



## Measuring Instruments for Flue Gas and Emissions



CO

CO<sub>2</sub>

NO

SO<sub>2</sub>

Vol. % O<sub>2</sub>

°C

hPa

rpm

V

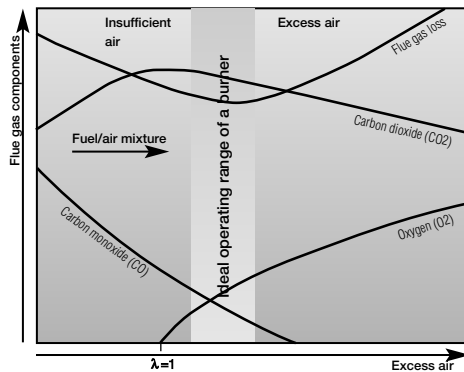
mA

HC



## Ideal operating range of burners

The purpose of flue gas analysis is to ensure environmentally friendly and economic operation of burners. These formulae and tables can be used to understand flue gas analysis. They are all stored in Testo's flue gas analysers. All of the calculations are carried out automatically.



## Flue gas loss (qA)

Flue gas loss is also a calculated variable for which there are two different formulae available, depending on fuel. The difference between flue gas temperature (FT) and ambient temperature (AT) play a decisive role in both calculations. The flue gas temperature is measured in the hot spot of the flue gas where the temperature is highest. The ambient temperature is measured at the intake opening of the burner or in the supply pipe of systems independent of ambient air.

### Table of fuel-specific factors

Fuel	A2	B	f	CO <sub>2max</sub>
Fuel oil	0,68	0,007	-	15,5
Natural gas	0,65	0,009	-	11,9
Liquefied gas	0,63	0,008	-	13,9
Coke, wood	0	0	0,74	20,0
Briquette	0	0	0,75	19,3
Brown coal	0	0	0,90	19,2
Anthracite	0	0	0,60	18,5
Coke oven gas	0,6	0,011	-	-
Town gas	0,63	0,011	-	11,6
Cal gas	0	0	-	13,0

## Efficiency (η)

Combustion efficiency is calculated by subtracting the flue gas losses from 100% or maximum efficiency.

Efficiency describes how well a burner combusts a specific fuel.

### Oil burners

CO<sub>2</sub> level as high as possible, smoke number between 0 and 1

### Gas burners

CO<sub>2</sub> level as high as possible, CO level 500 ppm in undiluted flue gas

Efficiency of a small burner

$$\eta = 100 \% - qA$$

qA = Flue gas loss (%)

## Calculating flue gas loss for solid fuels

Used if the fuel-specific factors A2 and B are zero.

$$qA = f \times \frac{AT - VT}{CO_2}$$

## Calculating CO<sub>2</sub>

$$CO_2 = \frac{CO_{2max} \times (21 - O_2)}{21}$$

## Calculating flue gas loss

$$qA = (AT - VT) \times \left[ \frac{A2}{(21 - O_2)} \right] + B$$

AT: Flue gas temperature (FT)

VT: Ambient temperature (AT)

A2/B: Fuel-specific factors (see Table)

21: Oxygen level in air

O<sub>2</sub>: O<sub>2</sub> value measured in flue gas

CO<sub>2</sub>: Carbon dioxide, calculated using CO<sub>2max</sub> value and O<sub>2</sub>

## Excess air λ

In order to achieve full combustion, it is necessary to supply the burner with more air than is theoretically necessary. The ratio of this air to the theoretical air requirement is known as excess air.

## NO<sub>x</sub> measurement

NO<sub>x</sub> is the name given to the combination of NO and NO<sub>2</sub> gases. The percentage of NO<sub>2</sub> gases in NO<sub>x</sub> varies greatly by source type. For instance, NO<sub>2</sub> levels in many burner systems is 3-5% but in engines can be 40% and above.

## Measuring industrial flue gases

The following goals apply when measuring industrial flue gases:

### Emissions monitoring

- Adherence to legally specified limits (e. g. TA Luft)
- Meeting ISO 14000 requirements
- Important parameters: NO<sub>x</sub> (NO + NO<sub>2</sub>), SO<sub>2</sub>, CO, H<sub>2</sub>S, O<sub>2</sub> and in some cases CO<sub>2</sub>

### Adjustment and optimisation of systems

This refers to adherence to emission limits. Otherwise the aim is to reduce operation costs by saving energy. Important parameters: O<sub>2</sub>, CO, CO<sub>2</sub>, excess air and efficiency.

### Process monitoring in the manufacturing industries

Monitoring combustion processes for quality assurance purposes, ISO 9000 requirements, reduction of non-spec products, reduction of costs by saving energy and minimising down periods.

Important parameters: O<sub>2</sub>, CO, CO<sub>2</sub>, SO<sub>2</sub>.

### Measurement principles

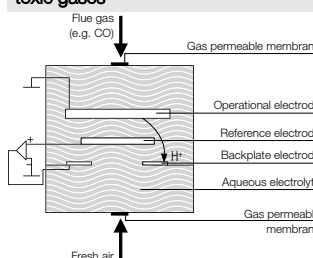
Testo uses electrochemical gas sensors for the O<sub>2</sub>, CO, NO, NO<sub>2</sub>, H<sub>2</sub>S and SO<sub>2</sub> parameters.

These sensors have major advantages for portable applications:

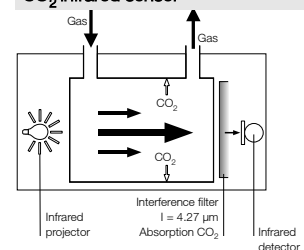
- Not affected by vibrations or changes in temperature
- Small dimensions and low weight
- Easy to change without cal gas
- Wide measuring ranges and low zero point drift for low concentrations
- Extreme linearity over the whole measuring range.

An NDIR sensor is used for CO<sub>2</sub>.

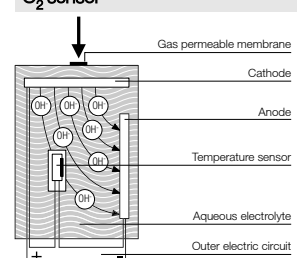
### Electrochemical gas sensor e.g. for toxic gases



### CO<sub>2</sub> infrared sensor



### O<sub>2</sub> sensor





## Contents

### Flue gas analysers for contractors

	Page
testo 308	The electronic smoke tester – "the real measurement" 4
testo 327-1	The starter instrument for flue gas analysis 5
testo 327-2	The service instrument for flue gas analysis 6
testo 330-1 LL	The flue gas analyzer with Longlife sensors 8
testo 330-2 LL	The flue gas analyzer with Longlife sensors and integrated draught/gas zeroing 9

### Flue gas analysers for industry

	Page
testo 325-I	Industrial flue gas – Affordable analysis and documentation 13
testo 325-I CO <sub>high</sub>	Your introduction to portable flue gas analysis 14
testo 335	Compact flue gas analyzer 15
testo 350	Versatile exhaust gas system 20
testo 350-MARITIME	The portable exhaust gas analyzer for marine diesel engines 34
testo 360	Portable multi-function analyser for industrial flue gases 36

## testo 308

testo 308 is the instrument for easy electronic soot count measurement. It records the soot count digitally to one decimal space with constant sampling. The powerful LED backlighting guarantees good legibility even under poor light conditions. The instrument excels through its easy menu structure and ergonomic pistol grip.

testo 308 achieves high accuracy thanks to the heating of the measurement spot, thus avoiding measurement errors due to condensation.

The infrared interface allows wireless communication with an IrDa printer, a flue gas analyzer and a Pocket PC.

## The electronic smoke tester – "the real measurement"

- Easy, self-explanatory menu
- Clear segment display
- LED display illumination
- Easy IR printout
- Integrated condensate trap (evacuatable)
- Integrated dirt filter (exchangeable)
- TÜV tested
- Additional soot count determination on filter paper
- Li-ion battery, (2600 mA, 45 individual measurements), chargeable inside or outside the instrument
- Operation with mains unit possible
- Battery and charger from testo 327 and testo 330 can be used
- BLUETOOTH interface (optional)\*
- Easy exchange of soot filter roll
- Spare battery chargeable separately or in instrument
- Protection class IP40



### testo 308

testo 308 smoke tester incl. rechargeable battery and calibration protocol for measuring soot count

Part no.

**0632 0308**

### testo 308 / BLUETOOTH®

testo 308 smoke tester with BLUETOOTH® interface incl. rechargeable battery and calibration protocol for measuring soot count, for the measurement of soot count\*

Part no.

**0632 0309**

### Set testo 308

Set testo 308 smoke tester incl. mains unit and bag

Part no.

**0563 3080**

### Set testo 308 / BLUETOOTH®

Set testo 308 smoke tester with BLUETOOTH® interface incl. mains unit and bag\*

Part no.

**0563 3090**

### Technical data

Sensor	Photodiode
Meas. range	0 to 6 RZ
Resolution	0.1 RZ
Accuracy	±0.2 RZ
Pump capacity	1,63 ± 0,1 l
Reference filter	at 990 mbar and +20 °C ambient temperature
Weight	600 g incl. battery
Dimensions	270 x 63 x 120 mm
Rech. battery	Lithium ion battery, 2600 mA
Battery life	45 individual measurements
Battery charge	in the instrument via mains unit or externally by charger

Display	Segment display with background illumination
Norms and tests	1. BImSchV, METAS, EU-guideline 2004/108/EG
Oper. temp.	0 to +40 °C
Storage temp.	-20 to +50 °C
Protection class	IP40
Interfaces	IR/IRDA interface, BLUETOOTH®*
Gas sampling	Stainless steel pipe ca. 220 mm, rubber hose 100 mm
Warranty	2 years

### Accessories

Accessories	Part no.
Instrument bag for smoke tester testo 308	0516 0002
100-240 V AC / 6.3 V DC international mains unit for mains operation or battery charging in instrument	0554 1096
Probe holder for smoke tester testo 308 and flue gas probes	0554 0616
Spare battery 2600 mA	0515 0107
Charger for spare battery	0554 1103
Spare soot filter paper (8 paper rolls)	0554 0146
Spare dirt filters (10 off)	0554 1101
Cone with fixing screw	0554 9010
Testo printer with wireless infrared interface, 1 roll of thermal paper and 4 AA batteries	0554 0547
Basic system case for analyzer, probes and accessories	0516 3330
Shaft length 330 mm, suitable for smoke tester testo 308	0440 1115

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## testo 327-1

testo 327-1 is your introductory instrument to flue gas analysis. It measures combustion efficiency, °C, O<sub>2</sub>, CO<sub>2</sub>, CO and flue draught. The strong LED background light in the 4 line display guarantees an easy-to-read display even if lighting conditions are unfavourable. The analyser stands out on account of its easy menu navigation and ergonomic housing as well as its durability.

The single-sensor versions testo 327-1 O<sub>2</sub> or testo 327-1 CO are ideal for very simple applications.

The testo 327-1 O<sub>2</sub> offers the standard flue gas analysis functions for the basic adjustments of oil and gas combustion. It measures the O<sub>2</sub> content of the exhaust gas, the exhaust gas temperature and the flue draught. The exhaust gas loss and the degree of efficiency are calculated.

The testo 327-1 CO offers the standard functions for CO safety measurements. It measures the CO content in the exhaust gas, the exhaust gas temperature and the flue draught.

## The starter instrument for flue gas analysis

- Easy menu navigation
- 4 line segment display
- LED display light
- Easy IR printout
- Built-in condensate trap
- TÜV By RgG 253 acc. to 1. BImSchV
- EN 50379 Part 2 for O<sub>2</sub>, °C, hPa
- EN 50379 Part 3 for CO
- Small Li-ion rechargeable battery (1200 mA, lifetime of 5 h) can be recharged inside or outside instrument
- Fast probe connection using single probe plug
- Ambient CO measurement using flue gas probe
- O<sub>2</sub> dual wall measurement (can be stored)
- Separate AT temperature measurement
- Undiluted CO measurement (can be stored)
- Draught measurement
- 8 fuels
- IP 40



### testo 327-1

testo 327-1 flue gas analyser, rechargeable battery and calibration protocol included, measures O<sub>2</sub>, CO, hPa and °C

Part no.

**0632 3201**

### testo 327-1 CO

testo 327-1 CO flue gas analyser, rechargeable battery and calibration protocol included, measures CO, hPa and °C

Part no.

**0632 3204**

### testo 327-1 O<sub>2</sub>

testo 327-1 O<sub>2</sub> flue gas analyser, rechargeable battery and calibration protocol included, measures O<sub>2</sub>, hPa and °C

Part no.

**0632 3203**

### Technical data

Temperature measurement	-40 to +600 °C
Draught measurement	±40 hPa
Efficiency measurement (Eta)	0 to 120%
Flue gas loss (qA)	0 to 99.9%
O <sub>2</sub> measurement	0 to 21 Vol. %
CO <sub>2</sub> measurement	0 to CO <sub>2</sub> max
CO measurement	0 to 4000 ppm

Weight	Approx. 500 g
Dimensions	216 x 68 x 47 mm
Storage temp.	-20 to +50 °C
Oper. temp.	-5 to +45 °C
Power supply	via Li-Ion rechargeable battery
Battery life	> 5 h
Warranty	2 years on instrument, probes and gas sensors 1 year on thermocouple and rechargeable battery (wearing parts excluded)

### testo 327-1 Basic Set for heating and installation technicians

- testo 327-1 flue gas analyser incl. rech. batteries and calibration protocol
- Mains unit 100-240 V for mains operation or battery charging in instrument
- Compact flue gas probe, 180 mm long, Ø 6 mm
- Combustion air temperature probe, immersion depth 190 mm
- Printer with wireless infrared interface
- Instrument cleaner 100 ml
- Basic system case for instrument, probes and accessories

**Part no.**  
**0563 3203 70**

## testo 327-2

The testo 327-2 service analyzer measures combustion efficiency, °C, O<sub>2</sub>, CO<sub>2</sub>, CO and flue draught. The bright LED backlight in the 4-line display guarantees an easy-to-read display even if lighting conditions are unfavourable. The analyzer stands out on account of its easy menu navigation and ergonomic housing as well as its durability.

testo 327-2 enthruses the user with additional useful features such as the data store (20 measurements), differential temperature measurement to determine flow and return temperatures or differential pressure measurement to adjust pressure ratios in gas systems.

Official measurements on gas burners in accordance with EN 50379 Part 2 are also possible thanks to the option of a H<sub>2</sub> compensated CO sensor.

The IrDa interface opens communication options with a Pocket PC.

## The service instrument for flue gas analysis

New

Now with **Bluetooth®** Wireless transmission

- Life expectancy of gas sensors up to 3 years
- Assurance thanks to instrument and sensor diagnosis
- IR and IRDA interface for easy reading out of data to printer or Pocket PC
- BLUETOOTH® wireless transfer (optional)
- Delta T measurement
- Delta P measurement: 2 measurement ranges
- Store (20 readings)
- Li-ion rechargeable battery (2,400 mA), 10 hr lifetime
- TÜV By RgG 254 acc. to 1. BlmSchV
- CO option with H<sub>2</sub> compensation
- Official test in accordance with EN standard 50379-2 for °C; O<sub>2</sub>, hPa, Part 3 for CO
- Optional Part 2 for CO with H<sub>2</sub> compensation



### testo 327-2

**testo 327-2 flue gas analyzer, rechargeable battery and calibration protocol included, measures O<sub>2</sub>, CO, hPa and °C**

Part no.  
**0632 3202**

### Technical data

Temperature measurement	-40 to +600 °C	Weight	Approx. 500 g
Draught measurement	±40 hPa	Dimensions	216 x 68 x 47 mm
Efficiency measurement (Eta)	0 to 120%	Storage temp.	-20 to +50 °C
Pressure measurement	±200 hPa	Oper. temp.	-5 to +45 °C
Flue gas loss (qA)	0 to 99.9%	Power supply	via Li-ion rechargeable battery
O <sub>2</sub> measurement	0 to 21 Vol. %	Battery life	> 10 h
CO <sub>2</sub> measurement	0 to CO <sub>2</sub> max	Warranty	2 years on instrument, probes and gas sensors 1 year on thermocouple and rechargeable battery (wearing parts excluded)
CO measurement	0 to 4000 ppm		
Option CO measurement (H <sub>2</sub> compensated)	0 to 8000 ppm		

### testo 327-2 Set for heating fitters

- testo 327-2 flue gas analyzer incl. rech. battery and calibration protocol
- Option: CO-H<sub>2</sub> measurement
- Mains unit 100-240 V for mains operation or battery charging in instrument
- Modular flue gas probe, 300 mm long, Ø 8 mm, TÜV approval
- Combustion air temperature probe, immersion depth 190 mm
- Hose connection set for separate gas pressure measurement
- Printer with wireless infrared interface
- Flexible probe shaft, 330 mm long, Ø 10 mm, Tmax. 180°C
- Instrument cleaner, 100 ml
- Basic system case for instrument, probes and accessories

