

USER MANUAL



Personal Air Sampling Pump

HB4058-06

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CASELLA
A DIVISION OF TSI

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Safety and warnings

The Apex2 does not present a safety risk when you use it as instructed in this User Manual. However, it is possible that the environment where you use the instrument may present a safety risk. For this reason, always follow correct, safe working practices.



WARNING

Although the Apex2 is designed to be intrinsically safe (IS), you must comply with these instructions relating to intrinsic safety:

Instructions specific to hazardous area installations (reference European ATEX Directive (2014/34/EU, Annex II, 1.0.6.) and the following Intrinsic Safety Standards:-

IEC60079-0:2011 IEC60079-11:2011

The following instructions apply to equipment covered by certificate number: CML 16ATEX2152, IECEx CML 16.0068, ANZEx 17.3007 (Australia and New Zealand) and QPS (USA and Canada) LR1409-2 for the Apex2 series.

The following warnings should be observed for intrinsically safe versions of the Apex2 Pump:-

- The Apex2 **MUST** be charged only using 1-Way Docking Station (Casella Part Number 209152B), or 5-Way Docking Station (Casella Part Number 209156C). A Um of 63V is specified for the USB and DC power inputs of the Docking station. This is ensured by connection to safety extra low-voltage circuits (SELV) or protective extra low-voltage (PELV) circuits.
- **DO NOT** use the battery charger in a hazardous area.
- **DO NOT** attempt to download data via USB in a hazardous area.
- **DO NOT** use the equipment if the outer case of the instrument is cracked as this invalidates the intrinsically safe certification.
- **DO NOT** service while in a hazardous area.
- The equipment is certified only for use in ambient temperatures in the range -20°C to +45°C and **MUST NOT** be used outside this range.
- The user **MUST ENSURE** that the I.S. rating of the pump to be used is suitable for the I.S. rating of the intended hazardous area.



CAUTION

The Apex2 air sampling pumps are designed to be robust, however please use the pump as follows:

- Do not drop the pump or subject it to mechanical shock.

- Avoid letting the pump suck in water, solid materials or highly saturated or corrosive gases as this may cause damage and will invalidate the warranty.
- The Apex2 pump contains no user serviceable parts. If a fault is suspected, return the pump to Casella or a Casella approved service centre.



CAUTION

If the equipment is likely to come into contact with aggressive substances, take precautions to prevent the instrument from being adversely affected, so that the type of protection is not compromised. (Aggressive substances such as solvents may affect polymeric materials.) Suitable precautions include, regular checks as part of routine inspections and establishing from the material's data sheet that the pump is resistant to specific chemicals.



CAUTION

Repair of this equipment shall only be carried out by the manufacturer or an authorised representative in accordance with the applicable code of practice.



CAUTION

When Bluetooth® is enabled, care must be taken to avoid interference with sensitive equipment such as in medical, aviation or safety critical environments.

Disposal



WEEE Notice

At the end of the instrument's life please do not throw away with the unsorted municipal waste. Please recycle with a registered WEEE handler.

Disclaimer

Do not use the Apex2 until you have thoroughly read this manual or have been instructed by a Casella engineer.

At the time of writing, this manual was up to date but due to continual improvements the final operating procedures may differ slightly from those in the manual. If there are any questions please contact Casella for clarification.

Casella makes continual advancements in its products and services. We therefore reserve the right to make changes and improvements to any information contained within this manual.

Whilst every care is taken to ensure that the information in this manual is correct, Casella will assume no responsibility for loss, damage or injury caused by any errors in, or omissions from, the information given.

Introduction

The Apex2 is the latest generation of personal sampling pump, which can now be monitored from your mobile phone or tablet without disturbing the wearer using the Airwave App and Bluetooth® 4.0 connectivity (Plus and Pro models). On models without remote connectivity, all the running parameters are clearly displayed on the pump LED screen.



Motion sensing allows you to confirm that the pump is being worn, and the slim ergonomic design provides a high degree of wearer acceptance. To provide greater protection against dust and water ingress the pump is IP65 rated and its smooth finish makes it easier to decontaminate.

The Apex2 has a maximum flow rate of 5 l/min and an impressive back pressure capability, which ensures it operates reliably with a wide range of filter media. Inlet pressure is continually sensed to establish filter loading and aid diagnostics. Gas and vapour collection is also possible using the gas bag outlet on the pump.

On a full battery charge the pump is designed to operate for up to three 8 hr shifts before it needs to be charged up. A gauge shows the battery charge level, and on Pro and Plus models, the remaining run time.

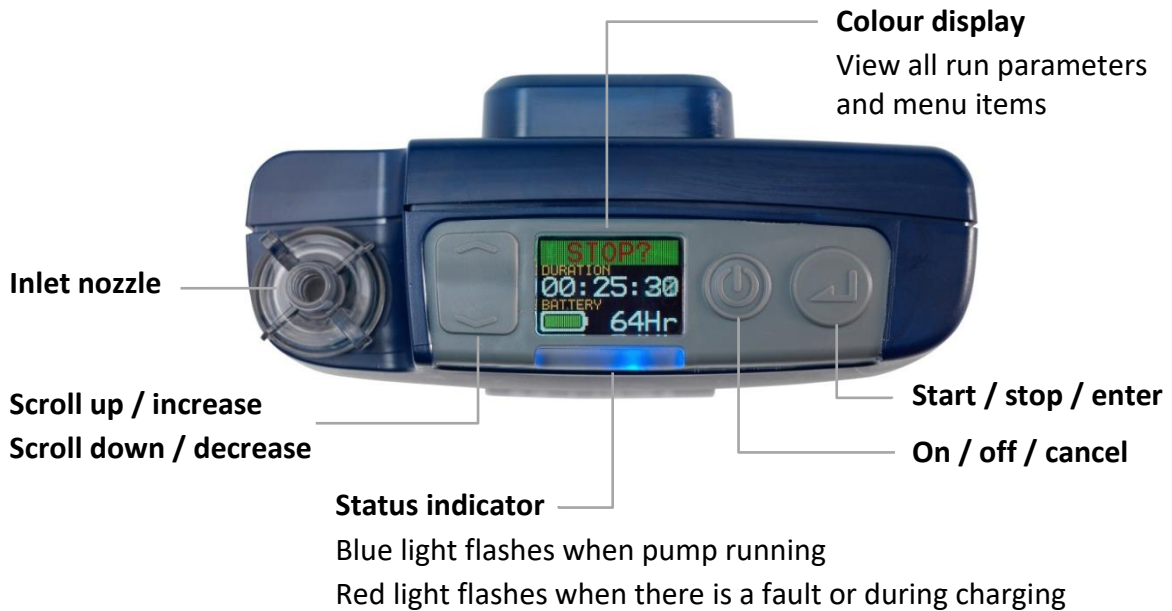
The following table summarises the features and capabilities of the Apex 2 range of pumps.

