



# CompostManager



## Users' Guide to CompostManager V2

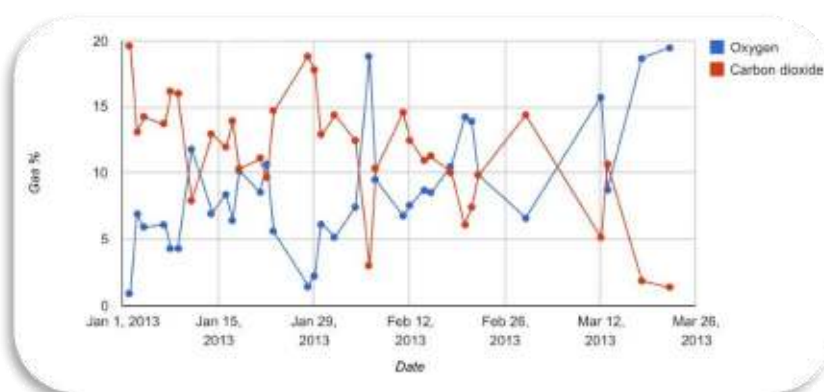
Issue 1.0.1

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# 1. Introduction to CompostManager

CompostManager is a unique product designed specifically for use in composting. It allows intelligent and rapid monitoring of the entire composting process from raw materials to finished product. This is achieved by regular and targeted sampling of selected batches using a probe with integrated instrument that simultaneously monitors oxygen, carbon dioxide, moisture, and temperature. By careful monitoring and control of these four parameters, it is possible to significantly improve the composting process. Data from these four readings are uploaded to a web server where they are analysed and stored alongside batch management information.



Barcode	Batch no	Client code	Date formed	Reading date	Oxygen average %	CO <sub>2</sub> average %	Temperature average (°C)	Moisture average %	Instruction	Sanitisation Status
									Please select	
3448	47		08/12/2012	12/03/2013	12.1	8.3	70.5	39.7	Turn	Sanitised
3449	48		22/12/2012	13/03/2013	8.8	10.7	69.8	39.5	Leave Alone	Sanitised
3450	49		21/01/2013	14/03/2013	9.6	10.6	66.0	36.2	Leave Alone	Sanitised
3451	50		12/02/2013	14/03/2013	20.3	0.3	47.2	39.4	Turn	7 Days At 65°C
3452	51		01/03/2013	14/03/2013	20.4	0.6	56.5	34.3	Irrigate	1 More Turn And 7 Days At 65°C

## 2. CompostManager at a Glance

### 2.1. Software overview

The software is web-based which means that you log on to a secure website in order to configure your site and view your results. The results can be viewed from any suitable Internet-connected device, and you can run the software on as many computers as you like.

### 2.2. Hardware overview

#### 2.2.1. The Instrument

The instrument is the link between the probe and the software. It provides you with simple instructions about where to carry out the monitoring.

