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Part Number: 80001210 Issue 2 07/22



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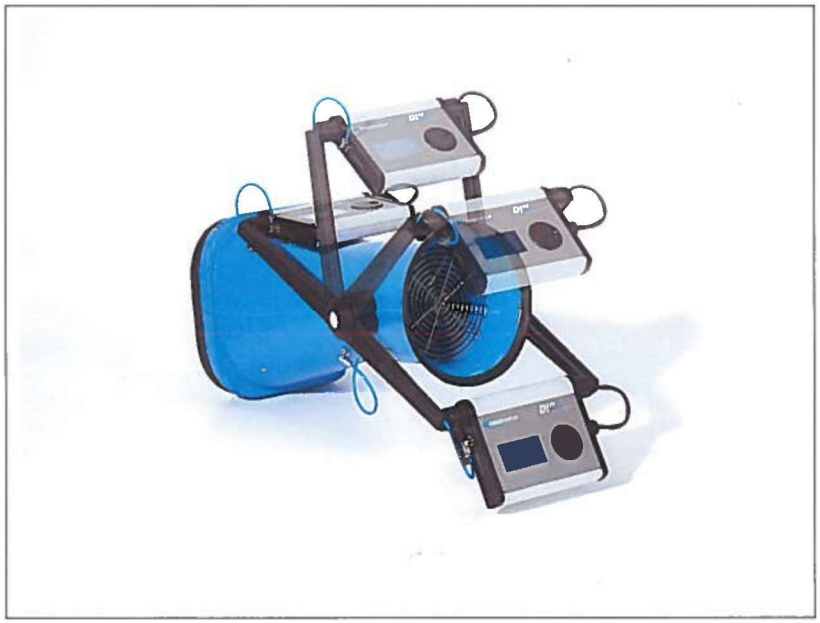
**United Kingdom.**

# Mensura (90001033)

Automatic volume flow meter with pressure compensation



Notes:

## 10. Warranty

During the warranty period of 12 months after delivery, this product will be repaired without charge for either parts or labor. This limited warranty does not cover, batteries, damage caused by the user or by improper treatment or connecting.





## Index

## 1. Introduction

The DIFF is a unique instrument developed by Observator for measuring air flow and air temperature. The DIFF is commonly used by installers and controllers in the housing and utility industry. The DIFF can perform a pressure compensated measurement in accordance with International Standards. Operating errors are prevented by an automated measurement process. The flow reading is digital and clear, this prevents reading errors. The DIFF is capable of data storage via SD card and the use of DIFFiner software.

The standard package contains:

DIFF automatic volume flow meter with zero pressure compensation
Battery charger
4 x 1,2V AA NIMH rechargeable batteries
Manual
Calibration report
Transport case
AT-242 Hood 315x315x220 mm, transparent plastic Data logging upgrade Incl.:

- SD card 2Gb
- DIFFiner pc-software

Options:

Fabric Hood (Nylon) incl. aluminum frame and fiber rods 400x400mm, 600x600mm, 310x1234mm or 310x1534mm
Extra rechargeable battery set

**Specifications**

| Description | | |
|---|---|---|
| Dimensions | (250x250)x510x0200 mm | |
| Net weight | 2.9 ka without batteries and transport case | |
| Operating temperature | -10 lo +50 •C, 0-95% RV | Non-condensing |
| Range | 10-400 m•th, -15 to +70 •C (5-158"F) C2,78-111 *Vs* and 5,89-235CFM1 | |
| Accuracy | ±3% of the reading ±1 m³/h, ±0,5°C | |
| Resolution display | 0,1<100>1 m·th, 0,1 •C | |
| Resolution zero pressure sensor | < 0,2 Pa | |
| Power SUDDIV | 4x 1,2 V AA NiMH 2450 mAh, rechargeable. | |
| Measuring time (nom) | < 30 sec | |
| Material casino | ABS | |
| Measuring method | Zera-method. In accordance with International Standards | |
| EMC | In accordance with EN60132-1, IEC61000-5-5 etc. | |
| | IP20 accordance IEC-60529 | |
| Battery life | 8 hour while measurinQ75 m /h | |





### 9.2 Replacing the fuse

The DIFF contains a fuse (5x20 mm 250V / 5A slow). The fuse is placed an the right side of the display unit. The fuse holder can be opened by turning the holder carefully with a big screwdriver. Take care that the batteries are In the right position before pulling the fuse back in.

The fuse In the DIFF should only be replaced with the original type: 5x20 mm 250V / 5A slow. Repair can be needed if a fuse replacement does not solve the problem.

