

# WÖHLER

## Manual Pressure Differential and Flowmeter



## Wöhler DC 410<sup>FLOW</sup>

Art. n° 22627 – 2020-04-16

*The Measure of Technology*

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# 1 General Information

- 1.1 Operation Manual Information** This operation manual allows you to work safely with the Wöhler DC 410<sup>FLOW</sup>. Please keep this manual for your information.  
The Wöhler DC 410<sup>FLOW</sup> Flow and Pressure Meter should be employed by professionals for its intended use only.  
Any damages caused by not following this manual are excluded from liability.

**1.2 Notes**



**WARNING!**

Not following this warning can cause injury or death.



**ATTENTION!**

Not following this note can cause permanent damage to the device.



**NOTE!**

*Useful information*

**1.3 Intended Use**

The meter can be used for the measurement of differential pressure, airflow, air speed and temperature as well as for the registration of humidity and barometric pressure. It is especially designed for the following purposes:

- Acceptance measurements at ventilation systems according to DIN EN 12599.
- 4 PA Pressure Test to confirm the combustion air availability.
- Measurement of the ventilation loss and the surface loss
- Flow pressure, installation pressure, standing pressure, jet pressure
- Flow measurement in air and flue gas ducts
- Data logger

**1.4 Basic equipment**

Meter	Components
Wöhler DC 410 <sup>FLOW</sup>	Flow and Pressure Meter
	2 capillary tubes
	Batteries
	Plastic case

**1.5 Transport****ATTENTION!**

Improper transport can harm the instrument.

Always transport the instrument in the provided carrying case in order to prevent damage. The pressure connectors have to be protected by the protection cap.

The case is included in the sets and can also be bought separately.

**1.6 Information on disposal**

Electronic equipment does not belong into domestic waste, but must be disposed according to the applicable statutory provisions.

You may hand in any defective batteries taken out of the unit to our company as well as to recycling places of public disposal systems or to selling points of new batteries or storage batteries.

**1.7 Manufacturer****Wöhler Technik GmbH**

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## 2 Specifications

### 2.1 Measured Data

Differential pressure

Description	Data
Range	$\pm 100$ hPa
Accuracy	< 3 % of the reading, if the value is < $\pm 5$ Pa, better than $\pm 0.15$ Pa
Resolution	0.01 Pa within the range $\pm 110$ Pa
	0.1 Pa within the range $\pm 1.000$ Pa
	otherwise 1 Pa

Temperature (internal sensor)

Description	Data
Range	-20 °C to 60°C
Accuracy	< $\pm 1$ °C
Resolution	0.1°C

External temperature probe (optional, e.g. with Measuring Pliers for Temperature Measurement or Special Wall Temperature Probe)

Description	Data
Range	2 canals, -20.0 °C to +800.0 °C
Accuracy	< $\pm 3$ °C at 0°C to 133°C, otherwise 1.5 % of the value, according to the directive EN 50379-2
Resolution	0.1°C

Relative humidity  
(internal sensor)

Description	Data
Range	0 % to 100 % rh (relative humidity), non condensing
Accuracy	< $\pm 2$ % RH, in range 0 to 90 % RH, otherwise < 3 % RH
Resolution	0.1 % RH

Barometric Pressure  
(integrated barometric pressure sensor)

Description	Data
Range	$\pm 300$ hPa to 1,100 Pa
Accuracy	< $\pm 2$ % hPa of reading
Resolution	0.1 hPa

## 2.2 Calculated Values

Variable	Calculation
Pressure units	hPa, Pa, mmH <sub>2</sub> O, PSI, in <sub>wc</sub> , bar, mbar, conversion according to the general conversion rules
Temperature unit	°C and °F, conversion according to the general conversion rules

## Specifications

### Air speed

Description	Data
Range (normal Pressure Measurement)	0.4 m/s to 120 m/s
Range (Fine Pressure Measurement)	0,13 m/s bis 12 m/s
Resolution	0.01 m/s
Continuous density correction	automatic, with temperature signal



#### **NOTE!**

*The user can select between the normal pressure measurement and the fine pressure measurement in the setup menu, see chapter 6.12, point "pressure measurement".*

### Volume Flow

Description	Units
Units	l/s, m <sup>3</sup> /h, m <sup>3</sup> /s, cfm



## 2.3 Logger

Description	Data
Extent	9999 measurements, each with the measured value of pressure and humidity and three temperature values (if the external temperature sensors are connected) can be stored in the internal memory. The user can set the log rate from 1 second to 24 hours.
USB interface for data transfer to a PC	Permanent online data, already during the registration
User adjustable log rate	Sampling interval of 1 second to 24 hours can be set.



**NOTE!**

*Ensure that the meter is connected to the power supply or that the batteries are charged.*

## 2.4 Technical Data

Description	Data
Current consumption	4 AA rechargeable batteries or 4 AA disposable batteries 1.5 volt - working mode: ca. 60 mA, - off-mode and log mode: ca. 45 $\mu$ A for clock and processor
Interfaces	USB- (COM-Port), data transfer to the PC It is possible to transfer the data directly from the meter to the Wöhler TD 600 thermal fast printer.
Storage temperature	-20 °C to +60 °C
Operating temperature	5 °C to +40 °C
Mass	ca. 365 g, with batteries and integrated magnet
Dimensions	80 x 550 x 60 mm
Date and time	Date and time are included in the measurement report
Internal memory	2 MB

### 3 Component Explanation

#### 3.1 Basic Unit

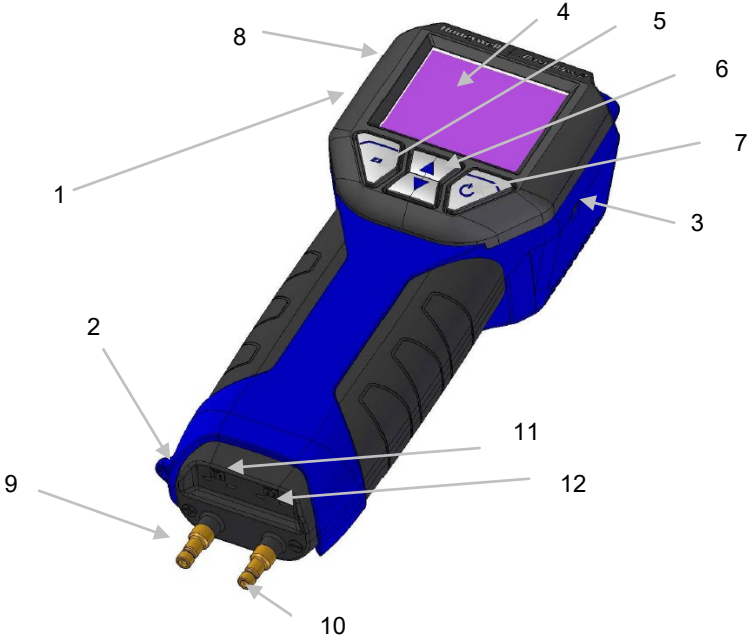



Fig. 1: Overview

## Component Explanation

Number	Function
1	Mini-USB-Port
2	Connection for protection cap
3	Power jack
4	Color display
5 ESC key	<p>context-sensitive Escape</p> <p> <b>NOTE!</b> <i>Keeping this button pressed will always call up the main menu.</i></p>
6 Arrow keys	The function changes according to the context. Scroll up and down.
7 ENTER and On-/Off key	<p>a) Confirm the setting.</p> <p>b) The function of the key changes according to the context.</p> <p>c) Press and hold the key for 3 seconds to turn off the unit.</p>
8 Infrared interface	Thermal fast printer to print out the measurement report
9 Overpressure socket (+)	Main connection
10 Underpressure socket (--)	Reference socket for the measurement of the differential pressure and static socket for the S-tube probe
11, 12	Standard jacks for temperature probes NiCr-Ni
14	Battery cover (in Fig. 1 on the rear side)
	There are diffusion openings for the internal registration of humidity and temperature on the rear side of the Wöhler DC 410 <sup>FLOW</sup> . The internal temperature measurement is necessary for the temperature compensation of the pressure sensor.

### 3.2 Probes and Components



Fig. 2: S-tube probe

S-tube probe for measuring the air speed (see chapter 6.2) and the airflow (see chapter 6.3).

- Insert the plug of the S-tube probe into jack 11 (Fig. 1) of the Wöhler DC 410<sup>FLOW</sup>.
- Connect the overpressure hose (turned against the flow) of the S-tube probe to the overpressure socket (+) (Fig. 1, part 9) and the underpressure hose to the underpressure socket (-) (fig. 1, part 10).



Capillary tube for the 4 PA test. Two capillary tubes are necessary.

Fig. 3: Capillary tube



Fig. 4: Connecting a temperature measuring plier

Two temperature measuring pliers can be connected at the same time.

- Insert the plug of the temperature measuring pliers into the jacks 11 and 12 (Fig. 1) of the Wöhler DC 410<sup>FLOW</sup>.

The temperature value measured by the meter connected to jack 11 will be indicated in the display as T1 and the one measured by the meter connected to jack 12 will be shown as T2.



### NOTE!

Any thermocouple type K may be connected to the jacks 12 and 13.



Fig. 5: Connecting the Special Wall Temperature Probe for measuring the heat transmission coefficient

Connecting the Special Wall Temperature Probe for measuring the heat transmission coefficient (See chapter 6.7). Two Special Wall Temperature Probes can be connected at the same time.

