

testo
term

**Combustion efficiency analyzer/
*Analyseur de combustion***

testo 340

**Instruction manual/
*Mode d'emploi***





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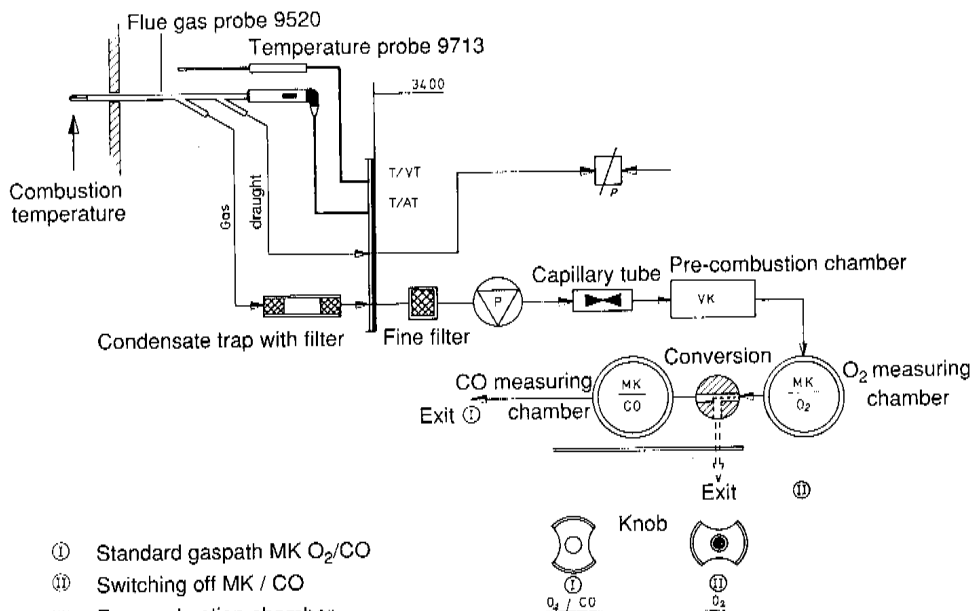
testo 340 is a light and compact instrument for flue gas analysis. The instrument can be used for control measurements or for the adjustment of burners.

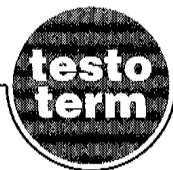
The measuring system testo 340 consists of an instrument and a flue gas probe.

The incorporated pump sucks the flue gas via the flue gas probe. An independent condensate trap and two particle filters have been placed between the tube lead. The processed gas is led through the measuring cells and leaves the instrument via the gas output. The instrument calculates the oxygen and carbon monoxide content via electrochemical fuel cells. The CO cell, which is integrated in the instrument, can be separated completely from the gaspath by a bypass valve. This protects the CO cell when measuring at high CO concentrations. The temperature is determined by thermocouples type K (NiCr-NiAl).

testo 340 calculates the flue gas loss, CO_2 , CO in undiluted flue gas and excess air value from the measured data.

The draught measurement is performed by means of an electronic DMS sensor and a separate tube lead.





Recharge the complete block of rechargeable batteries before measurement. (See voltage of the rechargeable batteries displayed during the calibration phase).

Operation with mains unit

Use only the original mains unit when operating the instrument.

Flue gas probes

Only the flue gas probe 0600.9520 can be connected directly to the testo 340. When a probe, without integrated filter and condensate trap, is connected directly to the instrument, an instrument failure will occur.

Tightness

Before a measurement is started, the complete measuring system (probe, condensate trap, tubes and screwings) must be tested for tightness. If the tube is not tight, measurement results may be incorrect.

Gas output

Please ensure during measurement that the gas output of the analyzer is uncovered so that the gas can escape unhindered. If this is not ensured, measurement results may be incorrect.

Condensate trap

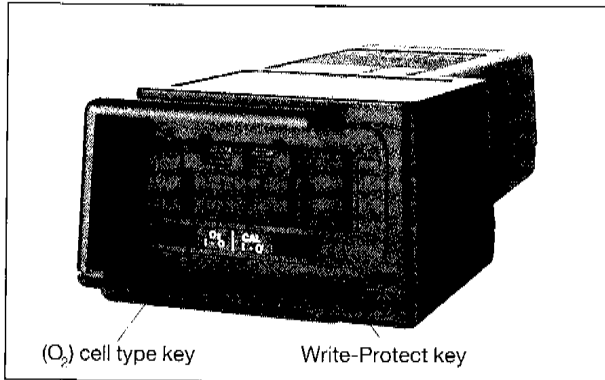
The condensate trap may only be emptied when the pump is switched off (otherwise the measuring cells may be damaged)!

Measuring cells

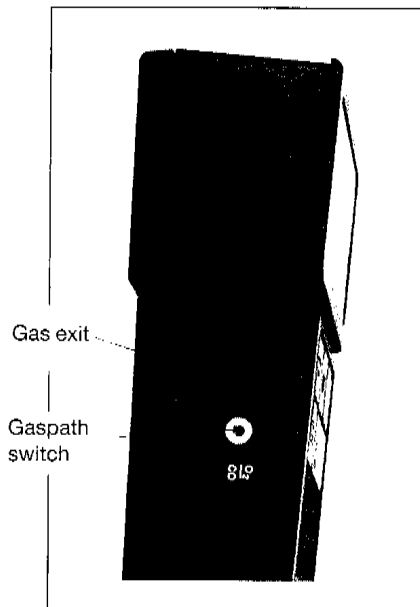
Small amounts of concentrated acids are contained in the measuring cells (except for O₂-sensor → lye) and should be treated as special waste (like commercial batteries).