	Apex 2	Apex 2 Plus	Apex 2 Pro
Intrinsically safe	✓	✓	✓
Motion sensor	✓	✓	✓
Bag outlet	✓	✓	✓
Bluetooth®		✓	✓
Computer download		✓	✓
Inlet pressure sense		✓	✓
Run duration timer		✓	✓
Fully programmable timers			✓
Graph time history data			✓

Controls and fittings

The Apex 2 has a limited number of easy to use controls and two pipe fittings.

Controls and menu structure



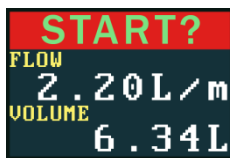
The up / down arrows, which are used to scroll through menu and setting items and also to change values.




The On / Off button, which is used to turn the pump on and off, and to return to a previous screen.



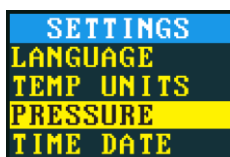
The enter key, which is used to enter sub-menu items and to save changed values.



This is one of three dashboard screens that cycle after you turn on the pump. The same information is also displayed when the pump is running (see *Operation* on page 11). To temporarily maintain a single screen as the visible screen, press and hold .



This is the menu that you use on a regular basis to reset, set the flow and calibrate the pump between sample runs. It also gives you access to timer control (see *Setup before starting a run* on page 12 and *Timer programmes (Plus and Pro models only)* on page 15).



The settings can be used to change the functionality of the pump or to access diagnostic information. You'll probably only access the settings infrequently (see *Settings* on page 18).

Tube connections

Sampling inlet connection



Gas bag outlet connection

When using the pump to collect gas, connect the gas bag tube to the pump outlet using the supplied Luer fitting.

Note: The gas bag tube must have a nominal inside diameter of 5 mm.



To collect a gas sample see *Gas sample collection* on page 17.

Protective boot

Ensure the protective boot (grey in colour) is fitted at all times as it helps to guard against knocks and rough treatment.

If you need to decontaminate the pump, remove the boot temporarily.




Operation

This section describes how to use the pump to take air samples using the minimum of settings. The Apex2 has many other menu and settings options and these are described in later chapters.

Turn the pump on/off

To turn on the pump:

On the top of the pump, press .


The following sequence is displayed:



This is followed by the three alternating dashboard screens, showing data from the last run. Notice that the screen header is prompting you to start a sampling run.



To turn off the pump:

On the top of the pump, press and hold  until the countdown has finished and the screen goes blank.



Note: You can't turn off the pump during a sampling run or when a programme timer is set.

Charge the pump battery

Before using the pump, check the battery level icon or battery gauge to ensure there is enough charge for the intended sampling run. A good discipline is to place the pump on a charger at the end of the shift so that it is always fully charged at the start of next shift. Remember, it takes approximately 6 hours to fully charge a pump battery.

To check the battery level:

1. Turn on the pump as described above.
2. Check the battery level, which will show either a percentage when the pump is not running or number of hours remaining when the pump is running (except Apex2 Standard which will show percentage).
3. Turn off the pump.



The Apex2 is supplied with either a single or five-way charger station and power supply. You cannot interchange the power supplies of the two chargers.

The chargers include a USB port for downloading data from the pump to a computer (see *Computer download utility* on page 26).

To charge the pump battery:


1. Ensure that the pump is either off or on but not running.

Note: If you place the pump on the charging station while it is running it will be powered by the charger and will continue to sample, however it will not charge.

2. Place the pump on a charging station in the orientation shown below with the belt clip towards the power supply connection end.



The red light on the top of the pump flashes during the whole of the charging time and the charge state is displayed for a user defined period.

3. To see the amount of charge at any time press .







Once fully charged the blue light turns on for 10 minutes, after which time the pump turns off.

Setup before starting a run

Depending on your sampling requirements you may want to perform one or more of the following setup procedures before starting a sampling run.

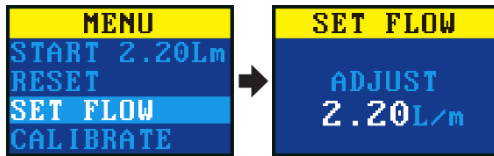
To access the menu items described below:


Ensure the pump is turned on and then press  to display the menu.

Press  or  to highlight the menu item you want to alter, and then press .

Set the flow rate


1. Navigate to **SET FLOW**, and then press .



2. Press  or  to change the flow rate, and then press the enter key.

Reset the data

Use this menu item to reset the accumulated run time, motion index and volume data to zero.

1. Navigate to **RESET**.
2. Press  for 3 seconds.

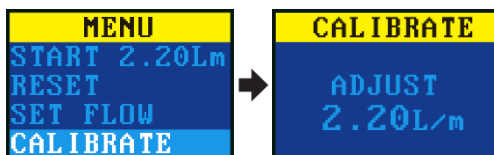






Calibrate the pump

Always calibrate the pump at the sampling flow rate for greatest accuracy.

Note: If using a filter with a small pore size or if operating at a high flow rate, which results in a high back pressure, it may take the pump a little longer to stabilise when adjusting the calibrated value.

1. Attach a sampling head or flow tube or other flow-measuring device to the pump's inlet nozzle. The flowmeter should be connected to the inlet of the sampling head.
2. Navigate to **CALIBRATE**.




3. Press  to start the test.
4. Press  or  to change the pump speed until the meter flow rate and the pump flow rate match.
5. Press  to stop the test.