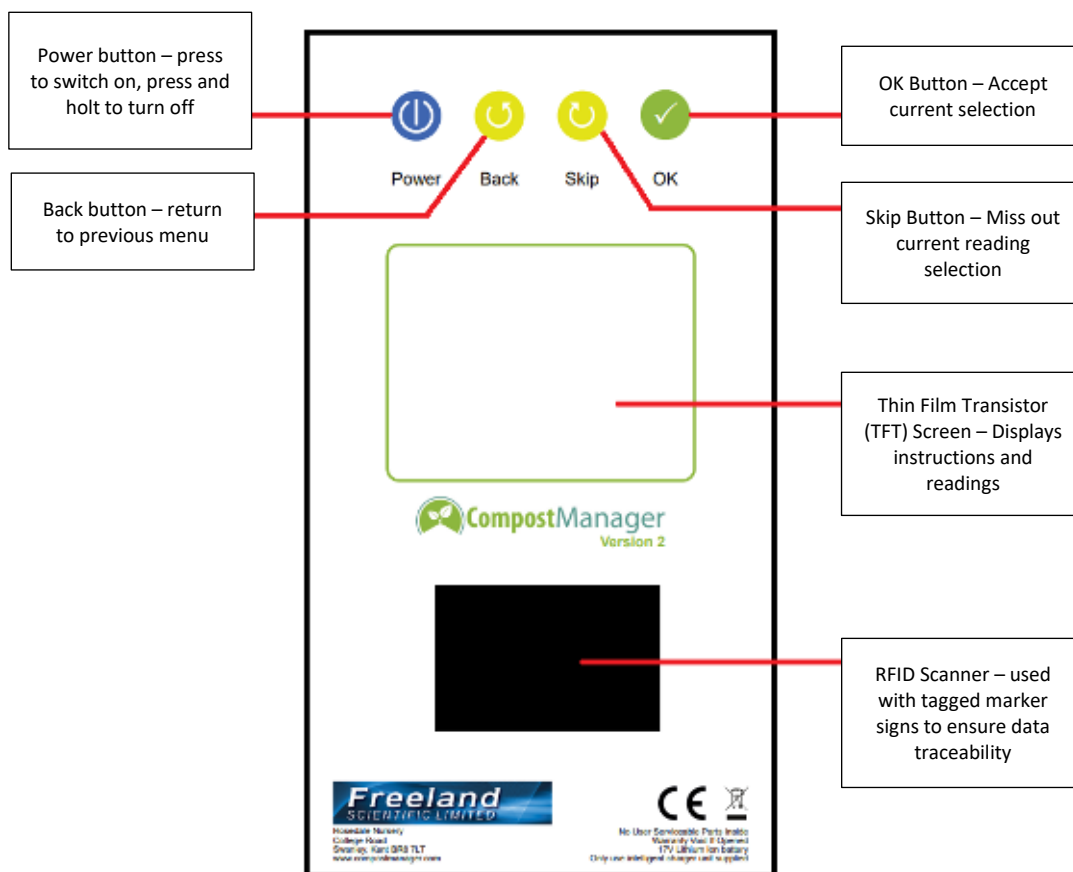


Fig. 1. The front of the instrument

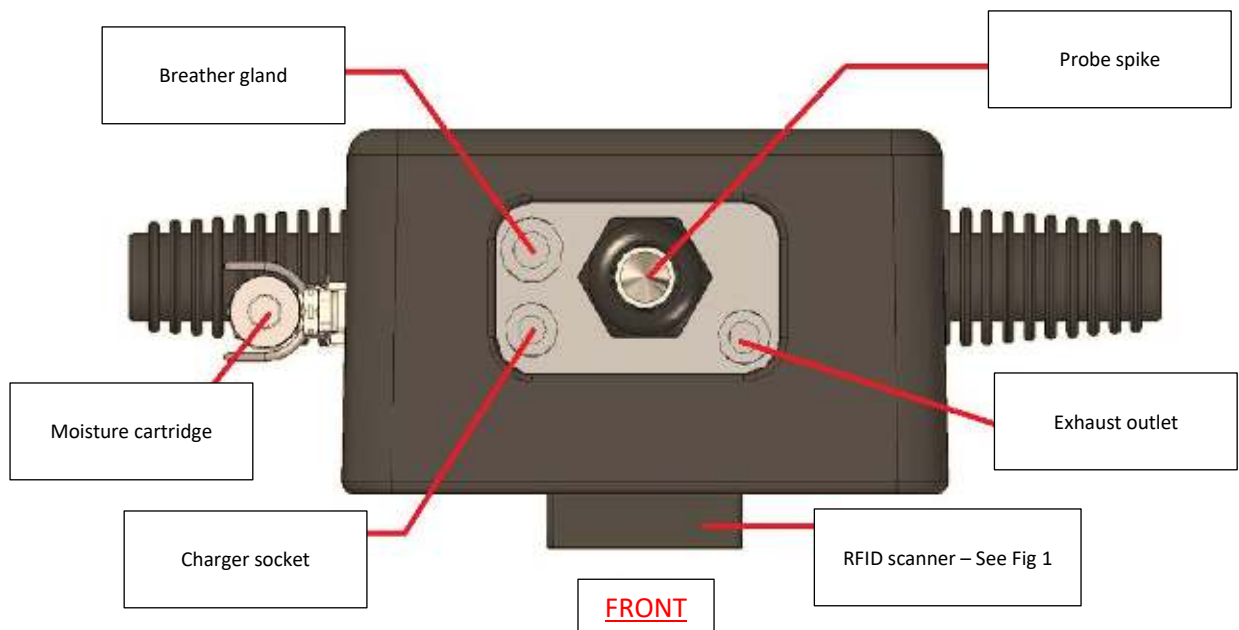


Fig. 2. The bottom of the instrument showing inlet and outlet connections

### 2.2.2. Accessories

Instrument charger



System hanging hooks, screws, and wall plugs (see page 26)



Spare moisture cartridge(s)



Marker signs with RFID tags



Instruction manual



## 3. Safety & Environmental

### ***3.1. Intended use***

This system is designed for use in windrow composting operations and related areas. Any use of the system outside of these areas or any modification of the system could be hazardous and will result in loss of warranty. It is assumed that the user/operator has the proper professional skills and experience to operate the system safely in this environment and can assess any dangers or risks. It is the responsibility of the user to ensure that all relevant legislation concerning health and safety is adhered to.

The system can only be operated safely when used in the environment for which it was intended. This includes a wide range of climatic conditions as specified in section 4.3.

The system is designed for sampling and monitoring gasses found within aerobic composting processes only. Exposing the instrument to any other form of gas risks personal injury or damage to the instrument and will invalidate the warranty.

The instrument should never be connected to any other source of gas (eg. landfill gas) particularly if there is a risk that the gas may be flammable or corrosive. Never connect the instrument to a supply of gas above atmospheric pressure (eg. compressed air or gas from a cylinder).

### ***3.2. General safety instructions***

Only the charger supplied by the manufacturer should be connected to the instrument. Never attempt to use a different charger or connect any other device to the instrument.

The complete system has been designed, manufactured, and tested in accordance with the relevant guidelines and standards for electronic measurement equipment. It has been supplied in a technically correct and operational condition.

In order to ensure the instrument remains safe, the user must observe the safety precautions outlined in this manual. If there is reason to believe that the instrument cannot be used without a risk, the instrument must be immediately removed from use and returned to the manufacturer or distributor for repair. The safety of the user may be at risk if any part of the system:

- shows visible damage; or
- no longer operates as specified; or

- has been subjected to conditions outside those specified in section 8.

If in doubt, please contact your supplier and arrange for the instrument to be returned to the manufacturer.

The battery pack used in the main unit may present a fire or chemical burn hazard if it is mistreated. Do not disassemble, heat above 100°C [212°F] or incinerate.

### **3.3. Electrical storms**

Due to the nature of the metal probe, the instrument is not suitable for use during thunderstorms. The operator may be placed at an increased risk from lightning strike if the probe is handled during electrical storms. If such storms are likely, sampling should be stopped immediately and not resumed until it is safe to do so.

### **3.4. Recycling**



Electrical and electronic equipment should not be disposed of with general waste. At the end of the product's lifecycle, you should contact your supplier to arrange collection for recycling and disposal in an environmentally friendly manner.



For the purposes of the EU waste electrical and electronic equipment regulations 2006 (WEEE) the manufacturer of this product is a member of the producer compliance scheme (registration number WEE/DA0482SW). You may need this number in order to recycle the equipment at the end of its life.

## 4. Getting Started

### 4.1. Unpacking

Unpack all the system components carefully and retain all packaging.



**IMPORTANT:** The original packaging must be used for returning the probe and instrument for calibration and maintenance.

### 4.2. Charging the system

Unless specified otherwise, your system will be shipped fully charged and ready to use. If the instrument has not been used for a while, you should ensure that it has at least 3-4 hours of charging before use (see page 24).

### 4.3. Login to CompostManager client website

Login to <http://clients.compostmanager.com> You should have already been sent your login username and password. If not, please contact CompostManager. You will then see the home page for your particular site(s).

### 4.4. Begin Monitoring

At this stage, you are nearly ready to start using the system to collect data which can then be analysed and viewed on the software. These are the required steps (in order), together with the relevant manual sections:

- a. Add details of all the batches on your site to the software (section 5.2.1, page 10);
- b. Update details of when each batch was last turned (section 5.1, page 9);
- c. Carry out the sampling (section 6.1, page 20);
- d. View the recorded and analysed data (section 5.2, page 10).



## 5. Using the software

See section 4.3 (page 8) for details of the software login procedure.

### 5.1. Action List

The action list page displays all the batches currently registered on your site. As well as checking which batches you have registered, you will use this page to record the following action that you take on the existing batches:

- *Turned* – a batch is turned or moved around the site;
- *Irrigated* – water is added to a batch; and
- *Screened* – the batch has reached the final stage of the process and no further monitoring will be carried out on it. It is usual to mark a batch as screened as soon as the screening process begins. You can log the date when screening is completed in the 'Additional Information' tab (page 15).

To register the actions, select the date the action was carried out from the date picker in the 'Action Date' column then tick the relevant boxes (Fig. 3). You can also select which user carried out or recorded the actions. Once you've marked all the actions, click the [Save] button to register the actions. It's usually easiest to update the actions at the end of every working day.



