately deleted by the user.

After the first installation, the TuberLog app can be found alongside all other apps in the main menu.

Exporting the data from the TuberLog device to the PC

You can also retrieve data directly from the TuberLog device, simply by connecting the device to your PC using the cable supplied. The TuberLog PC software will instantly display. The 'Measurement Series' box will appear, highlight the data you wish to retrieve and press 'Select'.

Your data is now ready to view.

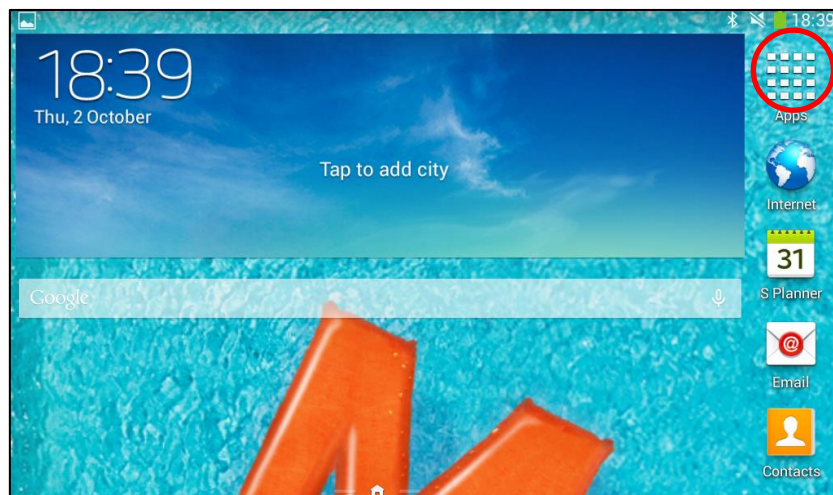
C.2. Using the *TuberLog*^{EXTRA} Android App

C.2.1. Open the App

Switch the tablet '*On*'.

Place your finger on the screen and swipe to unlock the handset.

Press the '*App*' symbol.



Select the *TuberLog* icon on the screen.

C.2.2. Select the data logger

On the initial screen after opening the App you will see a list (if you own more than one TuberLog) of paired devices that have an active Bluetooth connection. If the data logger you wish to use is not shown, but is within range of the Android device, activate it by shaking it. Select the desired logger by touching the screen. The data logger should now be connected. If not set to Always On, you will be prompted to activate the Bluetooth function in the device.

The following information will show on the screen (as below):

Battery status (%)

Memory status (%)

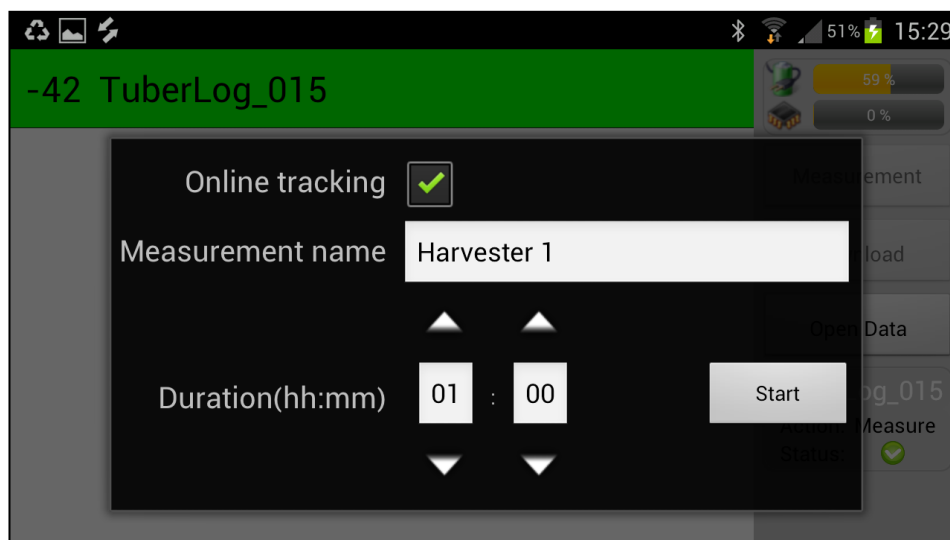
Remaining time (if a measurement is already running)