Block of rechargeable batteries



Side view of the instrument

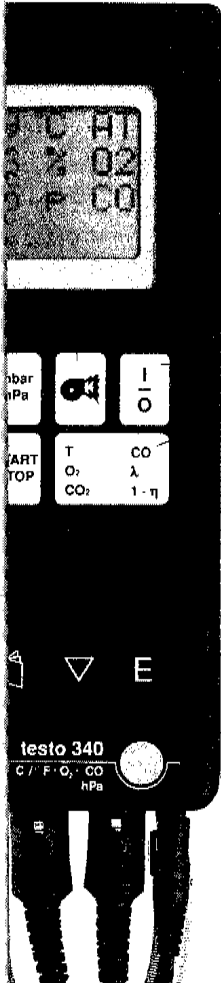


mbar/hPa key

Start/Stop key

Turnover
key

Instrument description



Large display

Burner key

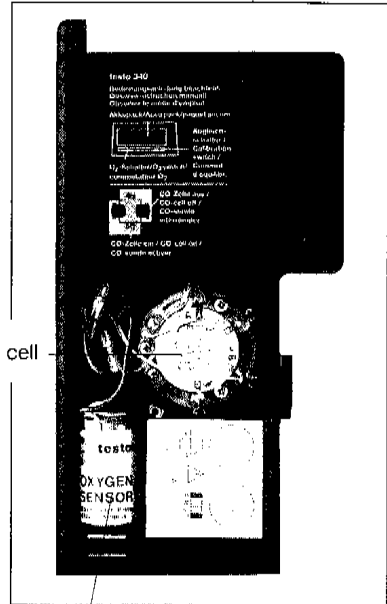
On/Off key

Measuring key

Arrow key

Enter key

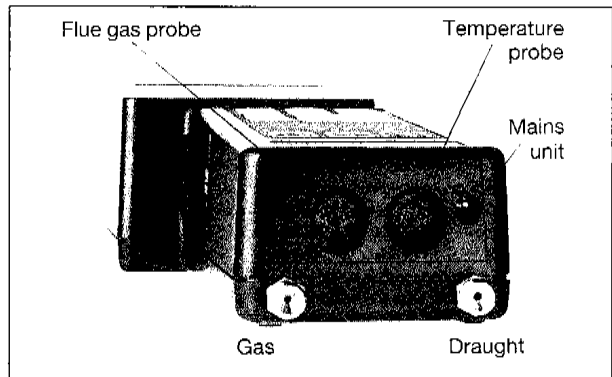
Rear view of the instrument and measuring cell block (unscrew the cover)



CO measuring cell

O₂ measuring cell

Connections



testo 340 can be powered by an interchangeable block of rechargeable batteries or via a mains unit with 220 V.

Operation with rechargeable batteries

The compartment for the rechargeable batteries is located under the cover at the top of the instrument. A 4.8 V block of rechargeable batteries (powerpack) is included in the standard delivery and inserted in the instrument. The block of rechargeable batteries is charged by the mains unit (duration of recharging when the instrument is switched off: 14 hours). Measurements are possible whilst recharging (floating battery operation).

Max. period of recharging is 24 hours - longer periods lead to an overcharge which would damage the rechargeable battery!

Battery charge displayed during the calibration phase: 4 segments indicate that the rechargeable batteries are charged, i. e. you may expect a battery life of approx. 3.5 h.

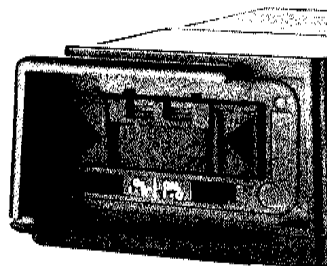
Replacement:

Push the marked points together (see figure); the block of rechargeable batteries slides out and can be replaced. When inserting the block of rechargeable batteries, a grating sound should be heard.

Mains operation:

Please observe the correct connection of the mains unit at the bottom of the instrument.

It is normal for the mains unit to get warm. At too high temperatures (e. g. if the instrument is defective), the mains unit is protected against overheating by a thermoprotective switch.





Connection of flue gas probe 0600.9520

Insert the 8 pin DIN plug of flue gas probe into the appropriate socket (flue gas probe symbol).

When attaching the gas and draught tubes, pay attention to coloured markings.

Red: Gaspath (with condensate trap + filter)

Blue: Draught route

Incorrect gas attachments can cause a complete instrument failure, which can damage the measuring cells.

Connection of a separate room temperature probe 0610.9713 (accessory)

When an air probe is connected (temperature probe symbol) the ambient air temperature is continually measured by this probe (and is recorded).

Please note the maximum operating temperature is +100 °C (210 ° F).

An independent condensate trap with 2 particle filters is integrated in the connecting lead of the flue gas probe 0600.9520.

Remove one of the end pieces to pour out the condensate.

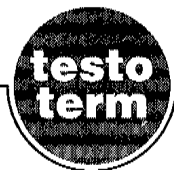
If the filter material is dirty (fleeze) it must be replaced. Withdraw the filter tubes to replace the filter material. Replacement material for the filter can be ordered under part no. 0554.0084.

The construction of the condensate trap requires a certain flow direction. It is marked by arrows on the housing. If the gas flows in the opposite direction the function of the condensate separation will not be correct; this may lead to instrument failure.