- Insert the plug of the Wall Temperature Probes into the jacks 11 and 12 (Fig. 1) of the Wöhler DC 410<sup>FLOW</sup>.

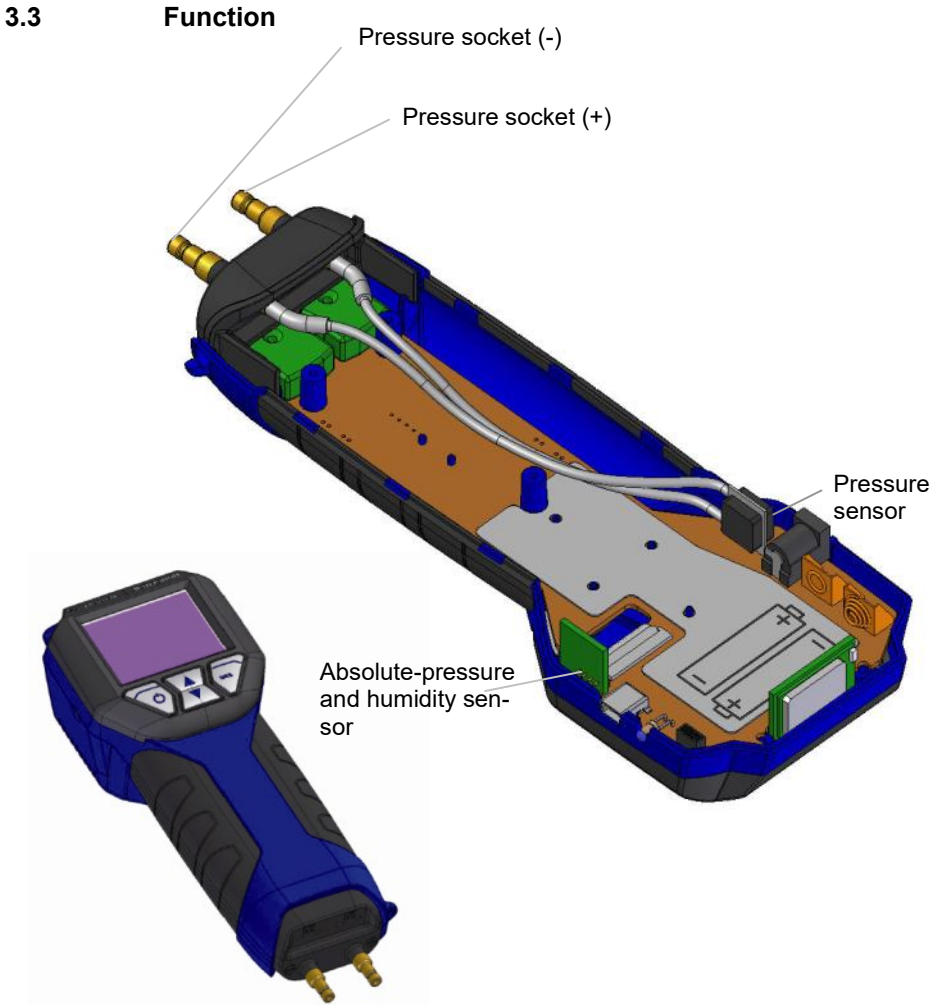


Fig. 6: Interior structure of the meter

### 3.4 Functions

The Flow and Pressure Meter Wöhler DC 410<sup>FLOW</sup> is a high precision multimeter for the measurement of differential pressure, volume flow and temperature as well as the registration of humidity and barometric pressure. Because of its extremely high precision, the meter measures even very small pressures. Therefore it is ideal to determine the air speed, gas pressure, volume, tension and also the flue gas temperature is registered. A maximum measuring range up to 100 hPa and a burst pressure of 0.75 bar provide a sufficient degree of security even for high pressure ranges.

### 3.5 Display and Key Setup

The Wöhler DC 410<sup>FLOW</sup> has a color 2.4" display.

The OLED-technology allows reading the display from almost every angle of view.

Below the display four keys are available to operate the Wöhler DC 410<sup>FLOW</sup>.



Fig. 7 : Display and keys



## Component Explanation

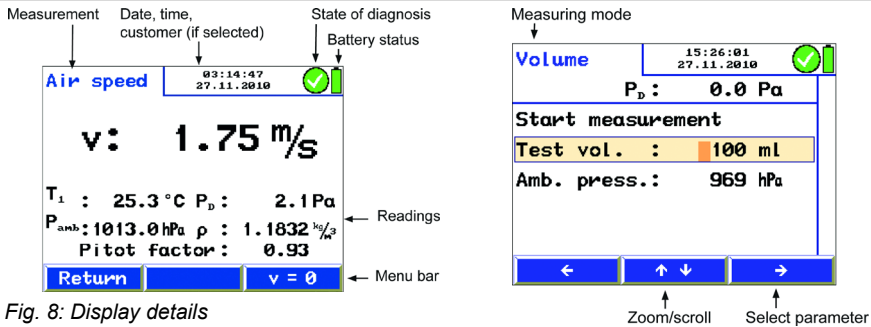


Fig. 8: Display details

The display is divided into a status, a menu and a readings segment.

The currently selected task is shown in the left status segment.

- Date and time, customer (if selected), system diagnosis status and battery level are shown in the status segment on the right.

The readings segment displays the readings or the menu items.

The menu segment is situated at the bottom of the display. It consists of three soft keys.

## 4 Getting Started

### 4.1 Check Battery Status



Fig. 9: Position of the batteries in the Wöhler DC 410<sup>FLOW</sup>

When the device is switched on, the battery indication is displayed in the upper right hand corner of the screen. A fully charged set of batteries is shown as a solid green battery symbol. An empty red symbol indicates discharged or empty batteries. If the batteries are almost empty the back light will dim out. The warning "charge batteries" will appear. In this case, finish the measuring process as soon as possible.



#### **WARNING!**

##### **Incorrect use of batteries can cause injury!**

Never expose the battery to fire or high temperatures. Danger of explosion!

Liquids can leak out of the batteries due to mistreatment. Never touch the liquid. If you got in contact to the liquid remove it with water. If the liquid got into your eyes, remove it with water and see your doctor as soon as possible.



#### **WARNING!**

##### **Risk of electrical shock!**

Never touch the power supply with wet hands!  
Protect the power supply against water and moisture!

Do not unplug the recharger by pulling the cable!  
Do not use the power supply when the voltage requirements of the recharger and the supply do not match!

The batteries can be recharged even while they are located in the analyzer.



#### **NOTE!**

*You can still go on measuring while battery charging is in progress.*

**!** **ATTENTION!**

- Ensure rechargeable batteries are equipped in the DC 430<sup>FLOW</sup> before charging. Never try to charge disposable batteries.

Use 4 AA rechargeable batteries only.

- Only use the Wöhler charger.

How to charge the batteries:

- Before you plug the recharger into the outlet, connect it with the charging connection of the DC 430<sup>FLOW</sup> (Fig. 1, part 3)

Standard AA rechargers can be used for external charging when the batteries are not located in the analyzer.

- To remove the batteries from the DC 430<sup>FLOW</sup> open the battery compartment cover by pressing the clip and pushing the battery compartment cover at the same time.

Recharging empty batteries can take up to 3 hours.



**NOTE!**

*To ensure maximum capacity use batteries of same age and condition only. Always replace a full set of batteries when necessary.*



Fig. 10: Open the battery compartment.

## 5 Operation

### 5.1 Turning the Pressure Computer on and Self Check



Fig. 11: Key pad with on/off-key

#### ! ATTENTION!

Before the meter is used, a visual check must ensure each and every time that all functions work properly.

- Turning on the meter: Press on/off-key (on the right)

The Meter will automatically start with a 10 second self test and zeroing.

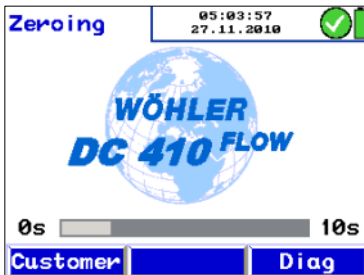


Fig. 12: Zeroing

#### ! ATTENTION!

Do not connect any hose while the meter is performing the self check and do not expose it to any differential pressure, because the pressure sensor will automatically be zeroed during the self test.

### 5.2 Measuring

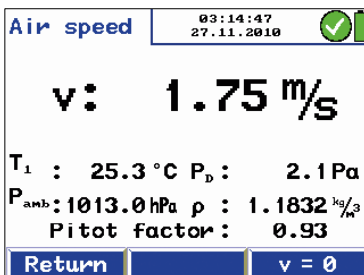


Fig. 13: Measuring mode

After that the meter will automatically switch to the measuring mode.

All readings (measured and computed values) will be shown continuously in the readings segment. The following functions can be selected from the menu segment

- "Menu" key: opens the main menu
- Zoom: Turns the zoom-mode on and off (holding the button pressed).
- Option „P<sub>D</sub>=0“: Differential pressure The pressure sensor will be zeroed once again.

### 5.3 Special Tips

- Holding the left button pressed (ESCAPE) will always stop the current menu and call up the main menu.