Part no.  
**0563 3202 70**

### testo 327-2, Complete set for heating installers

- testo 327-2 exhaust gas analyzer, rechargeable battery and calibration protocol included
- Option: CO-H<sub>2</sub> measurement
- testo 308 smoke tester, rechargeable and calibration protocol included
- Mains unit 100-240 V for mains operation or charging rechargeable battery in instrument
- Modular flue gas probe, 300 mm long, Ø 8 mm, TÜV approved
- Combustion air temperature probe, 190 mm immersion depth
- Hose connection set for separate gas pressure measurement
- Printer with wireless infrared interface
- Flexible probe shaft, 330 mm long, Ø 10 mm, Tmax. 180°C
- Instrument cleaning agent, 100 ml
- Basic system case for instrument, probes and accessories

Part no.  
**0563 3202 77**

### testo 327-2 Set for heating inspectors

- testo 327-2 flue gas analyzer incl. rech. battery and calibration protocol
- Option: CO-H<sub>2</sub> measurement
- Mains unit 100-240 V for mains operation or battery charging in instrument
- Modular flue gas probe, 300 mm long, Ø 8 mm, TÜV approval
- Combustion air temperature probe, immersion depth 190 mm
- Dual wall clearance probe for measuring O<sub>2</sub> in input air
- CO multiple hole probe shaft, 300 mm long, Ø 8 mm
- Flexible probe shaft, 330 mm long, Ø 10 mm, Tmax. 180°C
- Instrument cleaner, 100 ml
- Basic system case for instrument, probes and accessories

Part no.  
**0563 3202 71**

### testo 327-2, Complete set for heating inspectors

- testo 327-2 exhaust gas analyzer, rechargeable battery and calibration protocol included
- Option: CO-H<sub>2</sub> measurement
- testo 308 smoke tester, rechargeable battery and calibration protocol included
- Mains unit 100-240 V for mains operation or charging rechargeable battery in instrument
- Modular flue gas probe, 300 mm long, Ø 8 mm, TÜV approved
- Combustion air temperature probe, 190 mm immersion depth
- Dual wall probe for O<sub>2</sub> supply air measurement
- CO multiple hole probe shaft, 300 mm long, Ø 8 mm
- Flexible probe shaft, 330 mm long, Ø 10 mm, Tmax. 180°C
- Instrument cleaning agent, 100 ml
- Basic system case for instrument, probes and accessories

Part no.  
**0563 3202 78**

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## testo 327

## Accessories

Instrument/Options	Part no.
testo 327-1 flue gas analyser, rechargeable battery and calibration protocol included, measures O <sub>2</sub> , CO, hPa and °C	0632 3201
testo 327-1 O <sub>2</sub> flue gas analyser, rechargeable battery and calibration protocol included, measures O <sub>2</sub> , hPa and °C	0632 3203
testo 327-1 CO flue gas analyser, rechargeable battery and calibration protocol included, measures CO, hPa and °C	0632 3204
testo 327-2 flue gas analyzer, rechargeable battery and calibration protocol included, measures O <sub>2</sub> , CO, hPa and °C	0632 3202

Upgrade/Options	Part no.
Option: CO-H <sub>2</sub> -measurement for testo 327	0440 3273
Option: fine draught measurement, resolution 0.1 Pa, measurement range up to 100 Pa (instead of standard draught measurement) - for testo 327-1, 327-1 O <sub>2</sub> /CO and testo 327-2	0440 3271
Option: fine differential pressure measurement, resolution 1 Pa; for testo 327-2 only	0440 3272
BLUETOOTH® module*	0344 0011

Retrofits	Part no.
Retrofit: O <sub>2</sub> measurement for testo 327-1 CO	
Retrofit: CO measurement for testo 327-1 O <sub>2</sub>	

Spare sensors	Part no.
Spare O <sub>2</sub> sensor for testo 327-1, 327-1 O <sub>2</sub>	0390 0047
Spare CO sensor for testo 327-1, 327-1 CO	0390 0046
Spare O <sub>2</sub> sensor, Testo-specific	0390 0092
Spare CO sensor (without H <sub>2</sub> compensation) (testo 330-1)	0390 0095
Spare CO sensor (H <sub>2</sub> compensated) (testo 330-2/-3)	0390 0109


Probes	Part no.
Compact basic flue gas probes available in two lengths, probe stop, NiCr-Ni thermocouple, 1.5 m hose and particle filter included	
Compact flue gas probe, 180 mm long, Ø 6 mm, Tmax. 500°C	0600 9740
Compact flue gas probe, 300 mm long, Ø 6 mm, Tmax. 500°C	0600 9741
Flexible flue gas probe, 330 mm long, Ø 10.5 mm, connection head 6 mm, Tmax. 180°C, short-term up to 200°C	0600 9742
Modular flue gas probe from the testo 330 product line, available in 2 lengths, probe stop, NiCr-Ni thermocouple, 2.2 m hose and particle filter included	
Flue gas probe, 180 mm long, Ø 8 mm, Tmax 500 °C, TÜV approval	0600 9760
Flue gas probe, 300 mm long, Ø 8 mm, Tmax 500 °C, TÜV approval	0600 9761
Flue gas probe, 180 mm long, Ø 6 mm, Tmax 500 °C	0600 9762
Flue gas probe, 300 mm long, Ø 6 mm, Tmax 500 °C	0600 9763
Flexible flue gas probe, 330 mm long, Tmax. 180 °C, short-term 200 °C, bending radius max. 90° for measuring at inaccessible points	0600 9764




Probe accessories	Part no.
Probe shaft, 180 mm long, Ø 8 mm, Tmax 500 °C	0554 9760
Probe shaft, 180 mm long, Ø 6 mm, Tmax 500 °C	0554 9762
Probe shaft, 300 mm long, Ø 8 mm, Tmax 500 °C	0554 9761
Probe shaft, 300 mm long, Ø 6 mm, Tmax 500 °C	0554 9763
Probe shaft, 335 mm long, with probe stop, Ø 8 mm, Tmax 1000 °C	0554 8764
Flexible probe shaft, 330 mm long, Ø 10 mm, Tmax 180 °C	0554 9764
Multi-hole probe shaft, 300 mm long, Ø 8 mm, for mean CO calculation	0554 5762

Accessories	Part no.
100-240 V AC / 6.3 V DC international mains unit for mains operation or battery charging in instrument	0554 1096
Spare rech. batt. w/ charging station	0554 1087
Testo printer with wireless infrared interface, 1 roll of thermal paper and 4 AA batteries	0554 0547
Spare thermal paper for printer (6 rolls), permanent ink	0554 0568
Instrument cleaner (100 ml)	0554 1207
Smoke tester with oil, soot sheet, for measuring soot in flue gas	0554 0307
Hose connection set for separate gas pressure measurement	0554 1203
Full version easyheat and easyheat.mobile. Software package for PC and Pocket PC. Please order USB cable 0449 0047 separately. (for testo 327-2 only)	0554 1210
ISO calibration certificate/flue gas	0520 0003
Differential temperature set consisting of 2 Velcro probes and temperature adapter	0554 1208
Spare particle filter (10 off)	0554 0040

Cases	Part no.
Basic system case for analyzer, probes and accessories	0516 3330

Additional probes	Illustration	Part no.
Dual wall clearance probe for O <sub>2</sub> supply air measurement		0632 1260

Combustion air temperature probes	Illustration	Part no.
Combustion air temperature probe, immersion depth 300 mm		0600 9791
Combustion air temperature probe, immersion depth 190 mm		0600 9787
Combustion air temperature probe, immersion depth 60 mm		0600 9797
Pipe wrap probe with Velcro		0600 0020
Fast-action surface probe with sprung thermocouple strip, for measurements on floor heating, radiators, insulations...		0604 0194

## testo 330-1 LL

In the testo 330-1 LL, the follow-on costs for the user are greatly reduced by the extended sensor life of up to 6 years for O<sub>2</sub> and CO.

At least one sensor replacement is avoided during the typical duration of use of the instrument.

In addition to this, Testo gives a warranty of 4 years on the complete instrument (testo 330-1 LL incl. O<sub>2</sub> and CO sensors as well as probe).

The great advantage of the flue gas analyzer is its capability for dialogue. At the press of a button, the instrument diagnosis provides information on qualitative status, e.g. the filling level of the condensate trap, or of wearing parts such as the status of the gas sensors.

Maintenance intervals are displayed.

The modular probes, such as those for differential temperature and pressure as well as for flue gas, are automatically recognized by the measuring instrument. The measurement results thus immediately appear in the menu.

## The flue gas analyzer with Longlife sensors

**New**

Now with **Bluetooth®** Wireless transmission

- Instrument diagnosis
- $\Delta T$  measurement, flow/return
- Ambient CO measurement
- Ambient CO<sub>2</sub> measurement
- Detects gas leaks using gas leak detection probe
- $\Delta P$  measurement for gas pressure
- Gas/oil throughput
- 200 measurement data sets, system numbers included
- IRDA interface for data transfer to PDA/Notebook
- BLUETOOTH® wireless transfer (optional)\*
- USB interface for data transfer to PC
- TÜV By RgG 250 acc. to 1. BImSchV
- Official test acc. to EN 50379-2 for O<sub>2</sub>, °C, hPa
- Official test acc. to EN 50379-3 for CO
- Data management with easyheat software (PC) and easyheat.mobile (Pocket PC)
- Interface to automatic burner



**LL**

**4 year warranty on instrument and probe (testo 330-1 LL)**

### testo 330-1 LL

**testo 330-1 LL flue gas analyzer with long-life gas sensors, rechargeable battery and calibration protocol included**

Part no.

**0632 3304**

### Set testo 330-1 LL

#### Pro analysis for heating constructors and fitters

testo 330-1 LL flue gas analyser with rech. battery and calibration protocol	<b>Part no.</b>
Mains unit 100-240 V for mains operation or charging the battery in the instrument	0563 3324 70
Modular flue gas probe, immersion depth: 300 mm, Ø 8 mm	
Combustion air temperature probe, immersion depth: 190 mm	
Hose connection set for separate gas pressure measurement	
IRDA printer	
Flexible probe shaft, 330 mm long, Ø 10 mm, Tmax 180 °C	
Basic system case for instrument, probes and accessories	

### The new testo 330-1 LL communication set

• testo 330-1 LL flue gas analyser with rech. battery and calibration protocol	<b>Part no.</b>
• Power pack 100-240 V for mains operation or battery recharging in analyser	0563 3324 75
• Modular flue gas probe, 300 mm immersion depth, Ø 8 mm	
• Combustion air temperature probe, 190 mm long	
• Hose connection set for separate gas pressure measurement	
• Fast-action IRDA printer and rechargeable battery	
• Full version: easyheat and easyheat.mobile	
• USB cable connecting analyser to PC	
• Basic system case for analyser, probes and accessories	

\*Country permits: The BLUETOOTH® radio module used by Testo is permitted for the following countries and may only be used in those countries, i.e. the BLUETOOTH® wireless transmission may not be used in any other country! Europe including all EU member states: Austria, Belgium, Bulgaria, Czech Republic, Cyprus, Denmark, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Sweden, Slovakia, Slovenia, Spain and Turkey; European countries (EFTA): Iceland, Liechtenstein, Norway, Switzerland; Non-European countries: Ukraine.



## testo 330-2 LL

In the testo 330-2 LL, the follow-on costs for the user are greatly reduced by the extended sensor life of up to 6 years for O<sub>2</sub> and CO.

At least one sensor replacement is avoided during the typical duration of use of the instrument. In addition to this, Testo gives a warranty of 4 years on the complete instrument (testo 330-1 LL incl. O<sub>2</sub> and CO sensors as well as probe).

The flue gas analyzer is a reliable companion – whether in cases of malfunction and emergency, when monitoring legal limit values or in day-to-day maintenance work.

It supports the fast switch between measurement and maintenance. The probe can remain in the flue during draught and exhaust gas zeroing.

For use in extreme conditions, such as in highly contaminated combustion systems, the patented Testo technology guarantees the reliable display of the CO value up to 30,000 ppm.

## The flue gas analyzer with Longlife sensors and integrated draught/gas zeroing

New

Now with **Bluetooth** Wireless transmission

- Instrument diagnosis
- Automatic instrument leak-proofness test
- $\Delta T$  measurement, flow/return
- Ambient CO measurement
- Ambient CO<sub>2</sub> measurement
- Detects leaks with gas leak detection probe
- $\Delta P$  measurement for gas pressure
- Gas/oil throughput
- 400 measurement data sets incl. site address and system no.
- IRDA interface for data transfer to Pocket PC/notebook
- USB interface for data transfer to PC
- Interface to automatic furnaces
- TÜV By RgG 251 acc. to 1. BImSchV
- Official test acc. to EN 50379-2 for O<sub>2</sub>, °C, hPa and CO

- Draught zeroing without probe removal. The probe can remain in the flue during zeroing
- Zeroes flue gas sensors without probe removal

additionally:

- CO measurement with H<sub>2</sub> compensation
- CO measurement with automatic dilution (display up to 30,000 ppm.)



**LL**

**4 year warranty on instrument and probe (testo 330-2 LL)**

### testo 330-2 LL

**testo 330-2 LL flue gas analyser with long-life gas sensors and built-in draught and gas zeroing, rech. batt. and calibration protocol included**

Part no.

**0632 3305**

\*Country permits: The BLUETOOTH® radio module used by Testo is permitted for the following countries and may only be used in those countries, i.e. the BLUETOOTH® wireless transmission may not be used in any other country! Europe including all EU member states: Austria, Belgium, Bulgaria, Czech Republic, Cyprus, Denmark, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Sweden, Slovakia, Slovenia, Spain and Turkey; European countries (EFTA): Iceland, Liechtenstein, Norway, Switzerland; Non-European countries: Ukraine.

### Set testo 330-2 LL

#### Pro analysis for customer service and maintenance technicians

testo 330-2 LL flue gas analyser	Part no.
Mains unit 100-240 V for mains operation or charging battery in instrument	0563 3325 70
Modular flue gas probe, immersion depth: 300 mm, Ø 8 mm	
Combustion air temperature probe, immersion depth: 190 mm	
Hose connection set for separate gas pressure measurement	
IRDA printer	
Flexible probe shaft, 330 mm long, Ø 10 mm, Tmax 180 °C	
Basic system case for instrument, probes and accessories	

### Complete set testo 330-2 LL

#### Pro analysis for customer service and maintenance technicians

Exhaust gas analyzer testo 330-2 LL	Part no.
Smoke tester testo 308	0563 3325 77
Mains unit 100-240 V for mains operation or charging the battery in the instrument	
Modular flue gas probe, length 300 mm, Ø 8 mm	
Combustion temperature probe, immersion depth 190 mm	
Hose connection set for separate gas pressure measurement	
Report printer/IRDA	
Flexible probe pipe, length 330 mm, Ø 10 mm, Tmax. 180°C	
Basic system case for instrument, probes and accessories	

### Set testo 330-2 LL

#### Pro analysis for heating technicians

Exhaust gas analyzer testo 330-2 LL incl. rech. battery and calibration protocol	Part no.
Mains unit 100-240 V for mains operation or charging the battery in the instrument	0563 3325 71
Modular exhaust gas probe, immersion depth 300 mm, Ø 8 mm	
CO multi-hole probe shaft suitable for modular exhaust gas probe	
Combustion air temperature probe, immersion depth 190 mm	
Hose connection set for separate gas pressure measurement	
Flexible probe shaft, 330 mm long, Ø 10 mm, Tmax 180 °C	
Dual wall clearance probe	
Basic system case for instrument, probes and accessories	

### testo 330-2 LL, Complete set

#### Pro analysis for heating inspectors

testo 330-2 LL exhaust gas analyzer, rechargeable battery and calibration protocol included	Part no.
testo 308 smoke tester	0563 3325 78
Mains unit 100-240 V for mains operation or charging the rechargeable battery in instrument	
Modular flue gas probe, 300 mm immersion depth, Ø 8 mm	
CO multiple hole probe shaft suitable for modular flue gas probe	
Combustion air temperature probe, 190 mm immersion depth	
Hose connection set for separate gas pressure measurement	
Flexible probe shaft, 330 mm long, Ø 10 mm, Tmax 180 °C	
Dual wall probe	
Basic system case for instrument, probes and accessories	

### The new testo 330-2 LL communication set

testo 330-2 LL flue gas analyser with rech. battery and calibration protocol	Part no.
Power pack 100-240 V for mains operation or battery recharging in analyser	0563 3325 75
Modular flue gas probe, 300 mm immersion depth, Ø 8 mm	
Combustion air temperature probe, 190 mm long	
Hose connection set for separate gas pressure measurement	
Fast-action IRDA printer and rechargeable battery	
Full version: easyheat and easyheat.mobile	
USB cable connecting analyser to PC	
Basic system case for analyser, probes and accessories	

### The new testo 330-2 LL communication complete set

Exhaust gas analyzer testo 330-2 LL incl. battery and calibration protocol	Part no.
Smoke tester testo 308	0563 3325 79
Mains unit 100-240 V for mains operation or charging the battery in the instrument	
Modular flue gas probe, immersion depth 300 mm, Ø 8 mm	
Combustion temperature probe, length 190 mm	
Hose connection set for separate gas pressure measurement	
Full version easyheat and easyheat.mobile	
USB connection cable, instrument to PC	
Basic system case for instrument, probes and accessories	