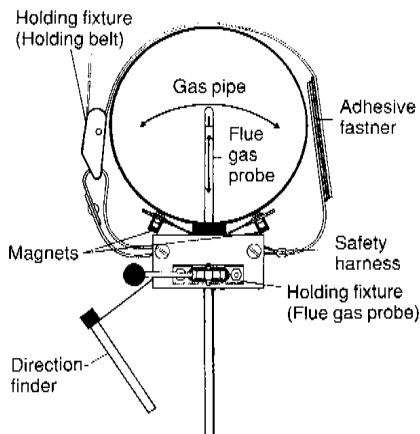


Operation

Holding device for flue gas probes (accessory)



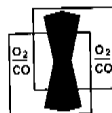
- Attach the fixing device with direction-finder and magnets at the extraction point (feed the direction-finder into the boring).
- Secure the holding device for the flue gas probe by means of the holding belt.
- Withdraw the direction-finder and push the flue gas probe in in such a way that the protective frame at the tip of the flue gas probe is situated across the flow direction of the gas. When the cocking lever is open, the flue gas probe can be moved in the gas pipe. If the flue gas probe is situated in the core flow, it is fixed with the cocking lever.
- When fixing the flue gas probe make sure that the tip of the probe is on the same level with or a little higher than the handle of the flue gas probe. Thus you avoid condensed water getting on to the thermocouple, which would lead to measuring errors.



Complete separation of the CO cell from the gaspath is possible by the gaspath switch. The CO-cell is thus protected against too high CO concentrations. Nevertheless, the remaining flue gas data can be determined. This gaspath switch is ideal in combination with the adjustable turn-off of the pump at high gas concentrations (see CO turn off, page 24).

When the knob is in a vertical position (O₂ and CO can be read), it means:

CO and O₂ cell are exposed to the gas.

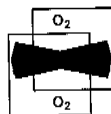


The gaspath switch must be in a vertical position for the calibration phase (CO and O₂ can be read). Otherwise, the CO cell is not rinsed with fresh air and the results of the subsequent measurements will be wrong.

When the knob is in a horizontal position, it means:

The CO-cell is outside the gaspath.

Even when the CO cell is outside the gaspath, low CO values can be indicated in the display, but they have no significance.



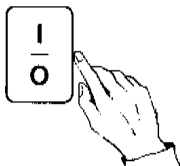
Command

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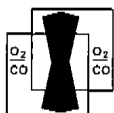
Temperature, O₂/CO₂ and CO measurement

e. g. for burner adjustment

You press:



Switch on the measuring instrument.



Turn the **gaspath switch** to the vertical position, so that CO/O₂ can be read.

E

You **confirm** the right position of the gaspath switch.



By using the arrow key and enter, the O₂ value can be altered to 21.0%.

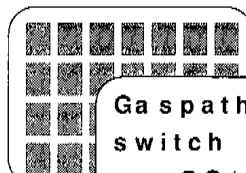
T	CO
O ₂	λ
CO ₂	1-η

Press the measuring units key in order to jump to the fuel selection chart.



Select the fuel by repeatedly pressing the key. The specific fuel factors are entered in the instrument and can be selected by moving the cursor.

The instrument answers:



Gas path
switch
on CO/O₂
Yes (E)

Calibrate
18.8° C AT
Accu:
Time = 19



The calibration phase takes approx. 70 sec.

O₂ cel.
calibrate
adjust.
O₂ = 21.0 %

Fuel oil EL
Natur.gas
Liq
Wo

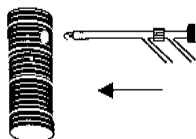
Briquette
Lignite
Har
Coal

Town gas
Fuel oil h
Test gas

You press:

T	CO
O ₂	λ
CO ₂	1-η

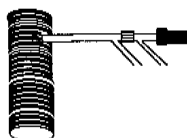
Go now to the measurement menu.



Place the **flue gas probe** **into the flue gas tube** (the protective frame at the tip of the flue gas probe is situated across the flow direction of the gas).

START
STOP

Start the pump



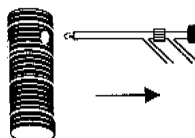
and **place the flue gas probe** in the **coreflow** (flue gas temperature FT max.)

T	CO
O ₂	λ
CO ₂	1-η

You can call the individual **measured values** in sequence.

START
STOP

If the measured values **do not change anymore** **stop the pump.**



Place the flue gas probe in **fresh air.**

The instrument answers:

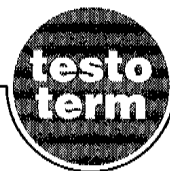
Fuel oil h
25.0 °C FT
21.0 % O₂

219.6 °C FT
6.9 % O₂
36 p CO

10.4 °%CO₂
11 %effg
1.50 λ

0.00 mbar
54 puCO
17.8 °C AT

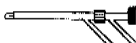
Rinse the measuring cells with fresh air after each measurement (pump start/stop).



You may choose when to measure the draught (before or after gas analysis).

Draught measurement is only possible with the pump switched off!

If draught measurement is performed after gas analysis, there is dynamic pressure in the tube, which must be degraded. However, this is done within approx. 15 seconds. Possible condensate residues in the flue gas probe must be removed (shake out!)



mbar
hPa

Start the draught measurement by **setting the zero point outside the flue gas tube**. This is done by pressing the mbar/hPa key. Do not change the position of the instrument after having set the zero point.

0.00 hPa

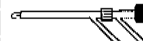
dr ght cal



approx. 2-3 sec.