Fig. 14: Display and keys

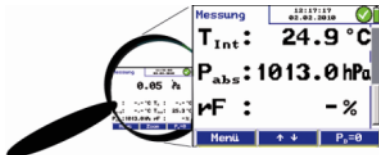


Fig. 15: Zoom feature

- In the measuring mode, press the up or down key to enter the zoom-mode. When the readings are zoomed in, they can be read even from a distance. In the zoom mode three values are indicated in the display. Press the up or down key shortly to scroll the readings.
- Hold the up or down key depressed to zoom in or out.



Fig. 16: DC 410<sup>FLOW</sup> with supporting loop

- The Wöhler DC 410<sup>FLOW</sup> is equipped with integrated magnetic holders on the rear side. The magnetic holders will fix the analyzer on any magnetic material surface.
- It is also possible to fix the Wöhler DC 410<sup>FLOW</sup> with the supporting loop during the measurement.

### **!** ATTENTION!

*Do NOT place the Pressure Computer unsecured, it can fall down and get damaged.*

While measuring either

- hold the Pressure Computer in one hand  
or
- place it with the magnetic holder to any appropriate surface  
or
- fix it with the supporting loop.

## 6 Measurement Modes in the Main Menu

### 6.1 Selecting the Main Menu

Press "menu" to switch to the main menu. In the main menu, all submenus and applications can be activated. The following options can be selected:

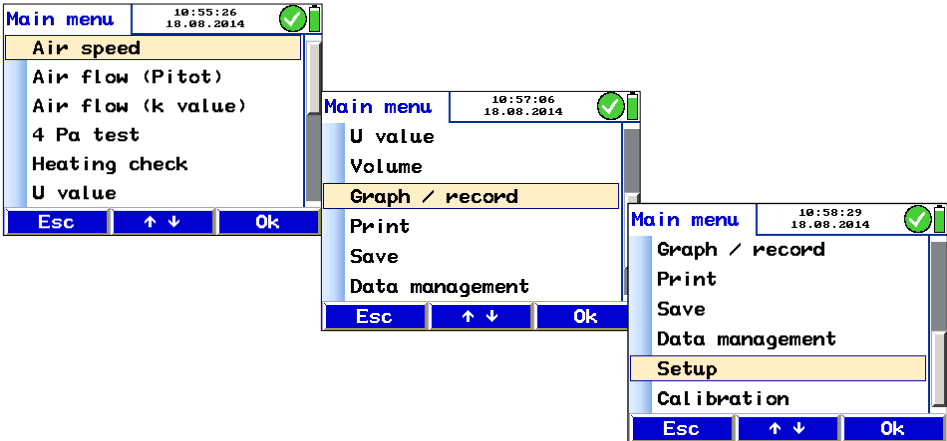


Fig. 17: Main menu

### 6.2 Option „Air Speed“

In this mode the air speed ( $v$ ) of the gas is measured in m/s when the gas temperature is up to 400°C.



Fig. 18: Connection of the S-tube probe to the Wöhler DC 410<sup>FLOW</sup>



#### NOTE!

An S-tube probe (see accessories) is needed for this measurement.

The wanted signal of the Wöhler S-tube probe is better than that of a normal pitot tube, if the flow speed is equal. In the setup-menu the pitot factor 0.93 must be set once (see chapter 6.12).

### 6.2.1 Measuring the Air Speed

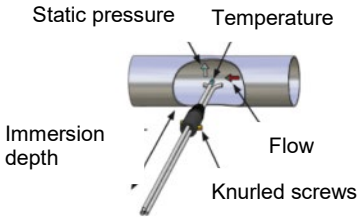


Fig. 19: Measuring the air speed with the S-tube

1. Connect the pressure connector of the S-tube to the (+) overpressure socket of the Wöhler DC 410<sup>FLOW</sup>.
2. Connect the static pressure connector of the S-tube to the (-) underpressure socket of the Wöhler DC 410<sup>FLOW</sup>.
3. In calm air, switch on the Wöhler DC 410<sup>FLOW</sup> and wait until the zeroing procedure of the sensor has finished.
4. When closed, the S-tube can be inserted through the measurement opening into the gas flow.
5. Fix the S-tube with a cone, open it and direct the sensors as shown in the figure.
6. If necessary, adapt the S-tube to the cross section of the gas line with the help of the two knurled screws.



**NOTE!**

The S-tube must be adjusted before the measurement procedure starts, since it is required to check and/or adjust the oppositely running orientation of the measuring tubes after loosening the knurled screws and adjusting the immersion depth.

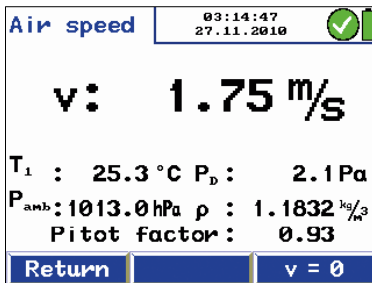


Fig. 20: Air speed measurement

7. In the main menu, select "Air speed" and confirm with OK.

The air speed  $v$  is indicated in the upper part of the display. The temperature, measured by the sensor or the S-tube, and the ambient pressure  $P_{amb}$ , measured by the integrated ambient pressure sensor, are indicated in the lower part of the display.

Also the differential pressure  $P_D$  and the density  $\rho$  are indicated.



- Press the left key to bring up the menu again.
- Press the right key to zero the pressure sensor.



**NOTE!**

*The pressure sensor must be zeroed, if the meter does not indicate V=0 after the tubes have been removed.*



**Note**

*If the air speed reading is not stable or if the resolution is not high enough, go to the Setup-menu and select Attenuation > fine (see chapter 6.12)*

## 6.2.2 Theoretical Background

The Wöhler DC 410<sup>FLOW</sup> will calculate the air speed automatically according with the following formula:

$$v = S \sqrt{\frac{2 \Delta p}{\rho}} \quad \text{Formula 1}$$

The air density  $\rho$  is determined as follows:

$$\rho = 1.29 \frac{\text{kg}}{\text{m}^3} \cdot \frac{273 \text{ }^\circ\text{C} \cdot p_{akt} [\text{hPa}]}{(\vartheta_{act} [^\circ\text{C}] + 273 \text{ }^\circ\text{C}) \cdot 1013 \text{ hPa}} \quad \text{Formula 2}$$

Explanation:

$v$ : air speed in m/s

$\rho$ : air density, app. 1.29 kg/m<sup>3</sup> (depends on temperature and air pressure)

$\Delta p$ : Differential pressure in Pa, measured with the S-tube

$p_{akt}$ : absolute air pressure, measured with the DC 410<sup>FLOW</sup>

S: Pitot factor 0.93 for S-tube probe

$\vartheta_{act}$ : Measured Temperature

### 6.3 Option „Airflow (Pitot)“

In this menu, the airflow is measured in l/s or in m<sup>3</sup>/h. Select the unit in the setup menu. (see chapter 6.12)

With the Wöhler DC 410<sup>FLOW</sup>, a grid point measurement can be done, so that the information provided by the measurement is significant (see chapter 6.3.2).

#### 6.3.1 Measuring the Airflow (Pitot)

Connect the S-tube probe to the Wöhler DC 410<sup>FLOW</sup> and insert it into the measurement opening. Proceed as described in chapter 0

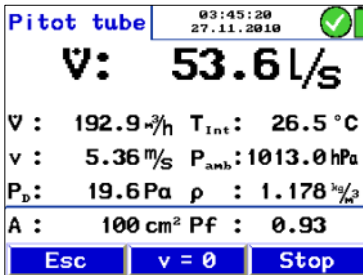


Fig. 21: Menu Airflow (Pitot)

After the Menu "Airflow (Pitot)" has been selected, the current airflow value  $\dot{V}$  will be indicated.

The airflow is calculated from the surface area and the air speed.

$$\dot{V} = A \cdot v \quad \text{Formula 3}$$

The Airflow  $\dot{v}$  is indicated in the unit which has been selected in the setup-menu.

Underneath the airflow  $\dot{v}$  is indicated in the other possible unit.

Also the following values are indicated.

Room temperature  $T_{int}$ , when there is no temperature sensor connected (see figure).

If temperature sensors are connected,  $T_1$  will show the temperature measured by the sensor connected left and  $T_2$  will measure the temperature measured by the sensor connected right.

Air speed  $v$ .

Air pressure  $P_{amb}$

Differential pressure  $P_D$

Air density  $\rho$

Pitot factor of the S-tube probe Pf: can be adjusted in the setup menu, 0.93 for the Wöhler S-tube probe, 1.0 for a "normal" Prandl tube)

Cross section area A of the duct (The user has to enter the cross section area A as follows:)

### Entering the cross section area:

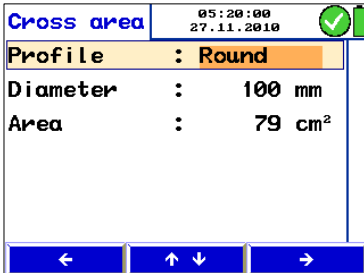


Fig. 22: Entering the cross section area

- Press "Stop" and then "Area" to bring up the cross section area menu.
- Go to the parameter "Profile" with the up and down keys.
- Use the right arrow to select between "round, rectangle, arbitrary"
- Select by using the up and down keys.
- Change the other parameters in the same way.

The Wöhler DC 410<sup>Flow</sup> will calculate the cross section area automatically.