### 9.3 DIFF Accessory

| Part number | Description |
|---|---|
| AT-251 | Standard/ Fast charger for 4xAA NiMH batteries. 100-240VAC EU, 50-60Hz and 12VDC, 1.5A (Car). Exel. Batteries. |
| AT-240 | Hood 31Ox1534mm - nylon with frame and fiber support |
| AT-241 | Hood 310x1234mm - nylon with frame and fiber support |
| AT-242 | Hood 330x330mm - PET |
| AT-245 | Hood 600x600mm - nylon with frame and fiber support |
| AT-244 | Hood 400x400mm - nylon with frame and fiber support |
| AT-255 | Extra set of 4 chargeable NIMH AA batteries 2450 mAh SANYO. |
| AT-260 | Upgrade data storage incl. pc-software DIFFiner and 2 GB SD-card. |
| | SD-card reader with USB |

### 9.4 DIFF Spare parts

The following spare parts are available

| Part number | Description |
|---|---|
| | Glass fuse 5x20mm SAT |
| AT-300-130 | Battery holder |
| AT-300-140 | Battery holder connection wire |
| AT-255 | Extra set of 4 chargeable NiMH AA batteries 1.2 V - 2450 mAhSANYO. |
| AT-280 | Suitcase for Diff |
| AT-281 | Suitcase for AT-242 |
| AT-282 | Suitcase for Diff and AT-242 |
| CAL-DIFF | Calibration-service. Calibration of 24-points with report. The instrument is adjusted when needed. |

## 9. *Trouble shooting*

### *9.1 Errors*

| Symptom | Solution |
|---|---|
| Message low battery while they are fully charged. The used batteries are new. | -New batteries will only reach full capacity after charging them a couple limes. Use the standard charging mode as much as possible. |
| Message low battery while they are fully charged. This occurs mostly while measuring high flows. | Old batteries can show these symptoms. Replace the batteries if this occurs by new ones of the specified type and fully charge them. |
| The DIFF keeps measuring and the flow value Is high. | Charge the batteries. The battery capacity does not reach the 80%. Order new batteries If the old batteries don't reach the full capacity. |
| The DIFF does not power when the selection button is pressed more than four limes. | Replace the batteries by fully charged ones or replace the fuse. (Chapter 9.2). |
| Extraordinary power usage. | Contact your dealer or Airflow Developments. |
| The calibration fails | There are pressure differences during the calibration, or the DIFF is moved during calibration. Recalibrate when the DIFF is on a flat surface. |
| II is not possible to get a successful calibration. | Return the DIFF to Observator for factory calibration or repair. |
| Difficult to read display. | Check the settings of the contrast and backlight. (Chapter 3.4) |
| Display turns dark. | This is caused by ESD or an auto power off because of low battery voltage. Reinsert the fuse or exchange the batteries. |
| A high deviation in the reading. | Charae the batteries and recalibrate the DIFF. |
| A high deviation in the reading and an OVERRANGED error occurs. | The measured flow is above the measuring range of the DIFF. Take partial measurements and add these or lower the flow that needs to be measured. |
| A high deviation in the reading and a LOW BAT error occurs. | The battery voltage is too low. Charge the batteries up to 80%. |
| A high deviation in the reading and/or the DIFF indicates the wrong flow direction. The measurement takes a Iona time. | The measurement was started before the DIFF was on the vent. Carry out a new measurement. When sure the vent is fully covered, start the measurement. |
| Deviation in the measurement. | Make sure that the DIFF is fully placed over the vent and the display unit is not in the airflow. |
| The measurement takes a long lime. | Make sure you keep the DIFF in place while measuring. **Make** sure that there are no gaps between the DIFF and the ceiling. |
| The motor stops during the measurement. | The flow is around 10 m"/h the lower limit of the DIFF. Re-try the measurement. |
| The DIFF leaves marks on the ceiling. | Clean the rubber with non-aggressive detergent. |
| ????? On the display in the battery menu. | You just exchanged the batteries. After a couple of minutes, the ???? will disappear. |
| The DIFF does not work. (display dark) | The DIFF is in auto off function. Switch it back on. |
| The excel button does not work. | Excel is not installed. Install Excel on your pc. |





## 2. *Description and usage*


| Nr. | Description |
|---|---|
| 1 | Scroll button |
| 2 | Information display |
| 3 | Measuring side DIFF |
| 4 | Air inlet /exhaust |
| 5 | Point of pressure measuring |
| 6 | Connection temperature sensor/motor |

### *2.1 Operation comfort and ergonomics*
The DIFF is self-adjusting for inlet and exhaust grilles. The DIFF automatically detects the flow direction, so the DIFF does not need to be turned around when changing the grill. For your convenience you are able to set the arms and the display unit in any position. This will make it easy to operate and to read out. Use of a ladder is mostly unnecessary because of these possibilities.