The screenshot shows the 'Action list - all active batches' page in the Compost Manager software. The page includes a navigation bar with tabs for 'Action list', 'Batch information', 'Update device', 'Retrieve data', and 'Sample order'. Below the navigation bar is a 'Print' button and a table of active batches. The table has the following columns: Site Barcode, Batch number, Client code, Instruction, Action Date, Turned, Irrigated, Screened, and Action taken by. The table contains 15 rows of data, each representing a batch with a unique site barcode and batch number. The 'Action Date' column contains date pickers, and the 'Turned', 'Irrigated', and 'Screened' columns contain checkboxes. The 'Action taken by' column contains a dropdown menu with 'UK Demo 1' selected. At the bottom left of the table, there are 'Save' and 'Cancel' buttons. A mouse cursor is pointing at the 'Save' button.

Site Barcode	Batch number	Client code	Instruction	Action Date	Turned	Irrigated	Screened	Action taken by
12705	180	01.13	Screen		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	UK Demo 1
12706	181	02.13	Leave Alone		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	UK Demo 1
12707	182	03.13	Screen		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	UK Demo 1
12708	183	04.13	Leave Alone		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	UK Demo 1
12709	184	05.13	Leave Alone		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	UK Demo 1
12710	185	06.13	Leave Alone		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	UK Demo 1
12711	186	07.13	Leave Alone		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	UK Demo 1
12712	187	08.13	Turn		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	UK Demo 1
12713	188	09.13	Leave Alone		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	UK Demo 1
12714	189	10.13	Turn		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	UK Demo 1
12715	190	11.13	Leave Alone		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	UK Demo 1

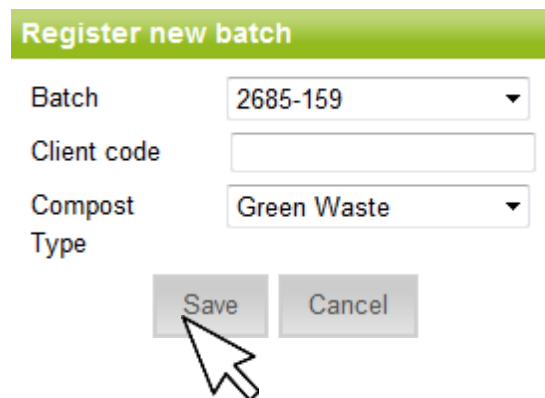
Fig. 3. Action list page of software.

If you make a mistake with logging any actions, this can be corrected in the 'Batch information' pages (page 11). If a batch start date is erroneously recorded, please contact CompostManager to change this.

## 5.2. Batch information

### 5.2.1. Register new batches

On the toolbar at the top of the page click on [Batch Information] and then click [Add Batch]. A pop-up box will appear (Fig. 4) which contains the next available barcode number for each batch number allocated to your site. The batch number after the dash should correspond with the number printed on the marker sign for that batch. You can only have one of each batch number on site at any given time. Once a batch is marked as screened, the next unique batch with the same number will become available for use.



The image shows a web-based form titled "Register new batch". The form contains three input fields: "Batch" (a dropdown menu with "2685-159" selected), "Client code" (an empty text box), and "Compost Type" (a dropdown menu with "Green Waste" selected). Below the form are two buttons: "Save" and "Cancel". A mouse cursor is pointing at the "Save" button.

Fig. 4. Registering new batches.

If you have a coding system of your own, you can record your codes alongside the CompostManager batch codes. Select the most relevant compost type from the drop-down list, then click [Save]. You can update the client code after the batch is registered from the 'Additional Info' tab of the 'Batch information' page (page 13). Repeat this process for each batch currently being processed.

### 5.2.2. Viewing data from a range of dates

Click on the [Batch information] tab on the top bar. This displays the 'Batch review' screen where you can see data and actions from your site (Fig. 5).



Fig. 5. Example of 'Batch review' screen showing date range selectors

There are two options for viewing the data:

- *View latest data* – shows only the most recent data in the range selected; and
- *View all data* – shows all data collected in the range selected.

The page defaults to show the latest data from the current month. In order to narrow down the data you're looking at or look at older data, you can move the date range selectors to the relevant dates. The options are:

- *View readings from* – the earliest date from which data will be shown;
- *... to* – the latest date from which data will be shown; and
- *View single day* – greys out the 'to' box and only displays data from the day selected in the 'from' box.

You can either type the dates directly in to the range boxes or select dates from the pop-up date picker. You'll see a red square around dates where readings have been recorded.

As well as viewing the averaged data, instructions, and (optionally) the PAS-100 sanitisation status, this page includes these additional buttons:

- *Export List to Excel* – allows you to save a csv file of the data which can be opened in Microsoft Excel and several other data handling programs;
- *View Graphs* – displays the data from any given date graphically in the form of bar charts;
- *Add Batch* – registers a new batch (section 5.2.1. page 10);
- *Print* – displays a printer-friendly version of the page; and
- *Clear Filter* – removes all column filters (section 5.2.4, page 13).

### 5.2.3. Viewing batch history

In order to view the history of a batch, first you must find it on the 'Batch review' screen. If it is a recently monitored batch, you will see it on the default date range but if it hasn't been monitored during the current month, you'll need to move the date ranges until the batch you're interested in is listed.

Having found the batch, you can view its history and additional information by clicking on the batch barcode number (Fig. 6). This then displays a history of everything that's happened to the selected batch from the moment monitoring began to the most recent set of data or action (Fig. 7).

Barcode	Batch no	Client code	Date formed	Reading date	Oxygen average %	CO <sub>2</sub> average %	Temperature average (C)	Moisture average %	Instruction	Sanitisation Status	Action/Screened
12704	179	71.12	21/12/2012	02/03/2013	15.8	3.8	69.8	41.3	Screen	SANITISED	screened
12706	180	01.13	07/01/2013	13/03/2013	20.2	0.3	56.6	46.9	Screen	SANITISED	active
12707	03.13	22/01/2013	13/03/2013	17.7	2.3	54.9	51.1	Screen	SANITISED	active	
12708	02.13	11/01/2013	14/03/2013	8.8	8.2	72.3	39.9	Leave Alone	SANITISED	active	

Fig. 6. Selecting an individual batch from the 'Batch review' screen

Data capture date	No. of data points	Oxygen average %	CO <sub>2</sub> average %	Temperature average (°C)	Moisture average %	Instruction	Turned	Irrigated	Sanitisation Status
01/03/2013	4	20.2	0.2	40.8	57.3	Leave Alone			SANITISED
02/03/2013	4	13.1	5.3	52.7	50.6	Re-Sample			SANITISED
04/03/2013	4	20.3	0.2	55.2	49.6	Leave Alone			SANITISED
07/03/2013	4	19.6	0.7	55.5	49.3	Leave Alone			SANITISED
08/03/2013	4	19.3	0.7	49.2	52.4	Leave Alone	08/03/2013 Under		SANITISED

Fig. 7. Example of historical data from a single batch.