Press "Return" and then "Proceed" to start the measuring with the correct area value.

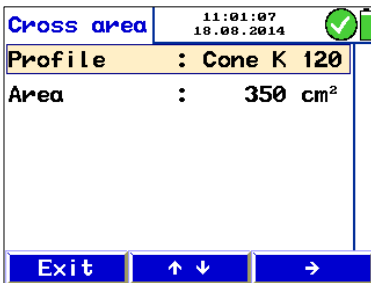


Fig. 23: Selecting the cone

If the airflow is measured with a cone (see chapter 6.3.3), the user has to select the cone which he will use (Cone K 35, K 75, K 120 and K 150). The Wöhler DC 410<sup>Flow</sup> will calculate the correspondent area automatically.

### 6.3.2 Grid-point Measurements

The readings shown in the display are instantaneous values.

The Wöhler DC 410<sup>Flow</sup> can do grid-point measurements. This means that the airflow is measured at up to 12 different points of the tube and the meter will calculate the average of the readings.



#### NOTE!

*The average value determined by the grid-point measurement is much more informative than a value measured in one point only, because possible fluctuations during the measurement will be compensated.*

**Measurement 1**

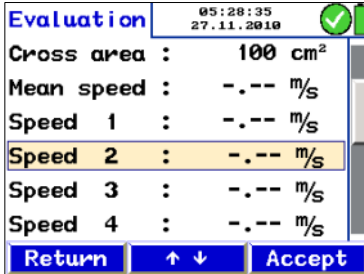


Fig. 24: Standard report, when no reading has been accepted yet.

- Enter the area-value and insert the S-tube into the measuring opening as described before. Then start measuring.
- When the value has stabilized, press "Stop".

The readings of the first measurement are shown in the display.

- Press "Evaluation" to display all the readings.

The result of the first measurement will not be shown, because it has not been accepted yet.

- Press "Accept" to accept the value as the velocity 1.

The airflow is indicated in the upper part of the display as the result of the measurement 1.

- Press "Return" to bring up the measurement menu.
- Press "Proceed" to start a new measurement.

**Measurements 2 - 12**

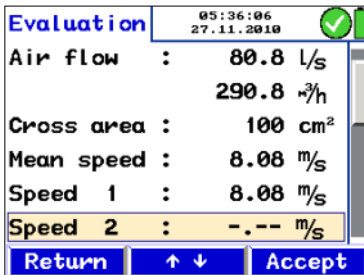


Fig. 25: Standard report after the readings have been accepted.

The current readings will be indicated in the display again.

- Press "Stop", when the values are stable.
- Press "Evaluation" to bring up a summary of all measurements.
- Press "Accept" to capture the recent value.
- Perform the measurements 2-12 the same way.

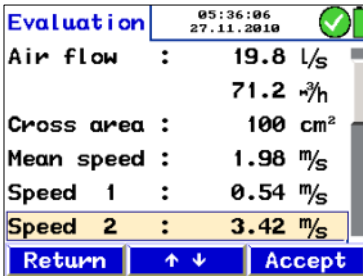


Fig. 26: Average value

In the display, the average of the speed readings is shown above the readings.

The airflow is indicated in the upper part of the display as the average of the results of all measurements performed until now.



**NOTE!**

Select "Print" to print out a report.

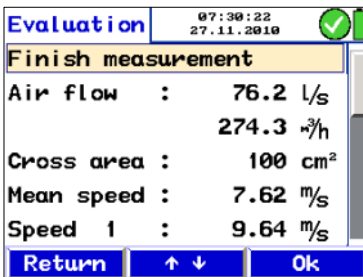


Fig. 27: Finish the measurement

- In the Evaluation menu select "Finish measurement" (top of the display) to finish the measurement.

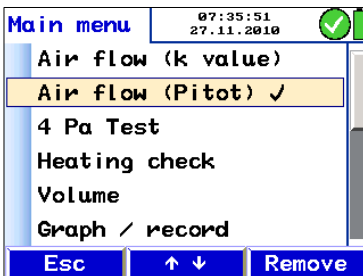


Fig. 28: Main menu when the readings have been accepted.

In the main menu, a tick mark beside the menu "Airflow (Pitot)" will indicate that the airflow measurement has already been done.

Select "Print" to print out a report.



**Note**

If the airflow reading is not stable or if the resolution is not high enough, go to the Setup-menu and select Attenuation > fine (see chapter 6.12)

### 6.3.3 Measuring the airflow with a cone

It is also possible to measure the air flow with a cone (see accessories) using the Wöhler DC 410<sup>Flow</sup> when an s-tube is connected.

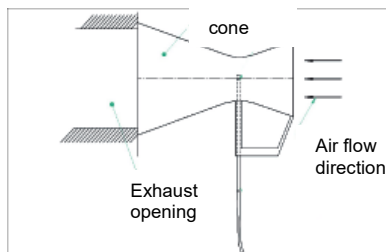


Fig. 29: Measuring with a cone

- In this case insert the s-tube into the funnel as shown in the figure on the left.

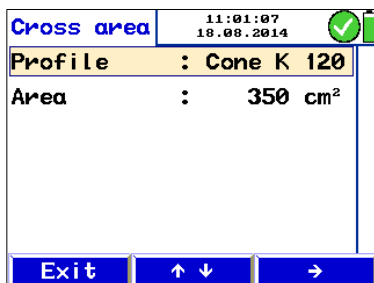


Fig. 30: Selecting the cone

Under "Profile" select the cone that you will use during the measurement, see chapter 6.3.1. The Wöhler DC 410<sup>Flow</sup> will calculate the corresponding area automatically.

Cone	Article n°	Corresponding area
K 150	53788	50 cm <sup>2</sup>
K 120	53789	350 cm <sup>2</sup>
K 75	53793	110 cm <sup>2</sup>
K 35	53794	50 cm <sup>2</sup>



**NOTE!**

The area to be entered depends on the cross section of the air sampling opening of the cone. As the cross section of the funnel K 150 and K 35 is the same, the area to be entered is also the same.

## 6.4 Option „Airflow (k value)“

Select the submenu "Airflow (k-value)" to measure the airflow at apertures or similar measuring openings of air pipes or vents. This method is simple and precise and therefore suitable for the adjustment of air pipe systems and vents.

### 6.4.1 Theoretical Background

In this menu, the air flow measurement is based on the k value. The k value is a factor which describes the relation between the decrease in pressure and the air flow.



#### NOTE!

The k-value is always entered into the meter related to l/s.

The k-value is entered into the meter related to l/s. The air flow will be indicated by the Wöhler DC 410<sup>FLOW</sup> in l/s and in m<sup>3</sup>/h.

The DC 410<sup>Flow</sup> will calculate the airflow according to the following formula:

$$\dot{V} = K \cdot \left( \Delta p \cdot \frac{1,2}{\rho} \right)^{0,5}$$

Formula 4

Explanation:

$\dot{V}$  = airflow

$K$  = K value (Enter the K-value, indicated in the data sheet, into the DC 410<sup>Flow</sup>).

$\Delta p$  = measured pressure

$\rho$  = air density, calculated on the basis of temperature and pressure

By default, the exponent will be 0.5 as indicated in the formula. Some fan manufacturers inform explicitly in the data sheet that a special exponent has to be used for the airflow calculation.

- In this case, go to the setup menu and enter the exponent indicated in the data-sheet in the Wöhler DC 410<sup>FLOW</sup>. (see chapter 6.12, „exponent“).

## 6.4.2 Connecting the Wöhler DC 410<sup>Flow</sup> to the Vent

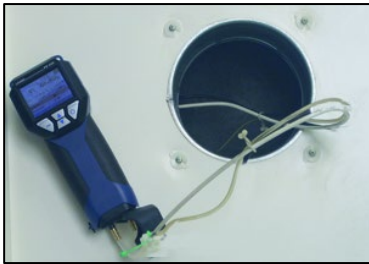


Fig. 31: Example - Connection of the measuring hoses

- Connect the Wöhler DC 410<sup>Flow</sup> with two measuring hoses to the vent.

The overpressure socket (+) of the DC 410<sup>Flow</sup> has to be connected to the aperture with the higher pressure and the underpressure socket (-) to the aperture with the lower pressure.



### NOTE!

If the hoses are wrongly connected, the reading will be negative. In this case inverse the hoses.

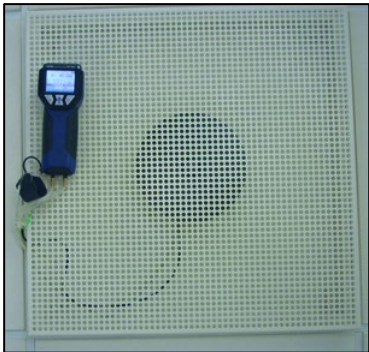


Fig. 32: Example - Fixing with a magnet

- During the measurement, the Wöhler DC 410<sup>Flow</sup> can be fixed to the protective grid with a magnet, so that the results can easily be read from the display.



Fig. 33: Example - Fixing with the supporting loop

- When the aperture is under the ceiling, the Wöhler DC 410<sup>Flow</sup> can be fixed with the supporting loop.



