Operation Manual

Flow Finder MK2®

Powered Flow Hood

Charge then remove battery when stored for more than 1 week

retrotec

1. Introduction

The FlowFinder mk2® is the successor of the well-known FlowFinder mk1, which became the gold standard in Europe for air flow measurements to balance mechanical air supply and exhaust systems. The new FlowFinder is fully zero pressure compensated in the range 6 to 323 CFM (10 to 550 m^3/h) and has a calculated compensation for its resistance up to 500 CFM (850 m^3/h).

The FlowFinder is the new standard for air-balancing. Extensive research and development in the ACIN labs over 6 years has resulted in a unique Zero pressure compensating flow measuring device that utilises a controlled integrated fan to compensate for the resistance caused by the device itself. It also uses an extremely sensitive zero sensing device that is much less affected by noise than typical pressure sensors. It solves another difficult problem which is measuring supply flows where high speed jets and turbulence will produce very large errors (up to 40% is common with passive flow hoods). Other velocity sensitive flow hoods will read extremely high where the turbulent vortexes will make the sensor see a lot more flow than is actually there. The Flow Finder solves this problem by separating zero sensing from flow measurement. Finally, the FlowFinder body has been reduced in size to make it extremely easy to access tight spaces and reduced in weight to make it comfortable to use for multiple tests.

Research has proven that the Zero Pressure Compensation method is the most accurate way of measuring the airflow of supply and exhaust registers of various shapes and sizes. The FlowFinder allows a user to balance and commission mechanical ventilation air supply and exhaust with a degree of accuracy unheard of in the testing and balancing industry. Even registers with low pressure drops, such as suspended ceiling grilles, can be measured accurately.

Features

1. Wide range or 6 to 500 CFM (10 to 850 m^3/h), supply or exhaust
2. Light and ergonomic
3. 10 second measurements
4. 12 hours operation on one battery charge at flows 45 CFM (75m^3/h)
5. High accuracy, stability and repeatability

Applications

1. Ventilation systems
2. Small flow rates
3. HRV and ERVs
4. Natural ventilation through doorways or passive vents
5. Line and large diffusers (with optional hoods or by adding measurements)

rev-2016-09-15 warnings re removing the battery for storage

rev-2016-11-16 charging dead battery

Figure 1: Flow Finder front view

Look at www.retrotec.com or www.acin.nl for more information

Table of Contents

Despite the fact that this manual has been carefully written, no responsibility is accepted for any errors in the manual and possible consequences. We are very interested in your comments and additions.

Retrotec claims copyright on this manual.

2. Parts of the FlowFinder

1. FlowFinder body with display
2. System Accessory Case
3. Battery charger
4. 9.5 x9.5 " (24 x 24 cm) hood (optional)
5. Micro SD card, USB adapter, SD adapter
6. 16 x16 " (41 x 41 cm) hood included