## testo 330-LL

## Technical data






## testo 330-LL

Temperature measurement	Meas. range	-40 to +1200 °C	
	Accuracy (±1 digit)	±0,5 °C (0.0 to +100.0 °C) ±0,5 % of mv (remaining range)	
	Resolution	0.1 °C (-40 to 999,9 °C) 1 °C (remaining range)	
Draught measurement	Meas. range	-9.99 to +40 hPa	
	Accuracy (±1 digit)	±0.02 hPa or ±5% of mv (-0.50 to +0.60 hPa) ±0.03 hPa (+0.61 to +3.00 hPa) ±1.5% of mv (+3.01 to +40.00 hPa)	
	Resolution	0.01 hPa	
Pressure measurement	Meas. range	0 to 200 hPa	
	Accuracy (±1 digit)	±0.5 hPa (0.0 to 50.0 hPa) ±1% of mv (50.1 to 100.0 hPa) ±1.5 % of mv (remaining range)	
	Resolution	0.1 hPa	
O <sub>2</sub> measurement	Meas. range	0 to 21 Vol. %	
	Accuracy (±1 digit)	±0.2 Vol. %	
	Resolution	0.1 Vol. %	
	Response time t <sub>90</sub>	< 20 s	
CO measurement		testo 330-1 LL (without H2 compensation)	testo 330-2 LL (H2 compensated)
	Meas. range	0 to 4000 ppm	0 to 8000 ppm
	Accuracy (±1 digit)	±20 ppm (0 to 400 ppm) ±5% of mv (401 to 1000 ppm) ±10% of mv (1001 to 4000 ppm)	±10 ppm or ±10% of mv (0 to 200 ppm) ±20 ppm or ±5% of mv (201 to 2000 ppm) ±10% of mv (2001 to 8000 ppm)
	Resolution	1 ppm	1 ppm
	Response time t <sub>90</sub>	< 60 s	< 40 s
			From 8000 ppm: Display range 8000 to 30000 ppm (automatic dilution) / 500 ppm resolution
Efficiency measurement (η)	Meas. range	0 to 120%	
	Resolution	0.1%	
Flue gas loss (qA)	Meas. range	0 to 99.9%	
	Resolution	0.1%	
CO <sub>2</sub> measurement digital calculation from O <sub>2</sub>	Display range	0 to CO <sub>2</sub> max	
	Accuracy (±1 digit)	±0.2 Vol. %	
	Resolution	0.1 Vol. %	
	Response time t <sub>90</sub>	< 40 s	
Option: NO <sub>low</sub> measurement	Meas. range	0 to 300 ppm	
	Accuracy (±1 digit)	±2 ppm (0.0 to 40.0 ppm) ±5% of mv (remaining range)	
	Resolution	0.1 ppm	
	Response time t <sub>90</sub>	< 30 s	
Option: NO measurement	Meas. range	0 to 3000 ppm	
	Accuracy (±1 digit)	±5 ppm (0 to 100 ppm) ±5% of mv (101 to 2000 ppm) ±10% of mv (2001 to 3000 ppm)	
	Resolution	1 ppm	
	Response time t <sub>90</sub>	< 30 s	
Ambient CO measurement (with CO probe)	Meas. range	0 to 500 ppm	
	Accuracy (±1 digit)	±5 ppm (0 to 100 ppm) ±5% of mv (>100 ppm)	
	Resolution	1 ppm	
	Response time t <sub>90</sub>	Approx. 35 s	
Gas leak measurement for combustible gases (with gas leak detection probe)	Display range	0 to 10,000 ppm CH <sub>4</sub> / C <sub>3</sub> H <sub>8</sub>	
	Signal	Optical display (LED) Audible display via buzzer	
	Adjustment time t <sub>90</sub>	< 2 s	
Ambient CO <sub>2</sub> measurement (with ambient CO <sub>2</sub> probe)	Meas. range	0 to 1 Vol. % 0 to 10000 ppm	
	Accuracy (±1 digit)	±(50 ppm ±2% of mv) (0 to 5000 ppm)	
	Response time t <sub>90</sub>	Approx. 35 s	
Warranty	testo 330-1 LL/-2 LL	Instrument/probe/gas sensors (O <sub>2</sub> , CO) NO, NO <sub>low</sub> sensor Thermocouple and battery	4 years 2 years 1 year


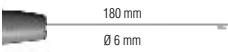
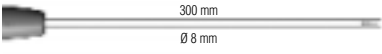

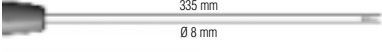
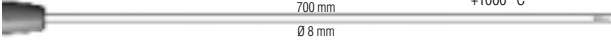

## Common data





Oper. temp.	-5 to +45 °C
Storage temp.	-20 to +50 °C
Dimensions	270 x 90 x 65 mm
Weight	600 g (w/o rech. battery)
Memory	testo 330-1 LL: 200 Sites testo 330-2 LL: 400 Sites
Display	Graphics display 160 x 240 pixel
Power supply	Rech. batt. block 3.7 V / 2.2 Ah Mains unit 6 V / 1.2 A


\*the larger value applies




Modular flue gas probes	Illustration	Tmax	Part no.
Flue gas probe, 180 mm long, Ø 8 mm, Tmax 500 °C, TÜV approval		+500 °C	0600 9760
Flue gas probe, 300 mm long, Ø 8 mm, Tmax 500 °C, TÜV approval		+500 °C	0600 9761
Flue gas probe, 180 mm long, Ø 6 mm, Tmax 500 °C		+500 °C	0600 9762
Flue gas probe, 300 mm long, Ø 6 mm, Tmax 500 °C		+500 °C	0600 9763
Flexible flue gas probe, 330 mm long, Tmax 180 °C, short-term 200 °C, bending radius max. 90° for measuring at inaccessible points		+180 °C	0600 9764

**Modular flue gas probes, available in 2 lengths, incl. probe stop, NiCr-Ni thermocouple, 2.2m hose and particle filter**

Probe accessories	Illustration	Tmax	Part no.
Probe shaft, 180 mm long, Ø 8 mm, Tmax 500 °C		+500 °C	0554 9760
Probe shaft, 180 mm long, Ø 6 mm, Tmax 500 °C		+500 °C	0554 9762
Probe shaft, 300 mm long, Ø 8 mm, Tmax 500 °C		+500 °C	0554 9761
Probe shaft, 300 mm long, Ø 6 mm, Tmax 500 °C		+500 °C	0554 9763
Probe shaft, 335 mm long, with probe stop, Ø 8 mm, Tmax 1000 °C		+1000 °C	0554 8764
Probe shaft, 700 mm long, with probe stop, Ø 8 mm, Tmax 1000 °C		+1000 °C	0554 8765
Flexible probe shaft, 330 mm long, Ø 10 mm, Tmax 180 °C		+180 °C	0554 9764
Multi-hole probe shaft, 300 mm long, Ø 8 mm, for mean CO calculation			0554 5762
Multi-hole probe shaft, 180 mm long, Ø 8 mm, for mean CO calculation			0554 5763
Hose extension, 2.8 m, extension cable for probe and analyser			0554 1202
6 mm probe stop, PTFE, with spring clamp and handle, Tmax 200 °C			0554 3327
8 mm probe stop, PTFE, with spring clamp and handle, Tmax 200 °C			0554 3328
8 mm probe stop, steel, with spring clamp and handle, Tmax 500 °C			0554 3330
6 mm, probe stop, steel, with spring clamp and handle, Tmax 500 °C			0554 3329

Additional probes	Illustration	Meas. range	Accuracy	Part no.
Dual wall clearance probe for O <sub>2</sub> supply air measurement				0632 1260
Gas leak probe				0632 3330
Ambient CO probe, for detecting CO in buildings and rooms		Fixed cable 1.5 m	0 to +500 ppm CO ±5% of mv (+100.1 to +500 ppm CO) ±5 ppm CO (0 to +100 ppm CO)	0632 3331
Ambient CO <sub>2</sub> probe		Plug-in head, connection cable 0430 0143 or 0430 0145 required	0 ... +1 Vol. % CO <sub>2</sub> 0 ... +10000 ppm CO <sub>2</sub> ±(50 ppm CO <sub>2</sub> ±2% of mv)(0 to +5000 ppm CO <sub>2</sub> ) ±(100 ppm CO <sub>2</sub> ±3% of mv)(+5001 to +10000 ppm CO <sub>2</sub> )	0632 1240

Ambient air temperature probes	Illustration	Meas. range	Accuracy	t99	Part no.
Combustion air temperature probe, immersion depth 300 mm		0 to +100 °C	±0.5 °C (0 to +100 °C)	30 s	0600 9791
Combustion air temperature probe, immersion depth 190 mm		0 to +100 °C			0600 9787
Combustion air temperature probe, immersion depth 60 mm		0 to +100 °C	±0.5 °C (0 to +100 °C)	30 s	0600 9797

Temperature probes	Illustration	Meas. range	Accuracy	t99	Part no.
Mini ambient air probe, Tmax +80°C, for separate ambient air temperature measurement		0 to +80 °C			0600 3692
Pipe wrap probe for pipes with diameter of up to 2", for flow/return temp. meas. in hydronic systems		-60 to +130 °C	Class 2	5 s	0600 4593
Fast-action surface probe with sprung thermocouple strip, for measurements on floor heating, radiators, insulations...		-200 to +300 °C	Class 2	3 s	0604 0194

Plug-in head, connection cable 0430 0143 or 0430 0145 required

Accessories	Part no.
Connection cable, 1.5 m long	0430 0143

Accessories	Part no.
<b>Instrument options and upgrades</b>	
Option: Fine draught measurement, Resolution 0.1 Pa, measurement range to 100 Pa (instead of the standard draught measurement)	0440 3921
Option: NO sensor, meas. range 0 to 3000 ppm, 1 ppm resolution	0440 3922
Option: NOlow sensor, meas. range 0 to 300 ppm, 0.1 ppm resolution	0440 3931
BLUETOOTH® module	0344 0011
Retrofit: NO sensor, meas. range 0 to 3000 ppm, 1 ppm resolution	0554 3922
Retrofit: NOlow sensor, meas. range 0 to 300 ppm, 0.1 ppm resolution	0554 3931

Spare sensors	Part no.
O2 sensor for testo 330-1 LL/-2 LL	0390 0061
CO sensor (without H2 compensation) for testo 330-1 LL	0390 0110
CO sensor (H2 compensated) for testo 330-2 LL	0390 0090
NO sensor 0-3000 ppm for testo 330-1 LL/-2 LL	0390 0074
NOlow sensor 0 to 300 ppm	0390 0094

#### Upgrade testo 330-1 to testo 330-1 LL (only possible by Testo service!)

Upgrade testo 330-1 to testo 330-1 LL consisting of:

Option code upgrade	0450 1100
Retrofit: O2 LL sensor	0554 3938
Retrofit: CO LL sensor	0554 3936

#### Upgrade testo 330-2 to testo 330-2 LL (only possible by Testo service!)

Upgrade testo 330-2 to testo 330-2 LL consisting of:

Option code upgrade	0450 1100
Retrofit: O2 LL sensor	0554 3938
Retrofit: CO LL sensor	0554 3937

Printer and accessories	Part no.
Testo printer with wireless infrared interface, 1 roll of thermal paper and 4 AA batteries, for printout of reading on site	0554 0547
Spare thermal paper for printer (6 rolls), permanent ink, measurement data documentation legible for up to 10 years	0554 0568

Accessories	Part no.
<b>Transport and Protection</b>	
Basic system case for analyzer, probes and accessories	0516 3330
Basic system case with two levels for analyser, probes and additional accessories	0516 3331
Tools system case with tools section, without contents, attachable to basic system case	0516 0329
Versatile system case without sections, attachable to basic system case, For easy storage of analyser and additional accessories	0516 0331
Measurement case (leather) with drawers for instruments and accessories	0516 0303

Software	Part no.
easyheat PC analysis software, shows measurement in form of diagrams, tables and manages customer data	0554 3332
Demo version easyheat and easyheat.mobile.	0554 1212
Full version easyheat and easyheat.mobile. Software package for PC and Pocket PC. Please order USB cable 0449 0047 separately.	0554 1210
USB connection cable, instrument to PC	0449 0047

Additional accessories and spare parts	Part no.
100-240 V AC / 6.3 V DC international mains unit for mains operation or battery charging in instrument	0554 1096
Spare rech. batt. w/ charging station	0554 1087
Barcode reader, to read in customer number on site	0554 0461
Instrument cleaner (100 ml)	0554 1207
Adhesive pockets (50 off) for printout, paper barcode labels...	0554 0116
Smoke tester with oil, soot sheet, for measuring soot in flue gas	0554 0307
Hose connection set for separate gas pressure measurement	0554 1203
Differential temperature set consisting of 2 pipe clamp probes and adapter	0554 1204
Spare particle filter (10 off)	0554 3385
Readout adapter for automatic furnaces	0554 1206

Calibration certificates	Part no.
ISO calibration certificate/flue gas, calibration points 2.5% O2; 100 and 1000 ppm CO; 800 ppm NO; 80 ppm NO2; 1000 ppm SO2	0520 0003

## testo 325-I

## Industrial flue gas – Affordable analysis and documentation

testo 325-I is the introduction to affordable flue gas analysis for SO<sub>2</sub>. It combines precision with user-friendly operation and low costs. It is the ideal instrument for checking emissions and monitoring thermal processes.

- User-friendly operation and handling – large display
- Gas sensor can be easily changed by the user



### 1 testo 325-I SO<sub>2</sub> Set

SO<sub>2</sub> Set includes analyser and sampling probe (with Tygon® hose), with batteries and calibration protocol

Part no.

**0563 3260**

### Flue gas probes

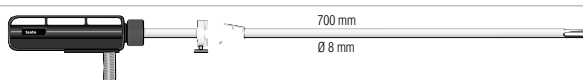
Sampling probe, 300 mm immersion depth, Ø 6 mm, Tmax. +500 °C, 3 m hose, without handle, is included in SO<sub>2</sub> set

### Illustration

### Part no.

Included in set

Sampling probe, 700 mm immersion depth, incl. probe stop, Tmax +1000°C, 3 m hose



0699 3451/3

### Technical data

Meas. range	0 to +3000 ppm SO <sub>2</sub>
Accuracy	±5% of mv
±1 digit	(+400 to +3000 ppm SO <sub>2</sub> )
	±20 ppm SO <sub>2</sub> (0 to +400 ppm SO <sub>2</sub> )
Response time t <sub>90</sub>	< 80 s
Resolution	1 ppm SO <sub>2</sub>
Oper. temp.	+4 to +45 °C
Storage temp.	-20 to +50 °C
Battery life	4 h

Power supply	Mains unit
Battery type	4 AA batteries
Battery life	+4 to +45 °C
Material/Housing	ABS
Dimensions	216 x 68 x 47 mm
Weight	500 g
Warranty:	
Measuring instrument:	2 years (excluding working parts, e.g. gas sensors, ...)
Gas sensors:	6 months
Power supply:	Battery or power unit

### Accessories

### Part no.

#### Printer and accessories

Testo printer with wireless infrared interface, 1 roll of thermal paper and 4 AA batteries, for printout of reading on site

0554 0547

External fast charger for 1-4 AA rech. batteries, incl. 4 Ni-MH rech. batteries with individual cell charging and charge control display, incl. impulse trickle charging, integrated discharge function, with built-in international mains plug, 100-240 V, 300 mA, 50/60 Hz

0554 0610

Spare thermal paper for printer (6 rolls)

0554 0569

Spare thermal paper for printer (6 rolls), permanent ink, measurement data documentation legible for up to 10 years

0554 0568

#### Transport and Protection

Transport case (plastic) for instrument, probes and accessories, for safe and orderly storage

0516 3250

#### Additional accessories and spare parts

Sealing cone with knurled screw for sampling probe

0554 9050

Mains unit 230 V/ 8 V/ 1 A, for instrument (European plug), for mains operation and battery recharging

0554 1084

Spare particle filter (10 off), for CO flue gas probe

0554 0040

Smoke tester with oil, soot sheet, for measuring soot in flue gas

0554 0307

Filter paper to determine smoke number, 40 strips for approx. 200 measurements

0554 0308

## testo 325-I CO<sub>high</sub>

testo 325-I CO<sub>high</sub> [O<sub>2</sub>] is your starter instrument for affordable flue gas analysis. User-friendly operation and low purchasing and maintenance costs make it the ideal mobile partner for monitoring the atmosphere of thermal processes in the production sector and tuning process burners and gas motors.

## Your introduction to portable flue gas analysis

- The readings are shown constantly in the display for as long as the pump as is running.
- Gas sensors are easily changed by the user
- Instrument protection on account of detachable condensate trap



**2** testo 325-I CO<sub>high</sub>  
Flue gas analyzer equipped with CO, rechargeable batteries and calibration protocol included

Part no.

**0632 3264**

**3** testo 325-I CO<sub>high</sub> [O<sub>2</sub>]  
Flue gas analyzer equipped with CO, O<sub>2</sub>, rechargeable batteries and calibration protocol included

Part no.