Start/stop a sampling run

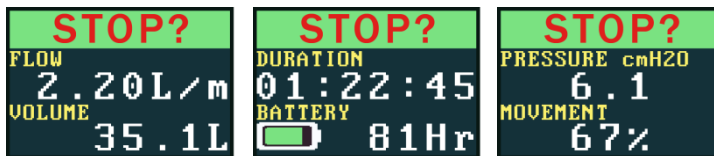
Ensure your pump is calibrated, set to the correct flow rate and you have reset the accumulated data if necessary. If you want to start a timed sampling run see page 15.

To start a sampling run:

1. Turn on the pump.
2. Press  for 3 seconds.



The following screens should be visible.



To stop or pause a sampling run:

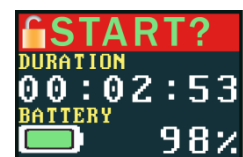
- Press  for 3 seconds.



Lock and unlock the pump

Partial lock

Partial Lock mode is denoted by a half open padlock icon and can be set in **Run** or **Stop** modes. While partially locked, the wearer may stop and start the sampling pump but has no access to the menu or other functions.



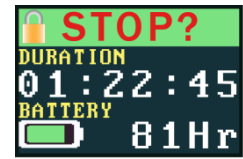
To partially lock and unlock the pump:

- Press and hold , and then press  3 times within quick succession. The partial lock icon will be displayed.



Note: If you try to remove a partial lock when the pump is running you will need to apply the above procedure twice, which applies and then removes a full lock.

Full lock



The full lock can only be set when the pump is running and is denoted by a closed padlock icon. While fully locked, the keypad is fully de-activated. The wearer cannot stop or disturb the pump by any key presses.



To fully lock the pump:

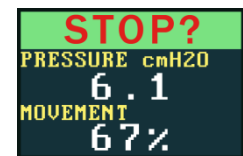
- Press and hold , and then press  6 times in quick succession. The full lock icon will be displayed.

To unlock the pump:

- Press and hold , and then press  3 times in quick succession.

Motion sensing

The Apex2 includes a motion sensor, which reports the amount of time the pump is moving as a percentage of the sample run time (shown as 67% in the example on the right). This ensures wearer compliance giving you confidence in the validity of the sample.



Note: The percentage value is only updated after a fixed time interval that you set in minutes. The available intervals are 1, 3, 5, 10 or 15 minutes (see *Activity* on page 19).


Timer programmes (Plus and Pro models only)

The duration and programmed sequence timer functions are only available when **ADV. MODE** (Advanced Mode) has been enabled in the **SETTINGS** menu (see page 19).

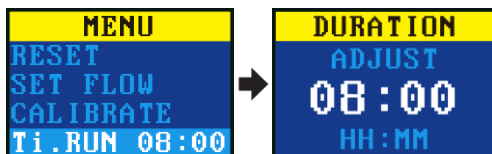
Timed run




Using this mode you can run the pump for a set period, after which the pump will turn off automatically.

To start a timed run for a set period:

- Navigate to **Ti RUN 08:00**, and then press .

Note: 08:00 in this example is the previously set time.



- Press  or  to set the time in hours and minutes.
- Press  for 3 seconds to start the timed run.

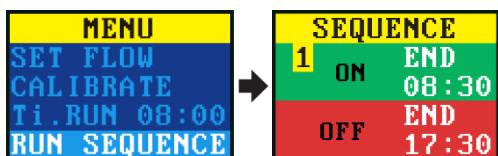
Run Sequence (Pro model only)


The **RUN SEQUENCE** timer allows nine **ON** and **OFF** events to be run in sequence. These may be used to define daily or weekly sampling sequences. For example, sampling may start in the morning then automatically pause for a worker's lunch or rest breaks.

To set up the run sequence, see *Sequencer* on page 20.

To start the run sequence:

1. Navigate to **RUN SEQUENCE**, and then .



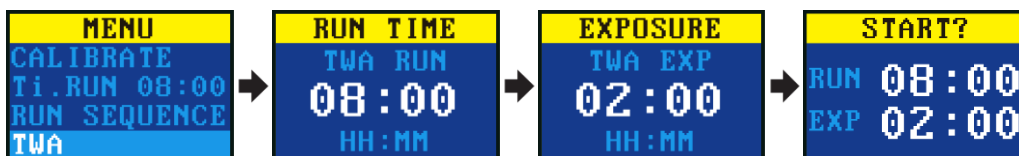
2. Press  for 3 seconds to start the run sequence.







TWA run (Pro model only)

In time weighted average (TWA) mode the pump samples for a proportion of the specified run time (called the exposure time). The pump calculates the required ON/OFF cycle to spread the total sample time evenly over the run time. The ON time is always 1 minute and the OFF time is varied according to the calculation. For example, with an exposure time of 2 hours and a total run time of 8 hours the pump turns on for 1 minute every 4 minutes.

To start a TWA sampling run:

1. Navigate to **TWA**, and then press .



2. Press  or  to set the run time in hours and minutes, and then press .
3. Press  or  to set the exposure time in hours and minutes.
4. Press  for 3 seconds to start the pump immediately.

Flow mode







Flow mode enables the pump to be operated as follows:

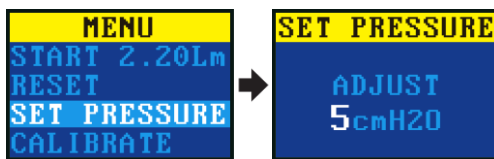
- Outlet flow is controlled – this is the normal setting for air sampling in which the flow rate is controlled by varying the back pressure.
- Inlet pressure control – use this setting to set the inlet pressure to a fixed value. This would normally be used for sampling with sorbent tubes (e.g. charcoal). Further details are available on using low flow adaptors with the inlet pressure control on the Apex2 product page at www.casellasolutions.com.

To set the flow mode:

1. Navigate to **FLOW MODE**, and then press .




2. Press  or  to select either **OUTLET FLOW** or **INLET PRESSURE**, and then press .
3. If you selected **INLET PRESSURE**, the last action takes you to the **SET PRESSURE** menu option (which replaces the **SET FLOW** option). Press  or  to set the pressure, and then press .

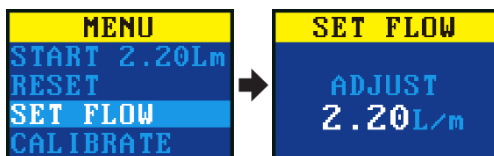


Gas sample collection

The pump has an outlet to which you can connect a gas sample bag. When operating in bag fill mode the pump runs until the back pressure reaches 15 mBar and therefore it automatically fills bags of any size.


