



# Lindab **Flow and Pressure Meter** **PC 410**

Manual



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# 1. General information

**1.1 Operation Manual Information** This operation manual allows you to safely work with the PC 410. Please keep this manual for your information.

The PC 410 Flow and Pressure Meter should be employed by professionals for its in-tended use only.

Liability is void for any damages caused by not following this manual.

## 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, flow speed and temperature as well as for the registration of humidity and ambient 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

Device	Components
PC 410	Flow and Pressure Meter with batteries
	Hand strap
	Silicone hose, 6 m
	Rubber hose, 1,5 m
	Plastic case

## 1.2 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 also can be bought separately.

## 1.6 Information on disposal



Electronic equipment does not belong into domestic waste, but must be disposed in accordance with 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 Contact

**Please contact your local Lindab distributor**  
or send for technical questions an E-Mail:

## 2. Specifications

### 2.1 Measured values

Description	Data
Range	±100 hPa
Accuracy	< 3 % of the reading, if the value is < ± 10 Pa, better than ± 0.3 Pa
Resolution	0.1 Pa at -1100 hPa to +1100 hPa, otherwise 1 Pa

Measurement of very small pressures

Description	Data
Range	±100 hPa
Accuracy	< 3 % of the reading, if the value is < ± 10 Pa, better than ± 0.3 Pa
Resolution	± 0,01 Pa

Internal temperature measurement

Description	Data
Range	-20 °C to 60°C
Accuracy	< ± 1 °C
Resolution	0.1°C

External temperature measurement

(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	< ± 2 °C at 0°C to 133°C, otherwise 1.5 % of the value, according to the directive EN 50379-2
Resolution	0.1°C

Humidity measurement (only AF version)

(integrated humidity sensor)

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

Ambient Pressure measurement (only AF version with humidity sensor)

Description	Data
Range	±300 hPa, else 1100 Pa
Accuracy	< ± 1.5 % 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 units	°C, °F, conversion according to the general conversion rules.

## Air speed

Description	Data
Range	0.3 m/s to 120 m/s
Resolution	0.01 m/s
Continuous density correction	automatic, with temperature signal.

## 2.3 Logger

Description	Data
Extent	9999 measurements, each with the measured value of pressure and humidity (optional) 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 hour can be set.
 <b>NOTE!</b> Ensure that the meter is connected to the power supply or that the batteries are charged.	

## 2.4 Technical Data

Description	Data
Power 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
Interface	USB- (COM-Port), data transfer to the PC.  It is possible to transfer the data directly from the meter to the 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
Dimension	80 × 550 × 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

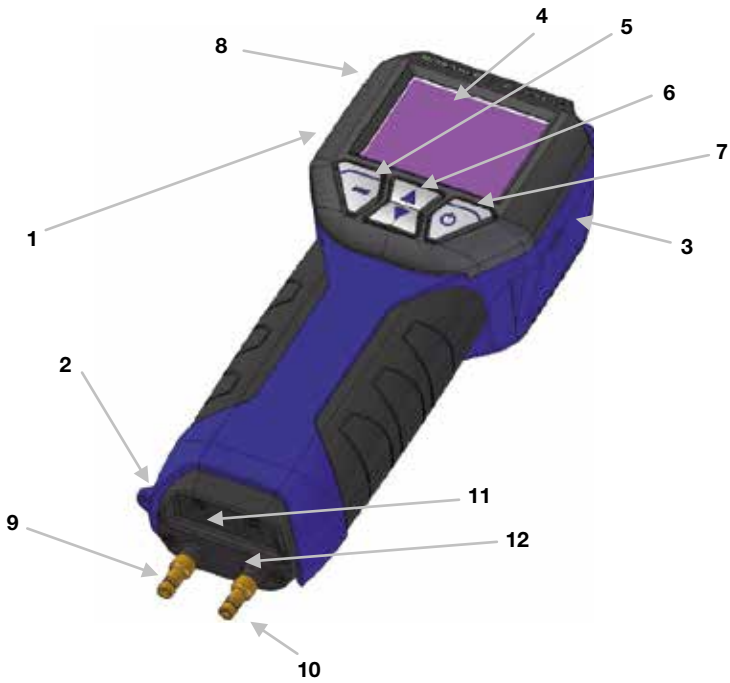



Fig. 1: Overview



Number	Part
1	Mini-USB-Port
2	Connection for protection cap
3	Power jack
4	Color display
5 ESC key	<p>context-sensitive</p> <p>Escape</p> <p> <b>NOTE!</b></p> <p>Keeping this key depressed will always call up the main menu.</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 14	<p>Standard jacks for temperature probes NiCr-Ni</p> <p>14 Battery cover (in Fig. 1 on the rear side)</p> <p>There are diffusion openings for the internal registration of the humidity and temperature on the rear side of the Lindab PC 410. The internal temperature measurement is necessary for the temperature compensation of the pressure sensor.</p>

### 3.2 Probes and Components



S-tube probe for measuring the flow speed (see chapter 6.5) and the airflow (see chapter 6.2).

- Insert the plug of the S-tube probe into jack 11 (Fig. 1) of the PC 410.
- 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).

Fig. 2: S-tube probe



Flexible capillary

For the 4 PA test two flexible capillaries are needed.

Fig. 3: Capillary tube



Fig. 4: Connecting temperature measuring pliers

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 PC 410.

The temperature value measured by the meter connected to jack 11 will be indicated in the display as  $T_1$  and the one measured by the meter connected to jack 12 will be shown as  $T_2$ .



**NOTE!**

Any thermocouple type K may be connected to the jacks 11 and 12.



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

Connection of the Special Wall Temperature Probe to measure the heat transmission coefficient (See chapter 6.9) Two Special Wall Temperature Probes 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 PC 410.