### 6.4.3 Performing the Test

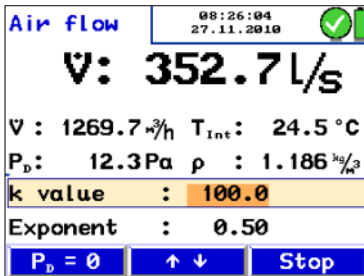


Fig. 34: Menu "Airflow (k value)"

After the measuring mode has been activated, in the upper part of the display the airflow will be indicated in the unit selected in the setup-menu.

Underneath, the airflow will be indicated in the other unit.

The following values will also be indicated.

Room temperature  $T_{int}$ , when there is no temperature sensor connected (see figure).

If temperature sensors are connected,  $T_1$  is the temperature value measured by the sensor connected left and  $T_2$  is the temperature sensor measured by the sensor connected right.

Differential pressure  $P_D$

Air density  $\rho$

#### k value

Underneath, the k value entered by the user is indicated.



#### NOTE!

The k value is specified in the data sheet of the air vent. The user must enter this k value into the DC 410<sup>Flow</sup> before starting the measurement.

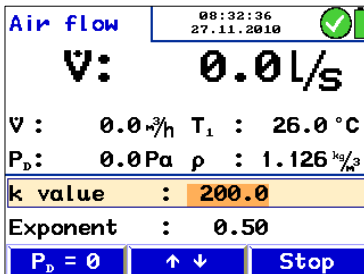


Fig. 35: Entering the k value

How to enter the k value:

- Select K value, see Fig. 34: Menu "Airflow (k value)"
- Increase or reduce the value with the up and down keys.
- Press OK to confirm.



#### NOTE!

Always enter the k value related to l/s (even if you have changed the air flow unit from l/s to m<sup>3</sup>/h in the setup-menu).

## Measurement Modes in the Main Menu

$P_D = 0$

Press  $P_D = 0$  (menu bar, see Fig. 34: Menu "Air-flow (k value)") to zero the pressure sensor.



### NOTE!

We recommend to zero the pressure sensor, if the pressure indicated in the display is not  $P_D = 0$  after the measuring hoses have been removed.

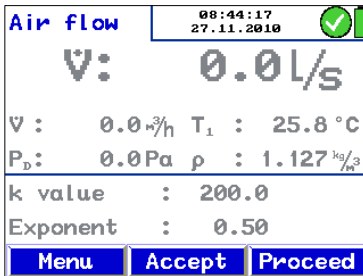


Fig. 36: Measuring data that has not been accepted yet.

- When measuring, wait until the value has stabilized and then press "Stop".
- Press "Accept" to accept and save the value. In the main menu a tick mark beside the menu "airflow (k value)" will indicate that the measurement has already been done.



### NOTE!

Select the Print-option in the main menu to print out a report.

Press "Menu" to exit the "Airflow (k value)" option without saving.

Press "Proceed" to return to the "Airflow (k value)" option for further measurements.



### Note

If the airflow reading is not stable or if the resolution is not high enough, go to the Setup-menu and select Attenuation > fine (see chapter 6.12)

## 6.5 Option “4 Pa Test”



Fig. 37: Wöhler DC 410<sup>FLOW</sup> with capillary hoses

The 4 Pa Pressure Test is a simple control of the underpressure limit 4 Pa for the confirmation of a sufficient combustion air supply.

In a closed room or in connected rooms, simultaneous operation of non-roomsealed heating appliances and ventilation and air conditioning systems can cause dangerous underpressure.

With the 4 Pa Pressure Test the underpressure value can be controlled. The readings are plotted in a graph during about 4 minutes, and can be saved and print out afterwards.



### NOTE!

For the 4 Pa Test two capillary hoses must be connected to the Wöhler DC 410<sup>FLOW</sup>.

The 4-Pa Test measures the pressure difference between the room where the fireplace is installed and another room which is not connected (e.g. outside air, stairway etc.) Before starting the measurement, two flexible capillary hoses must be connected (see accessories). The pressure sensor of the meter will measure the pressure difference.

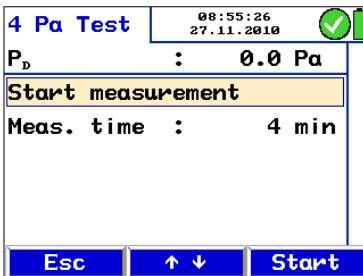


Fig. 38: Initial display of the 4 Pa test

Before starting the measurement:

1. Select 4 Pa Test in the main menu of the DC 410<sup>FLOW</sup>.  
The current differential pressure reading will be displayed.
2. Connect the capillary hose leading to the reference point (stairway or outside air), to the negative pressure socket (fig. 1, part 10).
3. Connect the second capillary hose to the positive pressure socket (fig. 1, part 9). The second hose stays in the room where the fireplace is installed. With this hose the march of pressure will be recorded.

Underpressure in the fireplace room in relation to the pressure at the reference point will lead to a negative differential pressure.

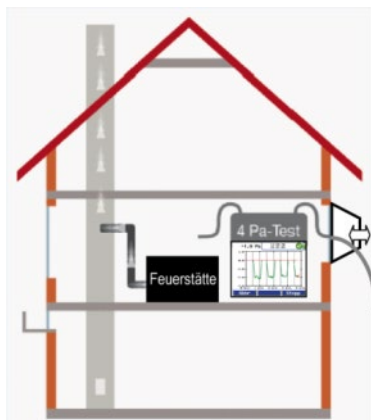


Fig. 39: 4 Pa Test

How to perform the 4 Pa Pressure Test:

4. Switch on appliance and all air conditioning (fan, dryer) with maximum power.
5. Open an outside window or a door to the reference room and test proper operation of the appliance, ensure that there are no back-draft conditions.
6. Position the reference capillary hose: Lead the hose outside through a window seal or into the stairways through the door rebate or the key-hole.



### NOTE!

*Especially on stormy days, the stairways may be a stable reference room.*

*If the stairways are used as reference room, all windows, doors, cellar doors and trap doors have to be closed.*

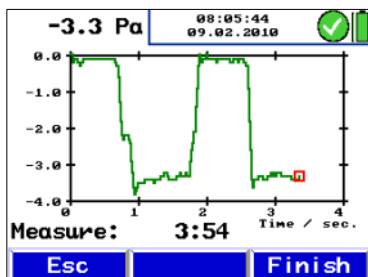


Fig. 40: Pressure profile during the 4 Pa Test

The second capillary hose will stay uncut in the fireplace room.

7. Press „P<sub>D</sub>=0“ to zero the pressure sensor.
8. Press "Start measurement" to start the 4 PA Test.  
The DC 410<sup>FLOW</sup> will now record the pressure profile for 4 minutes.
9. Open the window/door for about 30 seconds, so that the zero line can be registered.
10. Close the window/door for about 30 seconds, control underpressure.
11. Open the window/door for about 30 seconds, the zero line should be reached again.
12. Close the window/door for about 30 seconds, control underpressure.
13. Open the window/door for about 30 seconds, the zero line should be reached again.
14. Close the window/door for about 30 seconds, control underpressure.

For a better orientation, there are auxiliary lines in the diagram every 30 seconds. After a maximum of 4 minutes, the measurement will stop automatically.



**NOTE!**

Press "Stop" to stop the 4 Pa Test earlier.

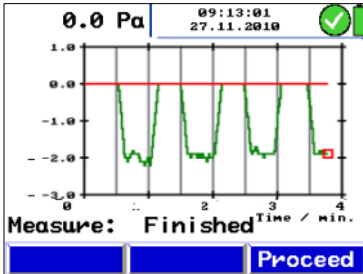


Fig. 41: Diagram 4 Pa Test

Normally a diagram as shown in figure Fig. 41. will appear. The pressure peaks in the diagram are caused by the rapid movement of the window or the door and therefore they are not relevant for the interpretation of the diagram.

In Fig. 41 the pressure drop is about 2.0 Pa.

The reliability of the system is considered sufficient, when the pressure drop caused by opening and closing the window is less or equal to 4 Pa (8 Pa in the case of wood burning without surrounding air)

After the 4 Pa test is completed, "4 Pa Test" will be marked by a tick mark in the main menu. Select "Print" from the main menu (see chapter 6.10) to print out the readings and select "Save measurements" (see chapter 6.11) to save them.

For the detailed procedure according to the Technical Rules for Gas Installations (TRGI), working sheet G 625 (2009), it is necessary to replace the fireplace by the Wöhler DP 600 (see manual Wöhler DP 600).

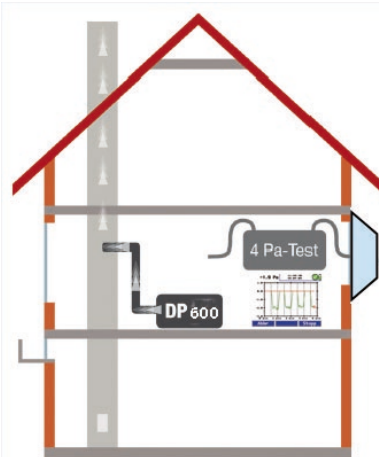


Fig. 42: 4 Pa Test with Wöhler DP 23

## 6.6 Option „Energy Utilization Check“

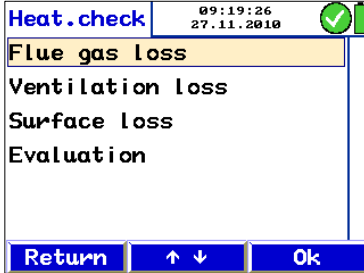


Fig. 43: Energy Utilization Check

The Energy Utilization Check provides a checklist to determine the potential efficiency improvements.