C.2.3. Start the data logger

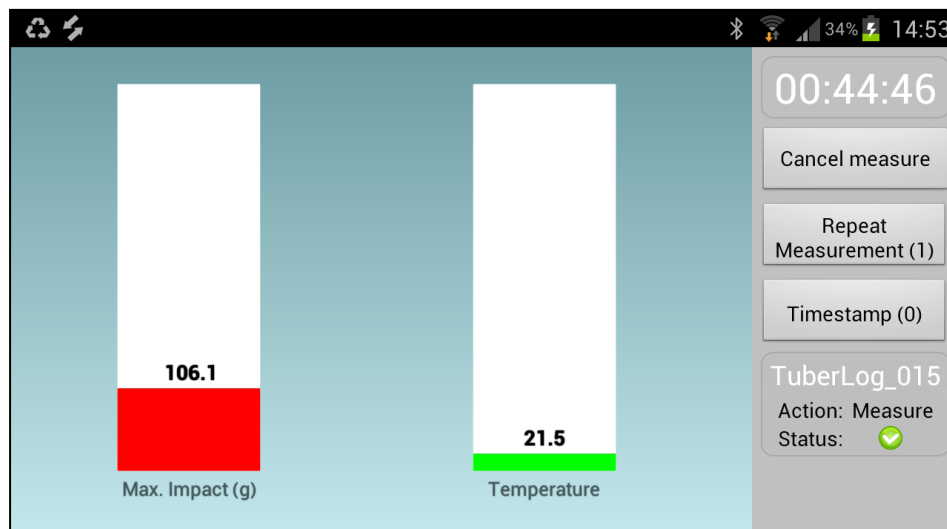
Touch [Measurement](#) in the right menu bar to display the *Start Measurement* window. Enter a Measurement Name and Measurement duration. To follow the measurement on the screen live and as it happens, select [Online Tracking](#). Touch [Start](#) in the bottom right of the window.

Important: Make sure that the data logger battery is adequately charged.



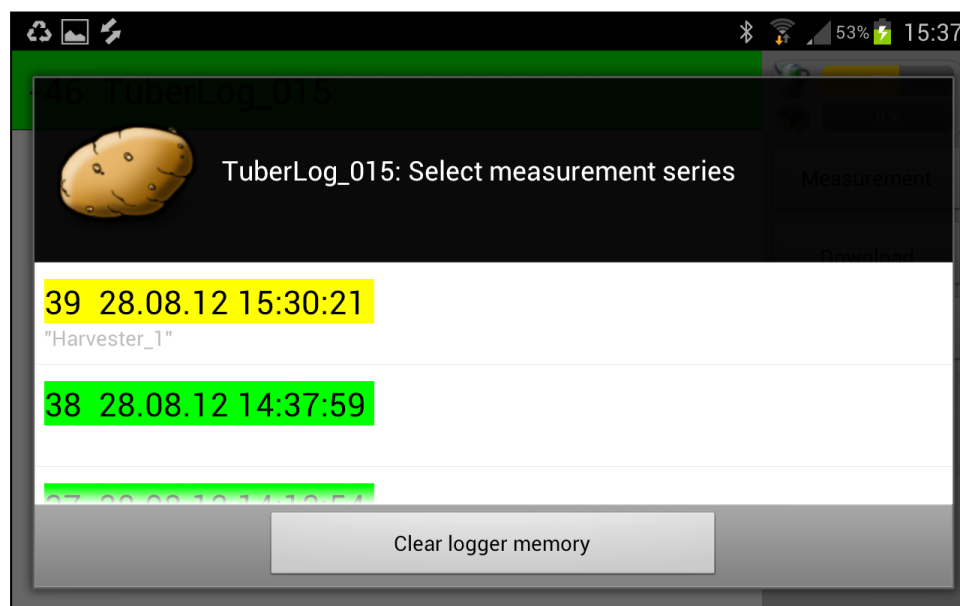
C.2.4. Place the data logger in the machine to be tested

The remaining measurement duration will count down at the top of the screen. In Online Tracking mode each impact will be indicated, as it happens, on the screen and also by an audible tone (if selected in Settings).