As well as viewing the averaged data, instructions, and (optionally) the PAS-100 sanitisation status, this page includes these additional buttons:

- *Add manual reading* – allows manual entry of temperature readings (section 5.2.7, page 16);
- *Export to Excel* – allows you to save a csv file of the averaged data and instructions;
- *Export Raw Values* – allows you to save a csv file of the individual datapoints which make up the averages displayed on the screen;
- *PAS-100 report* – generates a report of temperature and moisture data, together with turning and sanitisation information as required for PAS-100;
- *Print* – displays a printer-friendly version of the page; and
- *Clear Filter* – removes all column filters (section 5.2.4, page 13).

The three tabs along the top of this screen give you the option to view different information about the selected batch:

- *Data* – displays the data in a table (default);
- *Graphs* – displays the historical graphically in the form of line graphs; and
- *Additional Info* – displays additional information about the selected batch which can then be updated (section 5.2.6, page 15).

#### 5.2.4. Sorting and filtering the data

Data displayed in both ‘Batch review’ screens can be sorted by clicking on the column heading which you want to sort by. Clicking once will sort the data in ascending order; clicking a second time will switch this to descending order.

You can filter the data by entering information in the boxes on the first row of the table. When data is selected by date range, you have the option of filtering the displayed batches data in the right-hand column; these are the options for filtering:

- *All* – displays data from all batches (default);
- *Active* – displays data only from batches which have been started but not yet screened;
- *Screened* – displays data only from batches which have been marked as screened; and
- *No Data* – displays data only from batches which have been registered but have not yet had any monitoring carried out.

#### 5.2.5. Interpreting the instructions

Having analysed the most recent data alongside the historical data and recorded actions, the software gives a suggested management instruction. These instructions aim to optimise conditions within the composting mass and should be taken as a ‘guide to best practice’ rather than an absolute instruction. When your composting process is working efficiently, the management instructions provide a guide of the best way to manage your batches (Table 1). However, if the data suggest that conditions have the potential to cause problems with odour or inefficiency, the system gives instructions which will alert you of this and give you some help in diagnosing and rectifying the underlying problems (Table 2).

Instruction	Description	Likely Causes	Action Required
Irrigate	The moisture content in the batch is below the limits set up for your site.	Dry feedstock or excessive moisture loss during processing due to excessive turning, insufficient pile size, or excessive aeration.	If feasible, add water to the batch. Only turn the batch when beneficial to the process. Consider increasing pile size or decreasing aeration rate, if applicable.
Leave Alone	The data suggest that no action is required.	The composting process is working well and there is no benefit to turning the batch.	Turning the batch under these conditions will not significantly improve the process and may even have a negative effect on the process efficiency.
Re-sample	The spread of the readings taken is too large to base a decision on; batch should be resampled in the next sampling session.	Readings from some points within the batch are very high whilst others are very low indicating that conditions within the batch are quite heterogeneous. This is common for newly formed batches.	Re-sample the batch during your next sampling session; there is no need to repeat the measurements on the same day. Conditions usually settle down after a few days and the instruction will change. Consider increasing the number of sample points per batch if this instruction occurs often.
Screen	Batch activity has fallen, indicating that the batch is likely to be ready to screen.	The batch is no longer very active. Your turning and sampling regime and feedstock blend will affect how often you see this instruction.	If deemed suitable, the batch can be screened. Batches may well have reached an acceptable level of stability without seeing this instruction; provided that the conditions within the batch have been satisfactory for a suitable period of time (usually dictated by your product end use) then the batch will be ready for screening.
Turn	The composting process will be improved by turning the batch.	The composting process has slowed significantly and will be revived by turning.	Turn the batch at the next available opportunity.

Table 1. 'Routine' management instructions produced by the system.

Instruction	Description	Likely Causes	Action Required
Diffusion Problem	There is insufficient oxygen in the batch to allow for aerobic composting. The batch is likely to become odorous unless conditions improve.	Inadequate structure, excessive moisture, unbalanced feedstock, excessive height, or excessive compaction.	Monitor the batch closely to see if conditions improve. Make changes to batch composition for future batches to avoid repeat problems.
Turn - Low Oxygen	The batch has had consistently low oxygen levels for several days.	The 'Diffusion Problem' instruction has occurred several times.	Turn the batch to relieve compaction and release excess heat, being aware that it is very likely to be odorous. Make attempts to diagnose and correct the issues responsible for the low oxygen levels.
Turn - High Temperature	Temperatures within the batch are significantly above optimum for aerobic composting.	Excessive pile size, unbalanced feedstock, inadequate aeration.	Turn the batch to release excess heat, being aware that it is likely to be odorous. Reduce pile size, increase aeration (if applicable).

**Table 2. 'Problem' management instructions and alerts produced by the system.**

### 5.2.6. Viewing or updating additional batch information

You can store additional information relating to individual batches. Although this information does not affect the instructions generated, it can be useful in record keeping and can be re-presented in custom reports.

In order to view or update the additional information, you first need to click on the 'Additional info' tab of the batch history (section 5.2.3, page 11). This brings up all the additional information registered for the chosen batch (Fig. 8). You can also update the client code you entered at the time the batch was registered here. Click the [Save] button to save the updated data.

Note that the 'Finished Screening' box is simply a means of recording when a batch is completely processed for recordkeeping purposes. The system will expect to monitor a batch until is marked as 'Screened' in the 'Action List' page (section 5.1, page 9).



Batch information			
Batch number:	186	Date formed:	20 February 2013
Client code:	07.13	Screened:	No
Compost type:	Green Waste		

Data	Graphs	Additional info	
Waste transfer ticket number from:	<input type="text"/>	Waste transfer ticket number to:	<input type="text"/>
Initial weight:	<input type="text"/>	Initial volume:	<input type="text"/>
Batch formation start date:	<input type="text"/>	Finished screening:	<input type="text"/>
Oversize from batches:	<input type="text"/>	Spreading field numbers:	<input type="text"/>
Notes:	<input type="text"/>	Client code:	07.13
<input type="button" value="Save"/> <input type="button" value="Cancel"/>			

**Fig. 8. Additional Information tab showing available information.**

### 5.2.7. Adding manual temperature readings

To maintain statutory temperature records at times when the probe is not in service, it is possible to enter manual temperature readings for a batch. The instructions generated by the system will not be fully effective when only temperature data is present so you should not use this feature as a substitute for the full range of readings collected by the instrument. To add manual readings, first find the batch history page for the relevant batch (section 5.2.3, page 11). Now click on [Add Manual Reading] button to open the manual reading dialogue box (Fig. 9). Select the date the readings were taken and the operator who recorded them. If required, you can record weather conditions at this point too. Enter the temperatures from each sample point in your local units into the relevant boxes. The maximum number of points you can record is the same as the number of sample points configured for your site. Click [Save] to save the readings.