Use the packing list to verify all elements of the FlowFinder are present.
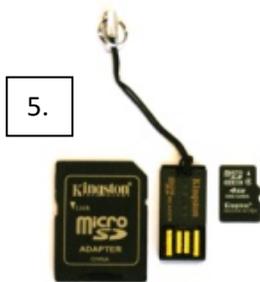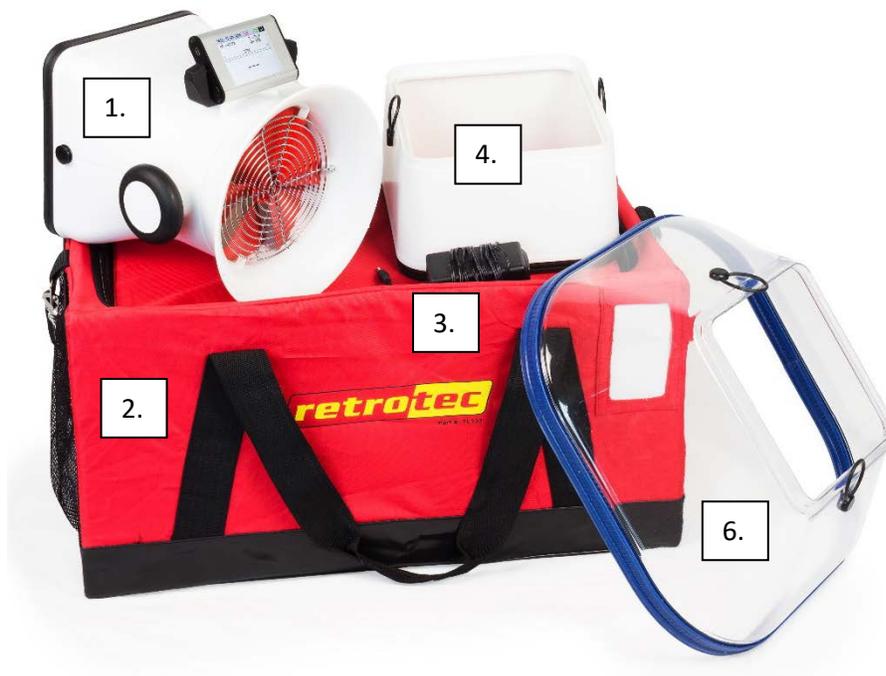
3. Specifications

Air flow range (supply and exhaust)	6 to 327 CFM (10 to 556 m^3/h) with zero pressure compensation 327 to 502 CFM (556 to 853 m^3/h) with calculated compensation
Air temperature range	-4 to +176°F (-20°C to +80°C)
Uncertainty @68°F (@ 20°C) *	3% of the reading, with a minimum of 2 CFM (3.4 m^3/h)
Repeatability	Better than 3%, with a minimum of 2 CFM (3.4 m^3/h)
Resolution	1 m³/hr, 0.1 l/s, 0.1 CFM
RH range	0 to100%
Full charge capacity	8 hours for flows < 59 CFM (100 m^3/h)
Weight	4.9 lb (2.23 kg) battery included
Dimensions FlowFinder	10 x 10 x 10 inches (25 x 25 x 25 cm)

* Uncertainty is defined as the square root of the sum of the squares of non-linearity, hysteresis and repeatability.

Conversion of flow units.

m^3/h	l/s	CFM
1.000	0.278	0.586
3.600	1.000	2.119
1.699	0.472	1.000

Flow Corrections needed:

- A flow hood must **always** be attached while measuring **supply** flows and **exhaust** flows above 30 CFM (50m^3/h).
- Hoods smaller than the 24x24" (61x61cm) must be lowered as given in the table below:

Flow ➡	greater than 102 CFM (175 m^3/h)	greater than 190 CFM (325 m^3/h)
Exhaust	-1.5%	-1.5%
Supply	-3.0%	-4.6%

This correction is needed to compensate for the pressure drop in the hood.

4. Charging the battery

Remove the battery pack by turning the inner white disc anti-clockwise until the knob comes loose. Remove the battery pack by sliding it over the pin. Connect the charger to the battery. Plug the charger into a power outlet. Charge overnight but no longer.

LED indicates the status of the charger as follows:

> Yellow: charger not connected to battery
> orange: fast charging
> green-yellow: charging complete
> green: trickle charging
> orange-green: ERROR

Storage for a week or more

To prevent battery failure, charge the battery pack and store it disconnected from the Flow Finder. Extra battery packs can be ordered from Retrotec or ACIN.

Charging dead battery

If battery is NOT removed the battery may only hold enough charge for 15 minutes. In that case, run the FF until the battery is dead and recharge again overnight. Now you'll get about 2-hours operation. Recharge again over night and you should get 8 hours of use.

5. Switching on the FlowFinder

The on/off push button is on the lower left side of the panel. Press this button and the FlowFinder will start in the default (user-defined) **measuring mode**, directly ready to use.