**0632 3265**

### Recommended set

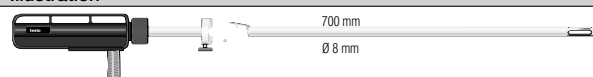
**Basic Set: testo 325-I CO<sub>high</sub> [O<sub>2</sub>] in case**

- testo 325-I CO<sub>high</sub> [O<sub>2</sub>] Flue gas analyzer equipped with CO, O<sub>2</sub>, rechargeable batteries and calibration protocol included (Part no. 0632 3265)
- Mains unit 230 V/ 8 V/ 1 A, for instrument (European plug) (Part no. 0554 1084)
- Flexible flue gas probe, specially for measuring motor emissions, Tmax +500°C, 3 m hose (Part no. 0600 9640)
- Spare particle filter (10 off) (Part no. 0554 0040)
- Transport case (plastic) for instrument, probes and accessories (Part no. 0516 3250)

### Flue gas probes

Sampling probe, 700 mm immersion depth, incl. probe stop, Tmax +1000°C, 3 m hose

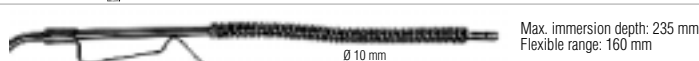
### Illustration



### Part no.

0699 3451/3

Flexible flue gas probe, specially for measuring motor emissions, Tmax +500°C, 3 m hose

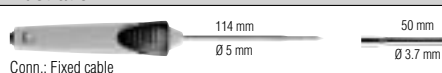


0600 9640

### Temperature probes

Waterproof immersion/penetration probe, TC Type K

### Illustration



### Meas. range

-60 to +400 °C

### Accuracy

Class 2

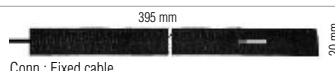
### t99

7 s

### Part no.

0602 1293

Pipe wrap probe with Velcro strip, for temperature measurement on pipes with diameter up to max. 120 mm, Tmax +120°C, TC Type K



-50 to +120 °C

Class 1

90 s

0628 0020

Robust air probe, T/C Type K



-60 to +400 °C

Class 2

25 s

0602 1793

### Technical data

	<b>2 + 3</b> CO (testo 325-I CO <sub>high</sub> [O <sub>2</sub> ])	<b>3</b> O <sub>2</sub> (testo 325-I CO <sub>high</sub> [O <sub>2</sub> ])
Meas. range	0 to 7 Vol. % CO	0 to 21 Vol. % O <sub>2</sub>
Accuracy	±40 ppm (0 to 0.08 Vol. %) ±5% of mv (0.08 to 0.2 Vol. %) ±10% of mv (0.2 to 7 Vol. %)	±0.2 Vol. % O <sub>2</sub>
Resolution	0.001 Vol. % CO	0.1 Vol. % O <sub>2</sub>

### Common data

Meas. range	-40 to +1000 °C	<b>Warranty</b>  Meas. instr.: 2 years (excluding wear parts, e.g. gas sensors, ...); O <sub>2</sub> sensor: 1.5 years; CO sensor: 1 year
Accuracy	±0.5 °C (-40 to +99.9 °C) ±0.5 % of mv (+100 to +1000 °C)	
Resolution	0.1 °C	
Oper. temp.	-5 to +45 °C	
Storage temp.	-20 to +50 °C	

### Accessories

	Part no.
Transport case (plastic) for instrument, probes and accessories, for safe and orderly storage	0516 3250
Mains unit 230 V/ 8 V/ 1 A, for instrument (European plug), for mains operation and battery recharging	0554 1084
Testo printer with wireless infrared interface, 1 roll of thermal paper and 4 AA batteries, for printout of reading on site	0554 0547
Spare thermal paper for printer (6 rolls)	0554 0569
Spare thermal paper for printer (6 rolls), permanent ink, measurement data documentation legible for up to 10 years	0554 0568
Spare particle filter (10 off), for CO flue gas probe	0554 0040



## testo 335

testo 335 is the new generation flue gas analyser, specially tailored to industrial applications' requirements. testo 335 can be used for all emission monitoring applications by the operators of industrial furnaces such as processing and power plants, by service technicians for burner/furnace manufacturers, for plant construction as well as for stationary motors. Even spot measurements for up to 2 hours are possible.

testo 335 flue gas analyzer, rechargeable battery and calibration protocol included, equipped with O<sub>2</sub> sensor

*A second gas sensor must be fitted in testo 335, the instrument will not be able to function otherwise. A maximum of two additional sensors can be fitted.*

Part no.

**0632 3350**

## Compact flue gas analyzer

- **Two toxic sensors freely selectable** – CO, CO<sub>low</sub>, NO, NO<sub>low</sub>, NO<sub>2</sub>, SO<sub>2</sub>
- **Two different measurement range extensions** – To continue measurement despite high CO concentrations
  - **Standard:** Single dilution Slot 2 (CO, NO<sub>2</sub>, SO<sub>2</sub>) with dilution factor 5
  - **Option:** Dilution for all sensors with dilution factor 2
- **Option: Parallel ΔP or m/s measurement for flue gas analysis** – Simultaneous, convenient flow or mass flow measurement
- **Powerful, automatically controlled diaphragm pump** – Benefits:
  - Constant pump flow over a wide negative or positive pressure range (-200 to +50 hPa)
  - Gas sampling hose up to max. 7.8 m long (corresponds to two hose extensions, each 2.8 m)
- **18 standard fuels and an additional 10 user-defined fuels** – Fuel data is calculated using the new "easyEmission" software
- **Industrial probes with a new probe preliminary filter** Up to max. 1000 °C
- **Graphic representation of sensor calibration data**
- **Calculated flue gas dewpoint parameter**
- **Logger function** – Records data in analyser for up to 2 hours
- **Initialisation of gas sensors without removing probe from flue**
- Accuracy approved for O<sub>2</sub>, CO<sub>2</sub>, CO, NO, NO<sub>low</sub>, °C, hPa to EN Standard 50379 Part 2



### Options

### Part no.

*A second gas sensor must be fitted in testo 335, the instrument will not be able to function otherwise. A maximum of two additional sensors can be fitted.*

Option: CO sensor, 0 to 10000 ppm	0440 3988
Option: CO <sub>low</sub> sensor, 0 to 500 ppm	0440 3936
Option: NO sensor, built-in in analyser box, 0 to +3000 ppm NO	0440 3935
Option: NO <sub>low</sub> sensor, 0 to +300 ppm NO	0440 3928
Option: NO <sub>2</sub> sensor, 0 to +500 ppm NO <sub>2</sub>	0440 3926
Option: SO <sub>2</sub> sensor, 0 to +5000 ppm SO <sub>2</sub>	0440 3927
Option: dilution of all sensors	0440 3350
Option: pressure/flow measurement	0440 3351
BLUETOOTH® module*	0344 0011

Information about instrument upgrades and prices available on request.

The compact flue gas analyzer, testo 335, provides an affordable introduction to industrial flue gas analysis engineering. It can be used to carry out spot check measurements lasting up to 2 hours in pure gas, for burner tuning or process monitoring.

### Benefits:

- Measurement range extension for CO to continue measuring even in high CO concentrations
- Automatically controlled gas pump for constant pump flow at a negative pressure of -200 mbar up to a positive pressure of max. 50 mbar

\*Country permits: The BLUETOOTH® radio module used by Testo is permitted for the following countries and may only be used in those countries, i.e. the BLUETOOTH® wireless transmission may not be used in any other country! Europe including all EU member states: Austria, Belgium, Bulgaria, Czech Republic, Cyprus, Denmark, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Sweden, Slovakia, Slovenia, Spain and Turkey; European countries (EFTA): Iceland, Liechtenstein, Norway, Switzerland; Non-European countries: Ukraine.

**Standard probes, 335 mm long**

Flue gas probe, modular, 335 mm immersion depth, incl. probe stop, thermocouple NiCr-Ni (Ti) Tmax 500°C and hose 2.2 m

**Part no.**

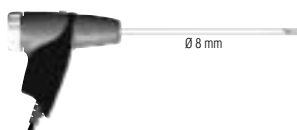
0600 9766

Flue gas probe, modular, 335 mm immersion depth, incl. probe stop, thermocouple NiCr-Ni (Ti) Tmax 1000°C and hose 2.2 m

0600 8764

Flue gas probe, modular, with preliminary filter, 335 mm immersion depth, incl. probe stop, thermocouple NiCr-Ni (Ti) Tmax 1000°C and hose 2.2 m

0600 8766


**Standard probes, 700 mm long**

Flue gas probe, modular, 700 mm immersion depth, incl. probe stop, thermocouple NiCr-Ni (Ti) Tmax 500°C and hose 2.2 m

**Part no.**

0600 9767

Flue gas probe, modular, 700 mm immersion depth, incl. probe stop, thermocouple NiCr-Ni (Ti) Tmax 1000°C and hose 2.2 m

0600 8765

Flue gas probe, modular, with preliminary filter, 700 mm immersion depth, incl. probe stop, thermocouple NiCr-Ni (Ti) Tmax 1000°C and hose 2.2 m

0600 8767


**Accessories**

Hose extension, 2.8 m, extension cable for probe and analyser

**Part no.**

0554 1202

Probe shaft with preliminary filter, 335 mm long, with probe stop, Ø 8 mm, Tmax 1000 °C

0554 8766

Probe shaft with preliminary filter, 700 mm long, with probe stop, Ø 8 mm, Tmax 1000 °C

0554 8767

Spare sintered filter (2 off)

0554 3372

Probe shaft, 700 mm long, with probe stop, Ø 8 mm, Tmax 500 °C

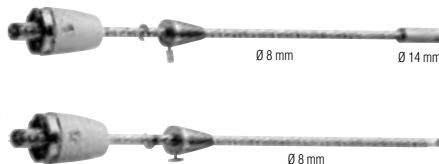
0554 9767

Probe shaft, 335 mm long, with probe stop, Ø 8 mm, Tmax 1000 °C

0554 8764

Probe shaft, 700 mm long, with probe stop, Ø 8 mm, Tmax 1000 °C

0554 8765


**Industrial probes**

Adapter, non-heated

**Part no.**

0600 7911

Extension pipe to +600 °C, stainless steel 1.4571

Extension pipe to +1200 °C, Inconel 625

Ambient temp.: -20 to +50 °C; Protection class: IP54; Gas inlet: G1/4"; Gas outlet: M 10x1 outer thread; Weight: 0.4 kg

Connection: Thread screw/screw socket G1/4"; Weight: 0.45 kg

0600 7802

0600 7804

Non-heated sampling pipe to +600 °C, stainless steel 1.4571

Non-heated sampling pipe to +1200 °C, Inconel 625

Connection: G1/4" Weight 0.4 kg

0600 7801

0600 7803

Non-heated sampling pipe to +1800 °C, Al-Oxide

Connection: G1/4" Weight 0.4 kg

0600 7805

Preliminary filter for dusty flue gases, ceramic

Preliminary filter can only be mounted on extension pipe 0600 7802 or 0600 7804.

Gas sampling hose for accurate NO<sub>2</sub>/SO<sub>2</sub> measurements with built-in condensate trap, 2.2 m long

Dust load: max. 20 g / m<sup>3</sup>; filter fineness: 20 µm; Temperature: max. 1000 °C; Material: ceramic; Connection: G1/4" thread nipple; Weight: 0.2 kg

0554 0710

Thermocouple, NiCr-Ni, -200 to +1200 °C, Inconel 625, 1.2 m long

Thermocouple, NiCr-Ni, -200 to +1200 °C, Inconel 625, 2.2 m long

Thermocouple, NiCr-Ni, -200 to +1200 °C, Inconel 625, 3.2 m long

Connection: To analyser via 4 m connection cable with 8 pin plug; Weight: 0.15 kg. The length depends on the number of sampling and extension pipes used.

0430 0065

0430 0066

0430 0067

Mounting flange, stainless steel 1.4571, adjustable quick-action fitting suitable for all sampling/extension pipes



0554 0760

**Transport case for industry probes**

Transport case for industrial probes, aluminium, space for: handle, probes, flange and accessories

**Part no.**

0516 7900

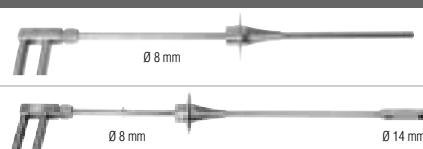
**Gas sampling probes for measurements on industrial motors**

Flue gas probe for industrial motors, 335 mm immersion depth, with probe stop, built-in condensate trap and heat protection plate, Tmax 1000 °C, special hose for NO<sub>2</sub>/SO<sub>2</sub> measurements, 2.2 m long

**Part no.**

0600 7560

Flue gas probe for industrial motors with probe shaft prefilter, 335 mm immersion depth, with probe stop, built-in condensate trap and heat protection plate, Tmax 1000 °C, special hose for NO<sub>2</sub>/SO<sub>2</sub> measurements, 2.2 m long



0600 7561

**Accessories for gas sampling probes for measurements on industrial engines**

Spare particle filter (10 off) for condensate trap in gas sampling hose and measurement range extension (gas dilution) testo 360

**Part no.**

0554 3371

Spare sintered filter (2 off)



0554 3372

Thermocouple for exhaust gas temperature measurement (NiCr-Ni, length 400 mm, Tmax. +1000 °C), with 2.4 m connection cable and additional temperature protection



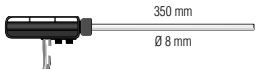
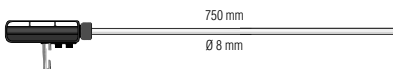
0600 8894

## testo 335

## More probes

For testo 300 M-I/XL-I	Illustration	Meas. range	Accuracy	t <sub>99</sub>	Part no.
Mini ambient air probe, T <sub>max</sub> +80 °C, for separate ambient air temperature measurement		0 to +80 °C			0600 3692
Pipe wrap probe for pipes with diameter of up to 2", for flow/return temp. meas. in hydronic systems	 Conn.: Fixed cable	-60 to +130 °C	Class 2	5 s	0600 4593
Combustion air temperature probe, immersion depth 60 mm					0600 9797

Pitot tubes for flow measurement	Illustration	Meas. range	Part no.
Pitot tube, 350 mm long, stainless steel, for measuring flow velocity in connection with 0638 1347/..1447 pressure probes		Oper. temp. 0 to +600 °C	0635 2145
Pitot tube, 1000 mm long, stainless steel, measures flow speed with pressure probes 0638 1347/..1447		Oper. temp. 0 to +600 °C	0635 2345
Pitot tube, stainless steel, 350 mm long, measures flow speed with temperature, 3 x hoses (5 m long) and heat protection plate		-40 to +1000 °C	0635 2041
Pitot tube, stainless steel, 750 mm long, measures flow speed with temperature, 3x hoses (5 m long) and heat protection plate		-40 to +1000 °C	0635 2042
Connection hose, silicone, 5m long, max. load 700 hPa (mbar)			0554 0440

## testo 335

## Accessories

Accessories	Part no.
100-240 V AC / 6.3 V DC international mains unit, for mains operation or battery charging in instrument	0554 1096
"easyEmission" software for testo 335, with USB cable to connect instrument to PC	0554 3334
Testo printer with wireless infrared interface, 1 roll of thermal paper and 4 AA batteries, for printout of reading on site	0554 0547
Spare thermal paper for printer (6 rolls), permanent ink, measurement data documentation legible for up to 10 years	0554 0568
Spare thermal paper for printer (6 rolls)	0554 0569
Holster (SoftCase) for testo 335 with belt	0516 0335
Spare rech. batt. w/ charging station	0554 1087
Spare particle filter (10 off)	0554 3385
Instrument cleaner (100 ml), for easy and fast removal of dirt from housing, display screen, keypad, probe handle and probe cable	0554 1207
USB connection cable instrument-PC	0449 0047
Multiple licence software "easyEmission" for testo 335	0554 3338
Transport case, for measuring instrument and probes	0516 3350
ISO calibration certificate/flue gas, calibration points 2.5% O <sub>2</sub> ; 100 and 1000 ppm CO; 800 ppm NO; 80 ppm NO <sub>2</sub> ; 1000 ppm SO <sub>2</sub>	0520 0003
Information about instrument upgrades and prices available on request.	

Recommended set
<b>Professional set for measuring emissions</b>
<ul style="list-style-type: none"> <li>- testo 335 flue gas analyzer, rechargeable battery and calibration protocol included, equipped with O<sub>2</sub> sensor (Part no. 0632 3350)</li> <li>- Option: CO sensor (Part no. 0440 3988)</li> <li>- Option: NO sensor (Part no. 0440 3935)</li> <li>- Option: dilution of all sensors (Part no. 0440 3350)</li> <li>- Option: pressure/flow measurement (Part no. 0440 3351)</li> <li>- Flue gas probe, modular, 335 mm immersion depth, incl. probe stop, thermocouple NiCr-Ni (Ti) T<sub>max</sub> 1000 °C and hose 2.2 m (Part no. 0600 8764)</li> <li>- Pitot tube, stainless steel, 350 mm long, measures flow speed with temperature, 3 x hoses (5 m long) and heat protection plate (Part no. 0635 2041)</li> <li>- 100-240 V AC / 6.3 V DC international mains unit (Part no. 0554 1096)</li> <li>- Spare particle filter (10 off) (Part no. 0554 3385)</li> <li>- Connection hose, silicone, 5m long (Part no. 0554 0440)</li> <li>- Transport case (Part no. 0516 3350)</li> </ul>

During quick checks on emissions, flow speed is also measured simultaneously with flue gas. In this way, for example, the position of a stationary sampling probe can be checked or mass flow can be calculated simultaneously.