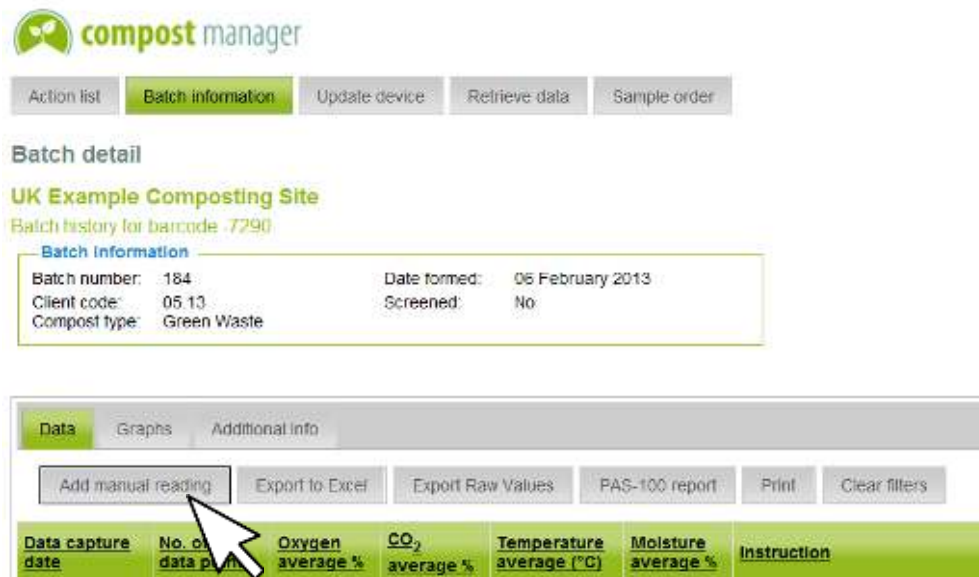


Fig. 9. Launching the manual reading dialogue.

### 5.2.8. Exporting data

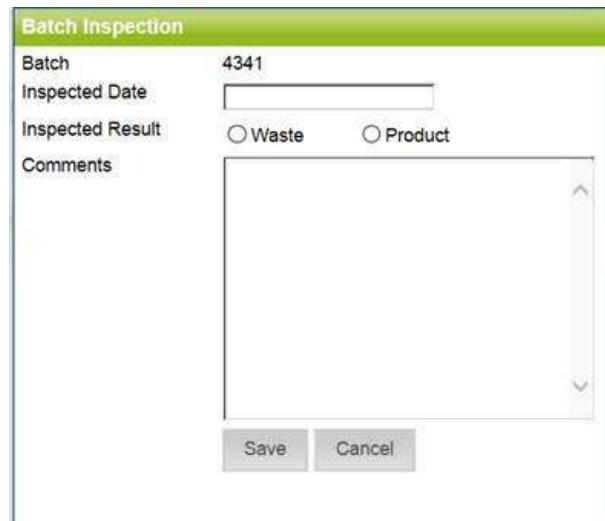
You can export batch information or individual datapoints in csv file format which can be opened in Microsoft Excel and several other data handling programs. Click [Export to Excel] to export the averaged data with instructions, or [Export Raw Values] to view each individual datapoint collected for the selected batch; this will create a link to the csv file. How you open or save the file will depend on your browser – most browsers will ask if you would like to run or save the file. If this approach doesn't work, try right-clicking the link then selecting 'Save As' from the list.

### 5.3. Batch inspections (UK PAS-100 / QCP sites only)

If your site is PAS100 / QCP certified then you are required to visually assess each batch within three days of screening. The CompostManager software can help you to keep track of this. You should record the following information into the software:

1. The date the inspection was carried out;
2. The result of the inspection (whether the batch was assessed as being a waste or product); and
3. Any comments relating to the inspection. If the batch is classed as a waste, you should record the fate of the batch (*e.g.* re-screening, dispatch under deployment, *etc.*).

As soon as a batch is marked as screened, it will appear in the 'Batch Inspections' table. You can access this at any time from the 'Batch Inspection' menu tab; this tab will be hidden if no batches are due for inspection, or your site is not configured for PAS sampling. Once the inspection has been completed, you can record this by clicking the 'Inspection' link; this will bring up a form to fill in the details (Fig. 10).



**Fig. 10. Batch Inspection dialog used to enter information for PAS-100 / QCP-accredited sites.**

Once you've saved the inspection details, the batch will disappear from the table. If you make a mistake or need to change the details, there is an 'undo' link on the batch history page. Please contact CompostManager should you need to change whether or not this feature is enabled in the software.

### ***5.4. Changing the sample order***

You can change the order in which batches are sampled to reflect the layout of your site. Click on [Sample Order] in the top ribbon, then click the relevant site. Drag the batches up and down to change the order in which the instrument will ask for them to be sampled, and then click [Update Order] to save. It is possible to set the default sampling order for your site based on date or windrow number – contact CompostManager if you would like to change this.

### ***5.5. Admin section***

There are two permission levels for software users:

- a. *User Administrators* – can view the admin page and change details of any user registered to their company, as well as adding and deleting users; and
- b. *Standard Users* – have access to everything except the admin page.

Initially, you will be sent login details for a default user account with user admin permissions. Using this login, you can set up accounts for all users who are likely to use the system. It is possible to upgrade any standard user to a user administrator by contacting CompostManager.



Fig. 11. Example view of admin screen.

Fig. 11 shows an example of the admin screen. The features available in the admin screen are:

- *Users > Add User* – add additional users to your company;
- *Users > [Click Username]* – edit details for the username clicked, you can change login details or archive a user;
- *Site Settings > [Click Site]* – display the default settings for the site clicked in the default settings panel; and
- *Default settings panel* – displays centrally configured information for the selected site such as number of sampling points. Contact CompostManager if you would like to change any of these.

## 6. Using the Hardware

### **6.1. Sampling procedure overview**

During batch sampling, the operator is guided around the site by instructions on the instrument screen, such as 'Go to batch 1 position 1'. It is not possible to change the sampling instructions once the measurement procedure has started although you can skip over batches and go back to previously skipped ones using the buttons on the instrument. As details of the required sampling are obtained from the server before each sampling session, the sampling instructions will always be up to date. Remember that you can change the order in which the batches are sampled in the software (page 18).