To collect a gas sample:

1. Connect the gas bag (see *Gas bag outlet connection* on page 10).
2. Navigate to **SET FLOW**, and then press .



3. Press and hold  until **BAG FILL** is displayed.

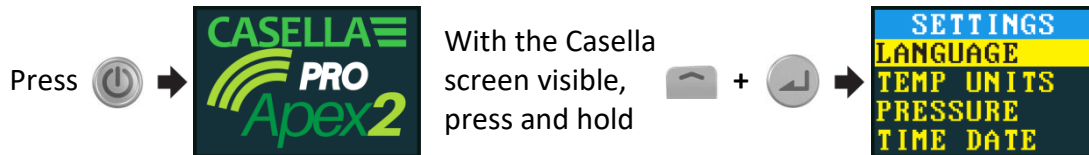




4. Press  to save the setting.



Settings

This section describes the settings you may wish, or need, to alter occasionally, and it describes how to access system information you may be asked for by a service technician.

To access the **SETTINGS** menu:



Press  or  to scroll to any of the following settings.

Press  to enter/save a setting or move between values, and press  to go back.

Language

Supported languages include English, Portuguese, Brazilian, Spanish, Italian, German and French.



Temperature units

Select centigrade or Fahrenheit.



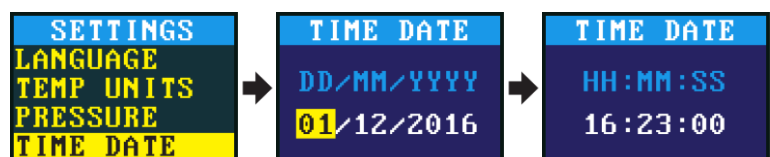
Pressure units

Select cmH2O, kPa, "H2O or mBar.



Time and date

Set the date and time. Press enter to sequence through the numbers to be set.



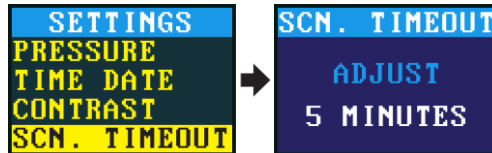
Screen contrast

You may want to reduce the contrast for operation in low light conditions.



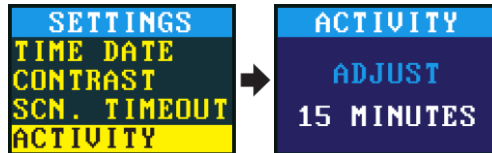
Screen timeout

Use a screen timeout if you want to save power. Once the screen is off, press any key to turn it on again.



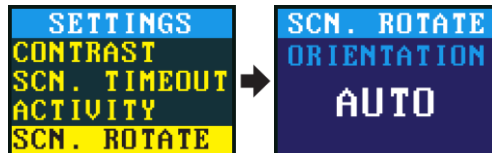
Activity

Set the averaging period of the motion sensor in minutes.



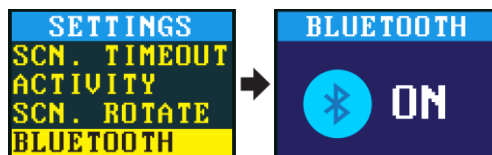
Screen rotation

Allows the screen to rotate 180° when the pump is held horizontally and rotated.



Bluetooth

Enable or disable Bluetooth. You need to enable Bluetooth when using the AirWave app (see page 23).



Advanced mode

Hides or displays these menu items:

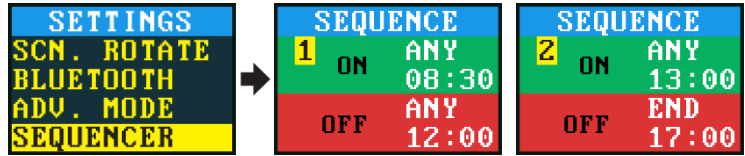
Run Duration, Run Sequencer, TWA and Flow Control.



Sequencer

You can specify up to nine ON/OFF times/days. A number in the corner of the screen identifies each sequence.

A sequence runs until an OFF period has been set to END.

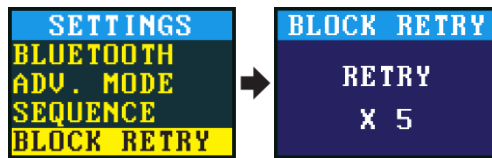


In the example above the pump runs in the morning and afternoon with a one hour stop during the wearer’s lunch.

Block Retry

When the inlet is blocked for more than 20 seconds the pump stops sampling. After 1 minute the pump tries to resume sampling.

You can set the number of retries before the pump stops working.



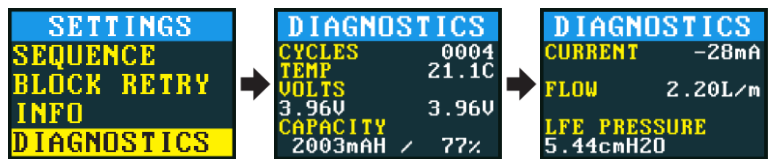
Pump information

Use this setting to see the serial number and firmware version. A contact telephone number is also provided.



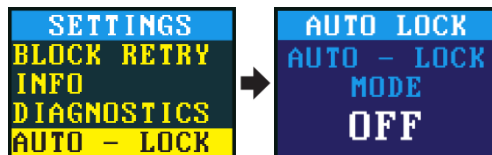
Diagnostics

This information is intended for routine maintenance and fault diagnosis.



Auto – Lock

Use this setting if you want a full lock (see page 15) to be applied automatically after you start the pump.



Auto – Run

The pump can be run automatically by selecting either ON+PWR or ON-PWR options from the Auto – Run menu.



When set to ON+PWR, the pump runs automatically when placed on the charging dock. Use this mode when, for example, you want to run a static long-term sample in a non-hazardous area.



When set to ON-PWR, the pump runs automatically when on battery power after the pump is switched on.

NOTE: The pump can also be shut down quickly while in the **Run** mode. Pressing and holding down the power key for 5 seconds will safely shutdown the pump while saving the last run data. When the pump is turned back on, it will then start a new run. This feature will only work when both **Auto-Run** and **Auto-Lock** are enabled in the settings menu

B/Press Stop

This function allows you to stop the pump automatically if the backpressure is too high, for example, in the case of an overloaded filter, or too low, for example, when sample media is accidentally removed from the pump.