0.00 hPa

dr g h m e a s



Place the flue gas probe in
the flue gas tube.



mbar
hPa

If the measured value has
stabilized, **finish the draught
measurement.**

0.25 hPa

drgh meas

0.25 hPa

finishd

Calibration phase

All measuring cells are rinsed with air for approx. 60 sec. The cells are then tested for 10 sec. (display cell cal.).

If the analyzer unit has reached a temperature below + 4 ° C, an error message "IT" is indicated and the instrument enters a new calibration phase (time = 60).

Because of the required stability of the CO cell, it is possible, that the instrument repeats the calibration phase several times even with usual temperatures (e. g. if measurements have previously been performed at too high gas concentrations).

After the calibration phase the O₂ value must be manually adjusted to 21.0%.

Submenu fuel selection

The most common fuels are stored with their characteristic values.

Fuel	Kgross	Knet	K2	K3
Natural gas	0.35	0.39	11.9	9.83
Light oil	0.48	0.51	15.5	6.1
Heavy oil	0.51	0.54	15.8	5.7
Coal	0.62	0.65	18.4	2.2
Anthracite	0.67	0.69	19.1	1.8
Coke	0.75	0.76	20.6	0.3
Propane	0.42	0.45	13.8	7.7
Butane	0.43	0.46	14.1	7.4
Natural gas 2	0.388	0.431	11.7	11.0

The last acknowledged fuel remains stored even after switching off the instrument.

calibrate
24.8 ° C AT
accu [][][][]
time = 19

Calibration phase
Temp. value of flue gas probe
State of rechargeable battery
Remaining time in seconds

O2 cel.
calibrate
adjust
O2 = 21.0 %

natur. gas 1
light oil
heavy oil
coal

anthracite
coke
propane
butane

natur. gas 2

T CO
O₂ λ
CO₂ 1-η

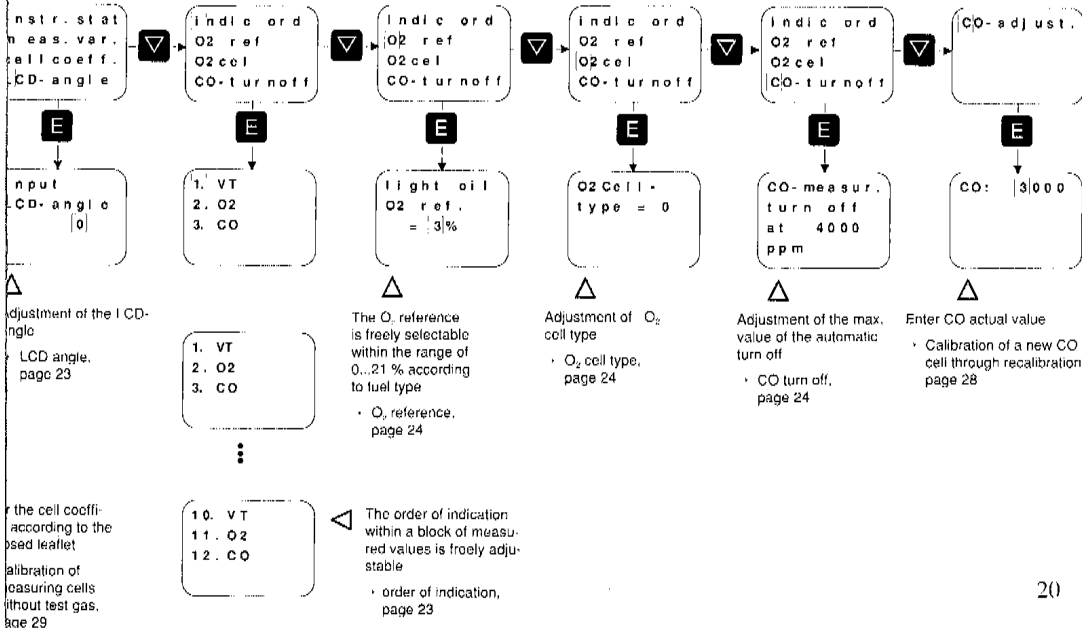
Store the selected fuel.

You wish to

- turn the instrument on.
- enter the **fuel** of the apparatus at which you wish to measure in order to **activate** the specific fuel factors for the calculation of the values not to be measured.
- **jump** from the fuel selection chart **directly to the "measurement" menu.**
- **check the measured values** displayed in 4 sections
- **record the settings** in the service menu
- a draught measurement, i.e. step by step:
set at zero - start/stop the draught measurement - record the draught values
- **start/stop the pump**
- return to the main menu
- select a menu/submenu by moving the cursor down
- adjust the numerical values
- recall selected menus/submenus



T	CO
O ₂	λ
CO ₂	1-η

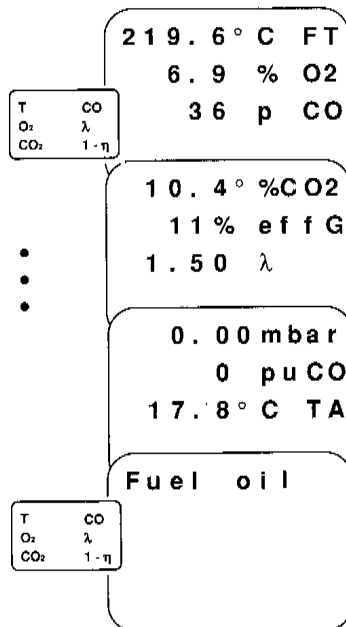


Menu measurement
Menu correction of ambient air temperature
Menu measurement

When the pump runs, the flue gas temperature (FT), O₂ and CO content are measured during gas analysis; flue gas loss (effg/effn), CO₂, CO_{undiluted} contents and excess air value (λ) are calculated in an instant.