During a normal sampling procedure, you will do the following:

- register any batches which have been added / removed;
- collect the data; then
- view the collected data on any Internet connected device

### **6.2. Instrument overview**

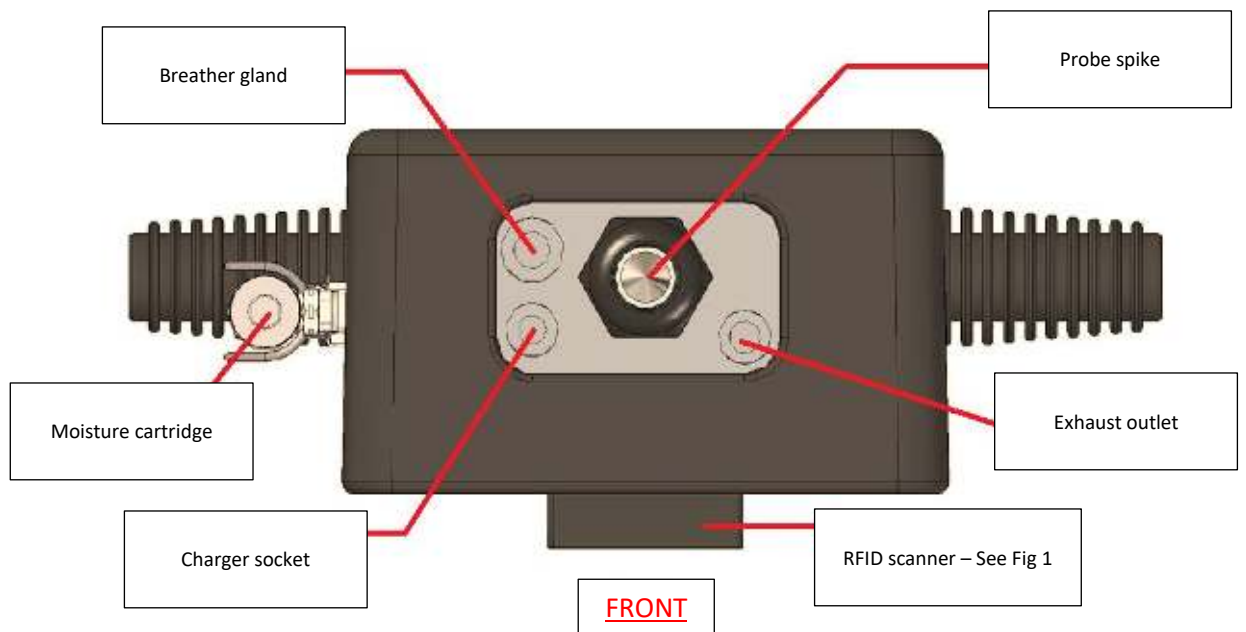
The instrument is designed for use in shredded organic composting materials only.



**WARNING:** Do not attempt to insert the probe into anything other than shredded, uncompacted, organic composting materials as this may irreparably damage the probe.

The main instrument contains the following:

- a pump, filter, and gas sensors for gas analysis;
- a system of electronics to control the measurement and store the data;
- a TFT screen to display sampling instructions and collected data to the user;
- three control buttons and a power button on the front panel;
- a 2G modem module to upload / download data and sampling instructions;
- an RFID module to read the batch identification tags; and
- a charger connection port (



- 
- Fig. 2, page 5).

### ***6.3. Handling and storage of the instrument***

The instrument is rain-proof and has been specifically designed for use on composting sites. However, the instrument contains delicate electronic components and should be treated with due care. Never immerse the instrument in water or leave it anywhere where it could be damaged by machinery or vehicles.

**IMPORTANT:** Never leave the instrument un-supported on a flat surface, as this risks damage and injury from falling.

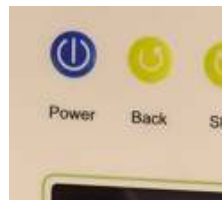


The instrument should be stored and re-charged indoors under the conditions specified in section 8.1 (page 30). When not in use the instrument should be stored on the hanging hooks provided.

When transporting the instrument in a vehicle do not place any other objects on top of the instrument and take care to ensure that no sharp objects are allowed to damage the front panel.

#### ***6.4. Switching the Instrument on and off***

To switch the instrument on or off, simply press the blue button on the front panel of the instrument (Fig. 12). The instrument can be switched off at any point without loss of any collected data.



**Fig. 12. Location of on/off switch**

#### ***6.5. Instrument operation***

The entire system is controlled from the batch information on the software and the buttons on the front panel. Each button performs one simple function only. The display screen will guide you through the operation procedure.

Each time the instrument is powered up, a calibration span check is carried out on the oxygen sensor. The user is instructed to ensure the probe is in fresh air and the measurement cycle begins. A warning is displayed if the probe is blocked, or the oxygen sensor does not respond correctly.

Following the oxygen calibration, a list of batches to sample is obtained from the server using the on-board modem module. The instrument will then request a scan from the tag corresponding to the first batch to be sampled. The identifying tag is only scanned at the beginning of sampling for each batch.

At the end of each measurement, the instrument will display the level of each of the parameters being measured (oxygen, carbon dioxide, moisture, and temperature). This provides the user with an indication of the conditions within the windrow. The exact data values are stored on the instrument before being downloaded to the computer.

It is important that the display is used for reference only and that any management decisions are taken based on the accurate data downloaded from the instrument to the computer together with historical data for that particular batch.

### **6.6. Scanning the tags**

When requested by the instrument, the RFID scanner should be held in range of the tag on the marker sign for the appropriate batch. There is no need to make contact with the tag: it can be read from a distance of up to 25mm [1”].



**WARNING:** Take care not to damage the tag reader or instrument panel when scanning the tags

### **6.7. Maintaining the instrument**

There are no user serviceable parts inside the case, and you should not attempt to open it. Breaking the factory seal will invalidate the warranty and will breach the terms of your contract of sale.

The external surfaces of the instrument may be cleaned with soapy water. Never immerse the instrument in water or spray it with water. Do not expose any part of the instrument to solvents or corrosive chemicals (eg. petrol, oil, bleach).

Several parts of the instrument require calibration or checking by the manufacturer at yearly intervals. For more detail on servicing and calibration, see section 6.13.

### **6.8. Handling and storage of the instrument**

When not in use, the instrument should be stored indoors on the hanging hooks provided.. The probe must never be struck against any solid object such as concrete and care must be taken not to put excessive strain on the probe spike. Do not place any other items on top of the instrument and take care that the pointed end does not present a risk of injury to people or damage to other equipment.