### Benefit:

- Measurement range extension for all sensors - gas sensors can be protected in the case of unexpectedly high concentrations of different gases and the measurement can continue

	Meas. range	Accuracy	Resolution	Response time
O <sub>2</sub> measurement	0 to 25 Vol. %	±0.2 Vol. %	0.01 Vol. %	t <sub>90</sub> <20 s
CO measurement (H <sub>2</sub> compensated)	0 to 10000 ppm	±10 ppm or ±10% of mv (0 to 200 ppm) ±20 ppm or ±5% of mv (201 to 2000 ppm) ±10% of mv (2001 to 10000 ppm)	1 ppm	t <sub>90</sub> <40 s
CO <sub>low</sub> measurement (H <sub>2</sub> compensated)	0 to 500 ppm	±2 ppm (0 to 39.9 ppm) ±5% of mv (remaining range) <sup>x</sup>  <sup>x</sup> Data correspond to 20°C ambient temperature. Additional temperature coefficient 0.25% of mv/K.	0.1 ppm	t <sub>90</sub> <40 s
NO measurement	0 to 3000 ppm	±5 ppm (0 to 99 ppm) ±5% of mv (100 to 1999 ppm) ±10% of mv (2000 to 3000 ppm)	1 ppm	t <sub>90</sub> <30 s
NO <sub>low</sub> measurement	0 to 300 ppm	±2 ppm (0 to 39.9 ppm) ±5% of mv (remaining range)	0.1 ppm	t <sub>90</sub> <30 s
NO <sub>2</sub> measurement*	0 to 500 ppm	±10 ppm (0 to 199 ppm) ±5% of mv (remaining range)	0.1 ppm	t <sub>90</sub> <40 s
SO <sub>2</sub> measurement*	0 to 5000 ppm	±10 ppm (0 to 99 ppm) ±10% of mv (remaining range)	1 ppm	t <sub>90</sub> <40 s
Temperature meas. Probe type	-40 to +1200 °C	±0.5 °C (0 to +99 °C) ±0.5 % of mv (remaining range)	0.1 °C	
Draught measurement	-40 to +40 hPa	±0.03 hPa (-2.99 to +2.99 hPa) ±1.5 % of mv (remaining range)	0.01 hPa	
Differential pressure measurement	-200 to 200 hPa	±0.5 hPa (-49.9 to 49.9 hPa) ±1.5 % of mv (remaining range)	0.1 hPa	
Absolute pressure measurement	600 to +1150 hPa	±10 hPa	1 hPa	
Derived parameters				
Efficiency	0 to 120 %		0.1 %	
Flue gas loss	0 to 99.9 %		0.1 %	
Flue gas dewpoint	0 to 99.9 °C		0.1 °C	
CO <sub>2</sub> measurement (calculation from O <sub>2</sub> )	0 to CO <sub>2</sub> max.	±0.2 Vol. %	0.1 Vol. %	
Response time t <sub>90</sub> = < 40 s				

\*Max. measurement duration of 2 hours should not be exceeded in order to avoid absorption.

**Measurement range extension**

Single dilution factor 5 (standard)

CO measurement (H <sub>2</sub> compensated)	Meas. range Accuracy Resolution	700 ppm to 50000 ppm ±10 % of mv (additional error) 1 ppm
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CO <sub>low</sub> measurement (H <sub>2</sub> compensated)	Meas. range Accuracy Resolution	500 ppm to 2500 ppm ±10 % of mv (additional error) 0.1 ppm
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NO <sub>2</sub> measurement	Meas. range Accuracy Resolution	200 ppm to 2500 ppm ±10 % of mv (additional error) 0.1 ppm
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SO <sub>2</sub> measurement	Meas. range Accuracy Resolution	500 ppm to 25000 ppm ±10 % of mv (additional error) 1 ppm
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Dilution of all sensors, Factor 2 (option, Part no. 0440 3350)

O <sub>2</sub> measurement	If measurement range extension is activated on all sensors: <b>Accuracy:</b> ±1 vol.% additional error (0 to 4.99 vol.%) ±0.5 Vol.% additional error (5 to 25 vol.%)	
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CO measurement (H <sub>2</sub> compensated)	Meas. range Accuracy Resolution	700 ppm to 20000 ppm ±10 % of mv (additional error) 1 ppm
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CO <sub>low</sub> measurement (H <sub>2</sub> compensated)	Meas. range Accuracy Resolution	500 ppm to 1000 ppm ±10 % of mv (additional error) 0.1 ppm
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NO measurement	Meas. range Accuracy Resolution	500 ppm to 6000 ppm ±10 % of mv (additional error) 1 ppm
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NO <sub>low</sub> measurement	Meas. range Accuracy Resolution	300 ppm to 600 ppm ±10 % of mv (additional error) 0.1 ppm
-------------------------------	---------------------------------------	---

NO <sub>2</sub> measurement	Meas. range Accuracy Resolution	200 ppm to 1000 ppm ±10 % of mv (additional error) 0.1 ppm
-----------------------------	---------------------------------------	--

SO <sub>2</sub> measurement	Meas. range Accuracy Resolution	500 ppm to 10000 ppm ±10 % of mv (additional error) 1 ppm
-----------------------------	---------------------------------------	---

**General technical data**

Memory	Maximum Per folder Per site Max. number of protocols is determined by the number of folders or sites	100 folders max. 10 sites max. 200 protocols
Controlled diaphragm pump:	Pump flow Hose length hose extensions) Max positive pressure/Flue gas Max negative pressure/Flue gas	0.6l/min (controlled) max. 7.8 m (corresponds to two probe +50 mbar -200 mbar
User-defineable fuels	10 user-defineable fuels incl. test gas as fuel	
Weight	600 g	
Dimensions	270 x 90 x 65 mm	
Storage temp.	-20 to +50 °C	
Oper. temp.	-5 to +50 °C	
Display	Graphics display: 160 x 240 pixels	
Power supply	Rech. block: 3.7V/2.2Ah Power: 6.3 V/1.2A	
Material/Housing	TPE PC	
Protection class	IP40	
Warranty	Analyzer 2 years (excluding wearing parts, e.g. gas sensors) Rech. batt. 1 year Gas sensors CO, CO <sub>low</sub> , NO, NO <sub>low</sub> , NO <sub>2</sub> , SO <sub>2</sub> 1 year O <sub>2</sub> gas sensors: 1.5 years	

## testo 350-S/-XL

**testo 350** is a flexible, portable analysis system which is basically made up of a control unit, a flue gas analyzer and a flue gas probe, depending on customer requirements.

The detachable **control unit** can control the analysis system and read out data. The testo 350 XL control unit can also be used as a separate hand-held analyzer for differential pressure (built-in) and also for temperature, humidity, flow etc. thanks to its additional probe socket. Readings are printed on the built-in printer.

The **flue gas analyzer** is the "heart" of the analysis system and is available in two different versions:

- testo 350 S Basic version
- testo 350 XL Advanced version.

The **testo 350 S flue gas analyzer** is equipped with a gas sensor for  $O_2$  as standard. One sensor must be fitted or up to 5 additional sensors for  $NO$  (option),  $NO_2$  (option),  $SO_2$  (option),  $NO_{low}$  (option),  $CO$  (option),  $CO_{low}$  (option),  $H_2S$  (option),  $HC$  (option) or  $CO_2$  via infrared gas sensor (option) can be fitted. Temperature and differential pressure as well as the usual parameters such as  $\Delta$ ,  $qA$ , etc. are also calculated.

The even more convenient **testo 350 XL flue gas analyzer** is equipped with gas sensors for  $O_2$ ,  $CO$ ,  $NO$  and  $NO_2$  as standard. Additional sensors for  $HC$  (option),  $NO_{low}$  (option),  $CO_{low}$  (option),  $SO_2$  (option),  $H_2S$  (option) or  $CO_2$  via infrared gas sensor (option) are available. In addition to the features of the S version, the testo 350 XL flue gas analyzer also has a Peltier gas preparation unit with a hose pump to regulate condensate disposal as well as a fresh air valve for long-term measurements lasting several hours.

Both versions of the flue gas analyzers can be equipped with up to 6 gas sensors, have a built-in rechargeable battery as standard, (for battery operation), data logger (250,000 readings) as well as a Testo data bus connection.

The testo 350 S flue gas analyzer can be retrofitted with all the features/functions of the testo 350 XL flue gas analyzer.

### Tests and permits

- TÜV Bayern RgG 211
- Conforms to DIN EN 50379 Part 2

## testo 350 S/XL, flexible flue gas measuring system

New

Now with **Bluetooth** Wireless transmission

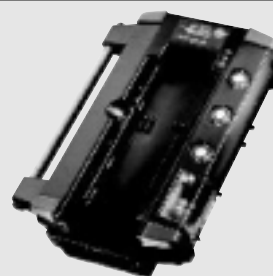


**Advanced Testing Program**

### Tests and permits

- TÜV Bavaria RgG 211
- Conforms to DIN EN 50379 Part 2




**S testo 350-S control unit**

Control unit displays measurement data and controls measurement system, built-in printer, connection for Testo data bus and terminal plug included

Part no.  
**0563 0369**

**XL testo 350 XL control unit**

Control unit displays measurement data and controls the measurement system, incl. built-in printer, pressure measurement 40/200 hPa, 1 user defined probe socket, programmable measurements and memory space for 250,000 readings, connection for Testo data bus, incl. terminal plug

Part no.  
**0563 0353**

**S testo 350-S flue gas analyser box**

testo 350-S flue gas analyser, equipped with: O<sub>2</sub>, differential pressure measurement, 2 temperature probe sockets, testo data bus connection, built-in rechargeable battery, data logger, can be upgraded to max. 6 sensors (with NO, NO<sub>2</sub>, CO, H<sub>2</sub>S, HC, SO<sub>2</sub>, CO<sub>2</sub> NDIR)

A second gas sensor must be installed in testo 350-S, otherwise the instrument is unable to function. Up to 5 additional sensors can be fitted.

Part no.  
**0563 0368**

**XL testo 350 XL flue gas analyser box**

testo 350 XL analyzer box, equipped with O<sub>2</sub>, CO (with switch-off and rinse function), NO, NO<sub>2</sub>, differential pressure measurement, 2 temperature probe sockets, gas preparation, Testo data bus adapter, automatic fresh air rinse with valve (including measurement range extension with dilution factor 5 for all sensors), built-in rechargeable battery, data memory, can be upgraded to max. 6 gas sensors (with H<sub>2</sub>S, HC, SO<sub>2</sub>, CO<sub>2</sub> NDIR)

Part no.  
**0563 0350**

**Differences between control units at a glance**

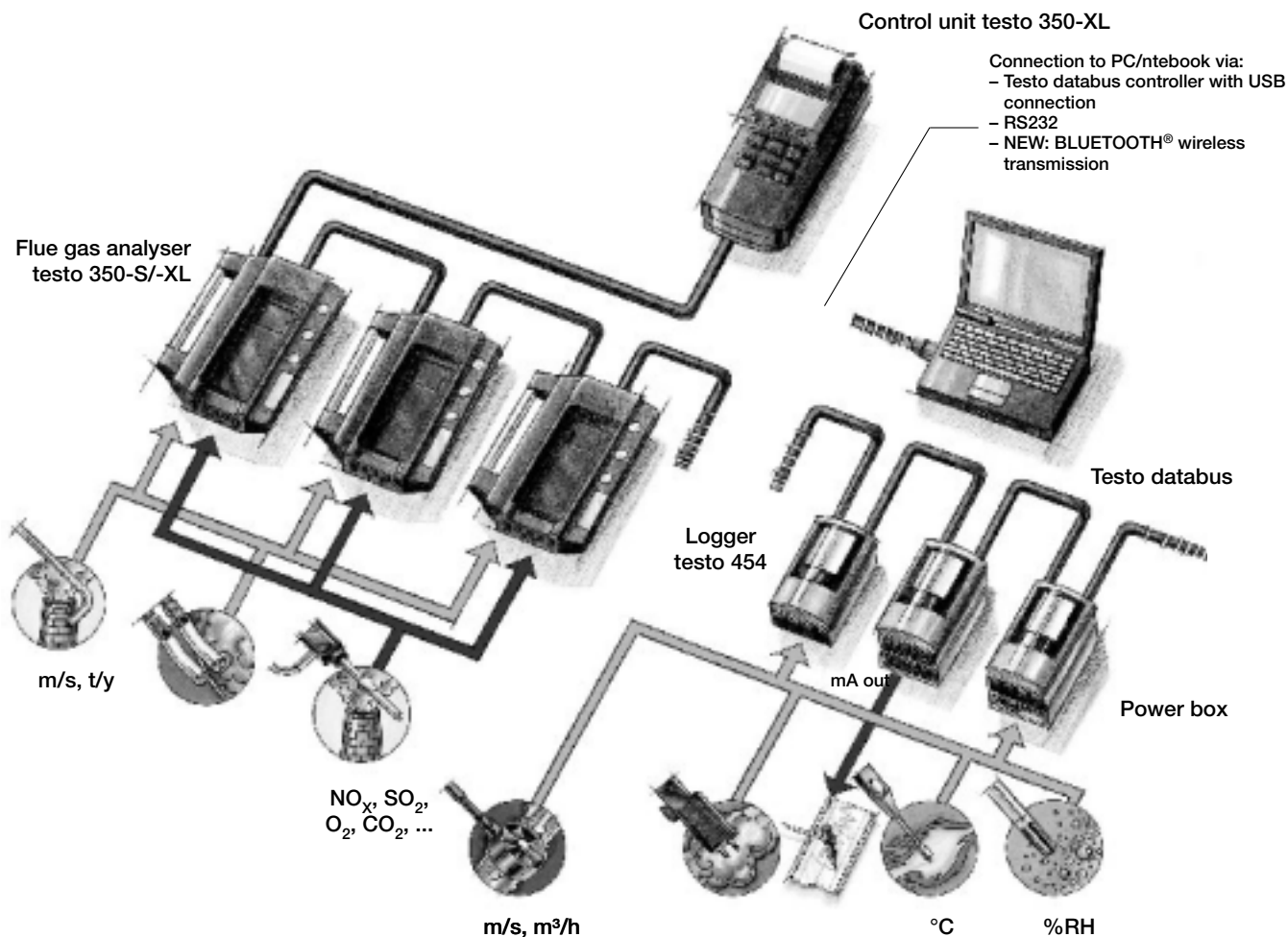
	testo 350 S control unit	testo 350 XL control unit
Built-in printer	■	■
Differential pressure measurement (-40 to +40 hPa / -200 to +200 hPa)	—	■
1 user-defined probe socket (for e.g. temperature, relative humidity measurement, etc.)	—	■
Touchscreen	—	○
Connection from a flue gas analyzer to the Testo data bus	■	■
Connection of several flue gas analyzers, analog output boxes and testo 454 loggers to the Testo data bus	—	■
NiMH rechargeable battery pack	—	○
Internal memory for 250,000 readings	—	■
BLUETOOTH® wireless transmission	○	—

■ = Standard    ○ = option    — = Not possible

**Differences between flue gas analysers at a glance**

	testo 350 S	testo 350 XL
Maximum no. of gas sensors	6	6
O <sub>2</sub> 0 – 25 Vol.	■	■
CO (H <sub>2</sub> ) 0 – 10,000 ppm	○	■
CO <sub>low</sub> (H <sub>2</sub> ) 0 – 500 ppm	○	○
NO 0 – 3,000 ppm (0.1 ppm resolution)	○	■
NO <sub>low</sub> 0 – 300 ppm (0.1 ppm resolution)	○	○
NO <sub>2</sub> 0 – 500 ppm (0.1 ppm resolution)	○	■
SO <sub>2</sub> 0 – 5,000 ppm	○	○
HC 0 – 4 Vol. % (0.001 % resolution)	○	○
H <sub>2</sub> S 0 – 300 ppm (0.1 ppm resolution)	○	○
CO <sub>2</sub> (NDIR) 0 – 50 Vol. %	○	○
Built-in gas preparation unit (is recommended with high humidity levels in flue gas and during long-term measurements >2 hrs measuring time)	○	■
Automatic fresh air rinse with valve (incl. measurement range extension with dilution factor 5 for all sensors)	○	■
Special gas pump for long-term measurements with extended warranty	○	○
Measurement range extension for CO gas sensor (with selectable dilution factors)	○	○
CO gas sensor switch-off via adjustable switch-off threshold	■	■
Trigger input – stops and starts measurement externally	○	○
Differential pressure measurement (-40 to +40 hPa / -200 to +200 hPa)	■	■
Built-in rechargeable battery	■	■
2 temperature probe sockets (Type K NiCr-Ni)	■	■
Data logger (250,000 readings)	■	■
Testo data bus connection	■	■
BLUETOOTH® wireless transmission	○	○

■ = Standard    ○ = option



#### The system concept of testo 350-S/-XL

For many applications in the industrial sector, a flue gas analyser with additional features is needed to fulfill the following requirements:

- Simultaneous gas and process analysis at different measurement points without a time-consuming measurement point changeover switch
- Option of connecting additional parameters such as °C; %RH; mA/mV etc.
- Long-term measurements in order to be able to assess different system cycles
- Flexibility of system in order to be able to react to the different requirements of the different systems. The **testo 350-S/-XL** measurement system fulfills these requirements. Several flue gas analysers, equipped differently, are connected together.