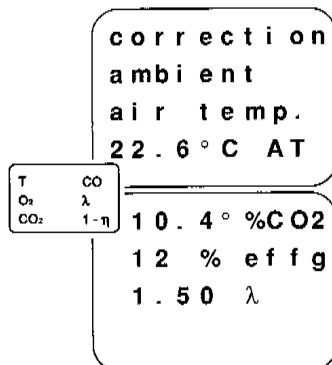
All flue gas components/data are held in display after having switched off the pump.

The pump switches automatically off at high CO concentrations (→ CO turn off, page 24).


Menu correction of the ambient air temperature

Use the **flue gas probe** for determination of the ambient air temperature, switch off the **pump**. Place the flue gas probe in the air intake channel of the burner. **Let** the flue gas probe **cool down** before determining the temperature in the air intake channel.

If a separate **temperature probe 0610.9713** is used, the ambient air temperature AT is **continuously measured** by this temperature probe as soon as it is placed in the flue gas tube and the flue gas loss is continuously determined. After withdrawal of the probe, the values last displayed remain stored.



"Service" menu

Submenu **instrument status**,
Submenu **measuring units**

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Instrument status

In this submenu, data, which is necessary in order to ensure that the instrument functions perfectly, is displayed for control.

Please observe the permissible operating temperature range of +4 to +40 ° C.

**The instrument does not enter the calibration phase at temperatures below + 4° C.
(An error message "IT?" is given.)**

22.4 ° C OT
11.6 Vi

OT: Operating temperature of the instrument
Vi: Power supply of the measuring instrument

Measuring units

It is possible to choose from two measuring units of a measured variable:

° C ↔ ° F;

ppm ↔ mg/m³;

hPa ↔ mbar (The indication mg/m³ refers to dry gas in normal state (0 ° C, 1013 hPa atmospheric pressure).

The adjustments are stored by pressing the measured variables key (and remain stored even after switching off the measuring system).

Automatic return to the measurement menu.

Temp. C
Gas ppm
draft hPa



Temp. C
Gas ppm
draft hPa

E

Temp. C
Gas mg
draft hPa

T CO
O₂ λ
CO₂ 1 - η

Adjustment and storage of "measuring units".

Cell coefficients

The measuring cells can be calibrated **with test gas** or **via the cell coefficients**. The cell coefficients are specific for each measuring cell. If they are calibrated with test gas, the measuring instrument itself determines the cell coefficient. For calibration without test gas, enclosed in the standard delivery of the CO cell you will find a leaflet on which the cell coefficients are indicated. These must be entered into the instrument.

The calibration procedure is described in detail in the maintenance chapter (→ see page 30).

Gas adjust
enter

E

B =	+	CO . 1	0 9 9 3
		H2 . 1	0 0 0 0
F =	+	CO . 2	0 9 9 3
		H2 . 2	0 0 0 0
E =	+		
C =	+	2 . 2 0 9 7	

LCD angle

The LCD angle can be adjusted to the light conditions or to the angle of view. A total of 8 different adjustments are possible, you should try all the possibilities. This always guarantees that the display can be read well.

The adjustments are stored by pressing the measured variables key (and remain stored even after the measuring instrument has been switched off).

Automatic return to the measurement menu.

input
LCD- angle

0

▽

T
O₂
CO₂

CO
λ
1 - η

Order of indication

The order of indication within a block of measured values can be adjusted by the customer according to his needs. Each block of measured values contains the following variables/indications: Selected fuel - flue gas temperature FT - O₂ contents - flue gas loss effg/effn - CO₂ contents - excess air value - draught - suction temperature of the burner - CO contents - undiluted CO contents. You can also produce empty lines (-----).

The adjustments are stored by pressing the measured variables key (and remain stored even after having switched off the measuring instrument).

Automatic return to the measurement menu.

E

1. AT
2. O2
3. CO

▽

T
O₂
CO₂

CO
λ
1 - η

"Service" menu

Submenu **O₂ reference**/submenu **O₂ cell type**

Submenu **CO turn off**

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term

O₂ reference

The O₂ reference value is required for the conversion of the ppm values into mg/m³. This value can be selected and stored individually for each fuel. With mg/m³ display, the O₂ reference value is indicated on the display. It is freely adjustable in the range 0 to 21 %.

The adjustments are stored by pressing the measuring units key (and remain stored even after the instrument is switched off). Automatic return to the measurement menu.

light oil
O₂ ref.
= 3%



T	CO
O ₂	λ
CO ₂	1-η

O₂ cell type

Two O₂ cells of the same quality are contained in the delivery programme under the same part no. However, their handling is different in the measuring instrument. If the measuring cell is replaced you must see which type is indicated on the measuring cell. Adjust the switch at the top of the instrument and check the entry in the O₂ cell type service menu.

The adjustments are stored by pressing the measuring units key (and remain stored even after having switched off the measuring instrument). Automatic return to the measurement menu.

O₂ Cell -
type = 0



T	CO
O ₂	λ
CO ₂	1-η

CO turn off

For protection of the CO measuring cell, the pump automatically switches itself off at high CO concentrations. The measuring instrument has been adjusted by the manufacturer in such a way that the pump automatically stops when measurements in CO concentrations of more than 4000 ppm are performed. The max. value is freely selectable in the range 2000 to 7000 ppm.