There are two measuring modes: 'Validate' and 'Adjust'.

If the start screen displays '- - -'the FF is in Validate mode. If a red zero is displayed the FF is in Adjust mode.

The display (here in Validate mode) shows a number of parameters:

USB connected? (only for service)	
SD card present? green ! not present? red..	
time and date	status battery pack
pressure difference to be compensated	temperature humidity
	Horizontal bar graph (0..1000m3/h) of the measured flow
Measured flow in m3/u, l/s or CFM,	Ready to measure in 'Validate' mode
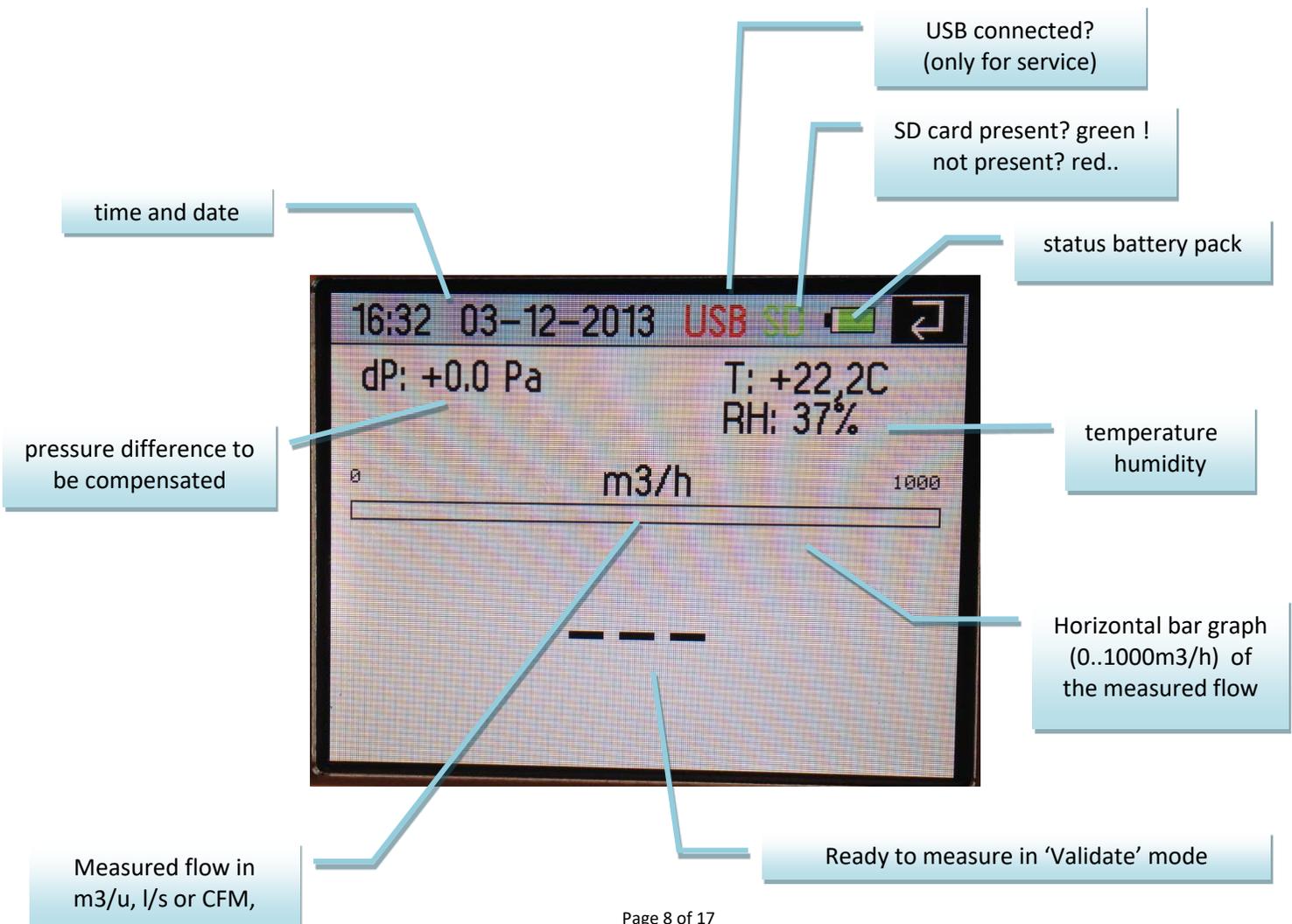
Below the flow unit there is a bar that fills up in green or red during a measurement. The length of the filled bar is proportional to the airflow. An orange bar indicates that the FF is using 'calculated compensation'.