If several flue gas analysers, for example, are connected to the Testo data bus, they can be controlled, read out or programmed via the following two options:

- **One flue gas analyser after the other** via the testo 350-XL Control Unit, for example, or via PC and an RS 232 cable
- Alternatively:
- **Several flue gas analysers simultaneously** via PC and the Testo data bus controller with USB connection.

#### Parameters

Parameters which can be measured using **testo 350-S/-XL**:

##### a) testo 350-S/-XL flue gas analyser

- Flue gas parameters such as O<sub>2</sub>, CO, NO<sub>x</sub>, SO<sub>2</sub>, H<sub>2</sub>S, HC, CO<sub>2</sub>(IR)
- Differential pressure, e.g. for combustion chamber pressure measurement
- Flow measurement with Pitot tube

The testo 350-S or testo 350-XL flue gas analysers are positioned at the respective measurement point. They are operated either connected to each other via the Testo data bus or as a separate datalogger without being connected. Separate measurement programs are saved in the flue gas analysers with the help of the testo 350-XL or PC Control unit. They include, for example, start/stop criteria, measurement cycles, fresh air phases etc. **testo 350-S** and **testo 350-XL** flue box analysers, equipped differently, can be used in the network.

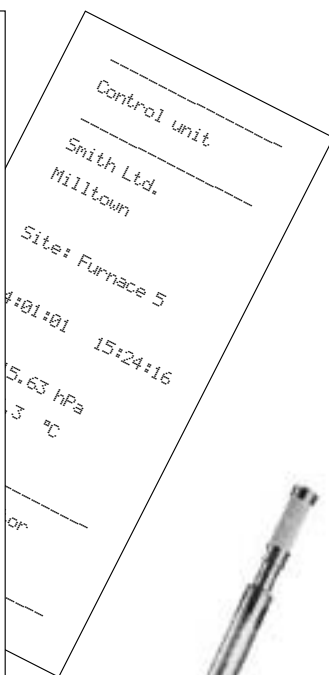
Likewise loggers and analog outputs (6 channels, 4-20mA) can be connected in this way (only to testo 350-XL Control Unit).

##### b) Logger box

- Temperature, e.g. of surfaces, liquids
- Humidity, e.g. in suction ducts or ambient air
- Pressure, e.g. with differential pressure and high pressure probes
- Flow and volume flow, e.g. with vanes, hot wire probes
- rpm etc.



	testo 350 XL SN: 000321/D
	Smith Ltd. Milltown
Site	Site: Furnace 5
Date, Time	15:01:01 08:20:15
Readings	Fuel: Natural gas  10.9 % CO <sub>2</sub> 0.45 % O <sub>2</sub> 2348 PPM CO 320 PPM NO 15 PPM NO <sub>2</sub> 30 PPM SO <sub>2</sub> 120 PPM H <sub>2</sub> S 1050 °C Flue gas temp. 32.5 °C Ambient temp. 15.2 m/s Velocity 1.2 % Flue gas loss 0.150 % HC  Batch 25/2



Status display	Site name	Selected analysis box	Page no.
●	TEST 24	002	01/05
11.2	324	23.6	
CO <sub>2</sub> %	CO PPM	H <sub>2</sub> S PPM	
522	292	193	
HC %	NO <sub>x</sub> PPM	SO <sub>2</sub> PPM	
PStop	Zoom	Gas	dP=0
4 user defined function buttons			

Set date/time			
S	Change date		23.6
E	View		
Instrument	PPM	UT	°C
Service			
Fuel oil	86	260	
Fuel	n	%	AT °C
		ESC	OK

Easy to follow menu guide and operation



Suitable flue gas and velocity probes as well as temperature probes are available for a wide range of applications.

Flue gas probes up to 4 m long, 1800 °C are available, heated or non-heated (to avoid condensate).

Temperature probes are also available for surface, gas and liquid measurements.

Velocity probe options include vane and hot wire/hot bulb probes which can be connected to the control unit testo 350-XL in addition to Pitot tubes.

## testo 350-S/-XL

## Gas sampling probes

Sampling probes have to endure extreme conditions when measuring flue gases for example:

- High temperatures
- Corrosive condensate
- Dust
- Mechanical loads.

The selection of the right probe is critical for accurate and consistent measurements. Because the sampling locations are often different, it's beneficial to have a standard probe designed for a wide variety of applications. In addition to the standard sampling probes, Testo also offers probe systems for specific industrial applications.



Standard sampling probes



Industrial probes – Options to fit every application

### Standard sampling probes

The standard sampling probe is available in lengths of 335 mm and 700 mm and for different temperature ranges. The outer pipe with a sintered filter is used for dusty flue gases. The hose has a standard length of 2.2 m (5 m optional).

Hose length:  
Standard 2.2 m / 5 m optional



Material: probe pipe  $T_{max} +500\text{ °C}$ :  
Stainless steel 1.4361  
Material: probe pipe  $T_{max} +1000\text{ °C}$ :  
Stainless steel 1.4841

Option: Outer pipe with filter for dusty flue gases



Pore size: 3  $\mu\text{m}$  / Material of probe pipe: Stainless steel 1.4841

### Standard probes, 335 mm long

#### Part no.



Basic flue gas probe, 335 mm immersion depth, with probe stop, NiCr-Ni (Ti) 0600 7451  
T/C, probe shaft: stainless steel 1.4361 ( $T_{max} 500\text{ °C}$ ), 2.2 m hose, robust plug-in coupling

Options	Part no.
Heat-resistant probe shaft with pre-filter, $T_{max} +1000\text{ °C}$ , 335 mm long, for dusty flue gases, 3 $\mu\text{m}$ pore size, probe shaft: stainless steel 1.4841	0440 7435
or	
Heat-resistant probe shaft without pre-filter (material: stainless steel 1.4841), $T_{max} +1000\text{ °C}$ , with heat-resistant plate, 335 mm long	0440 7437
<sup>1)</sup> Special hose for NO <sub>2</sub> /SO <sub>2</sub> measurements, 2.2 m long	0440 7442
<sup>1)</sup> Special hose for NO <sub>2</sub> /SO <sub>2</sub> measurements, 5 m long	0440 7445
Hose, 5 m long (not for SO <sub>2</sub> measurements)	0440 7443

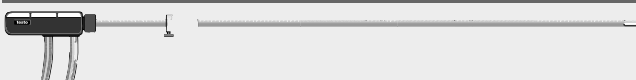
<sup>1)</sup> Use outer pipe with filter for dusty flue gases.

#### Accessories

Spare sintered filter (2 off)

### Standard probes, 700 mm long

#### Part no.



Basic flue gas probe, 700 mm immersion depth, with probe stop, NiCr-Ni (Ti) 0600 7452  
T/C, probe shaft: stainless steel 1.4361 ( $T_{max} 500\text{ °C}$ ), 2.2 m hose, robust plug-in coupling

Options	Part no.
Heat-resistant probe shaft with pre-filter, $T_{max} +1000\text{ °C}$ , 700 mm long, for dusty flue gases, 3 $\mu\text{m}$ pore size, probe shaft: stainless steel 1.4841	0440 7436
or	
Heat-resistant probe shaft without pre-filter (material: stainless steel 1.4841), $T_{max} +1000\text{ °C}$ , with heat-resistant plate, 700 mm long	0440 7438
Hose, 5 m long	0440 7444
<sup>1)</sup> Special hose for NO <sub>2</sub> /SO <sub>2</sub> measurements, 2.2 m long	0440 7442
<sup>1)</sup> Special hose for NO <sub>2</sub> /SO <sub>2</sub> measurements, 5 m long	0440 7446

<sup>1)</sup> Use outer pipe with filter for dusty flue gases.

Part no.  
0554 3372

### TÜV-tested gas sampling probes (specially for trade)

#### Part no.

TÜV approved flue gas probe, 180 mm immersion depth, up to  $+500\text{ °C}$ , corr. to the latest instr. test guidelines, also for meas. on atmospheric gas systems, 2.2 m hose



0600 9556

TÜV approved flue gas probe, 335 mm immersion depth, up to  $+500\text{ °C}$ , corresponding to the latest instrument test guidelines, also for atmospheric gas systems, 2.2 m hose



0600 9557

**Robust sampling probes for industrial applications**

This is a modular, portable probe system. The basic part of the system is the heated handle or non-heated adapter to which the sampling hoses are attached.

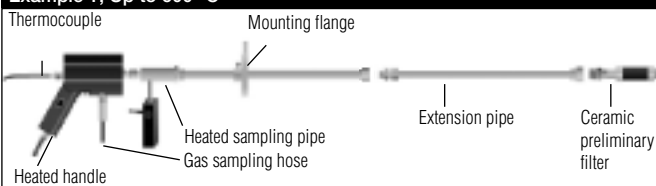
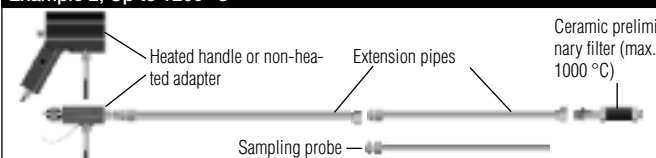
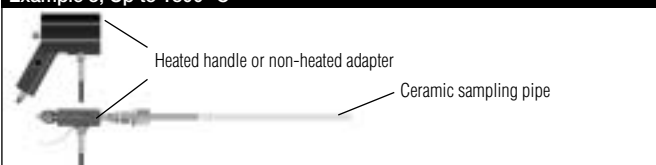
A thermocouple, connected to **testo 350 M/XL**, is used for simultaneous temperature measurements. Using extension pipes (up to max. 3 m) the probe can be used in large flue gas ducts. A preliminary filter is screwed on to protect the probe if used in dusty gases.

The heated probe (Ex. 1) is used for

moist flue gases to eliminate false readings caused by the absorption of NO<sub>2</sub> and SO<sub>2</sub>. The probes are attached to the flue gas duct using the mounting flange.

Non-heated probe pipes are used for flue gases up to 1200 °C (Ex. 2). The non-heated adapter can be used instead of a heated handle to measure O<sub>2</sub>, CO and NO or dry flue gases.

Ceramic sampling pipes (Ex. 3) which can withstand the enormous thermal load are used for measurements at more than 1200 °C.

**Example 1, Up to 600 °C**

**Example 2, Up to 1200 °C**

**Example 3, Up to 1800 °C**


Industrial probes			Part no.
Heated handle, power supply 115 to 230 V, 50/60 Hz		Power consumption: 200 watts; Temp. gas path: > 180 °C; Ready to operate: after approx. 20 min; Length of mains cable: 3 m; Protection class: IP54; Ambient temp.: -20 to +50 °C; gas inlet: G1/4"; gas outlet: M 10x1 outer thread; weight: 1.7 kg	0600 7920
Adapter, non-heated		Ambient temp.: -20 to +50 °C; Protection class: IP54; Gas inlet: G1/4"; Gas outlet: M 10x1 outer thread; Weight: 0.4 kg	0600 7911
Non-heated sampling pipe to +600 °C, stainless steel 1.4571		Connection: G1/4" 1000 mm Ø 12 mm	0600 7801
Non-heated sampling pipe to +1200 °C, Inconel 625		Connection: G1/4" 1000 mm Ø 12 mm	0600 7803
Non-heated sampling pipe to +1800 °C, Al-Oxyd		Connection: G1/4" 1000 mm Ø 12 mm	0600 7805
Heated sampling pipe, power supply 230 V / 50 Hz, stainless steel 1.4571		Heating: > +180 °C; power consumption: 650 watts; Connection: electr. connection to heated handle, connection adapter with thread connection/screw socket G1/4"; Max. flue gas temp.: +600 °C	0600 7820
Extension pipe to +600 °C, stainless steel 1.4571		Connection: Thread screw/screw socket G1/4"; Weight: 0.45 kg	0600 7802
Extension pipe to +1200 °C, Inconel 625		Connection: Thread screw/screw socket G1/4"; Weight: 0.45 kg	0600 7804
Preliminary filter for dusty flue gases, ceramic		Dust load: max. 20 g / m <sup>3</sup> ; filter fineness: 20 µm; Temperature: max. 1000 °C; Material: ceramic; Connection: G1/4" thread nipple; Weight: 0.2 kg	0554 0710
Preliminary filter can only be mounted on extension pipe 0600 7802 or 0600 7804.			
Thermocouple, NiCr-Ni, -200 to +1200 °C, Inconel 625, 1.2 m long		Connection: To analyser via 4 m connection cable with 8 pin plug; Weight: 0.15 kg.	0430 0065
Thermocouple, NiCr-Ni, -200 to +1200 °C, Inconel 625, 2.2 m long		The length depends on the number of sampling and extension pipes used.	0430 0066
Thermocouple, NiCr-Ni, -200 to +1200 °C, Inconel 625, 3.2 m long			0430 0067
Standard sampling hose, length 4 m		Weight: 0.4 kg	0554 3382
Special sampling hose for accurate NO <sub>2</sub> /SO <sub>2</sub> measurements, length 4 m		Hose material inside: PTFE hose with 2 mm inner diameter (lowest absorption, self-cleaning effect); Material outside: rubber; length: 4.0 m; Weight: 0.45 kg	0554 3384
Mounting flange, stainless steel 1.4571, adjustable quick-action fitting suitable for all sampling/extension pipes			0554 0760

Transport case for industry probes	Part no.
Transport case for industrial probes, aluminium, space for: handle, probes, flange and accessories	0516 7900

<b>Heated handle</b> Part no.: 0600 7920 Power: 115 to 230 V supply: 50/60 Hz Power required: 200 watts Temp. gas path: > 180 °C Ready to operate: After approx. 20 min Mains cable: 3 m long Protection class: IP54 Ambient temp.: -20 to +50 °C Gas input: G1/4" Gas output: M 10x1 outer thread Weight: 1.7 kg	<b>Adapter, non-heated</b> Part no.: 0600 7911 Ambient temp.: -20 to +50 °C Protection class: IP54 Gas input: G1/4" Gas output: M 10x1 outer thread Weight: 0.4 kg	<b>Non-heated sampling pipes</b> Dimensions: Length: 1 m, Ø 12 mm Connection: G1/4" Weight: 0.4 kg Sampling pipe up to +600 °C Part no.: 0600 7801	<b>Material:</b> Stainless steel 1.4571 Sampling pipe up to +1200 °C Part no.: 0600 7803 <b>Material:</b> Inconel 625 Sampling pipe up to +1800 °C Part no.: 0600 7805 <b>Material:</b> Al-Oxyd	<b>Heated sampling pipe</b> Part no.: 0600 7820 (230 V) Dim.: Length: 1 m, Ø 25 mm <b>Material:</b> Stainless steel 1.4571 Heating: > +180 °C Power supply: 230 V / 50 Hz Power required: 650 watts Connection: • Electr. connection to heated handle • Connection adapter with thread screw/screw socket G1/4" Max. flue gas temperature: +600 °C	<b>Extension pipe</b> Dimensions: L = 1 m, Ø 12 mm (pipe) Connection: Screw socket/thread screw G1/4" Weight: 0.45 kg Extension pipe Up to +600 °C Part no.: 0600 7802	<b>Material:</b> Stainless steel 1.4571 Extension pipe Up to +1200 °C Part no.: 0600 7804 <b>Material:</b> Inconel 625	<b>Preliminary filter for dusty flue gases</b> Part no.: 0554 0710 Dust load: max. 20 g / m <sup>3</sup> Filter fineness: 20 µm Temperature: max. 1000 °C Dimensions: 50 mm, Ø 20 mm <b>Material:</b> Ceramic Connection: G1/4" threaded nipple Weight: 0.2 kg	<b>Thermocouple</b> Part no.: 0430 0065 (1.2 m long) 0430 0066 (2.2 m long) 0430 0067 (3.2 m long) Sensor: NiCr-Ni Meas. range: -200 to +1000 °C Lengths: 1.2 / 2.2 / 3.2 m Diameter: 4 mm <b>Material:</b> Inconel 625 Connection: to analyser via 4 m connection cable with 8 pin plug Weight: 0.15 kg	<b>Standard sampling hose</b> for connection to <b>testo 350 M/XL</b> ana-	<b>lyser</b> Part no.: 0554 3382 Version: 1 Viton hose with robust plug Hose material: Viton Length: 4.0 m Weight: 0.4 kg	<b>Mounting flange</b> Part no.: 0554 0760 <b>Material:</b> Stainless steel 1.4571 Diameter: 160 mm Connection: Movable quick-action fitting, suitable for all sampling and extension pipes	<b>Special sampling hose for accurate NO<sub>2</sub>/SO<sub>2</sub> measurements</b> for connection to <b>testo 350 M/XL</b> analyser Part no.: 0554 3384 Version: patented 1 way hose with robust plug Host material/Inner: PTFE hose with 2 mm inner diameter (lowest absorption, self-cleaning effect) Host material/Outer: Rubber Length: 4 m Weight: 0.45 kg
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**Gas sampling probes for measurements on industrial motors**
**Part no.**
**Information about instrument upgrades and prices available on request.**

Flue gas probe for industrial motors, 335 mm immersion depth, with probe stop and heat protection plate, Tmax 1000 °C, special hose for NO<sub>2</sub>/SO<sub>2</sub> measurements, 2.2 m long