### 3.3 Function

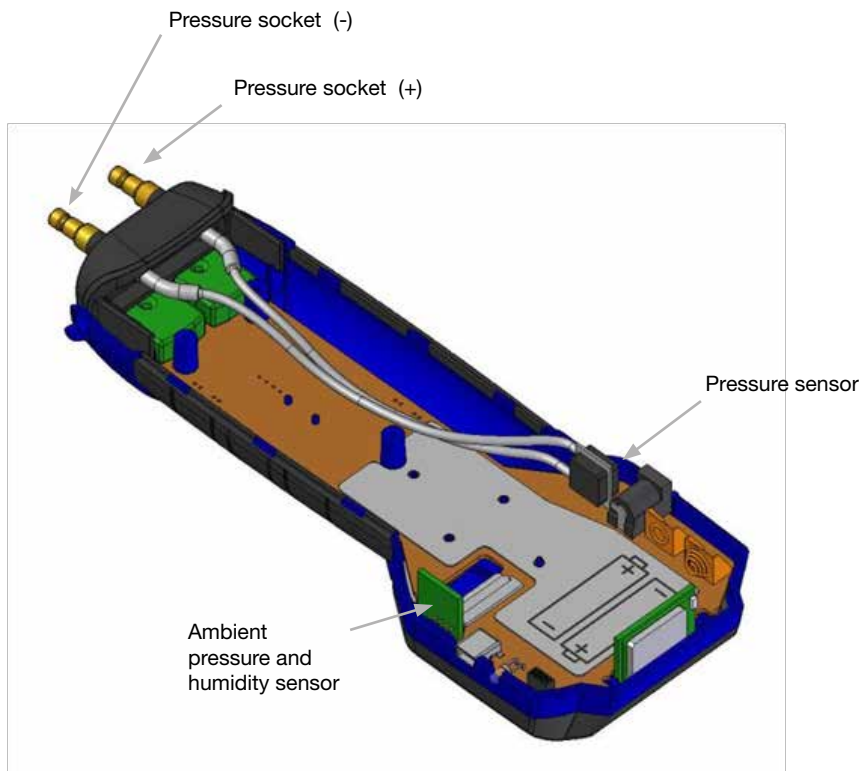


Fig. 6: Interior structure of the meter

### 3.4 Operating Mode

The Flow and Pressure Meter PC 410 is a high precision multimeter for the measurement of differential pressure, volume flow and temperature as well as the registration of humidity and ambient pressure. (These two functions are only available in the version AF). Because of its extremely high precision, the meter measures even very small pressures. Therefore, it is ideal to determinate air speed, gas pressure, volume, tension and also the flue gas temperature. 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



1. The PC 410 has a color 2.4' display.
2. The OLED-technology allows reading the display from almost any angle of view.
3. Four keys are available below the display to operate the PC 410.

Fig. 7: Display and keys

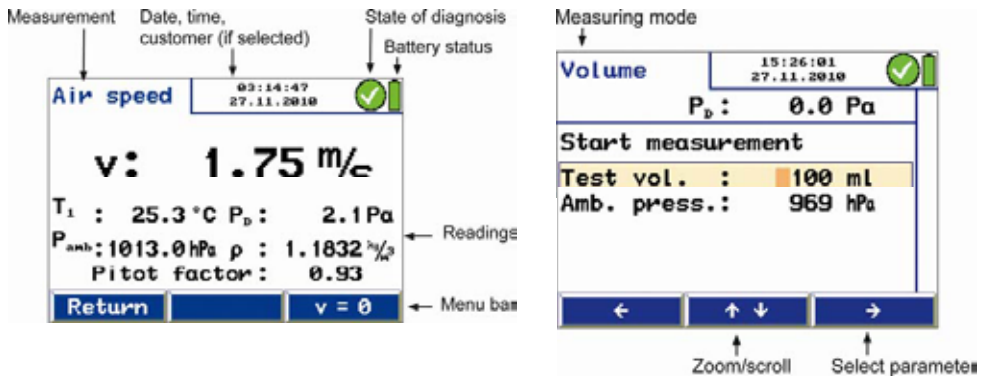


Fig. 8: Display details

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.

Version AF (with internal ambient pressure and humidity sensor): The values are indicated in the "pressure measurement" menu.

## 4. Getting started

### 4.1 Check battery status



Fig. 9: Position of the batteries in the PC 410

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 dispose 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 get 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 meter before charging. Never try to charge disposable batteries.

Use 4 AA rechargeable batteries only.

– Only use the charger delivered with the device.



Fig. 10: Open the battery compartment.

How to charge the batteries:

- Before you plug the recharger into the outlet, connect it with the charging connection of the PC 410 (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 meter 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.



# 5. Operation

## 5.1 Turning the Meter 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

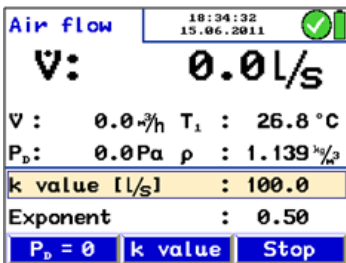


Fig. 13: Measuring mode

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

1. All readings (measured and computed values) will be shown continuously in the readings segment.  
The following functions can be selected from the menu segment
  - Submenu „PD=0“: The pressure sensor will be zeroed once again.
  - Change the k-value
  - Stop-key to stop the measurement

### 5.3 Using the Pressure computer

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



Fig. 14: Display and keys

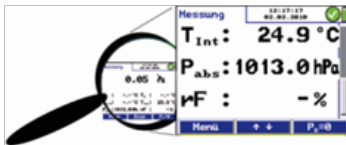


Fig. 15: Zoom feature

- In the pressure 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 shown 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: PC 410 with supporting loop

- The PC 410 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 PC 410 with the hand strap 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 hand strap.