CO- measur.
turn off
at 9000
ppm



T	CO
O ₂	λ
CO ₂	1-η

Even when this automatic CO turn off is switched off (when the max. value is adjusted to 0000 ppm), a certain protective function is maintained. The pump switches off at CO concentrations of ≥ 8100 ppm.

CO- measur.
turn off
at 0000
ppm



T	CO
O ₂	λ
CO ₂	1 - η

Attention!

If the pump has switched itself off (the display indicates the error message "rinsing"), remove the flue gas probe from the flue gas tube and rinse the measuring cells with fresh air. **Continue the measurement only if really necessary. However, 8000 ppm CO may not be exceeded during measurement.** After each automatic pump shut-down, we recommend rinsing the measuring cell with fresh air until the measured value falls below 50 ppm CO. Or turn the gaspath switch to the O₂ position. If a CO value is indicated, it corresponds to the residual content in the measuring chamber.

The adjustments are stored by pressing the measuring units key (and remain stored even after the instrument has been switched off).

Automatic return to the measurement menu.

CO recalibration

You have a CO reference value due to the presence of a test gas, a test stand or a reference instrument. This value can be used for informing the instrument of a correction factor for the determination of CO. The instrument then calculates the exact CO values via the measured values and this correction factor. Proceed as described on page 28.

CO = 000



T	CO
O ₂	λ
CO ₂	1 - η

The adjustments are stored by pressing the measured variables key (and remain stored even after the instrument has been switched off).

Automatic return to the measurement menu.

Replacement of CO measuring cell

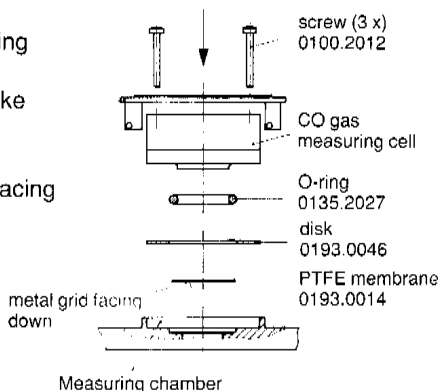
For replacement of a measuring cell, unscrew the screw at the back of the instrument and remove the cover.

Please observe the following:

- When the cell is built in, avoid putting any pressure (e. g. by thumb) on the sensor (especially at the bottom).
- The opening of the gas input at the front of the sensor should not be touched or pushed.
- The connecting clamps must not be turned or moved, as this may interrupt the electrical connections in the instrument or reduce tightness.
- The sensor must be screwed on in such a way, that maximum tightness is ensured. Therefore, the tension of the screws should not be too high.
- The sensors should never be glued, as dissolving glue vapours may cause cracks in the plastic housing and destroy the electrodes.

Please observe the following instructions for replacement:

- Remove the connecting cable from the measuring cell (plugged connection).
- Loosen the screws of the measuring cell and take out the measuring cell. Take out the O-ring and remove the white PTFE membrane.
- Insert membrane supplied (with the metal grid facing down) and disk.
- Insert O-ring in the middle.
- Insert measuring cell.
- Plug in connecting cable.



After having built in the measuring cell, calibration must be performed e. g. with cell coefficient enclosed with the cell (→ calibration of CO measuring cell without test gas, page 29).

Maintenance

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CO recalibration

- for test gases without an H_2 content -

Like the cell coefficients, the correction factor is subject to programming protection. To change these parameters the Write Protect switch at the top of the instrument must be set to "I" during calibration.

Select the submenu gas calibration (service menu → CO recalibration).

Perform a measurement of the test gas (same procedure as measurement, page 14). If the measured value is beyond the tolerance, enter the corresponding required CO value in the submenu CO recalibration (change the values via arrow key in increasing order, go to the next digit with Enter). Store the value by pressing the measuring units key, recalibration is performed.

Store the value by pressing the measuring units key, the measuring unit calculates the correction factor.

Set the Write Protect on position "0".

▽

CO = 0 0 0

E

CO = 0 0 0

CO = 4 0 0

T	CO
O ₂	λ
CO ₂	1 - η

Calibration of CO measuring cell with test gas - only possible if a known H₂ content exists in the test gas -

The calibration programmes are subject to programming protection. To change these parameters, the Write-Protect switch at the top of the instrument must be set to "I" during calibration.

If you do not have a test gas with an H₂ component, you may only perform calibration via CO redraught (> CO recalibration, page 28).

Select the submenu gas calibration (service menu -> cell coeff. > gas calibration).

1. **Change the numerical values in lines 1 and 2** according to the **test certificate of test gas 1**.
2. **dto. in the lines 3 and 4 for test gas 2.**
3. By pressing the **mbar/hPa** key the **calibration mode** of the **O₂ cell** is entered. Press the **arrow** key to enter the **CO/H₂ calibration mode**.
4. **Start the pump.**
5. Wait until the **ADC values have stabilized** and press the **enter key** to **set the zero point** of the measuring cell.
6. **Admit test gas 1** to the measuring cells.
Gas removal is done without pressure (max. 30 mbar) - takes approx. 3-4 minutes.
7. If the **ADC values have stabilized** (after approx. 3-4 minutes) press the **turnover key** to set the inclination for test gas 1.
8. **Admit test gas 2** to the measuring cells.
Gas removal is done without pressure (max. 30 mbar) - takes approx. 3-4 minutes.
9. If the **ADC values have stabilized** (after approx. 3-4 minutes) press the **burner key** to define the inclination for test gas 2.
10. The measuring instrument performs the cell calibration through **measuring units key**, stores the values and goes automatically into the calibration phase (place flue gas probe in fresh air - Write-Protect switch must be set to "O").