### *2.2 Operation*
Measuring on a vent will cause a difference in pressure caused by the measuring Instrument Itself. This difference in pressure will cause a deviation in the air distribution that causes a faulty measurement. The DIFF solves this problem by measuring the pressure difference and compensate this with the build-in fan. The rotation speed of the fan makes the pressure difference zero, this will solve the faulty measurements. In this situation the volume flow through the grill is exactly the same as it was before the DIFF was in place. The DIFF gives the right measurement of air flow and temperature after the beep.

### *2.3 Before first use*
Make sure there is no packing material or any other objects in the DIFF.

#### 2.3.1 Inserting the batteries
Charge the SANYO batteries as described in the manual of the included charger (we recommend reading this manual carefully). Use the standard charge mode whenever possible, but definitely for the first couple of times. (Please note: our specifications only apply when using the prescribed battery type) The batteries are fully charged when the green LED lights continuously lit. The batteries will only reach their full capacity after fully charge and un-charge them multiple times **(see** chapter 5).

Make sure the Diff is switched off when replacing the batteries. The batteries are placed in the battery compartment on the backside of the display housing. Unscrew the thumb screw complete and move the cover upwards, now you can remove the cover of the battery compartment. Take out the battery holder carefully to replace the batteries.

Note the polarity when placing batteries! When placing the batteries in the wrong way, the electronics of the Diff can be damaged. The battery positions are marked on the black battery holder. The stud is the + and the flat side Is the - of the batteries. The electronics are protected by means of a fuse, see item 9.2.

Hold the wires on top of the batteries when placing the battery holder back. The wires can be pinched off when they are positioned below the battery holder. Push the battery holder to the right side of the compartment and place the cover.





## *8. Decommissioning*

### *8.1 Decommissioning the DIFF (temporary)*
Remove the batteries when the DIFF is not going to be used for a couple of weeks or more. Charge the batteries fully before storage. Charging the batteries prevents that they get damaged because off a full discharge,

### *8.2 Disposal of the DIFF*
Waste batteries must be disposed in accordance with the currently applicable local laws.
The DIFF must be disposed in accordance with the current applicable local laws.

## 6. Maintenance

The DIFF is a precision-instrument. Simple routine checks will ensure that the DIFF will function for many years:

Remove moisture with a clean moisture absorbent cloth before storing the DIFF.
Always remove the batteries when the DIFF is not used for a long time.
Store and transport the DIFF always in the included transport case.
Store the DIFF in dry conditions.
Always let the DIFF adjust to the ambient temperature. The DIFF will adjust faster when it is hqd against an exhaust vent.
Never remove the grills inside the DIFF.
Check the DIFF periodical for cracks.
Do not expose the DIFF to water.
Do not use aggressive detergents. This will damage the DIFF.
Do not expose the hoods to sharp objects. A damaged hood can give wrong measurements.
The DIFF will be best antistatic, if the instrument will be cleaned with a clean lint-free cloth frequently. Normally this only applies to air conditions with a low humidity.
It Is recommended for this Instrument to be calibrated annually. After a repair, this Instrument wlj also need a calibration.





**2.3.2 Adjustment of the arms**
It is possible to adjust the arms of the Diff by pushing both grey buttons at the same time. The arms will "click" every 30'. This makes It possible to set a comfortable position for every situation. The display unit can be rotated to ensure an optimal reading during the measurement.

Make sure that the display of the DIFF is not placed in front of the round opemngl Putting the display In the air flow will cause faulty measurements. All measured values will be out of specifications.

These pictures show the right position of the arms and the display.

**2.3.3 Operation**
The DIFF can be operated with only one button. The readings are shown on the display.


The DIFF can be switched on by pushing in the middle of the scroll button. The recess in the scroll button is intended for scrolling through the menu.

## 3. The menu

The following menu will appear when the DIFF is powered.


You can scroll true the menu by rotating the control button. Push in the middle of the control button to select the option.