## 6. Measurement modes in the main menu

### 6.1 Selecting the main menu

- Top the current measurement.
- Press "menu" to activate the main menu. In the main menu, all submenus and applications can be activated. The following submenus can be selected:



Fig. 17: Main menu

## 6.2 Option "Air flow (k value)"

Select the submenu "Air flow (k-value)" to measure the air flow 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.

### 6.2.1 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.

The air flow of measuring equipments mentioned in chapter 6.2 is proportional to the term  $\sqrt{\frac{\square}{\square}}$ .

The different manufacturers indicate the proportionality factor in a different way (see table 1). In the PC 410 the measurement type is indicated with the corresponding short description (see table 1). The user can choose the unit of the volume flow in the setup-menu (l/s, m<sup>3</sup>/h, m<sup>3</sup>/s, cfm). The factory setting is l/s and m<sup>3</sup>/h respectively.



#### NOTE!

If you select a certain measurement type in the setup-menu, the displayed unit will not change automatically.

The PC 410 will always calculate with the unit l/s, even when another unit is displayed. Table 1 shows the formula used for the calculation.

For all calculations, the PC 410 will consider the standard air density  $\rho$ , if no external temperature probe is connected. When a temperature probe is connected, the air density will be calculated automatically.

Measurement type Short description	Manufacturer specific formula and unit	Components	Formula to determine l/s considering the density
l/s	$q = k \cdot \sqrt{\Delta p}$ [m³/h]	e.g. small fans and air passages, iris and calipers	$V = K_{[l/s]} \cdot \sqrt{1,2} \cdot \left(\frac{\Delta p}{\rho}\right)^E$ $K_{\min} = 0,1 \quad K_{\max} = 1000$
m³/h	$q = k \cdot \sqrt{\Delta p}$ [m³/h]	e.g. fans and air passages	$V = \frac{\sqrt{1,2} \cdot 1000}{K_{[1/(m³/s)]}} \cdot \left(\frac{\Delta p}{\rho}\right)^E$ $K_{\min} = 0,01 \quad K_{\max} = 100$
1/(m³/s)	$q = \frac{1}{k} \cdot \sqrt{\Delta p}$ [m³/s]	e.g. Scandinavian fans	$V = \frac{\sqrt{1,2} \cdot 1000}{K_{[1/(m³/s)]}} \cdot \left(\frac{\Delta p}{\rho}\right)^E$ $K_{\min} = 0,01 \quad K_{\max} = 100$
(m³/s) × 1,3	$q = K \cdot \sqrt{\frac{2}{\rho}} \times \Delta p$ [m³/h]	only used by few German fan producers	$V = K_{[m³/h \cdot 1,3]} \frac{\sqrt{1,2}}{3,6} \cdot \left(\frac{\Delta p}{\rho}\right)^E$ $K_{\min} = 1 \quad K_{\max} = 5000$

Table 1

Explanation:  $V$  = air flow  
 $k$  = k value (Take the k-value from the data sheet and enter it into the meter).

$\Delta p$  = measured pressure

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

Units

$V$	l/s
$\Delta p$	in Pa
$\rho$	in kg/m³
E	0,50 – 1,00

- In the Setup-Menu, select the formula that corresponds to the manufacturer according to table 1 (Setup>k-Value).

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, enter the exponent indicated in the data-sheet, in the setup-menu of the PC 410. (see chapter 6.12, „exponent“).

## 6.2.2 Connecting the meter to the vent



Fig. 18: Example - Connection of the measuring hoses

- Connect the Wöhler meter with two measuring hoses to the vent.

The overpressure socket (+) of the meter 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.

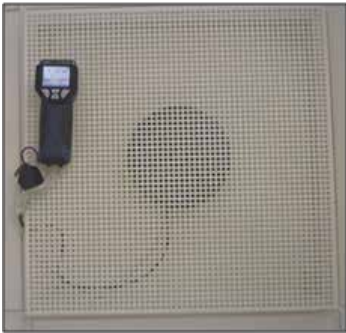


Fig. 19: Example - Fixing with a magnet

- During the measurement, the Wöhler meter can be fixed to the protective grid with a magnet, so that the results can easily be read from the display.



Fig. 20: Example - Fixing with the hand strap

- When the aperture is under the ceiling, the meter can be fixed with the hand strap.

### 6.2.3 Performing the Test

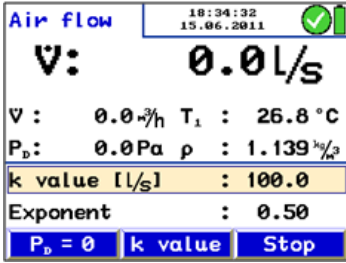


Fig. 21: Menu "Air flow (k value)"

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

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

If temperature sensors are connected, T1 is the reading of the temperature measured by the sensor connected left and T2 is the reading of the temperature measured by the sensor connected right. If no temperature sensor is connected, the meter will calculate with the standard density

value  $\rho = 1,200 \text{ kg/m}^3$ .

The following values will also be indicated:

Differential pressure  $P_D$

Air density  $\rho$

#### k value

Below, the k value that has been 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 Lindab PC 410 before starting the measurement.

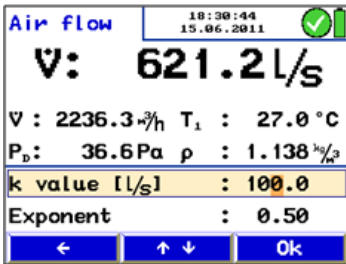


Fig. 22: Entering the K-value

Enter the k-value as follows.

- Select K value, see Fig. 21: Menu "Air flow (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).



$P_D = 0$

Press  $P_D = 0$  (menu bar, see Fig. 21: 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.

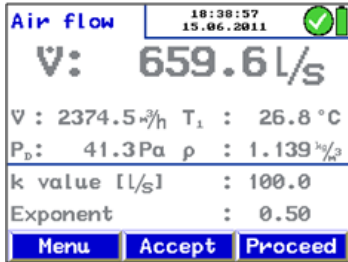


Fig. 23: measuring value that has not been accepted yet.