Below this bar, in Validate mode when the FlowFinder is not measuring, a '- - -'is displayed (see picture above) or, when in adjust mode a blinking red '0' will show up (picture below).
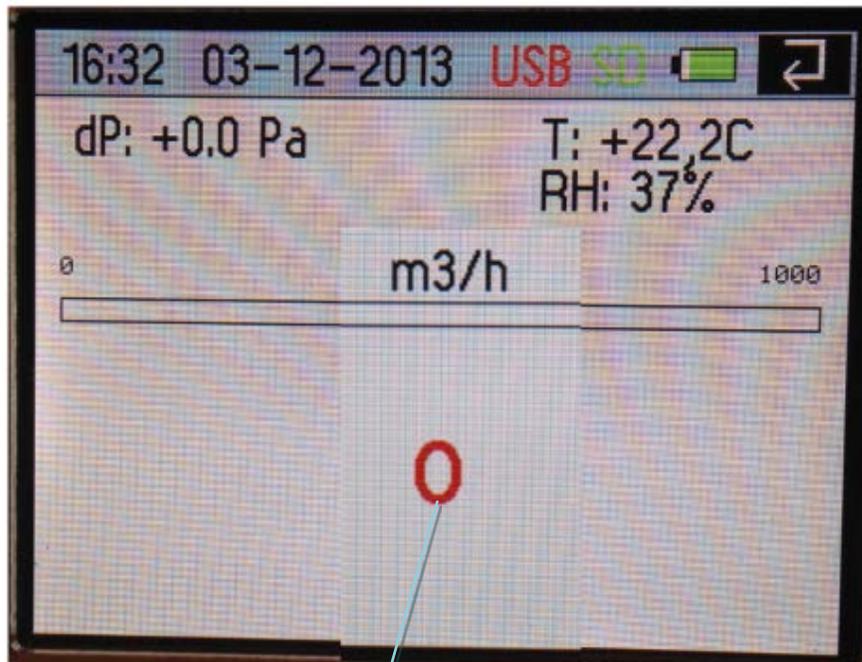
Ready to measure in 'Adjust' mode

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6. Default settings

To go from measuring mode to the FlowFinder Start Menu, touch the white arrow in the right upper corner of the screen. Choose Options to change the settings of the FF mk2®.