0600 7550

Flue gas probe for industrial motors with probe shaft prefilter, 335 mm immersion depth, with probe stop and heat protection plate, Tmax 1000 °C, special hose for NO<sub>2</sub>/SO<sub>2</sub> measurements, 2.2 m long



0600 7551

**Accessories for gas sampling probes for measurements on industrial engines**
**Part no.**

Spare sintered filter (2 off)

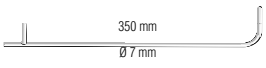
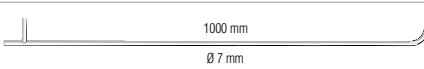

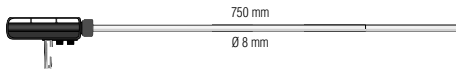

0554 3372

Thermocouple for exhaust gas temperature measurement (NiCr-Ni, length 400 mm, Tmax. +1000 °C), with 2.4 m connection cable and additional temperature protection

0600 8894

Temperature	Illustration	Meas. range	Accuracy	t <sub>99</sub>	Part no.
Combustion air temperature probe, immersion depth 300 mm	300 mm Ø 5 mm	0 to +100 °C		30 s	0600 9791
Combustion air temperature probe, immersion depth 190 mm	190 mm Ø 4 mm	0 to +100 °C			0600 9787
Combustion air temperature probe, immersion depth 60 mm	60 mm Ø 4 mm	0 to +100 °C		30 s	0600 9797
Mini ambient air probe, Tmax +80°C, for separate ambient air temperature measurement		0 to +80 °C			0600 3692
Pipe wrap probe for pipes with diameter of up to 2", for flow/return temp. meas. in hydronic systems	Conn.: Fixed cable	-60 to +130 °C	Class 2	5 s	0600 4593
Spare meas. head for pipe wrap probe, TC Type K	35 mm 15 mm	-60 to +130 °C	Class 2	5 s	0602 0092
Fast-action surface probe with sprung thermocouple strip, for measurements on floor heating, radiators, insulations...	150 mm Ø 10 mm Conn.: Plug-in head, connection cable 0430 0143 or 0430 0145 required	-200 to +300 °C	Class 2	3 s	0604 0194

More probes	Illustration	Meas. range	Other features	t <sub>90</sub>	Part no.
Gas leak probe					0632 3330
Ambient CO probe, for detecting CO in buildings and rooms	Fixed cable 1.5 m	0 to +500 ppm CO	±5% of mv (+100.1 to +500 ppm CO) ±5 ppm CO (0 to +100 ppm CO)		0632 3331
Ambient CO <sub>2</sub> probe		0 ... +1 Vol. % CO <sub>2</sub> 0 ... +10000 ppm CO <sub>2</sub>	±(50 ppm CO <sub>2</sub> ±2% of mv)(0 to +5000 ppm CO <sub>2</sub> ) ±(100 ppm CO <sub>2</sub> ±3% of mv)(+5001 to +10000 ppm CO <sub>2</sub> )		0632 1240
Current/voltage cable (±1 V, ±10 V, 20 mA)		0 to +1000 mV 0 to +10 V 0 to +20 mA	±1 mV (0 to +1000 mV) ±0.01 V (0 to +10 V) ±0.04 mA (0 to +20 mA)		0554 0007
Mechanical rpm probe with plug-in head	Conn.: Plug-in head, connection cable 0430 0143 or 0430 0145 required	20 to 20000 rpm	Plug-in head, connection cable 0430 0143 or 0430 0145 required		0640 0340
Included					
2 probe tips Ø 8 and Ø 12 mm					
1 hollow cone Ø 8 mm					
1 surface speed disc Ø 19 mm to measure rotational speed: rpm = rotational speed in mm/s					

Pitot tubes for flow measurement	Illustration	Meas. range	Part no.
Pitot tube, 350 mm long, stainless steel, for measuring flow velocity in connection with 0638 1347/..1447 pressure probes		Oper. temp. 0 to +600 °C	0635 2145
Pitot tube, 1000 mm long, stainless steel, measures flow speed with pressure probes 0638 1347/..1447		Oper. temp. 0 to +600 °C	0635 2345
Pitot tube, stainless steel, 500 mm long, measures flow speed with temperature, for pressure probes 0638 1347/..1447		-40 to +600 °C	0635 2140
Pitot tube, stainless steel, 750 mm long, measures flow speed with temperature, 3x hoses (5 m long) and heat protection plate		-40 to +1000 °C	0635 2042
Pitot tube, stainless steel, 1000 mm, measures flow speed with temperature, for pressure probes 0638 1347/..1447		-40 to +600 °C	0635 2240

Accessories	Part no.
Hose connection set for gas pressure measurement in heating systems, incl. silicone hoses and T-pieces, For separate gas pressure measurement	0554 0315
ISO calibration certificate velocity, hot wire, vane anemometer, Pitot tube; calibration points 1; 2; 5; 10 m/s	0520 0004
ISO calibration certificate/Velocity, hot wire, vane anemometer, Pitot tube; calibration points 5; 10; 15; 20 m/s	0520 0034

Accessories	Part no.
Cable, 1.5 m long, connects probe with plug-in head to meas. instrument, PUR coating material	0430 0143
Cable, 5 m long, connects probe with plug-in head to measuring instrument, PUR coating material	0430 0145
Extension cable, 5 m long, between plug-in head cable and instrument, PUR coating material	0409 0063
ISO calibration certificate/temperature, meas. instr. with surface probe; calibration points +60°C; +120°C; +180°C	0520 0071
ISO calibration certificate/CO <sub>2</sub> , CO <sub>2</sub> probes; calibration points 0; 1000; 5000 ppm	0520 0033



## testo 350-S/-XL

## Measurement System and Practical Accessories

testo 350-S control unit		Part no.
Control unit displays measurement data and controls measurement system, built-in printer, connection for Testo data bus and terminal plug included		0563 0369
Further options only for Control Unit testo 350-S		
New	BLUETOOTH® wireless transmission*	0440 0550
	Testo rechargeable battery pack NiMH for control unit, logger	0515 0097
	Spare thermal paper for printer (6 rolls)	0554 0569
testo 350 XL control unit		Part no.
Control unit displays measurement data and controls the measurement system, incl. built-in printer, pressure measurement 40/200 hPa, 1 user defined probe socket, programmable measurements and memory space for 250,000 readings, connection for Testo data bus, incl. terminal plug		0563 0353
Additional options only for control unit testo 350 XL		
	Touch screen with pen (available only with original order), for easy input of text and values	0440 0559
	Spare thermal paper for printer (6 rolls)	0554 0569
	Testo rechargeable battery pack NiMH for control unit, logger	0515 0097
	Mains unit 230 V/ 8 V/ 1 A, for instrument (European plug)	0554 1084
testo 350 S flue gas analyzer		Part no.
testo 350-S flue gas analyser, equipped with: O <sub>2</sub> , differential pressure measurement, 2 temperature probe sockets, testo data bus connection, built-in rechargeable battery, data logger, can be upgraded to max. 6 sensors (with NO, NO <sub>2</sub> , CO, H <sub>2</sub> S, HC, SO <sub>2</sub> , CO <sub>2</sub> NDIR)		0563 0368
A second gas sensor must be installed in testo 350-S, otherwise the instrument is unable to function. Up to 5 additional sensors can be fitted.		
	Option: COlow sensor	0440 3936
	Option: CO sensor	0440 3988
	Option: CO <sub>2</sub> sensor (infrared meas. principle, absolute pressure meas. and CO <sub>2</sub> absorption filter with refill pack incl.)	0440 0417
	Option: HC sensor (nonburned hydrocarbons)	0440 3929
	Option: H <sub>2</sub> S sensor	0440 3930
	Option: NO sensor	0440 3935
	Option: NOlow sensor	0440 3928
	Option: NO <sub>2</sub> sensor	0440 3926
	Option: SO <sub>2</sub> sensor	0440 3927
New	BLUETOOTH® wireless transmission*	0440 0550
	Option: Peltier gas preparation with hose pump to empty condensate automatically	0440 0355
	Fresh air valve for long-term measurement (measurement range extension with dilution factor 5 for all sensors included)	0440 0557
	Measuring range extension for CO sensor (dilution), built into analyser box, selectable dilution factors: 0, 2, 5, 10, 20, 40	0440 0555
	Event trigger socket, for starting and stopping measurement externally, built into analyser box	0440 3932
	Special gas pump for long-term measurements with extended warranty (For continuous measurements >2 h measurement time, the option Peltier gas preparation 0440 0355 is additionally recommended.)	0440 0378
testo 350 XL flue gas analyzer box		Part no.
testo 350 XL analyzer box, equipped with O <sub>2</sub> , CO (with switch-off and rinse function), NO, NO <sub>2</sub> , differential pressure measurement, 2 temperature probe sockets, gas preparation, Testo data bus adapter, automatic fresh air rinse with valve (including measurement range extension with dilution factor 5 for all sensors), built-in rechargeable battery, data memory, can be upgraded to max. 6 gas sensors (with H <sub>2</sub> S, HC, SO <sub>2</sub> , CO <sub>2</sub> NDIR)		0563 0350
	Option: COlow gas sensor	0440 3925
	Option: CO <sub>2</sub> sensor (infrared meas. principle, absolute pressure meas. and CO <sub>2</sub> absorption filter with refill pack incl.)	0440 0417
	Option: NOlow gas sensor	0440 3934
	Option: SO <sub>2</sub> sensor	0440 3927
	Option: HC sensor (nonburned hydrocarbons)	0440 3929
	Option: H <sub>2</sub> S sensor	0440 3930
New	BLUETOOTH® wireless transmission*	0440 0550
	Measuring range extension for CO sensor (dilution), built into analyser box, selectable dilution factors: 0, 2, 5, 10, 20, 40	0440 0555
	Event trigger socket, for starting and stopping measurement externally, built into analyser box	0440 3932
	Special gas pump for long-term measurements with extended warranty	0440 0378
Transport case and accessories for analyser boxes		Part no.
Robust protective case with trolley function for operating the testo 350 in the case in dusty and tough surroundings		0516 0355
Wall holder for analyzer box incl. heat protection plate, can be locked		0554 0203
Protective cover for analyser box (can also be used with wall holder)		0554 0199
Carrying belt set for analyser box and control unit		0554 0434
Transport case for analyser, probes and accessories		0516 0351
System case (aluminium), with drawer for accessories, for transport and protection during measurement		0516 0352
Transport case for industrial probes, aluminium; space for: handle, probes, flange and accessories		0516 7900
Calculation of fuel-specific factors to accurately display calculated variables in deviating fuels (calculation for one fuel)		0991 0030
Spare particle filter, pack of 20		0554 3381
Hose set to convey flue gas from analyzer box, 5 m long		0554 0451
Refill pack of filter pellets for CO <sub>2</sub> absorption filter		0554 0369
ISO calibration certificate/flue gas, calibration points 2.5% O <sub>2</sub> ; 100 and 1000 ppm CO; 800 ppm NO; 80 ppm NO <sub>2</sub> ; 1000 ppm SO <sub>2</sub>		0520 0003
testo 454 logger and accessories		Part no.
Logger, measures and saves (max. 250,000 readings), incl. 4 user defined probe sockets, alarm output/event trigger socket, stand/wall holder		0577 4540
Alarm/trigger cable		0554 0012
Power box, connected to control unit to increase operating life, for a battery-operated measuring system		0554 1045
Desk-top power supply with international connection options		0554 1143
Analog output box, 6 channels, 4 to 20 mA, for output on an analog recorder, (please also order mains unit 0554 1084)		0554 0845
Testo rechargeable battery pack NiMH for control unit, logger		0515 0097
Accessories for Testo data bus		Part no.
Mains unit (110/230 V; 50/60 Hz, 12 V, 3 A) supplies power to Testo data bus, when using the Testo plug-in card		0554 1145
Terminal plug for Testo data bus, for loggers and special lengths		0554 0119
Connection cable, 2 m, for Testo data bus		0449 0042
Connection cable, 5 m, for Testo data bus		0449 0043
Connection cable, 20 m, for Testo data bus		0449 0044
Additional cable lengths up to 1000 m on request		
PC software		Part no.
"easyEmission" software for testo 350-S/-XL, RS232 cable for connecting instrument to PC included		0554 3335
"easyEmission" software for testo 350 S/XL, Testo data bus controller included, with USB to connect instrument to PC, cable for Testo data bus and terminal plug		0554 3336
Multiple licence software "easyEmission" for testo 350-S/-XL		0554 3337
RS232 cable, connects instrument to PC (1.8 m) for data transfer		0409 0178
Accessories exhaust gas analysis instrument		Part no.
Cable with adapter for cigarette lighter and adapter for connection to testo 350-S/-XL		0554 1336
Cable with battery clamps and adapter for connection to testo 350-S/-XL		0554 1337
Information about instrument upgrades and prices available on request.		

\*Country permits: The BLUETOOTH® radio module used by Testo is permitted for the following countries and may only be used in those countries, i.e. the BLUETOOTH® wireless transmission may not be used in any other country! Europe including all EU member states: Austria, Belgium, Bulgaria, Czech Republic, Cyprus, Denmark, Estonia, Finland, France, Germany, Great Britain, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Sweden, Slovakia, Slovenia, Spain and Turkey; European countries (EFTA): Iceland, Liechtenstein, Norway, Switzerland; Non-European countries: Canada, USA and Japan and Ukraine.

## Robust protective case

The robust protective case provides unique protection for the flue gas analyzer testo 350-S/-XL. The impact-proof case is absolutely suitable anywhere where the testo -S/-XL needs to be protected from special loads – making the case indispensable, especially in "heavy-duty" applications!

In order to ensure ideal ventilation of the case, it is equipped with a ventilator fan as standard. This is switched on automatically by a thermal switch at external temperatures  $>+15^{\circ}\text{C}$ , and off again at temperatures  $<+15^{\circ}\text{C}$ . This allows the testo 350-S/-XL to be used in a closed case at ambient temperatures from  $-10^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ .

A built-in filter in the case additionally protects the testo 350-S/-XL from dust and particles from the surrounding air. Even when the cover is open, the case still complies with the requirements of the protective class IP42.

All connections of the testo 350-S/-XL are accessible from the outside through a cover in the baseplate of the protective case. The cover only needs to be opened in order to connect all the necessary cables and lines.

## Robust protective case with trolley function

- For the operation of testo 350 in the case in dusty and tough surroundings.
- Extendable handle and stainless steel ball bearing rollers for effortless transport.
- Extremely impact-resistant polypropylene copolymer for high stability and flexibility to protect from external impact.
- The protective case is equipped with a ventilator as standard. A thermal switch switches this on at outer temperatures  $>+15^{\circ}\text{C}$  and off at temperatures  $<+15^{\circ}\text{C}$ .
- Operation of the testo 350 in the closed case.
- Thanks to a cover in the base of the case, all connections of the testo 350 are accessible from the outside.

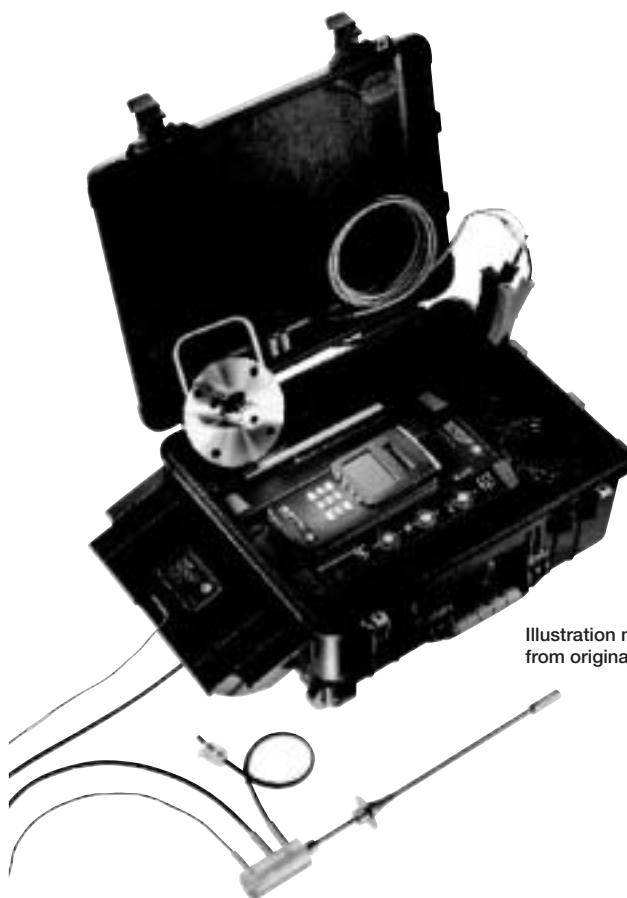


Illustration may differ from original!

### Robust protective case

Robust protective case with trolley function for operating the testo 350 in the case in dusty and tough surroundings

Part no.