### **6.9. Inserting and withdrawing the probe**



Before inserting the probe, make sure that the gas sampling holes are clear of compost material. During normal operation they will not block but when used in material that is excessively wet or contains a high proportion of fines, some holes may become blocked. If any holes are blocked, remove the material using a small screwdriver or similar.



Alternatively, the holes can be cleared with a jet of compressed air, provided the moisture cartridge is first removed.

The probe should be inserted into the windrow at around waist height. Place the probe on the side of the windrow, with the tip pointing towards the middle of the row. Using both hands, drive the probe into the windrow, leaving approximately 150 mm (6") between the bottom of the control box and the windrow.

Due to the nature of composting feedstocks, it may not always be possible to insert the probe on every attempt. If significant resistance is felt (eg. from a large piece of wood) withdraw the probe and re-insert at a nearby position. Do not force the probe and never use any form of tool to drive the probe into the pile.



Once the sampling has finished, withdraw the probe from the pile by pulling it straight out using both hands. It should come out easily.

Do not shake or twist the probe. Do not withdraw the probe from the windrow before sampling has finished as this will lead to inadequate contact between the compost and the moisture sensor.

### **6.10. Maintaining the probe**

The probe requires very little routine maintenance provided it is used properly. Before each sampling session, ensure that the gas sampling holes are clear of debris by flicking out the holes with a small screwdriver or similar. The holes can also be cleaned with a jet of compressed air, provided the moisture cartridge is first disconnected from the instrument. If desired, the external surfaces can be cleaned using a cloth and soapy water.



**WARNING:** Never immerse the probe in water as this could enter the gas system and cause significant damage to the instrument.

There are no user serviceable parts on the probe; see section 7.1 for details on probe troubleshooting and calibration.

### **6.11. Charging the instrument**

The instrument is supplied with an intelligent charger which handles the charge cycle. The charger includes a status indicator to provide information about the charge cycle (see charger operating instructions for further



details). The instrument can be left on charge indefinitely without damage, so it is recommended to charge the instrument daily. To start the charge cycle, simply ensure the charger is powered and push the charger cable plug into the socket on the bottom of the instrument (

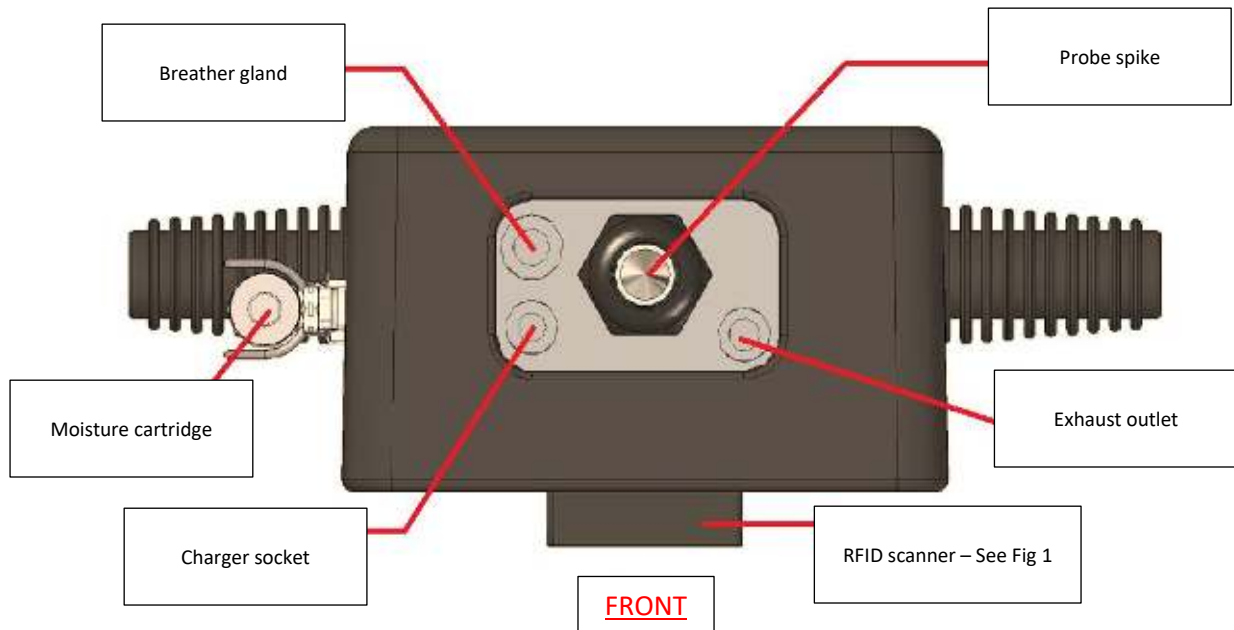


Fig. 2, page 5).

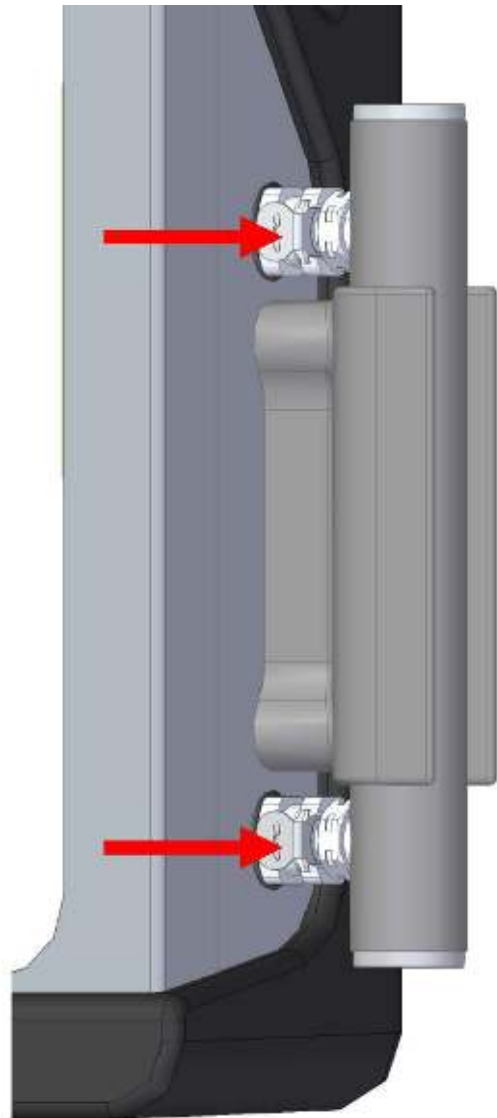
### **6.12. Changing the moisture-absorbing cartridge**

In order to prevent damage to the gas sensors, all CompostManager instruments are fitted with a moisture-absorbing cartridge in the gas line. These cartridges catch any liquid water in the gas sample line using an absorbent media. If the media has reached its capacity, the flow to the instrument will be shut off and the following message will be displayed on the instrument screen:



If you see this message, you must change the moisture cartridge, according to the following procedure:

1. Push down the two stainless steel quick-release tabs simultaneously:
2. Pull the moisture cartridge away from the instrument.
3. You should have been supplied with some spare cartridges; locate one of these.
4. Ensure both two stainless steel quick-release tabs are pushed all the way down.
5. Push the new cartridge into the quick release fittings until a click is heard from both connectors.
6. Place the old cartridge somewhere safe, ready to be returned to CompostManager during the next service.
7. Contact CompostManager if you have no spare cartridges left so that more can be sent.