The upper limit can be assigned any value based on your usage, from 70cmH₂O to 300cmH₂O. Similarly, a lower limit can be set to work from 1cmH₂O to 69cmH₂O. The upper and lower values also can be set to AUTO. Setting a lower value to AUTO would mean no lower limit. Upper set to AUTO would mean that the pump will cut out at its back pressure limit.



Warning and error messages

Warnings

When turning the pump on, if the battery level is below 10% a warning message will be displayed. The pump will then switch off. Recharge the pump as necessary.

Errors

If the pump cannot maintain the target flow rate within 5% for more than 20 seconds (due to a kinked tube or inlet blockage) then it will automatically stop sampling and show the Blocked Retry message.



After one minute the pump will attempt to re-start. If the pump has not been able to re-start after the specified number of retry attempts, the pump will terminate the current sampling run and display an error message.

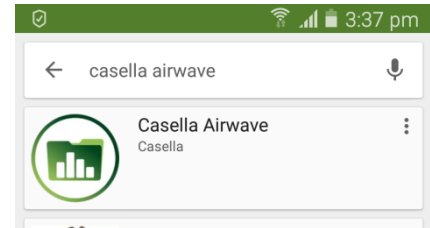
Airwave software for mobile devices

The Airwave software allows you to control and check the pump's status and measurement progress without having to disturb the wearer who may be performing a critical task or unavailable.

Note: Your mobile device must support Bluetooth® 4.0 connectivity and must be running Android version 4.3 or higher. Check you device specifications if unsure.

To install the Airwave software:

1. On your mobile device go to the Play Store and search for casella airwave.
2. Click the **Casella Airwave** selection to install the software.



Bluetooth connection and security

With Bluetooth® enabled, Airwave compatible products will always broadcast their basic status and dashboard data and will be visible on any number of local mobile devices running the Airwave Software.

However, Airwave compatible products, such as the Apex2, will only accept connection and control requests from a single known or paired mobile device. This prevents an unknown mobile device making a connection and then interrupting an active measurement run.

To pair a mobile device with your pump:

1. Ensure the pump is in Stop mode and that Bluetooth is switched on.
2. On your mobile device, open the Airwave software.

The identity of your mobile device is saved within the pump, and only this mobile device can connect to the instrument during an active run.

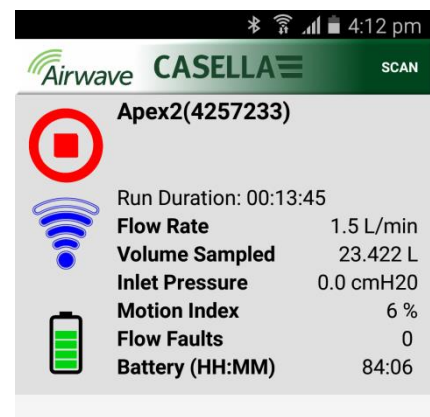
Dashboard view

When the Airwave Software is first opened it automatically scans for any Airwave compatible products within range (up to 25 m in a direct line with no solid obstructions in the path).

The dashboard provides an instantaneous view of the measured data and status of all Airwave compatible devices in range. Each device updates and broadcasts its dashboard data every 3 seconds approximately.

To save power, the Airwave Software stops scanning when all instruments within range have been detected.

To rescan for new devices, in the top-right corner of the software, touch **SCAN**.



Control panel

On the dashboard, touch the device you want to control.

A comprehensive set of measurement results similar to those shown on the right will be displayed. You may need to scroll up and down to view all the available data.

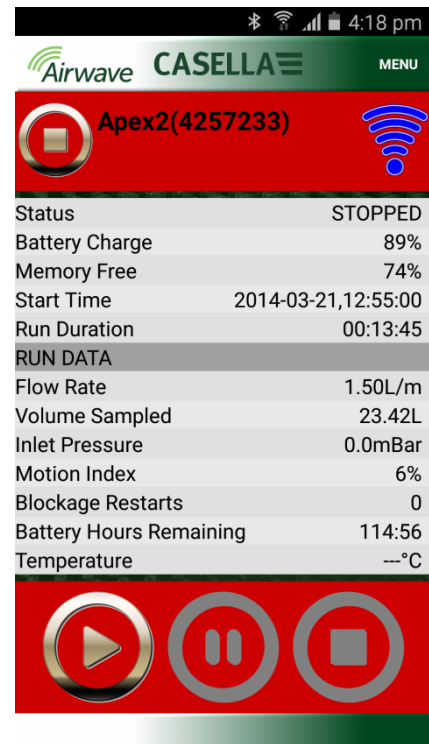
On the control panel you can, start, stop or pause a sampling run.

To start, stop or pause a run:

- At the bottom of the screen, touch the appropriate icon for 3 seconds, during which time a countdown is displayed as shown below.



Release at any time during the countdown to abort the operation.



Menu options

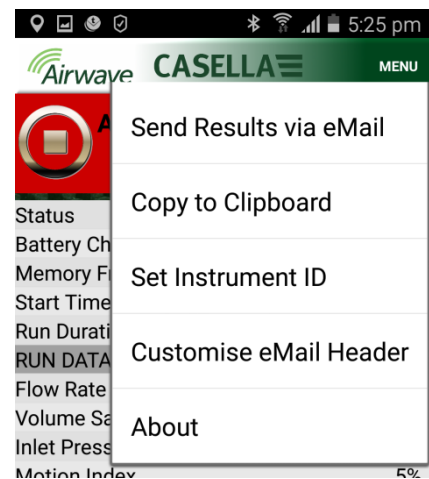
At the top of the control panel screen, touch **MENU** to display the options you can see in the screenshot on the right. Each option is described below.

Send Results via eMail

Use this option to email the sampling run results to an email address. When you select the option, the following form is displayed that allows you to add some additional information to the email.

A screenshot of the 'Enter Details' form. It contains several input fields: 'Worker Name' (e.g. Luke), 'Location' (e.g. Office), 'Task' (e.g. Spreadsheet), 'Sample ID' (e.g. 123456), and 'Shift Breaks' (e.g. 12:30-13:00). There are 'Cancel' and 'OK' buttons at the bottom.