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



**NOTE!**

Select "Print" to print out a report.

- Press "Escape" to exit the menu without saving.
- Press "Proceed" to return to the menu "air flow (k value)" 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)

### 6.3 Option "K-Value Matching"

This mode allows to adjust the k-value of iris apertures, air passages and terminal boxes.

If the component is equipped with an adjustment scale for the k-value, the airflow can be adjusted without a calculator or a diagram.

Go to the main menu and open the submenu "k-Value Matching".

The menu shown in the figure will appear. The k value is indicated in the upper part of the display.

Below the k value, the differential pressure PD and the air density  $\rho$  will appear.

If temperature sensors are connected, T1 is the reading of the temperature measured by the sensor connected left and T2 is the reading of the temperature measured by the sensor connected right.

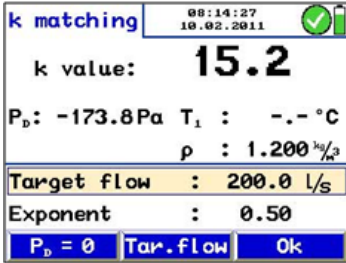


Fig. 24: Menu K-Value Matching

#### Target Flow

Below the target flow is indicated. The target flow has to be entered by the user.

Enter the target flow as follows:

- Select the "Tar. flow"-key from the menu bar (see Fig. 24).
- Increase or reduce the value with the up and down keys.
- If necessary, select m<sup>3</sup>/h or l/s and change the unit.
- Press OK to confirm.

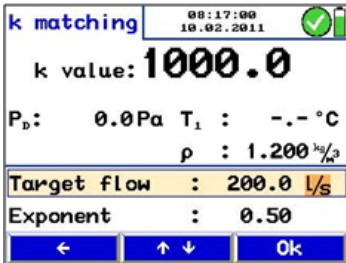


Fig. 25: Entering the Target Flow

**PD = 0**

Press PD = 0 (menu bar, see Fig. 24 ) to zero the pressure sensor.



**NOTE!**

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

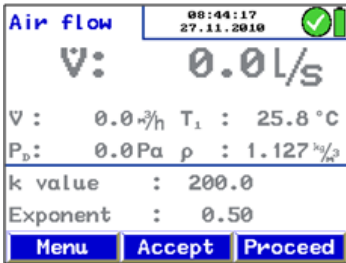


Fig. 26: Air Flow Mode

- Modify the k-value of the component until the k value of the component matches with the k-value indicated by the meter.
- Press OK to confirm. The air flow mode (k-value) will appear again.
- Now the user can perform another measurement to confirm the result and save the value afterwards.
- If necessary, select the "k-value matching" mode from the main menu again.

## 6.4 Option "Airflow (Pitot)"

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

1. With the Lindab PC 410, grid point measurements can be done, so that the information provided by the measurement is significant (see chapter 6.4.2).

### 6.4.1 Measuring the airflow (Pitot)

Connect the S-tube probe to the Lindab PC 410 and insert it into the measurement opening. Proceed as described in chapter 0

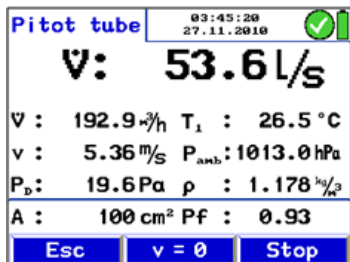


Fig. 27: Menu Airflow (Pitot)

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

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

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

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

Below the airflow is indicated in the other possible unit.

If temperature sensors are connected, T1 is the reading of the temperature measured by the sensor connected left and T2 is the reading of the temperature measured by the sensor connected right. If no temperature sensor is connected, the meter will calculate with the standard density

value  $\rho = 1,200 \text{ kg/m}^3$ .

The following values will also be indicated.

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 S-tube probe) cross section area  $A$  of the duct (The user has to enter the cross section area  $A$  as follows:)

## Entering the cross section area:

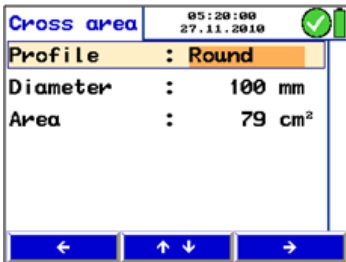


Fig. 28: Entering the cross section area

- Press "Stop" and then "Area" to bring up menu of the cross section area.
- 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 Lindab PC 410 will calculate the cross section area automatically.

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

## 6.4.2 Grid-point measurements

The readings shown in the display are instantaneous values.

With the Lindab PC 410 grid-point measurements can be done. This means that the air flow 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

- 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".

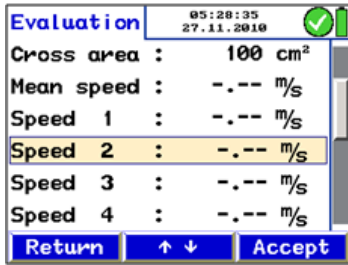


Fig. 29: Standard report, when no reading has been captured yet.

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

- Press the Evaluation-key to display all readings.

The result of the first measurement is not shown yet, because it has not been captured yet.

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

The air flow 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

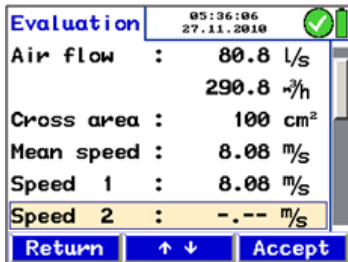


Fig. 30: Standard report after the readings have been captured.

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.

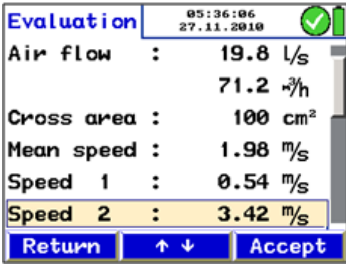


Fig. 31: Average value

In the display, the mean speed is shown above the readings.