**NOTE!**

*It is necessary to connect the S-tube probe (see accessories).*

Select the submenu "EUC" from the main menu. In the Display the following options will appear:

- Flue gas loss
- Ventilation loss
- Surface loss
- Evaluation

How to activate an option:

- Select the option with the up or down key.
- Confirm with "OK".

### Potential improvement points Flue gas loss

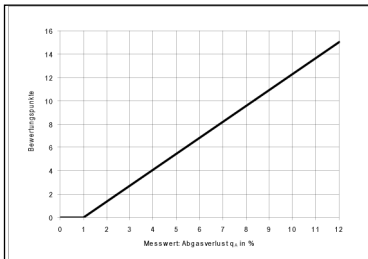


Fig. 44: Standard characteristic curve

The "Flue gas loss" function will convert the most recently measured flue gas loss into potential improvement points according to DIN EN 15378, national annex.

How to convert the flue gas loss into potential improvement points:

- In the submenu "Energy Utilization Check" select "flue gas loss". Enter the measured flue gas loss.

The meter will convert the flue gas loss automatically according to the standard curve in Fig. 44.

After the conversion, "Flue gas loss" will be marked by a tick mark in the "Energy Utilization Check" screen.

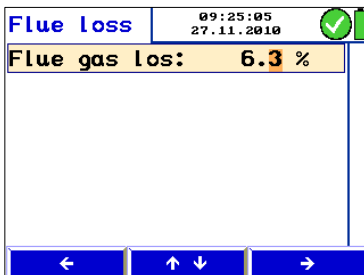


Fig. 45: Entering the Flue gas loss

**Measuring the Ventilation Loss**

*Fig. 46: S-tube probe*

The ventilation loss has to be measured 30 seconds after burn-out. It is based on the measurement of the air speed and of the temperature of the residual core flow. The test fulfills the requirements of DIN EN 15378, national annex, concerning the evaluation of the ventilation loss of boilers.

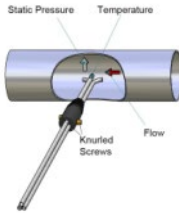


Fig. 47: Measuring the ventilation loss

<b>Vent. loss</b>	09:54:17	✓
	27.11.2016	
<b>Nom. power</b>	:	<b>12 kW</b>
<b>Diameter</b>	:	<b>150 mm</b>
<b>Outside t.</b>	:	<b>20.0 °C</b>
<b>Amb. press.</b>	:	<b>969 hPa</b>
←    ↑ ↓    →		

Fig. 48: Entering the parameters for the ventilation loss measurement

How to perform the measurement:



**NOTE!**

Connect the Special Wall Temperature Probe (see accessories) to jack 12, fig. 1.

If you do not connect any room temperature probe, the temperature measured by the internal probe will be adopted.

1. In the submenu "Energy Utilization Check", select "Ventilation Loss". Confirm with OK.
15. Enter or control the parameters. (Nominal power, diameter of the flue gas pipe, outside temperature and ambient pressure)



**NOTE!**

The Wöhler DC 410<sup>FLOW</sup> is equipped with an ambient pressure probe, so that the meter will determine the ambient pressure automatically.

Press "Procced". A message will appear: "Zeroing pressure sensor. Remove hoses."

16. Confirm with "OK". The pressure sensor will be zeroed. It is important that the S-tube probe is not connected yet.
17. Connect the S-tube probe to the Wöhler DC 410<sup>FLOW</sup>.
18. Insert the closed S-tube through the measurement opening into the gas line, while the burner is working.
19. Fix the S-tube with a cone, open it as shown in Fig. 47: Measuring the ventilation loss and direct the sensors as shown in the figure.
20. If necessary, adjust the S-tube with the knurled screws, so that it fits into the gas line.



**NOTE!**

Do not change the position of the meter after the pressure sensor has been zeroed. The sensor is extremely sensitive.



**NOTE!**

The S-tube must be adjusted before the measurement procedure starts, since it is required to check and/or adjust the oppositely running orientation of the measuring tubes after loosening the knurled screws and adjusting the immersion depth.

Vent. Loss		10:00:42	✓
		27.11.2010	
$P_D$	:	0.19 Pa	
Flue t. ( $T_1$ )	:	55.1 °C	
Room t. ( $T_2$ )	:	22.3 °C	
Air speed	:	0.55 m/s	
Vent. Loss	:	3.50 %	
Time remain:		0:19	
Esc		Stop	

Fig. 49: Measuring the ventilation loss

The measurement will be done automatically.

21. When the burner is turned off, press "Start" to start the data recording. After 30 seconds, the data recording will start automatically. The captured values are shown in the display.
22. Press "OK" to accept the calculated ventilation loss.

**NOTE!**

The wanted signal of the Wöhler S-tube probe is better than that of a normal pitot tube, if the flow speed is equal. In the setup-menu the pitot factor 0.93 must be set once.

The measured values are converted according to the following formula:

$$q_{LS\_Norm} = \frac{A_v \cdot v(t) \cdot \rho_{Luft} \cdot c_{pl} \cdot (\vartheta_L(t) - \vartheta_U)}{Q_{Kessel}} \cdot \frac{273 + \vartheta_{au\beta enIST}}{273 + \vartheta_{au\beta enREF}}$$

Description	Data
$q_{LS\_Norm}$	Ventilation loss in %
$A_v$	Area cross section of the flue gas pipe in m <sup>2</sup>
$v(t)$	Air speed in the flue gas pipe in m/s
$\rho_{air}$	air density, temperature compensated, e.g. 20 °C 1,2 kg/m <sup>3</sup>
$c_{pl}$	specific heat capacity, norm: 0,279 Wh/kg °C
$\vartheta_L$	air temperature in the exhaust stack
$\vartheta_U$	air temperature in ° in the room
$\vartheta_{outside IST}$	Outside temperature, actual value in °C
$\vartheta_{outsideREF}$	Outside reference temperature, 15 °C
$Q_{burner}$	Nominal heat output of the heat generator.

The conversion rule for the determination of the flue gas loss is integrated in the meter's program.

After the measurement of the ventilation loss has been completed, "Ventilation loss" will be marked by a tick mark in the "Energy Utilization Check" screen.

How to print out a report:

- Select the 'PRINT' option from the main menu.

How to save the results:

- Select the 'Save' option from the main menu.

The surface loss is the temperature that the burner emits via the surface.



**NOTE!**

*The Special Wall Temperature Probe is needed to measure the surface loss (see accessories).*

Before measuring the surface loss, it is necessary to enter certain data. For that purpose all partial areas of the burner must be considered that do not adjoin directly to other installations and/or walls and floors

Denomination	Explanation
A partial area = measured value/manufacturer information	Partial area in m <sup>2</sup>
T <sub>S</sub> partial area = measured value	Temperature of the partial area in °C
T <sub>R</sub> Room = measured value	Air temperature in ° in the fireplace room
α = value determined according to EN 304	Heat transfer coefficient in W/m <sup>2</sup> K
Q <sub>burner</sub> = value indicated in the instruction plate of the burner	Nominal power of the heat generator in kW

**Measuring the surface loss**

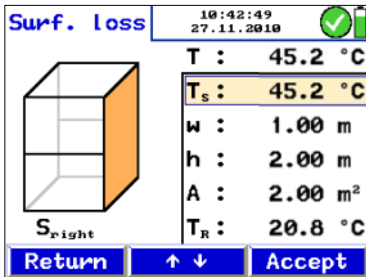


Fig. 50: Measuring the surface loss

How to measure the surface loss:

- Enter the nominal power of the burner.
- Press "Proceed"
- Enter the surface temperature  $T_s$  of the single area and its dimensions (width x height).
- Measure the average surface temperatures with the Special Wall Temperature Probe connected to the Wöhler DC 410<sup>FLOW</sup> and save it by pressing the "Accept" key.
- Do this for every partial surface

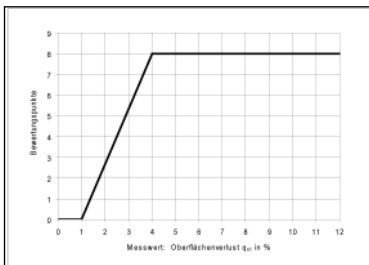


Fig. 51: Converting the surface loss in potential improvement points

The meter will calculate the surface loss  $q_r$  (r: radiation). The surface loss will be referred to the heat emission and then converted into improvement potential points according to the DIN EN 15378, national appendix. The conversion into improvement potential points is done according to the graphic in Fig. 51: Converting the surface loss in potential improvement points

After the measurement of the surface loss has been completed, "Surface loss" will be marked by a tick mark in the "Energy Utilization Check" screen.

### Evaluation

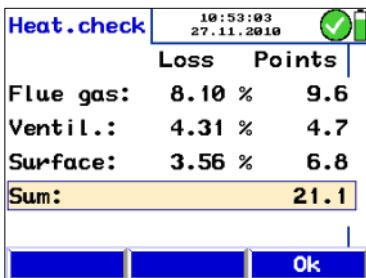


Fig. 52: Evaluation of the Energy Utilization Check

The menu item "Evaluation" presents all results and the corresponding improvement potential points according to DIN EN 15378. These have to be registered in the Energy Utilization Check certificate.