You can alter the field names (see *Customise eMail Header* on the next page).



Copy to Clipboard

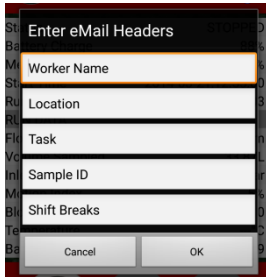
Use this option to copy and paste the sampling run results into any mobile software with text editing capabilities.

Set Instrument ID

Use this option to change the pump's ID.

Customise eMail Header

Use this option to change the field names on the **Send Results via eMail** form.



About

Use this option to see the version number of the Airwave software.



Computer download utility

The Apex 2 data download utility application allows you to download all the data from the pump, which is automatically loaded into an Excel spreadsheet file. You can then use this data directly in any reports you need to prepare. The Apex2 Pro includes data graphing capabilities in the Excel spreadsheet file.


Install the utility

To install the application:


1. In your browser, enter the URL
2. Click **Software and Utilities**.
3. Click **APEX2 Data Download Utility** to download the utility.
4. Install the utility EXE file or save it for later installation.

Download data from the pump

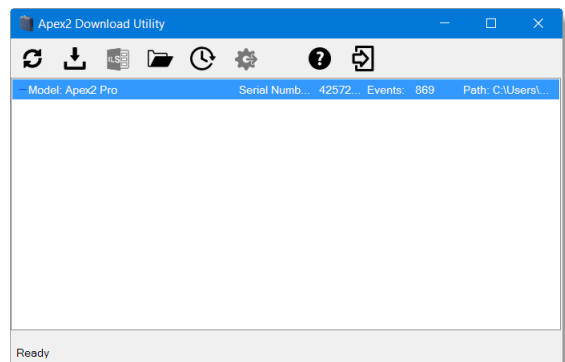
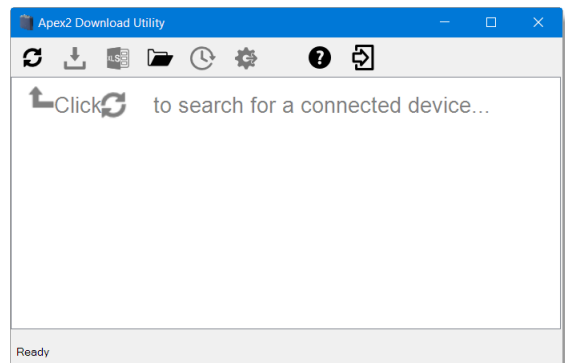
To download data from the pump:

1. Connect the charging station to your computer with the supplied USB cable and ensure the charging station power supply is connected and switched on.
2. Open the **Apex2 Download Utility**.
3. Turn on the pump and place it on the charger. If you have a 5-way charger, place the pump in the socket nearest to the USB connector.
4. On the menu bar, click  to scan for connected devices.

Your pump should be listed as shown in the example on the right.

5. On the menu bar, click  to download the data. You will be prompted to navigate to the folder in which you want to store your Excel file.
6. Navigate to a folder and click **OK**.

Note: The folder you select is used by the utility in subsequent downloads unless you select a different folder.




The data is downloaded and when finished the **Download complete** message is displayed.

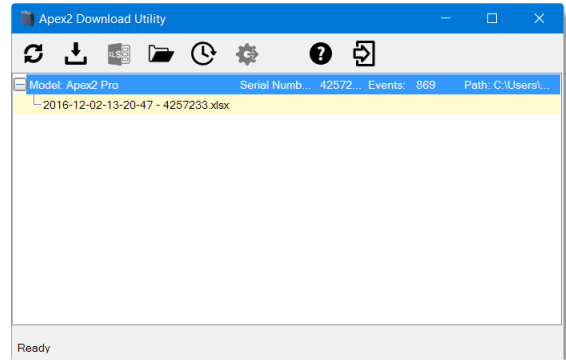
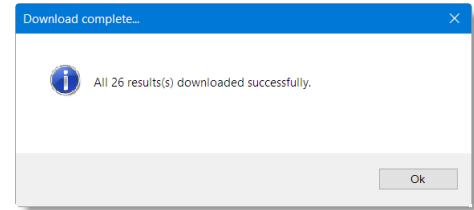
7. Click **OK** to remove the message.

The downloaded data is loaded into an Excel file.

A link to the file is displayed in the utility as you can see in the example shown.

You can double-click the link to open the Excel file.

You can also click  to open your selected folder containing any downloaded Excel files.



Technical specifications

Flow Performance	
Flow Range ml/min	800 to 5,000
Low Flow Range ml/min	5 to 500 (requires an adaptor)
Flow Control	< ± 5% at calibrated point
Pulsation	<10% at 2 l/min
Back Pressure Capability	see <i>Flow performance table</i> on page 29
Fault Detector	Detects blockages with a selectable number of automatic restarts up to 15 times

Operating	
Display	Colour OLED
Controls	4 buttons
Status Indicators	Red/Blue LED
Dimensions	112 x 37 x 102 mm (4.41 x 1.46 x 4.02 inches)
Weight	490g (including boot)

Environmental	
Temperature	Operation, 0 to 45°C (for IS Certification -20 to 45°C)
	Storage, -10 to 50°C
Humidity	30 to 95% RH (non-condensing)
Barometric Pressure	Auto-correcting

Electrical	
Battery Type	Li Ion
Battery Level Indicator	Yes
Battery Life	>9 hours
Chargers	Single or 5-way
Charge Time	Typically <6 hours
Compliance	EN1232 Compliant
	ISO 13137 Compliant
	Ingress Protections: IP65

Flow performance table

Flow rate	Back pressure
5.0 l/min	10" (25 cm) H ₂ O for 8 hours
	4" (10 cm) H ₂ O for 18 hours
4.0 l/min	28" (70 cm) H ₂ O for 8 hours
	16" (40 cm) H ₂ O for 15 hours
3.0 l/min	39" (100 cm) H ₂ O for 10 hours
	20" (50 cm) H ₂ O for 15 hours
2.0 l/min	59" (150 cm) H ₂ O for 10 hours
	39" (100 cm) H ₂ O for 15 hours
	20" (50 cm) H ₂ O for 25 hours
1.0 l/min	79" (200 cm) H ₂ O for 12 hours
	20" (50 cm) H ₂ O for 35 hours

Declarations

WIRELESS BLUETOOTH 4.0 CONNECTIVITY

All models support wireless connection via Bluetooth® 4.0 (Low energy or Smart). This connectivity is compatible with mobile and PC devices that support Bluetooth® 4.0 only.