To go the FlowFinder Start Menu touch here
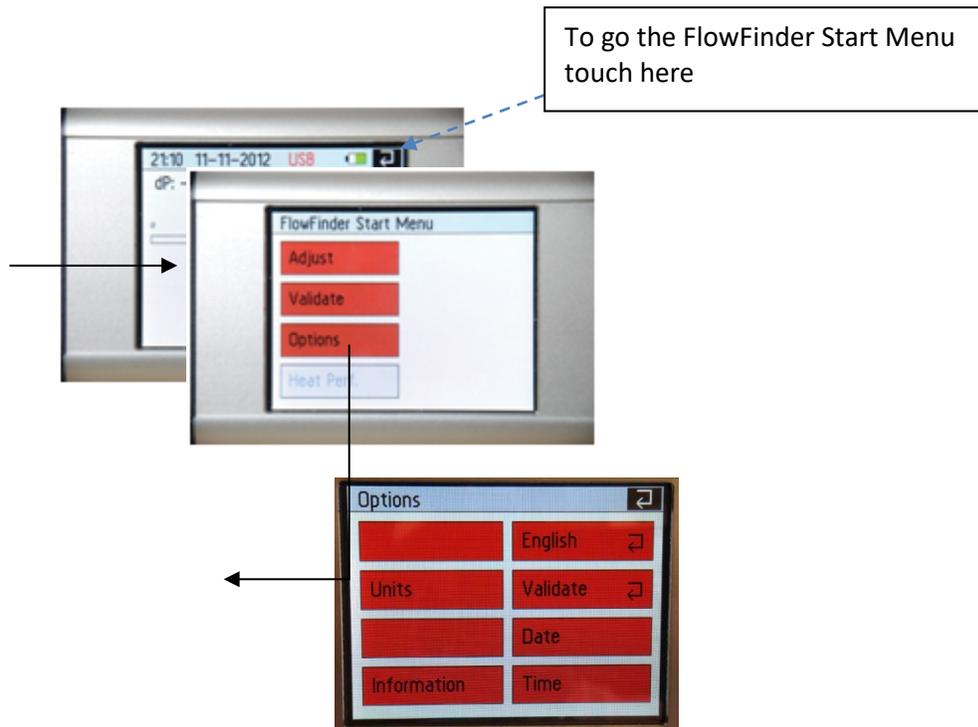
In Options you can:

1. Toggle between the available languages (Dutch and English) by touching the Language button.
2. Change the units. Touch the Units button and toggle the unit of temperature (Celsius or Fahrenheit) and the unit for flow (l/s, m³/h or CFM). Go back to the Options by touching the white arrow in the right upper hand corner.
3. choose Validate or Adjust as the default start up measurement method of the FlowFinder
4. set the Date:
   a) Press date
   b) Enter the year (yyyy)
   c) OK
   d) Enter the month (mm)
   e) OK
   f) Enter the day (dd)
   g) OK
5. set the Time:
   a) Press time
   b) Enter the hour (0 to 23)
   c) OK
   d) Enter the minutes
   e) OK
6. find the serial number, last calibration date etc. under the Information button

To go back to the FlowFinder Start Menu touch the white 'return' arrow. To go back from there to the measuring mode, depending on the mode you want to use, touch 'Validate' or 'Adjust'. Using the hoods

There are several different hoods for the FlowFinder:

- optional white straight hood 9.5 x 9.5 inches (241x241mm)
- clear square hood 16 x 16 inches (407x407mm)
- optional foldable hood 24 x 24 inches (610x610mm)

For small <u>exhaust</u> grilles the FlowFinder can be used without a hood. For larger exhaust grilles and for ALL supplies, a hood must be used.

Attach the hood by fitting it to the body of the Flow Finder then pull the O-rings over the black posts. Avoid using the Flow Hood for holding the Flow Finder but rather use the round knobs on both sides of the body.

Flow Corrections needed:

- A flow hood must **always** be attached while measuring **supply** flows and **exhaust** flows above 30 CFM (50m^3/h).
- Hoods smaller than the 24x24" (61x61cm) must be lowered as given in the table below:

Flow ➡	greater than 102 CFM (175 m^3/h)	greater than 190 CFM (325 m^3/h)
Exhaust	-1.5%	-1.5%
Supply	-3.0%	-4.6%

This correction is needed to compensate for the pressure drop in the hood

7. Measuring flows

There are two measuring modes. The so-called 'Validation mode' and the 'Adjustment mode'. In the options menu one of these modes can be set as default. At start-up the FF-mk2 will be ready to measure in the default mode. The measuring mode can be recognized by the red blinking '0' (adjustment mode) or the '- - -'(Validate mode).

To perform a measurement, hold the FlowFinder by its left and right round handles and place the instrument over the outlet or inlet you want to measure. Make sure to make a tight connection by pushing enough to avoid measuring secondary air.