6.7 Option „U value“

The heat transfer coefficient (U value) describes the heat flow  $W/m^2k$  flowing through a building element.



Fig. 53: Application example DC 430<sup>Flow</sup> with Special Wall Temperature Probe



**NOTE!**

A Special Wall Temperature Probe is needed to measure the heat transfer coefficient (see accessories). All temperatures (also the inside air temperature  $t_{ai}$  and the outside air temperature  $t_{ao}$ ) should be measured with the same sensor.

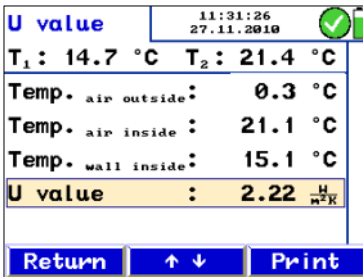


Fig. 54: U value

The temperature values measured by the Wöhler DC 410<sup>FLOW</sup> and the Special Wall Temperature Probe are necessary for the determination of the U value. The u-value is calculated with the following equation according to the DIN standard 4108.

$$U_{current} = \frac{\alpha_i \cdot [t_{AI} - t_{WI}]}{[t_{AI} - t_{AO}]}$$

$U_{current}$	U-value in $W/(m^2k)$ , current value
$t_{AI}$	interior air temperature
$t_{WI}$	interior wall temperature
$t_{AO}$	outside air temperature
$\alpha_i$	fix value, 7,69 $W/(m^2k)$

All temperatures (also the interior air temperature  $t_{ai}$  and the outside air temperature  $t_{ao}$ ) should be measured with the same temperature sensor.

**6.8 Option “Volume“** In this submenu, the content of a closed and hermetic room with a volume up to 6000 l is determined (e.g. tank, bottle or pipe).



**NOTE!**

For the volume measurement, a syringe (up to 100 ml), a cross piece and connection hoses are needed. We recommend the Wöhler Leakage Test Set.

Measuring principle of the determination of the volume

After a sample  $V_{\text{sample}}$  has been drawn with the syringe (up to 100 ml) or the soot test pump, the pressure in the tube will change. Based on this pressure change, the total volume  $V_{\text{tube}}$  can be calculated.

The Volume  $V_{\text{tube}}$  is determined with the following equation in accordance with the principle of the Boyle-Mariott's Law:

$$V_{\text{Tube}} = V_{\text{Sample}} \cdot \left( \frac{p_{\text{act}}}{\Delta p} - 1 \right) \Bigg|_{\text{Temp. = const.}}$$

$V_{\text{tube}}$	Tube volume to be determined, max. 6000 l
$V_{\text{sample}}$	Volume drawn as a sample
$\Delta p$	Maximum pressure difference that results when the sample is drawn
$p_{\text{act}}$	absolute air pressure, has to be entered in the setup menu by the user (Default: 1013 hPa)

The DC 430<sup>FLOW</sup> measures the pressure difference  $\Delta p$ . The pressure difference  $\Delta p$  should at least amount to 200 Pa so that an exact result can be reached. Therefore, the sample  $V_{\text{sample}}$  that the user draws with the syringe or the soot test pump should amount to at least 1/500 of the tube volume (see table).

Guidelines for the selection of the sample volume that has to be drawn with the soot test pump.

Pump volume	Max. tube volume
163 ml (1 strike with the soot test pump)	80 l
489 ml (3 strikes with the soot test pump)	240 l

Performing the test



Fig. 55: Volume measurement with the Wöhler DC 410<sup>FLOW</sup> and a syringe (up to 100 ml tube volume).



**NOTE!**

If the volume is smaller or equal 100 ml, a syringe has to be used. If the volume exceeds 100 ml, a Soot Test Pump will be needed. The volume of the Soot Test Pump is 163 ml per strike.

- Close the gas line and seal it with a suitable test plug.



**WARNING!**

Please observe the valid accident prevention regulations!

- Switch the Wöhler DC 410<sup>FLOW</sup> on before connecting the overpressure socket (+) via a hose to the test plug.
- Connect the soot test pump or the syringe with a second hose and the cross piece.
- Go to the main menu, select "Volume" and confirm with OK.
- Enter the test volume into the meter according to the sample volume that has to be drawn with the soot test pump or the syringe, e.g. 163 ml, that is one strike with the soot test pump.



Fig. 56: Volume measurement with the Wöhler DC 410<sup>FLOW</sup> and a soot test pump (from 100 ml tube volume on).

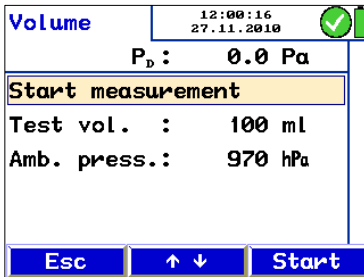


Fig. 57: Presettings (Volume test)

- Select "Start measurement" and press "Start". In the display the request to add/remove the sample volume will appear.
- Take the sample volume with the syringe or the soot test pump.

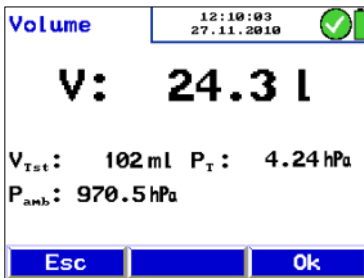


Fig. 58: Volume test

- When the value V keeps stable, press "OK" to save the data. In the main menu a tick mark beside "Volume" will indicate that the volume test already has been done.
- $V_{TST} = \text{Volume}_{Test}$   
 $P_T = \text{Pressure}_{Tube}$   
 $P_{amb} = \text{Ambient Pressure}$

## 6.9 Graph / Record

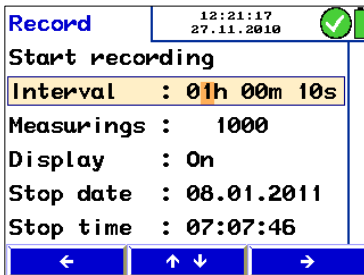


Fig. 59: "Record" screen

The "graph / record" mode is used to start a permanent data recording. A graph of the records will appear on screen.

The user can modify the log interval, the number of measurements, the stop date and the stop time as follows:

- Go to the digit by pressing the left-/right-key and increase or reduce the value by pressing the up- and down-keys.

The display can be switched off during the data recording.



### NOTE!

The display only will switch off between the measuring cycles, if a record interval of at least 20 seconds has been set.

- Select "Start recording" and press "Start"





### **NOTE!**

*Ensure that the meter is connected to the power supply or that the batteries are charged.*

A graph which presents the measured values appears in the display.

- Press "Stop" to save the logged data.
- Press "Print" to print a graph.
- Press "Proceed". The request "Accept measurements?" will appear in the display.
- Press "No" to return to the main menu without saving the measured values. In this case there will be no tick mark beside the menu "Graph / logging".
- Press "Yes" to return to the main menu after saving the measured values. Beside the menu "Graph / Logging" there will appear a tick mark that indicates that the recorded data have been saved.

After the logging process has stopped select the 'save measurements' option in the main menu screen to save the logged data as a customer record.

The data can be transferred to the PC with the Wöhler Software DC 4xx (see accessories).

## 6.10 Printing out Measurement Records



Fig. 60: Transmission of data records from the DC 410<sup>FLOW</sup> to the thermal fast printer TD 600.

- In the main menu, select "PRINT" to start a data printout of all measured values.

First, a print preview will appear on screen. In the Setup menu, the user can select between printing with the Wöhler thermal fast printer TD 600 or another printer.

The menu options in the preview screen are:

- Option "ESC" (left key): Click the left key to exit and return to the main menu screen.
- Option „↓↑“ (center keys): click either up or down key to scroll up or down in the preview. Keep the key pressed to scroll various lines.
- Option "Print" (right key): click the right key to start the print out.



### NOTE!

*The menu item "Print" can only be selected, when measured values have been accepted and a submenu is marked with a tick mark.*

When printing is in progress, a status bar will display the current process state. Press "ESC" to stop the printout.

**6.11 Option "Save measurements"**

To save all records which are marked by a tick mark in the main menu, select the "Save measurement" option.

**6.12 Option "SETUP"**

Select the option "SETUP" to enter the main setup menu.

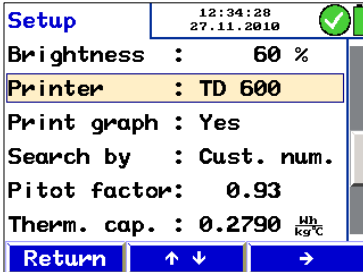


Fig. 61: Option "SETUP"

- Use the arrow keys to select and change the parameters.

The parameter that can be changed appears in red.

- Press "Return" to return to the main menu without saving the modification or press the right arrow key to confirm the modification.

Option "Time"

Change the current time of the internal clock (format 00:00)

Option "Date"

Change the current date of the internal calendar (format 01.01.2010)

Option "Ambient pressure"

The ambient pressure value of the DC 410<sup>LOW</sup> cannot be changed, because the meter is provided with an ambient pressure probe.

Pressure unit

Select the pressure unit hPa, Pa, mmH<sub>2</sub>O, PSI, in<sub>wc</sub>, bar or mbar. The preselected unit is hPa.