**IMPORTANT:** Do not throw away the cartridge.

### **6.13. Installing the hanging hooks**

The instrument and probe hanging hooks should be installed indoors within reach of mains power.

Before installing the hanging hooks, you should first ensure that there are no services, (electricity, gas, water, data, etc) in the installation area. If in doubt, consult a qualified tradesman. The bottom of the hooks should be at least 1.7 m (5'6") from the floor to ensure that the probe can be fully suspended, and the distance between the centre of the hooks should be 200 mm (8").

Fix the hooks securely to a solid surface using the template supplied. If the wall plugs are required, these are inserted into 5.5 mm [7/32"] diameter drill holes 25 mm [1"] deep.

## 7. Troubleshooting, Servicing, and Calibration

### 7.1. Technical support

Phone		+44 (0)1322 667076
Email		info@compostmanager.com
Web		www.compostmanager.com

### 7.2. The probe

Problem	Possible Solution
The tip section of the probe is no longer in line with the upper section.	The probe is damaged. Do not use the probe and contact your supplier to arrange repair.
The holes become blocked	Clear the holes before each sampling session with a small screwdriver or similar. Alternatively, the holes can be cleared with a jet of compressed air provided that the moisture cartridge is first removed from the instrument. Do not immerse the probe in water.
The handles no longer line up with the casing	The retention clips inside the casing have become loose. Do not attempt to realign and contact your supplier to arrange repair.

### 7.3. The instrument

Problem	Possible Solution
The instrument does not power up or 'Battery Voltage Low Please Re-charge!' appears on the screen	The battery may be flat. Ensure the charger power supply is switched on and charge the instrument for at least two hours. Verify that the charger status indicator shows a solid amber colour, indicating the fast charge cycle has started.
The moisture trap gas connector won't fully push into the instrument	Ensure that both metal clips are fully pushed down before inserting the cartridge. You should hear a click.
After oxygen calibration, the instrument asks to scan the tag of a non-existent row	The instrument's sampling instructions are not up to date. Press 'skip' to skip the row and continue with sampling. Ensure that up-to-date site information is logged on the software before each sampling session.
Instrument fails to connect to the 2G network	Move outside, to an area with sufficient cellular network signal.

## ***7.4. Calibration***

Apart from the automatic daily oxygen calibration in fresh air, all calibration must be carried out by a representative of the manufacturer. Do not attempt to open instrument case as this will invalidate the warranty and could breach the terms of your sales / rental agreement. The instrument must be checked and re-calibrated at yearly intervals. Please contact your supplier to arrange this.

## 8. Technical Specifications

### 8.1. Instrument

Protection Rating	IP54
Operating temperature	-10 – 40°C [14 – 104F]
Storage temperature	-20 – 50°C [-4 – 122F]
Battery life	6 hours (typical)
Recharging time	5 hours (typical from flat)
Aspiration rate	500 ml/min [30.5 cu in / min] (typical)
Dimensions	2680 × 154 × 110 mm [106 × 6 × 4.3"]
Weight	5.6 kg [12.3 lb]
Data storage capacity	4000 sampling points
Measurement time	1 minute approx. (< 5°C [9F] difference between sample points)
RFID Scanner operating frequency	13.56 MHz


### 8.2. Instrument charger

Supplied mains adaptor heads	UK, Euro, US, & AUS
Mains line voltage	100 – 240 VAC
Mains frequency	50 – 60 Hz
Operating temperature	0 – 40 °C [32 – 104F]
Storage temperature	-10 – 85°C [14 – 185F]
Dimensions	124 × 50 × 37 mm [4.9 × 2 × 1.5"]
Weight	220g [7.8oz]
Protection Rating	IP4X (Indoor use only)
Maximum output voltage	20VDC

### 8.3. O<sub>2</sub> sensor

Operating Principle	galvanic fuel cell
Measuring range	0 – 21% (v/v) O <sub>2</sub>
Accuracy	Better than ± 0.5 % (v/v) O <sub>2</sub>
Calibration interval	Daily in air, yearly zero
Expected lifespan	1 – 2 years

### 8.4. Legal & environmental

WEEE producer registration	WEE/DA0482SW
o	This system is CE marked
	The mains charger supplied with this unit meet with UL requirements

### **8.5. CO<sub>2</sub> sensor**

Operating Principle	Non-dispersive infrared (NDIR) dual wavelength detector
Measuring range	0 – 65% (v/v) CO <sub>2</sub>
Accuracy	Better than $\pm 1\%$ (v/v) CO <sub>2</sub>
Calibration interval	Yearly
Expected lifespan	> 5 years

### **8.6. Moisture sensor**

Operating Principle	Proprietary electronic measurement
Measuring range	25 – 65% moisture (w/w) in green waste compost
Accuracy	Better than $\pm 10\%$ (w/w) moisture
Calibration interval	Yearly
Expected lifespan	Life of probe

### **8.7. Temperature sensor**

Operating Principle	Semiconductor type digital temperature sensor
Measuring range	-5 – 95°C [23 – 203F]
Accuracy	Better than $\pm 1^\circ\text{C}$ [ $\pm 1.8\text{F}$ ], over calibrated range
Calibration interval	Yearly
Expected lifespan	Life of probe

### **8.1. Modem module**

Type	2G module with internal antenna
SIM card	Roaming type supplied
Wavelengths	Quad band 850/900/1800/1900MHz
Approvals	RE Directive (2014/53/EU) RoHS Compliant CE / GCF / Vodafone / UCRF / ATEX / Vodafone (Europe) DoC (Russia) FCC / PTCRB / IC / Rogers (North America) Anatel (Brazil) NCC (Taiwan) ICASA (South Africa)
GPRS Multi-slot Class	Class 12, 1~12 configurable
GPRS Mobile Station	Class B
Compliant to GSM Phase 2/2+	Class 4 (2W @ 850/ 900MHz) Class 1 (1W @ 1800/1900MHz)

Exact dimension & temperatures are given in metric units; approximate imperial equivalents are given for information only.