CO . 1	1 0 0 0
H2 . 1	0 0 0 0
CO . 2	1 0 0 0
H2 . 2	0 8 0 0

mbar
hPa

cal i b r a t e	
i n d i c a t o r	
O2 :	0 0 5 2 7

cal i b r a t e	
i n d i c a t o r	
CO :	0 0 5 2 7
H2 :	0 0 1 6 1

cal i b r a t e	
i n d i c a t o r	
CO :	0 0 0 2 9
H2 :	0 0 0 0 7

T	CO
O ₂	λ
CO ₂	1 - η



Calibration of CO measuring cell without test gas

The calibration programmes are subject to programming protection. To change these parameters, the Write-Protect switch at the top of the instrument must be set to "I" during calibration.

Select the submenu gas calibration (service menu → cell coeff. → enter)

After having calibrated the cell in our company with test gas, the replacement measuring cell receives 4 cell coefficients. You will be informed about these cell coefficients by an enclosed leaflet. **Enter these coefficients by means of the enter and the arrow key.**

As soon as you have entered all cell coefficients, **keep the cursor on a numerical value** and press the **measuring units** key in order to store the cell coefficients.

The basic **calibration temperature** is called. It is also indicated in the leaflet enclosed with the measuring cell. After the **entry**, press the **measuring units** key. The measuring instrument enters the calibration phase.

Return Write-Protect switch to position "O".

B = + 0 . 6 7 5 1
F = + 1 . 3 6 7 0
E = + 0 . 4 2 8 4
C = + 2 . 2 0 9 7



i n p u t :
c a l i b r a -
t i o n t e m p .
2 6 . 6

T	CO
O ₂	λ
CO ₂	1 - η

Replacement of O₂ measuring cell

For replacement of the measuring cell, unscrew the screw at the back of the instrument and remove cover.

- Withdraw textile band.
- Remove connecting cable from the measuring cell (plugged connection).
- Connect the cable of the new cell as described on the sheet.
- Insert the measuring cell and see that the gas input is on the top.
- Place cable into the corresponding guide.

Please check whether type 0 or type I is entered in the service menu (-> O₂ cell type, page 24). Compare the entry with the type name on the measuring cell. If necessary, correct the entry in the instrument (-> O₂ cell type, page 24).

After replacing the measuring cell, calibration must be performed (page 31).

Calibration of a new O₂ measuring cell

The calibration programmes are subject to programming protection. To change these parameters, the Write-Protect switch at the top of the instrument must be set to "I" during calibration.

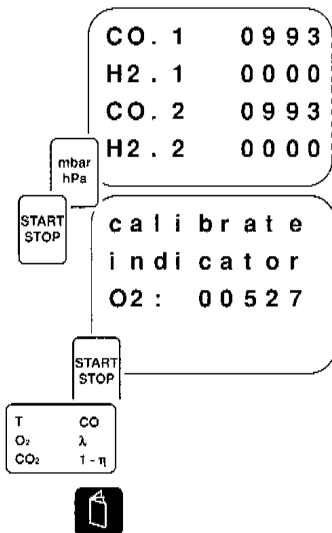
Select the submenu gas calibration (service menu → cell coeff. → gas calibration)

The input field for the CO-H₂ values is not relevant for this application. Press the mbar/hPa key to go into the calibration mode for the O₂ cell.

The flue gas probe is in fresh air. Start the pump. Press the turn-over key after approx. 15 minutes (or as soon as the ADC value has stabilized).

Store the adjustments by pressing the measuring units key (the values are maintained even when the instrument is switched off). The instrument switches itself off for a few moments and immediately enters the calibration phase.

Return the Write-Protect switch to position "O".



light oil
217.8 °C FT

calibrate 2
24.8 °C AT Vi ?
accu:
time:34Vi ?

Low voltage supply of the battery
(working voltage ≤ 4.6 V,
automatically "off" at 4.4 V)

natur. gas1
217.8 °C FT

calibrate 2
24.8 °C AT CO!
accu ■■■■
time=19CO!

CO is in the instrument.

This means that the calibration period of this measuring cell becomes considerably longer if measurements are performed at this high concentration for a long period of time.

This does not affect the function of the measuring cell.

natur. gas1
----- C AT

calibrate 02
----- C AT Tc ?
accu ■■■■
time=19Tc ?

Temperature probe is defective.

O2cel : ! ? !
217.8 °C FT
43 puCO

O₂-cell is used up.

set
memory
switch
on I

You did not turn the Write-Protect switch to position "I" for the calibration.

set
memory
switch
on 0

The Write-Protect switch has not been returned to "O" after calibration.

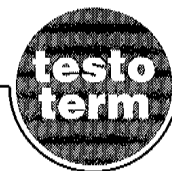
Fuel oil
217.8 °C FT

Temperature of the instrument below 4 °C.

calibrate
6.8 °C AT
Accu: ■■■■
time=58 OT?