The air flow 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.

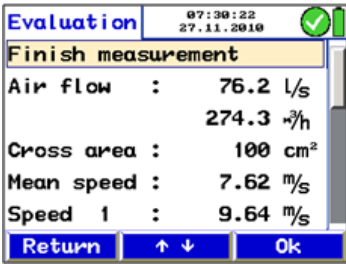


Fig. 32: Finishing the measurement

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



In the main menu, a tick mark beside the menu "Air flow (Pitot)" will indicate that the air flow 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)

## 6.5 Option "Air speed"



Fig. 34: Connection of the S-tube probe to the PC 410

### 6.5.1 Measuring the air speed

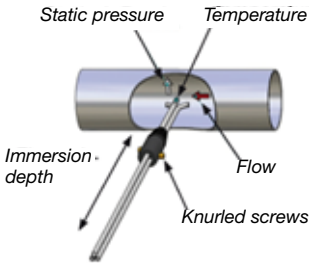


Fig. 35: Measuring the air speed with the S-tube

In the air speed mode, the air speed ( $v$ ) of the gas is measured in m/s when the gas temperature is 800 °C or less.



#### 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 air speed is equal. In the setup-menu the pitot factor 0,93 must be set once (see chapter 6.12).

1. Connect the pressure connector of the S-tube to the (+) overpressure socket of the Lindab PC 410.
2. Connect the static pressure connector of the S-tube to the (-) underpressure socket of the Lindab PC 410.
3. In calm air, switch on the Lindab PC 410 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.

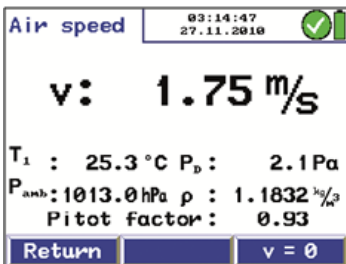


Fig. 36: Measurement of the air speed

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 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)

### 6.5.2 Theoretical background

The PC 410 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:

$$\rho = 1,29 \frac{\text{kg}}{\text{m}^3} \cdot \frac{273 \text{ }^\circ\text{C} \cdot P_{\text{akt}} [\text{hPa}]}{(\vartheta_{\text{akt}} [^\circ\text{C}] + 273 \text{ }^\circ\text{C}) \cdot 1013 \text{ hPa}} \quad \text{Formula 2}$$

- Explanation:
- v: air velocity in m/s
  - $\rho$ : air density, ca. 1.29 kg/m<sup>3</sup> (depends on temperature and air pressure)
  - $\Delta p$ : Differential pressure in Pa, measured with the S-tube
  - $P_{\text{akt}}$ : ambient air pressure, measured by the PC 410
  - S: Pitot factor 0,93 for S-tube probe
  - $\vartheta_{\text{akt}}$ : Measured Temperature

## 6.6 Option "4 Pa Test"



Fig. 37: PC 410 with capillary hoses

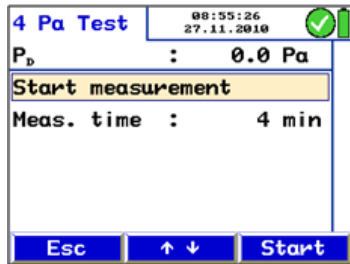


Fig. 38: Initial display of the 4 Pa test

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 under pressure.

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 PC 410.

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.

Before starting the measurement:

1. Select 4 Pa Test in the main menu of the PC 410. 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.

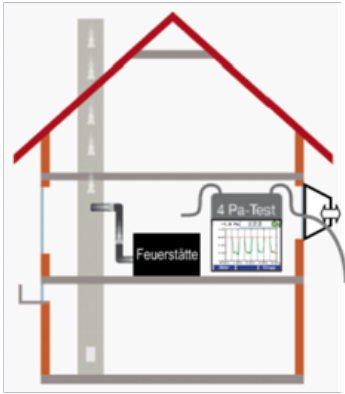


Fig. 39: 4-Pa Test

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 backdraft 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 keyhole.



**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.

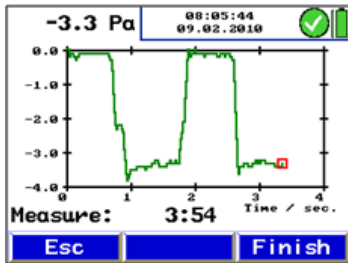


Fig. 40: Pressure profile during the 4 Pa Test

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

7. Press „PD =0“ to zero the pressure sensor.
8. Press "Start" to start the 4-PA Test. The meter 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, every 30 seconds there are auxiliary lines in the diagram. After a maximum of 4 minutes, the measurement will stop automatically.



**NOTE!**

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

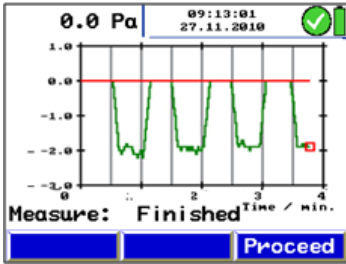


Fig. 41: Diagram 4 Pa Test

Normally a diagram as shown in 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 to print out the readings and select "Save measurements" (see chapter 0) 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 23 (see manual Wöhler DP 23).