Press the red button behind the left knob shortly in order to start the measurement. If you push it too long the measurement will start but also stop immediately.
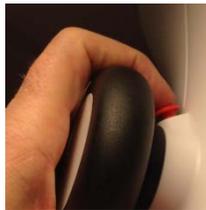
In *Validation mode* the text "compensating pressure" and the flow direction (red arrow at the bottom) will appear.
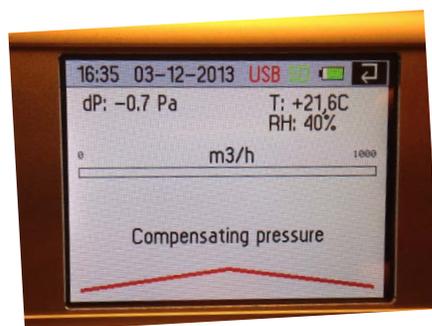
After a few seconds "compensating pressure" is replaced by "measuring".   After approximately 10 seconds the result of the measurement will appear, expressed in l/s, m³/hr or CFM.
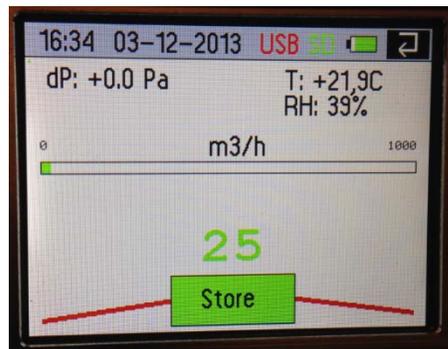
So the FF-mk2 decides when the measurement is ready, normally within 10 to 15 seconds. It will display the measurement result which then can be stored by touching 'store'.

As a consequence of variations in the ventilation system itself and to lower the total uncertainty, we advise to repeat the measurement 2 or 3 times shortly after each other.

A new measurement can be started by pressing the red button again. Best is to wait until the fan in the FF has come to a rest (at low flows) or runs at its non-zero pressure compensated speed as dictated by the flow.

If the FlowFinder becomes unstable during a measurement, you can stop the measurement by pressing and releasing the red button.

In Adjust mode the blinking number turns green and will change or stabilize depending on the air flow. The measurement will only stop after the red button is pushed and released again. This way you can adjust the grille, diffuser or register to the desired air flow while measuring lower airflows up to approximately 45 CFM (75m^3/h).

While measuring in ´Adjust mode´ you need to wait long enough until a stable reading is reached, also after placing the FF-mk2 back again.

When going from one measuring location to another, stop the measurement by pushing and releasing the red button. The measuring results in 'Adjust mode' can't be stored.

Switching between measuring modes: push the 'return' button in the right upper corner. Then select either 'Validate' or 'Adjust' in the FlowFinder Start Menu then the FF will return to the start screen ready to measure in the selected mode.

To go the FlowFinder Start Menu touch here
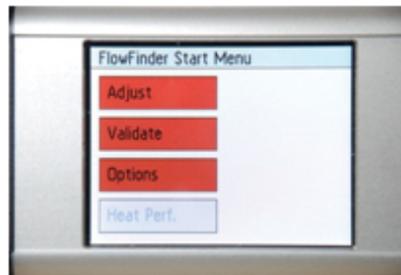
Adding of measurements

Thanks to the zero pressure compensation of the FlowFinder, it is possible to measure the air flow at a part of the diffuser. Because the FlowFinder actively compensates its own resistance, the flow through the other (free) part of the diffuser will not or hardly be influenced.

This way, as an example, the flow through a line diffuser can be measured by moving the FF across the diffuser evenly after every measurement, and adding the measured values.

Storing the data

1. Make sure there is a micro SD card in the micro SD card slot to be found at the right lower side of the display. If present 'SD' will show in green at the top of the screen.