2
OT?

Calculation Information



Information on the calculation of the CO₂ value,
flue gas loss and excess air value

The following equations are used for calculation of the listed
values:

CO₂ value:
$$\text{CO}_2 = \frac{\text{CO}_{2\text{max}} \times (21 - \text{O}_2)}{21}$$

CO_{2max}: specific fuel max .
CO₂-value

21: O₂ contents of the air

O₂: measured O₂ value

Gross/net
efficiency :

$$\text{effG} = 100 - \frac{K_{\text{gross}} (\text{FT} - \text{AT})}{\text{CO}_2} - K3 - 0.001 \times K3 \times (\text{FT} - \text{AT})$$

FT: Flue gas temperature

AT: Ambient air temperature

K_{gross} : specific fuel factors

K3 : (see table "fuel" - selection)

$$\text{effn} = 100 - \frac{K_{\text{net}} (\text{FT} - \text{AT})}{\text{CO}_2}$$

FT: Flue gas temperature

AT: Ambient air temperature

K_{net}: specific fuel factors

(see table "fuel" - selection)

$$\text{CO}_{\text{undiluted}}: \quad \text{CO}_{\text{undiluted}} = \text{CO} \times \lambda$$

CO: measured CO value

λ : Excess air value

Calculation of ppm in mg/m^3 referred to O_2 reference (freely selectable depending on the fuel)

$$\text{CO (mg/m}^3\text{)}: \quad \text{CO} = \frac{21 - \text{O}_{2\text{rel.}}}{(21 - \text{O}_2)} \times \text{CO (ppm)} \times 1,25$$

21: O_2 contents of the air

O_2 : measured O_2 value

$\text{O}_{2\text{rel.}}$: O_2 reference
for liquid and gaseous fuels: 3
for solid fuels: 7

Temperature measurement

Measuring range:	-40 to +1200 °C	-40 to +2192 ° F
Max. tolerance:	± 0.5 °C (0 to +100 °C) ± 0.5 % of m. v. (> +100 °C)	1 ° F (+32 to 200 ° F) ± 0.5 % of m. v. (> +100 °C)
Resolution:	0.1 ° above +1000 °C/ ° F: 1 °	
Sensor:	Thermocouple type K (NiCr-NiAl) according to DIN IEC 584, part 2, class 1	

Draught

Measuring range:	± 50 mbar
Resolution:	0.01 mbar

O₂ measurement:

Measuring range:	0 to 21 vol%
Max. tolerance:	± 0.2 vol% of m. v.
Resolution:	0.1 vol%
Measurement procedure:	Electrochem. measuring cell
Response time t_{90} :	Approx. 40 seconds

CO measurement (with H₂ compensation)

Measuring range:	0 to 4000 ppm
Precision:	± 20 ppm (up to 400 ppm) ± 5 % of m. v. (up to 2000 ppm) ± 10 % of m. v. (up to 4000 ppm)
Response time t_{90} :	Approx. 60 seconds

CO₂ calculation:

Indication range:	0 to CO ₂ max
Max. tolerance:	± 0.2 vol%
Resolution:	0.1 vol%
Determination:	Digital calculation from O ₂
Response time t_{90} :	Approx. 40 sec.

General data:

Instrument	
Dimensions:	210 x 95 x 60 mm (8.3 x 3.7 x 2.4 ")
Weight:	0.6 kg (21 oz)
Display:	5 x 7 dot matrix 4 lines, each with 10 symbols alphanumeric representation
Perm. operating temperature:	+4 to +40 ° C (32 to 105 ° F)
Perm. storage and transport temperature:	-20 to +50 ° C (0 to 120 ° F)
Power supply:	Via mains unit or interchangeable block of rech. batteries

Accessory flue gas probe 0600.9520

Tmax.:	+500 °C (+930 ° F)
Immersion depth:	335 mm (13")
Gas outputs:	2
Tube length:	1.5 m with integrated independent condensate trap
Weight:	0.75 kg (26 oz)

Warranty:

Instrument	
(except for measuring cells):	12 months
O ₂ measuring cell:	18 months
Flue gas probe:	6 months

Mechanical damage and/or destruction by improper handling excluded.

In reference to the gas admission times (measurement period), please observe the following:

- a. At CO concentrations of 0 to 4,000 ppm, measurements of 30 mins can be performed without intermediate calibration.
- b. At CO concentrations of 4,000 to 8,000 ppm, rinse with fresh air for about 10 minutes after the measurement (period approx. 5 minutes). Rinsing with fresh air as described under b and c is necessary for observing the above-mentioned tolerances. If the rinsing period is not observed, no statement can be made on the tolerances.



Description	Part no.
Combustion efficiency analyzer testo 340 with 2 temperature inputs, O ₂ , CO ₂ , CO (H ₂ -compensated) CO _{undiluted} , excess air value λ , flue gas loss and draught incl. mains unit and block of rechargeable batteries (power pack)	0563.3401
Flue gas probe T _{max.} = +500 °C (930 ° F), immersion depth 335 mm (13 "), 1.5 m (5 ft) connecting lead with integrated filter unit and site-independent condensate trap	0600.9520
Temperature air probe for separate measurement of the ambient air temperature, T _{max} = +100 °C (210 ° F), NTC sensor, L = 300 mm (11.8 ") with cone	0610.9713
Holding device for flue gas probe	0554.0094
Carrying case for flue gas analyzer testo 340 with magnetic plate and carrying strap	0516.0014
Service case for flue gas analyzer testo 340, flue gas probe 0600.9520 and accessories	0516.0134
Block of rechargeable batteries	0554.1014
Replacement filter material for flue gas probe filter unit	
Replacement measuring cell O₂	0390.0035
Replacement measuring cell CO (H₂-compensated)	0390.0015
Replacement filter material for flue gas probe 0600.9520	0600.9520