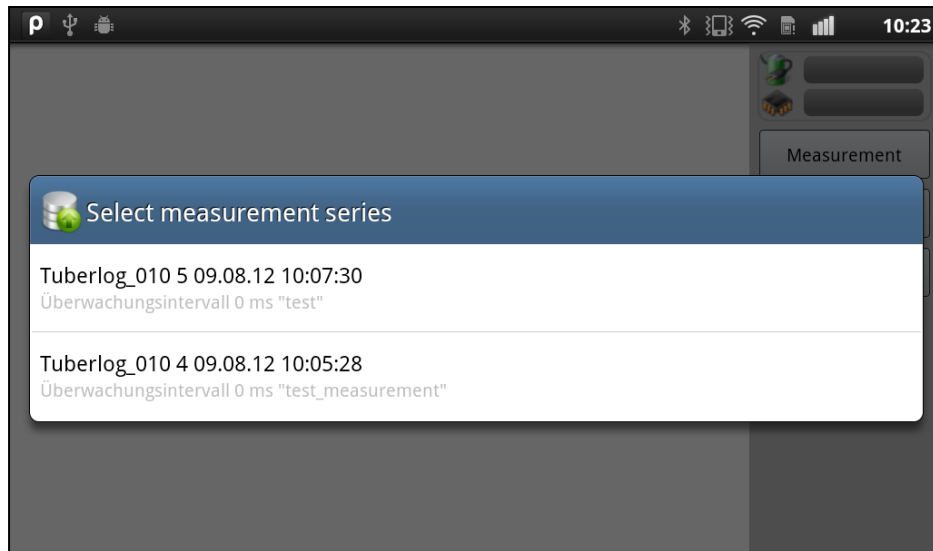
C.2.5. Display TuberLog data

If the measurement timer is still running, click [Cancel measure](#) in the right menu bar (see above). Touch [Download](#) to display the list of measurement names; touch to highlight the required measurement. The data will be displayed.



Note: Measurements marked Green are already stored on the Android device. Measurements marked Yellow have no data.

Touch the button [Open Data](#) to download measurements which are stored on the Android device.



C.2.6. Change the data display

Touch the graph icons above the data to change the display mode between a graph of the impacts during a measurement and a graph of the percentage distribution of the impacts.



Graph of impacts during a measurement

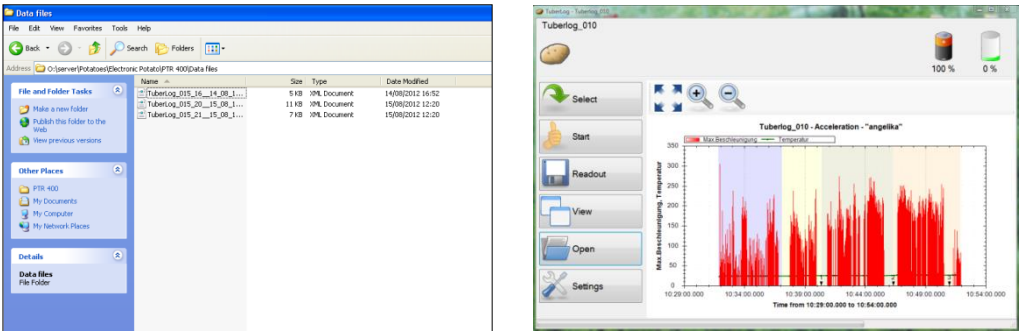


Graph of the percentage distribution of impacts

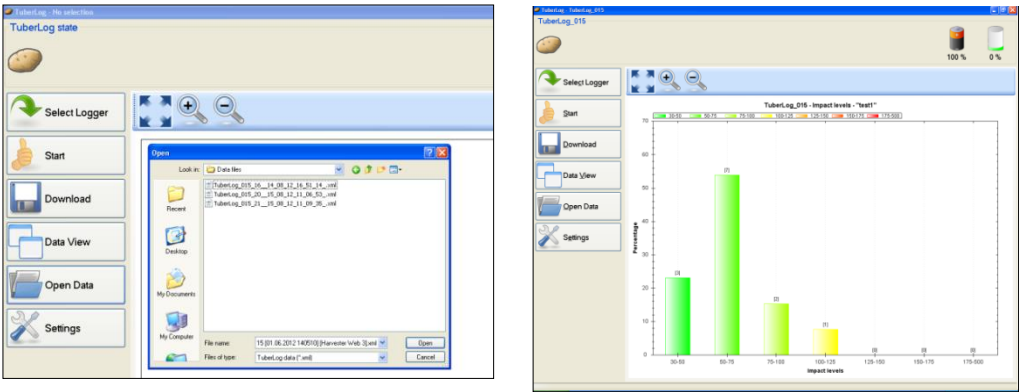
C.2.7. Export of data to the PC

Downloaded measurement files from the data logger are automatically stored in XML format in the TuberLog directory on the Android device SD card. This is accessed via My Files/TuberLog (folder names may differ on some devices). The data can be copied to the computer and processed using the *TuberLog* PC software.