2. Execute a measurement in 'Validate' mode as described in chapter 8

3. After the measurement is ready the result will appear together with a button 'Store'

4. Touch 'Store'

5. Now a screen with 8 buttons will show.
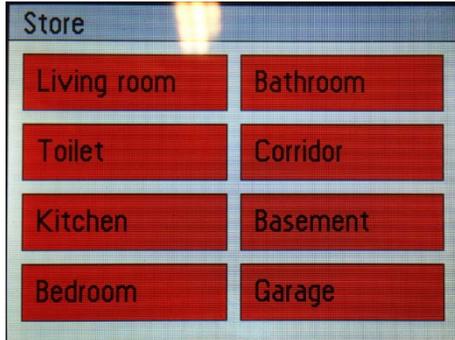
The text in the buttons can be defined by the user.

6. Touch the button of your choice and a numerical keypad will show
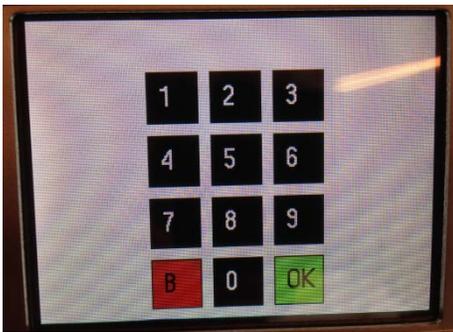
7. Here you can type in a 4-digit numerical identifier which is then added to the record of this measurement. This number can be a house number or some number from a plan or some clever combination. You are free to design your own data-id system.

8. After touching 'ok' the data are stored and the display will return to the measuring mode

Processing the stored data

1. Turn off the FF-mk2®

2. Remove the micro-SD card (lower right side of the LCD display) by pushing on it and then releasing it

3. Either the SD adapter or the USB adapter can be used to connect to your computer

4. After inserting the card, a screen 'Automatic...' will pop up.

5. Select 'Show maps and files'

6. Now you should see a list of text files with the name format yyyymmdd (year month day). The file names.txt will be discussed further down.

Processing the data in Excel

1. Turn off the FF-mk2®

2. Remove the micro-SD card by pushing on it and then releasing it

3. Either the SD adapter or the USB adapter can be used to connect to your computer

4. When inserted a screen 'Automatic...' will pop up. Ignore this screen or click cancel.

5. Open Excel

6. Select 'Data', 'From text'

7. The Wizard 'Import text' will be activated

8. Select the data file and 'next'

9. Select '; ' as separator and 'Continue'

10. The data are now ready for further processing and reporting

Naming the data storage labels

1. Connect de micro SD card using the USB or SD adapter with your computer

2. Open the file 'names.txt' with a text editor like WordPad. This file should already be on the micro SD card.

3. The labels for the buttons are listed where each label is given in square brackets like [kitchen].

4. All these identifiers can be edited to your wish (so project name / apartment type / room / grill type)

5. IMPORTANT: use this type of [] brackets around the labels. For instance [kitchen]

6. Save the file to the micro SD card overwriting the old file

Emergency stop

If for any reason it is needed to interrupt the measurement just press the red button briefly.

Switching off of the FlowFinder

To switch off the FlowFinder press the button on the left side of the display. The display will turn black for a moment and will then show an information screen displaying, among other info, the serial number,

the software version and the last calibration date. This screen can also be found through the touch screen under Options, Information.

Storage

1. Place the FlowFinder in the transport case with the display facing up.

2. The display must not be tilted, but lying horizontally.

3. When the FlowFinder will not be used for a longer period of time, the battery pack has to be removed from the body.

4. When the FF hasn't been used for several weeks, the battery has to be charged fully before using.

Calibration

We recommend to have the FlowFinder calibrated once every year. Please contact Retrotec or your distributor to arrange a calibration and to get shipping details.

Notes

Model FlowFinder
Serial no. Housing
Serial no. battery pack
Delivered to
Contact person
Department
Address
Zip code
City
Telephone
Email
Last calibration
Initials
Remarks
Next calibration
Manual