Pressure measurement

Select "fine pressure measurement" (1 reading per second, adjustable attenuation) "normal pressure measurement" (1 reading per second) and "fast pressure measurement" (4 readings per second).

"Fine pressure measurement" can only be selected for the pressure measurement and the flow measurement. In the range up to + 100 Pa the DC 410<sup>FLOW</sup> will then calculate with 0.01 Pa.

Attenuation

If the user increases the attenuation, the signal that represents the measured value will become more stable. At the same time the readings display will become slower. The DC 410<sup>FLOW</sup> will only consider the attenuation, if "fine pressure meas-

## Measurement Modes in the Main Menu

	urement" is selected in the setup-menu. (Setup>attenuation>fine pressure measurement.) Default: 75%
Temperature unit	Select the temperature unit °C or °F.
Airflow unit	Select between m <sup>3</sup> /h or l/s The airflow value will be indicated in the selected unit in the center of the display and below, smaller, in the other unit.
Exponent	Here the exponent of the formula of chapter 6.4 (Airflow (k value)) is entered. Per default the exponent is 0.50. The exponent can be risen from 0.50 to 1.00. It is only necessary to change the exponent, if another exponent is specified in the data sheet of the air vent.
Brightness	Adjust the brightness of the display from 20 % to 90 %.
Printer	Here the user can select between printing with the Wöhler thermal fast printer TD 600 or another printer.
Print graph	Option "Yes": A graph will be printed with the diagram. Option "No": No graph will be printed. The preselected option is "Yes".
Search by	Select between "customer name" and "customer number". Depending on this selection, the name or the number of the customer can be selected in the customer menu.
Pitot factor	The pitot factor is important for the measurement of the flow speed. It depends on the cross section of the utilized s-tube. The pitot factor of the Wöhler S-tube probe is 0.93. Therefore the preselected value is 0.93. If a "normal" S-tube is connected, the pitot factor 1.0 has to be entered.
Thermal capacity	The default setting of the thermal capacity is 0,2790 Wh/kg °C. The value is important for the measurement of the ventilation loss (Energy Utilization Check)
Reference temperature	The reference temperature can be adjusted from - 30 °C to + 70 °C.
Alpha	Heat transmission coefficient for the u-value

	measurement
Printer logo	Enter a custom corporate logo (6 lines) that will appear in every printout.
Factory defaults	Reset the DC 430 <sup>FLOW</sup> to its factory default setting (except the calibration).

## 7 Option 'Data management'

When working with the Wöhler DC 410<sup>FLOW</sup> it is possible to save and manage customized data which can be assigned to different risers. The user can create a folder for every customer and assign up to 128 risers to each one.

### 7.1.1 Save Customer Records

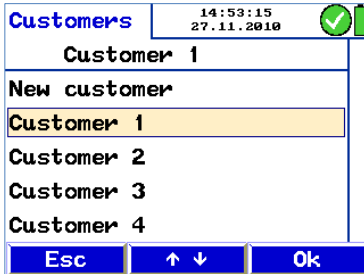


Fig. 62: Customer selection

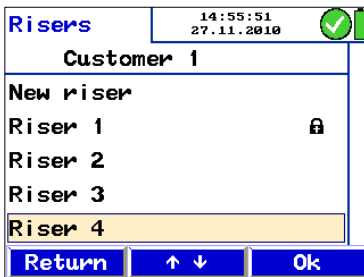


Fig. 63: Riser selection

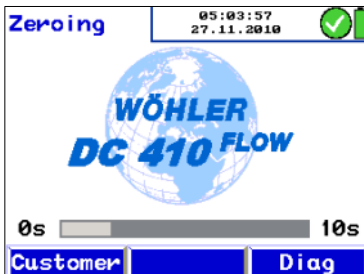


Fig. 64: customer option

When different measurements have been performed at one installation, they can be assigned to a customer as follows:

- Select the 'Save measurements' option from the main menu.

- Use the up- and down keys to navigate through the menu. If there exists no folder of the customer, whose data shall be saved, in the DC 410<sup>FLOW</sup> it can be created in the "new customer" menu (see chapter 7.1.2).



**NOTE!**

Keep the up or down key depressed to scroll faster.

- Confirm with "OK".

The riser list will appear. Select "New riser" to assign a new riser to this client.

- Confirm with "OK".



**NOTE!**

The records marked with a tick mark in the main menu are saved now.

After the records have been successfully saved, a lock will appear instead of the tick mark.



**NOTE!**

During the saving process, the data that has already been saved before under this riser, will be deleted.

How to add measurement data to the data that has already been saved under a riser:

- Press "Customer" directly after switching on the meter, during the zeroing-phase. Then select the riser, where you want to add the new data.

In the main menu, the saved data will be marked by a lock and the new measurements that have not been saved yet, will be marked by a tick mark.

- Save the data as described.

## 7.1.2 Creating a New Customer Folder

Fig. 65: Creating a new customer folder

The user can create new customer folders or new risers in the customer menu (see Fig. 12) or when saving the data. Enter the name, a customer number and the name of the riser.



### NOTE!

*The user can save all together 128 risers in the meter and assign them to different customers. The number of risers assigned to a customer is arbitrary.*

## 7.2 Option "Data management"

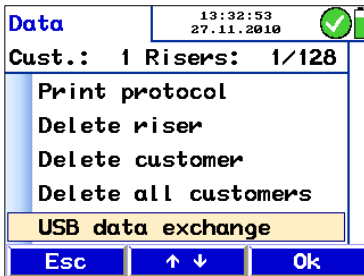


Fig. 66: USB data transfer

In the "Data management" display, the current number of customer folders and risers is indicated.

- Select "Print protocol" to print a report of any saved measurement.
- Select "Delete riser" to delete a single riser.



### NOTE!

*When there is only one riser saved in a customer folder, the customer folder will be deleted when the riser is deleted.*

- Select "Delete customer" to delete the complete customer folder with all risers.
- Select "Delete all customers" to delete all customer folders.
- Select "USB data exchange" to communicate with the PC, see chapter 7.3.

## 7.3 Data Transfer with the PC or Notebook

The user can easily transfer data from the DC 410<sup>FLOW</sup> to the PC or notebook via an USB cable. How to transfer data to the PC:

- Connect the Wöhler DC 410<sup>FLOW</sup> to the PC via the USB cable included in delivery.
- Select Main menu > Data management > USB data exchange



Fig. 67: USB mode

The USB mode of the Wöhler DC 410<sup>FLOW</sup> is activated now.

- Open the Wöhler DC 4xx PC Software on the PC and follow the instructions of the software.

## 7.4 Data Logging

With the Wöhler DC 4xx PC Software data logging is possible.



## 8 Troubleshooting

Error message	Possible reason	Solution
Batteries low	Disposable or rechargeable batteries are empty.	Replace or recharge batteries.
ATTENTION! Overpressure	high pressure	Deflate pressure

## 9 Maintenance

Proper operation of the Wöhler DC 410<sup>FLOW</sup> requires regular maintenance.

### 9.1 Maintenance work

Interval	Maintenance work
If required (user)	Clean the device with a wet cloth and a smooth cleanser.
Once a year (factory)	Send the device to one of our service points for checking and calibration.

## 10 Warranty and Service

### 10.1 Warranty

Each Wöhler DC 410<sup>FLOW</sup> probe will be tested in all functions and will leave our factory only after extensive quality control testing. The final control will be recorded in detail in a test report and delivered with any unit.

If used properly, the warranty period for the Wöhler Leakage Tester DC 410<sup>FLOW</sup> will be twelve month from the date of sale. Not covered by the warranty are batteries and defects of the pressure sensor caused by overpressure.

This warranty does not cover the freight and packing costs when the device is sent to the factory for repair.

Service by non authorized personnel or making modifications to the analyzer voids any warranty.

### 10.2 Service

Wöhler has built our reputation on excellence in customer service. Therefore, of course, we are readily available to assist you after the warranty period ends.

- Send us the device and we will repair it and return it to you with our package service.
- Immediate help is provided by our technical staff over the telephone.

## 11 Accessories

### Probes and sensors

Special Wall Temperature Probe	Order no. 4651
Measuring pliers for temperature measurement	Order no. 6679
Wöhler Telescopic Flow Probe	Order no. 1012
Clamp device for holes Ø 20 – 35 mm	Order no. 1044
Sealing element for clamp device, 2 pieces	Order no. 1078
S-tube probe	Order no. 3343
Capillar hoses	Order no. 4515

### Extras

Supporting loop with snap hook	Order no. 54348
Wöhler Thermal Fast Printer TD 100	Order no. 4160
Thermal Paper, 10 rolls	Order no. 4145

### Software

Wöhler DC 4xx Software	Order no. 997
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## 12 Declaration of conformity

The manufacturer:

**Wöhler Technik GmbH**  
**Wöhler-Platz 1, D-33181 Bad Wünnenberg**

declares that the product

**product name: Flow and Pressure Meter**  
**model number: Wöhler DC 410<sup>FLOW</sup>**

complies with the following requirements for conformity and electromagnetic compatibility::

- EN 61326-1: 1997+ A1: 1998+A2:2001
- DIN EN 61010-1:2002
- EN 60529:1991
- Tested to comply with standard EN 12599 „Ventilation for buildings“

TÜV tested

This declaration is submitted for the manufacturer by:

Dr. Stephan Ester, managing director                      Bad Wünnenberg, 2017-06-01

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