Note: Readings in the list of measurement series will be deleted from the database after one month, so make sure that required data has been downloaded to the TuberLog directory. The XML files will remain in the directory unless deliberately deleted by the user.



Typical stages of data presentation using the PC version of TuberLog – see the User Guide for more details



Maintenance and care of *TuberLog*

The Data Logger

Little ongoing maintenance of the data logger is required. It is a sealed waterproof unit and must not be opened by the user. Any warranty will be invalidated if the data logger has been opened.

During use, it is advisable to keep the surface of the data logger clear of accumulated mud. If allowed to harden on the surface any mud could affect the response of the unit to impacts.

General Care

TuberLog is a sophisticated and delicate electronic instrument that should be treated with care. It should be treated as if it was a real potato being produced to the highest possible quality. Like a real potato, *TuberLog* will be permanently damaged if it is dropped onto hard surfaces such as concrete. If a badly adjusted potato harvester is seriously damaging potatoes, for example by squeezing them through the haulm rollers, it must be assumed that *TuberLog* will also be damaged in this way. The examples given are non-exhaustive. The manufacturers cannot be held responsible for this kind of traumatic damage and it is the responsibility of the user to make sure that *TuberLog* is not put into a situation where such damage could occur.

Warranty

TuberLog is guaranteed for 12 months from the date of purchase against any defect or malfunction caused by faulty parts or workmanship. To claim under warranty, the complete set should be returned in its carry case, at the claimant's expense, to the supplier with a written explanation of the problem. Should there prove to be a defect or malfunction caused by faulty parts or workmanship, it will be repaired or replaced and returned to the claimant without charge. If a warranty claim is rejected, the cost of replacement or repair will be notified to the claimant before any work is carried out.

Any warranty claim will automatically be invalidated if the data logger has been opened or internally tampered with in any way. Damage or faults occurring which are deemed by the manufacturers or distributors to have been caused by inappropriate use of the equipment or by use not in accordance with the instruction manual will not be covered under warranty. Under no circumstances will the supplier re-imburse any costs associated with a warranty claim if these costs have been incurred without agreement in advance.

Under the terms of warranty under no circumstances will liability exceed the cost of replacement or repair. The manufacturer ESYS GmbH and the distributor Martin Lishman Ltd will not be liable for any consequential or indirect loss suffered by purchasers or users of *TuberLog*, whether this loss arises from correct or incorrect use of the data logger and software, defect or malfunction caused by faulty parts or workmanship or in any other way. Non-exhaustive illustrations of consequential or indirect loss are loss of profits, loss of contracts and damage to property.

Full Terms and Conditions of Sale can be supplied on request or viewed on our website www.martinlishman.com.

For technical help:

Please send a description of your query to:

Martin Lishman Ltd E-mail: sales@martinlishman.com; Tel: +44 1778 426600

Appendix

TuberLog Technical data

TuberLog captures all impacts during a selectable measurement period while using a sampling rate of 3000 Hz. When exceeding a preset threshold, the peak values of the 3 acceleration axes (x,y,z) are saved continuously in a millisecond cycle until the impact falls below the threshold again.

- Measured variable sensor: Acceleration / Temperature semiconductor sensor
- Measurement range acceleration: up to 250g, Resolution 0,1g, Accuracy ± 1
- Measurement range temperature: -40 to +125°C, Resolution 0,1°C, Accuracy $\pm 1^\circ\text{C}$
- Measurement duration: up to approx. 16 hours
- Memory capacity: 425,984 measurement value pairs
- Data preservation: >10 years without battery
- Power supply: Lithium-ion-battery 3,6V, 850mAh rechargeable in approx. 2 hours
- Operating temperature range: - 10°C to +70°C
- PC Interfaces: USB, Bluetooth
- Dimensions: approx. 90 x 65 x 50 mm
- Weight : 200g
- Compatible software OS: MS-Windows XP/7
- Format of saved data: *.xml
- Format of exported data: ASCII-compliant CSV-Format

Proper disposal of the data logger

Please support us with the proper disposal of the data logger, protecting our environment and also take care of local rules and regulations:

The proper disposal of electronic broken or disused devices is a legal duty of both the manufacturer and buyer alike. Electronic waste may not be disposed as domestic rubbish.

The disused devices may not be returned into public recycling systems. They have to be returned directly to ESYS GmbH. ESYS GmbH accepts returned disused devices (made by ESYS GmbH) free of charge for proper disposal/recycling.



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