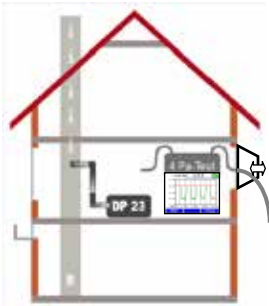


Fig. 42: 4 Pa Test with Wöhler DP 23

## 6.7 Option "Heating Check" (Energy Utilization Check)

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

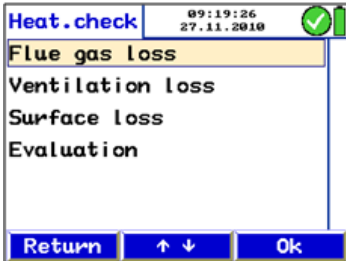


Fig. 43: Energy Utilization Check



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

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

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

How to activate a submenu:

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

### Potential Improvement Points

#### Flue gas loss

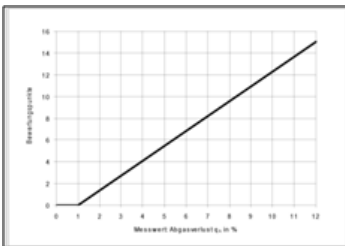


Fig. 44: Standard characteristic curve

In the submenu "Flue gas loss" the most recently measured flue gas loss will be converted 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 "Heating 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 "Heating check" screen.

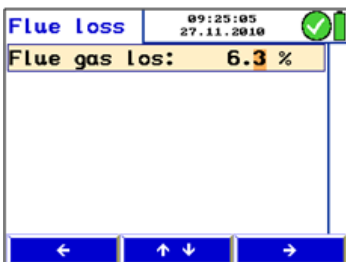


Fig. 45: Entering the flue gas loss

## Measuring the Ventilation Loss



Fig. 46: S-tube probe

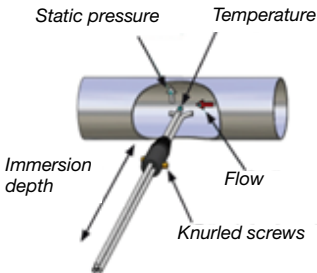


Fig. 47: Measuring the air speed with the S-tube

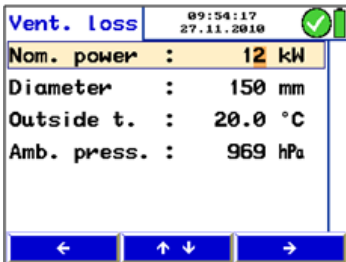


Fig. 48: Entering the parameters for the ventilation loss measurement

The ventilation loss has to be measured 30 seconds after burn-out. It is based on the measurement of the flow 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.

How to perform the measurement:



### NOTE!

A room temperature probe can be connected. 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.

- In the submenu "Heating check", select "ventilation loss". Confirm with OK.
- Enter or control the parameters. (Nominal power, diameter of the flue gas pipe, outside temperature and ambient pressure).



### NOTE!

If the Lindab PC 410 is equipped with an internal ambient pressure probe, the meter will determine the ambient pressure automatically.

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

- Confirm with "OK". The pressure sensor will be zeroed. It is important that the S-tube probe is not connected yet.



### NOTE!

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

- Connect the S-tube probe to the Lindab PC 410.
- Insert the closed S-tube through the measurement opening into the gas line, while the burner is working.
- Fix the S-tube with a cone, open it as shown in Fig. 47 and direct the sensors as shown in the figure.
- If necessary, adjust the S-tube with the knurled screws, so that it fits into the gas line.

**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

<b>Vent. loss</b>		10:09:42	
		27.11.2010	
<b>P<sub>D</sub></b>	:	<b>0.19 Pa</b>	
<b>Flue t. (T<sub>1</sub>)</b>	:	<b>55.1 °C</b>	
<b>Room t. (T<sub>2</sub>)</b>	:	<b>22.3 °C</b>	
<b>Air speed</b>	:	<b>0.55 m/s</b>	
<b>Vent. loss</b>	:	<b>3.50 %</b>	
<b>Time remain:</b>	:	<b>0:19</b>	
<b>Esc</b>		<b>Stop</b>	

Fig. 49: Measuring the ventilation loss

The measurement will be done automatically.

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

**NOTE!**

The wanted signal of the 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:

$$q_{LS\_Norm} = \frac{A_v \cdot v(t) \cdot \rho_{AIR} \cdot c_{pl} \cdot (\vartheta_L(t) - \vartheta_U)}{Q_{burner}} \cdot \frac{273 + \vartheta_{outside\ ACTUAL}}{273 + \vartheta_{outside\ REF}}$$

Description	Data
q <sub>LS_Norm</sub>	Ventilation loss in %
A <sub>v</sub>	Area cross section of the flue gas pipe in m <sup>2</sup>
v(t)	Air velocity in the flue gas pipe in m/s
ρ <sub>AIR</sub>	air density, temperature compensated, e.g. 20 °C 1,2 kg/m <sup>3</sup>
c <sub>pl</sub>	specific heat capacity, norm: 0,279 Wh/kg °C
ϑ <sub>L</sub>	air temperature in the exhaust stack
ϑ <sub>U</sub>	air temperature in ° in the fireplace room
ϑ <sub>outside ACTUAL</sub>	Outside temperature, actual value in °C
ϑ <sub>outside REF</sub>	Outside reference temperature, 15 °C
Q <sub>burner</sub>	Nominal power of the heat generator

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

After the measuring of the ventilation loss has been completed, "ventilation loss" will be marked by a tick mark in the "Heating 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.

## Measuring the surface loss



### 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

Determining	Denomination
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



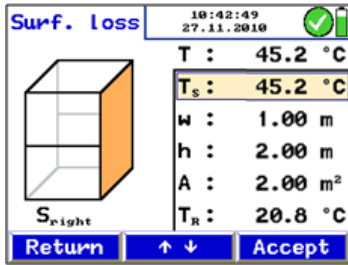


Fig. 50: Measuring the surface loss

How to measure the surface loss:

- Enter the nominal power of the burner.
- Press "Proceed"
- Enter the surface temperature  $T_S$  of the single areas and their dimensions (width x height).
- Measure the average surface temperatures with the Special Wall Temperature Probe connected to the Lindab PC 410 and accept it by pressing the "Accept" key.
- Proceed the same way for each partial surface.