TX power: 0 dBm to -23 dBm

Receiver sensitivity: -93 dBm

Range: Typically >25m line-of-sight and depending on local RF conditions.

The instrument contains a Bluetooth® Low energy wireless transmission module, BLE113 from Bluegiga technologies. The Bluetooth® Qualified Design IDs for this module are:

Bluetooth Controller QDID: B021015, **Bluetooth Smart Software:** QDID B018942

Copies of the modules regional approvals certificates may be obtained from Casella or Bluegiga.



This product contains an FCC and Industry Canada certified Bluetooth® Low energy wireless transmission module:

FCC IDENTIFIER: QQQBLE113

Industry Canada IC:5123A-BGTBLE113(Single)

Producer: BlueGiga Technologies Inc.

Model: BLE113 Bluetooth smart module

Modular Type: Single Modular

FCC CONFORMITY STATEMENT

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation

RADIATION EXPOSURE STATEMENT

The product complies with the FCC portable RF exposure limit set forth for an uncontrolled environment and is safe for intended operation as described in this manual.



CE DECLARATION OF CONFORMITY

Casella declares that this product is in compliance with the essential requirements and other relevant provisions of applicable EC directives. A copy of the EU Declaration of Conformity for this product may be obtained by clicking on the product compliance documentation link.



WEEE - INFORMATION FOR EU MEMBER STATES ONLY

The use of the WEEE symbol indicates that this product may not be treated as household waste. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. For more detailed information about recycling of this product, please contact your local waste disposal service or contact the agent where you purchased the product.

INTRINSIC SAFETY CERTIFICATION

Intrinsically Safe ATEX, IECEx and ANZEx variants of the Apex2 pump are marked:

Ex ia I Ma

Ex ia IIC T4 Ga

Ex ia IIIC T135°C Da

(Ta = -20°C to +45°C)

NTRL certification markings for USA and Canada:

	Canada	US
Standards coding:	Ex ia IIC T4 Ga Ex ia IIIC T135°C Da	Class I Zone 0, AEx ia IIC T4 Ga Zone 20, AEx ia IIIC T135°C Da
Ambient range	-20°C to +45°C	-20°C to +45°C

QPS File no:- LR1409-2

NOTE: The North America QPS certification does not include Mines.

Frequently asked questions

What is the difference between the Standard, Plus and Pro models?

We recognise that different users have different requirements and that is why we have created the three models listed in the table below. If you just want a basic version of the pump, i.e. without Bluetooth® and programming BUT with the same GREAT PERFORMANCE the Apex2 standard is the pump you need but if you would like greater functionality including the ability to remotely view the worker, please review the options.

	Apex 2	Apex 2 Plus	Apex 2 Pro
Intrinsically safe	✓	✓	✓
Flow range ml/min	500-5000	500-5000	500-5000
Back pressure capability	See table on page 29		
Battery type	Li Ion	Li Ion	Li Ion
Battery life	>9 hrs ¹	>9 hrs ¹	>9 hrs ¹
Display type	Colour	Colour	Colour
Motion sensor	✓	✓	✓
Bag outlet	✓	✓	✓
User lock	✓	✓	✓
Pump status indicator	✓	✓	✓
Fuel gauge	Batt. level icon	Fuel gauge ²	Fuel gauge ²
Bluetooth®		✓	✓
Airwave mobile app		✓	✓
Computer download		✓	✓
Inlet pressure sense		✓	✓
Run duration timer		✓	✓
Fully programmable timers			✓
Time weighted average mode			✓
Graph time history data (via software)			✓

¹ Dependent on flow rate and media

² Provides an estimated time remaining based on the current mode. This is much longer when the pump is stopped

I would like to upgrade models – is this possible?

If you own an Apex2 Plus and would like greater programming and timer capability it is possible to upgrade the firmware. If you own the Standard Apex2, this is not possible.

What program options are there for the Apex2?

The Apex2 Plus can be set to run for a programmed duration, for example 8 hours only.

The Apex2 Pro has run duration and these additional options:

- Timer facility – you can set a start and a finish time for a particular day.
- TWA (time weighted average) mode – you can set the pump to operate for a fixed percentage of a specified sample time. The pump calculates the required on/off cycle automatically to spread the total exposure time over the entire sample time.

	Apex 2	Apex 2 Plus	Apex 2 Pro
Run duration timer		✓	✓
Delay timer			✓
Timer programme			✓
Time weighted average mode			✓

Is there an intrinsically safe version?

All Apex2 pumps produced after December 2016 are intrinsically safe. If you are unsure whether your pump is intrinsically safe, check the labels on the product.

Will there be a model suitable for the mining industry?

Absolutely! The Apex2 has been specifically designed to meet the latest ATEX standards. Certification is expected within 6 months of launch. Please check your local mining certification requirements. The current IS certifications are suitable for mining use but some countries require additional certifications (e.g. MSHA for the USA) that the Apex 2 IS does not currently have. Please check your local legislation.

What is the recommended service interval for the Apex2?

Casella recommends annual factory maintenance and recalibration for accurate and reliable operation. The Apex2 pump logs usage and a reminder will appear after 2,500 hours if this comes sooner than 1 year. This is based on use at 2l/min at 40cmH₂O backpressure.

How do I know what filters and accessories I need for my application?

Filters and accessories do depend very much on your application. The website has a hazard search, which returns recommended methods and the equipment required.

Why include a motion sensor?

Workers are occasionally resistant to being monitored and feel that wearing the pump hampers their work. There have been examples of workers taking the equipment off and leaving it running in a cupboard and picking it up again at the end of a shift to hand it in to the Occupational Hygienist. The motion sensor tracks the amount of movement and gives an index to the Occupational Hygienist who can then tell if the sample is a valid one. If the pump has not been moving all day, it's quite likely it's been taken off.

Is wearer acceptance a problem then?