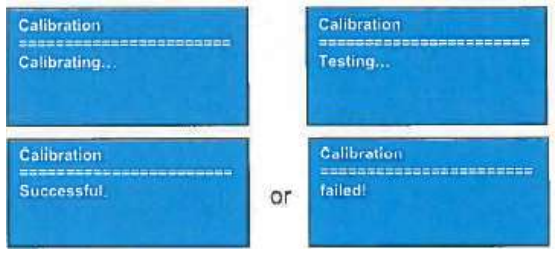
### 3.1 Calibration

Calibration of the DIFF is necessary after powering. The ultrasensitive pressure sensor will be adjusted to the environmental temperature.

> II is advisable to let the DIFF acclimatize for a minimum of 15 minutes when there are big differences in temperature. The DIFF must be calibrated after the acclimatizing. It is recommended to calibrate the DIFF from time to time during usage.

To ensure the accuracy, it is necessary to calibrate the DIFF at least once every 30 minutes. When the environmental temperature is changing rapidly, or when the DIFF has a different temperature than the environment in which it is used, it is necessary to calibrate more often.

Please note that the DIFF has to stand on a flat surface and the room has to be free of air flow, while calibrating (close doors and windows).
When the DIFF is being calibrated the following screens will show up:




The last screen indicates that the calibration failed. The failure can be caused by air flows in the room. Make sure that the DIFF is calibrated on a flat surface. You can put a flat object on top of the DIFF to avoid airflow through the DIFF.





## 5. Batteries

### 5.1 First use of the batteries

Fully charge the batteries the first time in standard charging mode. The batteries will only reach full capacity after charging them fully a couple times. The batteries are fully charged when the green indication LEDs are continuously lit. Using fast charge will reduce the battery life, we advise to use the standard charge mode whenever possible. For more detailed information we refer to the charger manual.

### 5.2 Compatible batteries

The DIFF is designed for the usage of SANYO rechargeable NiMH batteries with a minimum capacity of 2450mAh. Beware: Different suppliers have different specifications. The included SANYO batteries are tested by Observator for the usage with the DIFF. We recommend to use these batteries only!

Non-chargeable batteries, like the alkaline type, are not suitable for the DIFF. Same counts for rechargeable batteries with less capacity. If you do use these types of batteries, keep in mind that the range most likely win be limited to 100 - 300 $m^3$/h. It is also possible that the DIFF will power itself down due to voltage drop. Non-chargeable batteries have much lower capacity than the included NiMH batteries.

### 5.3 Battery life

With the DIFF fully charged you will be able to measure 1 working day (typical 8 hours of usage when the average measuring is 75 $m^3$/h). The actual operation time depends on the measured flow. When the maximum measured flow is 100 $m^3$/h or lower, you will be able to measure up to 2 or 3 days before the batteries need to be replaced.

Tips for optimal use of the batteries:
Cold batteries can deliver less energy. Store the batteries preferably in a room with an ambient temperature above 5°C. Take care that the batteries have the same temperature as the DIFF, this will avoid moisture.

### 5.4 Lifetime

The expected lifetime of the included NiMH batteries is about 1 year when using them daily. It is safe to assume that the batteries need replacement when they need to be charged more frequently than before. We recommend replacing the batteries every year or when they are charged / discharged 250 times. Fast charging cycles will decrease the battery life.
Waste batteries must be disposed in accordance with the currently applicable local laws.

### 5.5 Warnings

Read the manual of the battery charger before using. Never try to charge non-chargeable batteries. Qn!Y use the (included) SANYO NiMH (model HR-3U 1.2Vl batteries with a minimum capacity of 2450 mAh. Only charge the batteries In an ambient temperature of 0..•50'CIn the standard battery charger. The fast battery charger can only be used in an ambient temperature of 10 .. 40'C. Also refer to the manual of the battery charger.

> It's not possible to use a fixed power supply, usage of a fixed power supply can cause EMC problems, will void your warranty and CE approval.
> Faults and damage caused by other type of batteries then specified, is excluded from the Observator warranty. Batteries are excluded from the standard warranty terms.

## 4. Optional Hoods

There are different types of hoods available for vents larger then the standard opening of 25x25cm. The cross needs to be mounted (Velcro) when measuring a diffuser of 40x40 or 60x60cm. The cross avoids that the measurements are influenced by the vortices created by the diffuser.

To mount the hood, place the round opening of the hood over the square opening of the OIFF. The pull strings need to be positioned on the left.

Pull the lower pull string and lift the hood till the lower pull string hooks behind the edge of the DIFF. With the lower pull string tightened you can pull the upper pull string.
Note that the upper pull string needs to be placed above the edge.

Tighten the hood by placing the fiber poles crosswise. The poles can be placed In the recesses in the edge inside the DIFF. The fiber poles may bend about ±6 cm while placing them.
There is also a repair kit included to repair holes in the canvas.