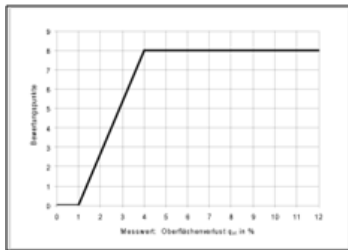


Fig. 51: Converting the surface loss in potential improvement points

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 "Heating check" screen.

## Evaluation

The screenshot shows the 'Heat. check' menu with the following data:

	Loss	Points
Flue gas:	8.10 %	9.6
Ventil.:	4.31 %	4.7
Surface:	3.56 %	6.8
<b>Sum:</b>		<b>21.1</b>

At the bottom, there is an 'Ok' button.

Fig. 52: Evaluation of the heating 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.

## 6.8 Option „Volume“

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



### NOTE!

For the volume measurement, a medical syringe (up to 100 ml), a Wöhler Soot Test Pump, a cross-union 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 determined.

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

$$V_{\text{tube}} = V_{\text{sample}} \cdot \left( \frac{P_{\text{act}}}{\Delta p} - 1 \right) \quad | \text{Temp.} = \text{const.}$$

$V_{\text{tube}}$	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
$P_{\text{act}}$	ambient pressure, has to be entered in the setup menu by the user (Default: 1013 hPa)

The Lindab PC 410 measures the pressure difference  $\Delta p$ . For an exact measuring result, 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. 53: Volume measurement with the Lindab PC 410 and a syringe (up to 100 ml tube volume).



Fig. 54: Volume measurement with the Lindab PC 410 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 Lindab PC 410 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.

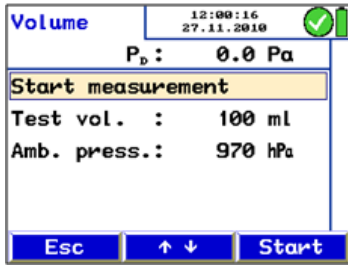


Fig. 55: Presettings (Volume test)

- 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.

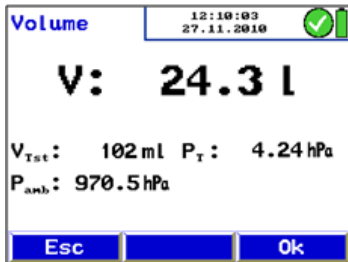


Fig. 56: Volume test result

- 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 Option “U-value”

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



Fig. 57: Application example 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.

<b>U value</b>	11:31:26 27.11.2010	
<b>T<sub>1</sub> :</b>	14.7 °C	<b>T<sub>2</sub> :</b> 21.4 °C
<b>Temp. air outside :</b>	0.3 °C	
<b>Temp. air inside :</b>	21.1 °C	
<b>Temp. wall inside :</b>	15.1 °C	
<b>U value :</b>	2.22 $\frac{W}{m^2K}$	
<b>Return</b>	<b>↑ ↓</b>	<b>Print</b>

Fig. 58: Display during the measurement of the U value

The temperature values measured by the Lindab PC 410 and the Special Wall Temperature Probe are necessary for the determination of the heat transfer coefficient. The u-value is determined with the following equation according to the DIN standard 4108.

$$U_{ist} = \frac{\alpha_i \cdot [t_{Li} - t_{Wi}]}{[t_{Li} - t_{La}]}$$

$U_{current}$	U-value in $W/(m^2k)$ , current value
$t_{AI}$	interior air temperature
$t_{WI}$	interior wall 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 sensor.

## 6.10 Option "Graph / Record"



Fig. 59: Submenu Logging

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 next 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.

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 Lindab Software PC 410 (see accessories).

## 6.11 Option „Print“



Fig. 60: Transmission of data records from the PC 410 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 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.

## 6.12 Option "Setup"



Fig. 61: Option "SETUP"

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

- 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 01.01.2011)

Option "Ambient Pressure"

It is not necessary to enter an ambient pressure value, because the meter is provided with an ambient pressure probe (only version AF).

Air density	Standard air density in kg/m <sup>3</sup> . This value will be considered for all calculations, if no external temperature probe is connected. When a temperature probe is connected, the air density will be calculated automatically.
Pressure unit	Select the pressure unit hPa, Pa, mm/H <sub>2</sub> O, PSI, inwc, bar or mbar. The preselected unit is hPa.
Pressure measurement	Select "fine pressure measurement" (1 reading per second, the attenuation is adjustable) "normal pressure measurement" (1 reading per second) and "fast pressure measurement" (4 readings per second).  When measuring the pressure and the flow the user can select "fine", so that the resolution will be 0,01 PA (range: ± 100 Pa).
Attenuation	If the user increases the attenuation, the signal that represents the measured value will be more stable. At the same time the readings display will become slower. The PC 410 will only consider the attenuation, if "fine pressure measurement" is selected in the setup-menu. (Setup>attenuation>fine pressure measurement).
Temperature unit	Select the temperature unit °C or °F.

Air flow unit

Select between l/s, m<sup>3</sup>/h, m<sup>3</sup>/s and cfm. The air flow value will be indicated in the center of the display in the unit that is selected first (here: l/s) and below, smaller, in the unit that is selected afterwards (here: m<sup>3</sup>/h).

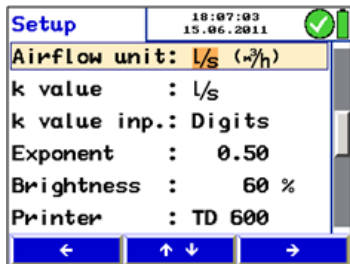


Fig. 62: Selecting the airflow unit

K-value	Depending on the manufacturer of the measurement equipment, the user can choose between different formula for the determination of the volume flow (see chapter 6.2.1).
K Value Input	Select between "Digits" (the user selects the digits that he wants to change) and "Fast" (the user changes the k-value by selecting it and simply pressing the up or down keys)
Exponent	Here the exponent of the formula of chapter 6.2 (Air flow (k value)) is entered. Per default the exponent is 0.50. The exponent can be risen from 0.50 to 1.00. It will only be 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 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 specific heat capacity is 0,2790 Wh/kg °C. The value is important for the measurement of the ventilation loss (heating check)
Reference temperature	The reference temperature can be adjusted from - 30 °C to + 70 °C.
Alpha	Heat transmission coefficient for the u-value measurement
Language	Depending on the version, the languages English, German or other languages can be selected.
Printer logo	Enter a custom corporate logo (6 lines) that will appear in every printout.
Default	Reset the PC 410 to its factory default setting (except the calibration).