It can be – workers' may not always see the benefit of being monitored and only see that wearing a pump will be an unnecessary encumbrance rather than the long term goal of protecting their health. To try and combat this, the Apex2 has been designed to be less obtrusive to the wearer. It's a smaller, slimmer, lighter design, which makes moving around easier: sitting, standing and climbing. The sturdy clip can be fitted to a variety of belts and harnesses and the rubber boot guards against knocks and rough treatment.

What is the battery life and charge time and what's the benefit?

The Apex2 incorporates Li Ion batteries for greater battery life. You can be confident that you can get to the end of the shift without running out of charge. Battery life does depend on the application, and factors such as the flow rate and the back pressure must be taken into account. It is difficult to give a definitive answer as to 'how long will the charge last' because it does depend on the individual sample. We can only give guidance.

What is the pulsation value and why is it so important?

When choosing a pump, you should ensure that the pulsation value given is <10% to ensure confidence in your results. (ISO13137)

Pulsations in air flow can affect the size-cut performance of size-selective sampling heads such as cyclones. Pulsations can also make the filter vibrate, which means there is a potential to lose the sample.

With every cycle of the pump, air is drawn in and then exhausted. The resulting air flow will not be completely smooth and includes an alternating, or pulsating component due to the pumps rotation. The pulsation performance is expressed as the ratio of the pulsating component amplitude to the mean (steady) flow rate. A smaller pulsation ratio indicates a smoother flow of air. The Apex2 incorporates an elastomeric cavity to absorb and minimize these flow pulsations.

What is the flow control and why is that so important?

During the sample run a number of factors can slow the pump, for example a loaded filter or reduced battery voltage, resulting in a reduced flow rate. If this happens the air volume measurement becomes inaccurate, affecting the accuracy of your results. To counter this potential issue, the Apex2 monitors and maintains flow accuracy so you can have confidence in your results.

The Apex2 conforms to ISO13137:2013, which states that flow control is $\pm 5\%$ for ambient temperatures between +5 to 40°C and pressures of 850 to 1,255 mBar. This is the international standard specifying performance requirements for personal sampling pumps.

What is back pressure?

This is the resistance to flow caused by the filter media as opposed to free flow of air through the pump (like having a sock over your vacuum cleaner nozzle, the pump has to work a bit harder!). Back pressure is measured in inches or cm of water. The smaller the pore size of your filter, the greater the back pressure and the harder the pump has to work. As well as being a drain on the battery the pump needs to be powerful enough to overcome the resistance. Another factor is the flow rate and it is the combination of flow rate and filter media that determines the back pressure.

Having a pump that is capable of dealing with a wide variety of flow rates and filter media is really important and the Apex2 has class beating back pressure capability. Please refer to the table below for typical back pressures exerted by particular filter media.

Flow rate ml/min	25 mm MCE/0.8		25 mm MCE/0.45		37 mm MCE/0.8		37 mm PVC/5.0		37 mm Polycarb/0.45		37 mm PTFE/1.0	
	inches	cm	inches	cm	inches	cm	inches	cm	inches	cm	inches	cm
1000	6	15.24	14	35.56	2	5.08	1	2.54	4	10.16	1.5	3.81
1500	9	22.86	22	55.88	3	7.62	1	2.54	6	15.24	2.5	6.35
2000	12	30.48	28	71.12	4	10.16	2	5.08	8	20.32	4	10.16
2500	15	38.1	35	88.9	5	12.7	2	5.08	10	25.4	5.5	13.97
3000	18	45.72	40	101.6	6	15.24	2.5	6.35	12	30.48	7	17.78
3500	21	53.34	44	111.76	7	17.78	3	7.62	15	38.1	8	20.32
4000	25	63.5	50	127	9	22.86	3	7.62	17	43.18	9.5	24.13
5000	31	78.74	63	160.02	11	27.94	4	10.16	21	53.34	12	30.48

Servicing, maintenance and support

Servicing

The Apex2 pump contains no user serviceable parts and if a fault is suspected, return the pump to Casella or a Casella approved service centre.

The warranty DOES NOT extend to cleaning or general servicing of the instrument.

Casella's in-house service department offers a comprehensive range of repair and calibration services designed to maintain a fast and efficient back-up for all our products. The Service Department is operated in accordance with our BSI registration for products manufactured by us. We will however, undertake the repair of other manufacturer's equipment.

For further information please contact our service department at our UK headquarters or contact an approved servicing distributor. We will be happy to provide quotations for individual repairs or provide annual maintenance under contract.

Intrinsically Safe products must only be repaired by Casella or an authorised body.

Maintenance

The Apex2 Personal Air Sampling Pump is designed to provide long and reliable service. Routine maintenance should be minimal.

- Avoid leaving the battery pack in a discharged condition for extended periods.
- Do not operate without an inlet filter. Ingested dirt and dust particles may cause internal damage, malfunction or erratic flow.
- Replace the inlet filter every 3 months.

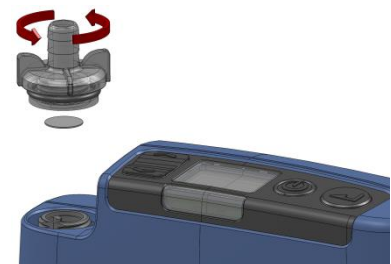
Note: The pump running time and the operating environment can reduce this time considerably.

- Keep the instrument body clean.

Replacing the inlet filter

To replace the inlet filter:

1. Unscrew and remove the inlet nozzle.
2. Discard the filter element.
3. Fit a new filter element and ensure it is centrally located to achieve a good seal.
4. Refit and hand-tighten the inlet nozzle.



Support

Part numbers and accessories

Apex2 models	
APEX2IS	Apex2 IS Standard pump
APEX2ISPLUS	Apex2 IS Plus pump
APEX2ISPRO	Apex2 IS Pro pump

All pumps include a 1 m tube, Field Guide, Certificate of Conformity and protective rubber boot.

Apex2 accessories	
209152B/KIT	Single docking station for Apex2 pump inc. PSU and USB cable
209156C/KIT	5-way docking station for Apex2 pump inc. PSU and USB cable
209025C	Protective rubber boot (included with pump)

Apex2 kits	
APEX2IS/KIT	5-way Apex2 IS standard kit
APEX2ISPLUS/KIT	5-way Apex2 IS Plus kit
APEX2ISPRO/KIT	5-way Apex2 IS Pro kit