Check if the pull strings are fit well around the DIFF and pull them tight if they are still a bit loose.

The **AT-242** Is required for measuring supply and exhaust vents In residential housing. This light hood simply slides over the top of the Diff and doesn't require any additional tightening.





### 3.2 Measurement

The DIFF starts to measure Immediately once the option is selected from the menu. Make sure that the follow hg is prepared before measuring:

Closed doors and windows, the wind can create pressure waves that influence the measurement.

Put the square opening of the DIFF against the vent. When sure that the vent is fully covered the measurement can be started. The measurements can be faulty when the measurement Is started before the DIFF is in place.
The DIFF w ll start with a pre-measurement. You can hear the motor starts running. The pre-measurement w ll be followed by the final measurement.

- Wait until the measurement is completed. The measurement can take tens of seconds. The display will show the instantaneous flow and temperature value. This value is not reliable because the DIFF i s stll compensating the measurement.
There will be a beeping sound when the measurement is finished. The value shown on the display is the measured value. You can remove the DIFF from the vent.


The plus sign indicates that an air inlet is being measured. It is also indicated as SUPPLY on the upper left of the display.
A negative sign indicates that an air exhaust is being measured. It is also indicated as EXHAUST on the upper left of the display.
The battery status is indicated by the blocks on the upper right of the display. tis recommended to charge and/or replace the batteries when the battery status reaches the value of one block.
The air temperature of the air flowing through the DIFF is shown below the battery Indication.
You can return to the menu by pressing the selection button. The measured value won't be available anymore.

Comments:
The motor can reach a RPM of thousands of rounds per minute, and **will** create some sound. This can create a high pitched tone caused by the motor control, which is normal.

Measurement duration:
The duration of the measurement depends on the amount of airflow going through the DIFF. The DIFF will measure faster when the airflow is higher. The reason for this, is that the accuracy may be lower with higher airflows

### 3.3 Datalogging

Contact Airflow Developments Ltd for more information.

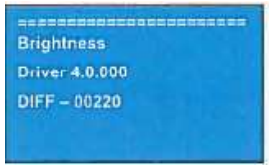
### *3.4 Settings*

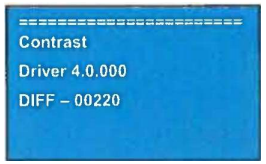
You can choose the following options in the settings menu:

- Brightness
- Contrast
- Battery
- Language
- Measuring unit
- Temperature unit
- Technical Menu


**3.4.1 Brightness - Contrast**

The following screens are shown when selecting the option brightness or contrast.




The screen gives information about the serial number and the driver number of the DIFF. The brightness or contrast is adjustable by turning the selection button. The setting can be confirmed by pressing the selection button.

**3.4.2 Battery**

The option Battery shows the percentage of battery capacity that is left. It is possible that the percentage goes up after a measurement.
The battery status is also shown on the display while measuring. It is indicated with 4 white blocks in the upper right of the screen.
It Is recommended to charge and/or exchange the batteries when the battery level has dropped to one block.


**3.4.3 Language**

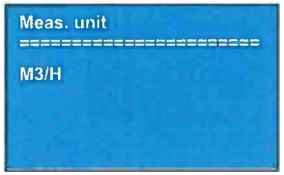


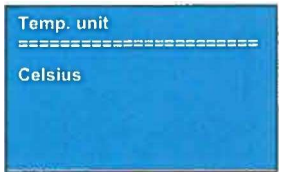

The screen changes to another language by turning the selection button. You can confirm the selection by pressing the selection button.





**3.4.4 Measuring unit/ temperature unit**




The measuring or temperature unit can be selected by turning the selection button. The setting has to be confirmed by pressing the selection button. The following units can be selected.

Measuring unit:
- M3/H
- CFM
- US

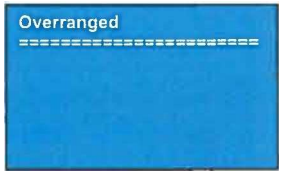
Temperature unit:
- Celsius
- Fahrenheit

**3.4.5 Technical menu**

The technical menu is only available by the Observator technicians.

### *3.5 Overrange protection*

The measuring range goes up to 400m³/h. When you try to measure a value higher then 400m³/h the DIFF will stop measuring show OVERRANGED and an incorrect value on the display.




### *3.6 Off*

The option will power the DIFF down. The DIFF will also be turned off when it is not used for 10 minutes or more. This will prevent unnecessary energy consumption.