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

## 7. Option 'Data management'

When working with the Lindab PC 410 it is possible to save and manage customized data which can be assigned to different ducts. The user can create a folder for every customer and assign up to 128 ducts to each one.

### 7.1.1 Save Customer Records



Fig. 63: Customer selection

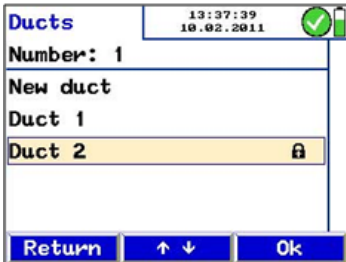


Fig. 64: Duct selection

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, 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 duct list will appear. Select "New duct" to assign a new duct to this client.

- Confirm with "OK".



#### NOTE!

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

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 duct, will be deleted.



Fig. 65: customer option

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

- Press "Customer" directly after switching on the meter, during the zeroing-phase. Then select the duct, 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. 66: Creating a new customer folder

The user can create new customer folders or new ducts in the customer menu (see **Fehler! Verweisquelle konnte nicht gefunden werden.**) or when saving the data. Enter the name, a customer number and the name of the duct.



#### NOTE!

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

### 7.2 Option "Data management"

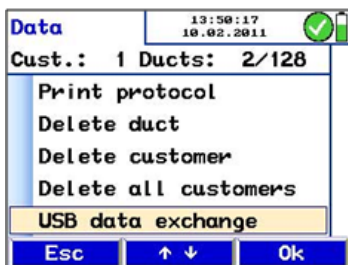


Fig. 67: USB data transfer

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

Select "Print protocol" to print a report of any saved measurement.

Select "Delete duct" to delete a single duct.



#### NOTE!

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

Select "Delete customer" to delete the complete customer folder with all ducts.

Select "Delete all customers" to delete all customer folders.

Select "USB data exchange" to communicate with the computer, see chapter 7.3.

### 7.3 Data Transfer with the Computer or Notebook

The user can easily transfer data from the PC 410 to the Computer or notebook via a USB cable. How to transfer data to the Computer:

- Connect the Lindab PC 410 to the Computer via the USB cable included in delivery.
- Select Main menu < Data management > USB data exchange



The USB mode of the Lindab PC 410 is activated now.

- Open the Data Management Programm PC 410 on the computer. Follow the instructions of the PC 410 Software.

Fig. 68: USB mode

### 7.4 Data Logging

With the Lindab PC 410 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 Lindab PC 410 requires regular maintenance.

## 9.1 Maintenance work

<b>Interval</b>	<b>Maintenance work</b>
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 Lindab PC 410 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 Lindab PC 410 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.

# 11. Accessories

## Probes and sensors

Prandl tube, 1000 mm	PCPRA
Capillary tubes 4 Pa Test	PCKAP
S-tube probe	PCSRS
Measuring pliers for temperature measurement	PCZA500
Special Wall Temperature Probe	PCHC
Wall Temperature Probe	PCTF1
Penetration Temperature Probe	PCTF4
Combustion and Temperature Probe	PCTF5

## Extras

Rechargeable batteries NiMH, 2 Ah	PCAKKU
Charger	PCLGA400
Thermal Fast Printer TD 600	TD 600
Thermal Paper, 10 rolls	LTPP

## Software

PC 410 Software with USB cable.	PC410DAT
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## 12. Declaration of conformity

The manufacturer:

**Wöhler Messgeräte Kehrgeräte GmbH**  
**Schützenstr. 41, D-33181 Bad Wünnenberg**

declares that the product

**product name: Flow and Pressure Meter**  
**model number: Lindab PC 410**

complies with the following protective requirements:

- requirements for electromagnetic compatibility in accordance with EN 61326-1 1997+ A1: 1998+A2:2001
- requirements according to DIN EN 61010-1:2002
- the essential requirements for the protective system in accordance with EN 60529:1991

certified by TÜV SÜD

- Directive "Richtlinie für die Eignungsprüfung von Differenzdruckmessgeräten zur Messung von Unterdrücken in Aufstellungsräumen von Feuerstätten" (ZIV, Dez. 2007)"
- Requirements "Mindestanforderungen an geeignete Messgeräte zur Messung des Abgas-Ventilations- und Strahlungsverlustes im Rahmen der energetischen Inspektion, Entwurf, ZIV, Stand 14. Januar 2010"

This declaration is submitted for the manufacturer by:

Dr. Stephan Ester, managing director  
Bad Wünnenberg, 22nd of October 2010

## 13. Lindab local

Contact your local Lindab distributor or find our representatives on [www.lindab.com](http://www.lindab.com)



## Good Thinking

**At Lindab**, good thinking is a philosophy that guides us in everything we do. We have made it our mission to create a healthy indoor climate – and to simplify the construction of sustainable buildings. We do that by designing innovative products and solutions that are easy to use, as well as offering efficient availability and logistics. We are also working on ways to reduce our impact on our environment and climate. We do that by developing methods to produce our solutions using a minimum of energy and natural resources, and by reducing negative effects on the environment. We use steel in our products. It's one of few materials that can be recycled an infinite number of times without losing any of its properties. That means less carbon emissions in nature and less energy wasted.

**We simplify construction**