**0516 0355**

### Technical data

Dimensions	56.5 x 45.5 x 26.5 cm
Oper. temp.	$-10$ to $+50^{\circ}\text{C}$
Storage temp.	$-20$ to $+50^{\circ}\text{C}$
Protection class	IP42

**testo 350 M: Set for fast emission monitoring on industrial burners (O<sub>2</sub>, CO, NO)**

- testo 350-S control unit (Part no. 0563 0369)
- Option BLUETOOTH® wireless transmission (Part no. 0440 0550)
- testo 350-S flue gas analyser box (Part no. 0563 0368)
- Option BLUETOOTH® wireless transmission (Part no. 0440 0550)
- Option: NO sensor (Part no. 0440 3935)
- Option: CO sensor (Part no. 0440 3988)
- Flue gas probe, 335 mm immersion depth, Thermocouple NiCr-Ni (Ti), Hose 2.2 m (Part no. 0600 7451)
- Heat-proof probe pipe, 335 mm long, Tmax. +1000°C (Part no. 0440 7437)
- Connection cable, 2 m, for Testo data bus (Part no. 0449 0042)
- Protective cover for analyser box (Part no. 0554 0199)
- Carrying belt set for analyser box (Part no. 0554 0434)
- Transport case for analyser, probes and accessories (Part no. 0516 0351)
- Spare particle filter, pack of 20 (Part no. 0554 3381)
- Spare thermal paper for printer (6 rolls) (Part no. 0554 0569)

**testo 350 XL: Standard set for measurements on process systems (O<sub>2</sub>, CO, NO, NO<sub>2</sub>)**

- testo 350 XL control unit (Part no. 0563 0353)
- Testo rechargeable pack for control unit (Part no. 0515 0097)
- testo 350 XL flue gas analyzer box (Part no. 0563 0350)
- Flue gas probe, 335 mm immersion depth, Thermocouple NiCr-Ni (Ti), Hose 2.2 m (Part no. 0600 7451)
- Heat-proof probe pipe, 335 mm long, Tmax. +1000°C (Part no. 0440 7437)
- Special hose for NO<sub>2</sub>/SO<sub>2</sub> measurements, 2.2 m long (Part no. 0440 7442)
- Connection cable, 2 m, for Testo data bus (Part no. 0449 0042)
- "easyEmission" software for testo 350 S/XL (Part no. 0554 3335)
- Carrying belt set for analyser box (Part no. 0554 0434)
- Robust protective case with trolley function for operating the testo 350 in the case in dusty and tough surroundings (Part no. 0516 0355)
- Spare particle filter, pack of 20 (Part no. 0554 3381)
- Spare thermal paper for printer (6 rolls) (Part no. 0554 0569)

**testo 350 XL: Portable measurements on motors (O<sub>2</sub>, CO, NO, NO<sub>2</sub>)**

- testo 350 XL control unit (Part no. 0563 0353)
- Testo rechargeable pack for control unit (Part no. 0515 0097)
- testo 350 XL flue gas analyzer box (Part no. 0563 0350)
- Measurement range extension for CO sensor (dilution) (Part no. 0440 0555)
- Flue gas probe for industrial motors (Part no. 0600 7550)
- Thermocouple for exhaust gas temperature measurement (NiCr-Ni, length 400 mm, Tmax. +1000 °C), with 2.4 m connection cable and additional temperature protection (Part no. 0600 8894)
- Connection cable, 5 m, for Testo data bus (Part no. 0449 0043)
- "easyEmission" software for testo 350 S/XL (Part no. 0554 3335)
- Carrying belt set for analyser box (Part no. 0554 0434)
- Robust protective case with trolley function for operating the testo 350 in the case in dusty and tough surroundings (Part no. 0516 0355)
- Spare particle filter, pack of 20 (Part no. 0554 3381)
- Spare thermal paper for printer (6 rolls) (Part no. 0554 0569)

**testo 350 XL: Portable measurements on gas turbines (O<sub>2</sub>, CO<sub>low</sub>, NO<sub>low</sub>, NO<sub>2</sub>)**

- testo 350 XL control unit (Part no. 0563 0353)
- Testo rechargeable pack for control unit (Part no. 0515 0097)
- Touchscreen with reader (Part no. 0440 0559)
- testo 350 XL flue gas analyzer box (Part no. 0563 0350)
- CO<sub>low</sub> sensor, 0 to 500 ppm, built into analyser box (Part no. 0440 3925)
- NO<sub>low</sub> sensor, 0 to 300 ppm, built-in in analyser box (Part no. 0440 3934)
- Measurement range extension for CO sensor (dilution) (Part no. 0440 0555)
- Flue gas probe, 335 mm immersion depth, Thermocouple NiCr-Ni (Ti), Hose 2.2 m (Part no. 0600 7451)
- Heat-proof probe pipe, 335 mm long, Tmax. +1000°C (Part no. 0440 7437)
- Special hose for NO<sub>2</sub>/SO<sub>2</sub> measurements, 5 m long (Part no. 0440 7445)
- Connection cable, 5 m, for Testo data bus (Part no. 0449 0043)
- "easyEmission" software for testo 350 S/XL (Part no. 0554 3335)
- Protective cover for analyzer box (Part no. 0554 0199)
- Carrying belt set for analyser box (Part no. 0554 0434)
- System case (aluminium), incl. drawer (Part no. 0516 0352)
- Spare particle filter, pack of 20 (Part no. 0554 3381)
- Spare thermal paper for printer (6 rolls) (Part no. 0554 0569)

**Technical Data for Control unit testo 350-S/-XL and testo 454 logger box**

	testo 350-S control unit	testo 350 XL control unit	Logger, measures and saves readings	Analog output box (mA out)
Oper. temp.	-5 to +45 °C	-5 to +45 °C	-10 to +50 °C	-10 to +50 °C
Storage temp.	-20 to +50 °C	-20 to +50 °C	-25 to +60 °C	-25 to +60 °C
Battery type	4 AA batteries	4 AA batteries	Alkali manganese	–
Battery life	8 h	8 h	24 h	–
Memory	–	250000 readings	250000 readings	–
Weight	850 g	850 g	450 g	305 g
Dimensions	252 x 115 x 58 mm	252 x 115 x 58 mm	200 x 89 x 37 mm	200 x 89 x 37 mm
Warranty	2 years	2 years	3 years	3 years

**Technical data control unit testo 350-XL and testo 454 logger box**

Probe type	Vane	Thermal	Testo humid. sensor, cap.	Pressure	
Meas. range	0 to +60 m/s	0 to +20 m/s	0 to +100 %RH	10 to 30000 hPa	
Accuracy ±1 digit	See probe data for system accuracy	±0.01 m/s (0 to +1.99 m/s) ±0.02 m/s (+2 to +4.99 m/s) ±0.04 m/s (+5 to +20 m/s)	See probe data	Probe 0638 1345 Probe 0638 1445 Probe 0638 1545 Probe 0638 1645 ±0.1% of m.v.	
Resolution	0.01 m/s (for Ø 60/100 mm), 0.1 m/s (for remaining probes)	0.01 m/s (0 to +20 m/s)	0.1 %RH (0 to +100 %RH)	0.001 hPa (probe 0638 1345) 0.001 hPa (probe 0638 1445) 0.01 hPa (probe 0638 1545)	
Probe type	Pt100	Type K (NiCr-Ni)	Type S (Pt10Rh-Pt)	Type J (Fe-CuNi)	Type T (Cu-CuNi)
Meas. range	-200 to +800 °C	-200 to +1370 °C	0 to +1760 °C	-200 to +1000 °C	-40 to +350 °C
Accuracy ±1 digit	±0.1 °C (-49.9 to +99.9 °C) ±0.4 °C (-99.9 to -50 °C) ±0.4 °C (+100 to +199.9 °C) ±1 °C (-200 to -100 °C) ±1 °C (+200 to +800 °C)	±0.4 °C (-100 to +200 °C) ±1 °C (-200 to -100.1 °C) ±1 °C (+200.1 to +1370 °C)	±1 °C (0 to +1760 °C)	±0.4 °C (-150 to +150 °C) ±1 °C (-200 to -150.1 °C) ±1 °C (+150.1 to +199.9 °C)	±0.4 °C (-40 to +200 °C) ±1 °C (+200.1 to +350 °C)
Resolution	0.001 °C (-9.999 to +300 °C) 0.1 °C (-200 to -100 °C) 0.1 °C (+301 to +800 °C)	0.1 °C (-200 to +1370 °C)	1 °C (0 to +1760 °C)	0.1 °C (-200 to +1000 °C)	0.1 °C (-40 to +350 °C)
Probe type	NTC	CO probe	CO2 probe	CO2 probe	
Meas. range	-40 to +150 °C	0 to +500 ppm CO	0 to +1 Vol. % CO <sub>2</sub>	0 to +10000 ppm CO <sub>2</sub>	
Accuracy ±1 digit	±0.2 °C (-10 to +50 °C) ±0.4 °C (-40 to -11 °C) ±0.4 °C (+51 to +150 °C)	±5% of mv (0 to +500 ppm CO)	See probe data	See probe data	
Resolution	0.1 °C (-40 to +150 °C)				
	Mechanical	Current/voltage measurement	Current/voltage measurement	Control unit, integ. press. sensor	
Meas. range	20 to 20000 rpm	0 to +20 mA	0 to +10 V	-200 to +200 hPa	-40 to +40 hPa
Accuracy ±1 digit	±1 digit	±0.04 mA (0 to +20 mA)	±0.01 V (0 to +10 V)	±1.5% of mv (-50 to -200 hPa) ±1.5% of mv (+50 to +200 hPa) ±0.5 hPa (-49.9 to +49.9 hPa)	±1.5% of mv (-3 to -40 hPa) ±1.5% of mv (+3 to +40 hPa) ±0.03 hPa (-2.99 to +2.99 hPa)
Resolution	1 rpm	0.01 mA (0 to +20 mA)	0.01 V (0 to +10 V)	0.1 hPa (-200 to +200 hPa)	0.01 hPa (-40 to +40 hPa)





## Technical data/testo analyser box, testo 350-S XL

Parameters	°C measurement (Type K NiCr-Ni)	O <sub>2</sub> measurement	CO measurement (H <sub>2</sub> compensated)	CO <sub>low</sub> meas. (H <sub>2</sub> compensated)	CO <sub>2</sub> measurement	NO measurement	NO <sub>low</sub> measurement	NO <sub>2</sub> measurement	SO <sub>2</sub> measurement
Meas. range	-40 to +1200 °C	0 to +25 Vol. % O <sub>2</sub>	0 to +10000 ppm CO	0 to +500 ppm CO	0 to CO <sub>2</sub> max Vol. % CO <sub>2</sub>	0 to +3000 ppm NO	0 to +300 ppm NO	0 to +500 ppm NO <sub>2</sub>	0 to +5000 ppm SO <sub>2</sub>
Accuracy	±0.5% of mv (+100 to +1200 °C) ±0.5 °C (-40 to +99.9 °C)	±0.8% of fsv (0 to +25 Vol. % O <sub>2</sub> )	±5% of mv (+200 to +2000 ppm CO) ±10% of mv (+2001 to +10000 ppm CO) ±10 ppm CO (0 to +199 ppm CO)	±5% of mv (+40 to +500 ppm CO) ±2 ppm CO (0 to +39.9 ppm CO)	Calculated from O <sub>2</sub>	±5% of mv (+100 to +1999.9 ppm NO) ±10% of mv (+2000 to +3000 ppm NO) ±5 ppm NO (0 to +99 ppm NO)	±5% of mv (+40 to +300 ppm NO) ±2 ppm NO (0 to +39.9 ppm NO)	±5% of mv (+100 to +500 ppm NO <sub>2</sub> ) ±5 ppm NO <sub>2</sub> (0 to +99.9 ppm NO <sub>2</sub> )	±5% of mv (+100 to +2000 ppm SO <sub>2</sub> ) ±10% of mv (+2001 to +5000 ppm SO <sub>2</sub> ) ±5 ppm SO <sub>2</sub> (0 to +99 ppm SO <sub>2</sub> )
Resolution	0.1 °C (-40 to +1200 °C)	0.01 Vol. % O <sub>2</sub> (0 to +25 Vol. % O <sub>2</sub> )	1 ppm CO (0 to +10000 ppm CO)	0.1 ppm CO (0 to +500 ppm CO)	0.01 Vol. % CO <sub>2</sub>	1 ppm NO (0 to +3000 ppm NO)	0.1 ppm NO (0 to +300 ppm NO)	0.1 ppm NO <sub>2</sub> (0 to +500 ppm NO <sub>2</sub> )	1 ppm SO <sub>2</sub> (0 to +5000 ppm SO <sub>2</sub> )
Reaction time		20 s	40 s	40 s	20 s	30 s	30 s	40 s	30 s
Reaction type		t <sub>95</sub>	t <sub>90</sub>	t <sub>90</sub>	t <sub>95</sub>	t <sub>90</sub>	t <sub>90</sub>	t <sub>90</sub>	t <sub>90</sub>
Parameters	Efficiency	Flue gas loss	Differential pressure 1	Differential pressure 2	Velocity	CO <sub>2</sub> meas. (IR)	H <sub>2</sub> S measurement		
Meas. range	0 to +120 %	-20 to +99.9 % qA	-200 to +200 hPa	-40 to +40 hPa	0 to +40 m/s	0 to +50 Vol. % CO <sub>2</sub>	0 to +300 ppm H <sub>2</sub> S		
Accuracy			±1.5% of mv (-50 to -200 hPa) ±1.5% of mv (+50 to +200 hPa) ±0.5 hPa (-49.9 to +49.9 hPa)	±1.5% of mv (-40 to -3 hPa) ±1.5% of mv (+3 to +40 hPa) ±0.03 hPa (-2.99 to +2.99 hPa)		±0.3 Vol. % CO <sub>2</sub> + 1% of mv (0 to 25 Vol. % CO <sub>2</sub> ) ±0.5 Vol. % CO <sub>2</sub> + 1.5% of mv (>25 to 50 Vol. % CO <sub>2</sub> )	±5% of mv (+40 to +300 ppm) ±2 ppm (0 to +39.9 ppm)		
Resolution	0.1 % (0 to +120 %)	0.1 % qA (-20 to +99.9 % qA)	0.1 hPa (-200 to +200 hPa)	0.01 hPa (-40 to +40 hPa)	0.1 m/s (0 to +40 m/s)	0.01 Vol. % CO <sub>2</sub> (0 to 25 Vol. % CO <sub>2</sub> ) 0.1 Vol. % CO <sub>2</sub> (>25 Vol. % CO <sub>2</sub> )	0.1 ppm (0 to +300 ppm)		
Reaction time						<10 s	35 s		
Reaction type						t <sub>90</sub>	t <sub>90</sub>		

## Measurement range extension

Single dilution with selectable dilution factor (option)

CO measurement (H <sub>2</sub> compensated)	Meas. range	depending on factor selected
Accuracy	±2 % of mv (additional error)	
CO <sub>low</sub> meas. (H <sub>2</sub> compensated)	Resolution	1 ppm or 0.1 ppm at CO <sub>low</sub>
Dilution of all sensors by factor 5 (standard testo 350 XL)		
O <sub>2</sub> measurement	Reading is not shown in display	
HC measurement	Reading is not shown in display	
CO <sub>2</sub> (IR) meas.	Reading is not shown in display	
CO measurement (H <sub>2</sub> compensated)	Meas. range	2500 to 50000 ppm
Accuracy	±5 % of mv (additional error)	
Resolution	Pressure range -150 to 0 mbar at probe tip	1 ppm
CO <sub>low</sub> meas. (H <sub>2</sub> compensated)	Meas. range	500 to 2500 ppm
Accuracy	±5 % of mv (additional error)	
Resolution	Pressure range -150 to 0 mbar at probe tip	0.1 ppm
NO measurement	Meas. range	1500 to 15000 ppm
Accuracy	±5 % of mv (additional error)	
Resolution	Pressure range -100 to 0 mbar at probe tip	1 ppm
NO <sub>low</sub> measurement	Meas. range	300 to 1500 ppm
Accuracy	±5 % of mv (additional error)	
Resolution	Pressure range -150 to 0 mbar at probe tip	0.1 ppm
NO <sub>2</sub> measurement	Meas. range	500 to 2500 ppm
Accuracy	±5 % of mv (additional error)	
Resolution	Pressure range -50 to 0 mbar at probe tip	0.1 ppm
SO <sub>2</sub> measurement	Meas. range	500 to 25000 ppm
Accuracy	±5 % of mv (additional error)	
Resolution	Pressure range -100 to 0 mbar at probe tip	1 ppm
H <sub>2</sub> S measurement	Meas. range	200 to 1500 ppm
Accuracy	±5 % of mv (additional error)	
Resolution	Pressure range -100 to 0 mbar at probe tip	0.1 ppm

## Technical data for HC gas sensor

Parameter	Methane	Propane	Butane
Meas. range <sup>1</sup>	100 to 40,000 ppm	100 to 21,000 ppm	100 to 18,000 ppm
Accuracy	less than 400 ppm (100 to 4000 ppm less than 10 % of m.v. (greater than 4000 ppm))	less than 400 ppm (100 to 4000 ppm less than 10 % of m.v. (greater than 4000 ppm))	less than 400 ppm (100 to 4000 ppm less than 10 % of m.v. (greater than 4000 ppm))
Resolution	10 ppm	10 ppm	10 ppm
Min. Q2 req. in flue gas	2% + (2 x methane reading)	2% + (5 x propane reading)	2% + (6.5 x butane reading)
Reaction time t <sub>90</sub>	less than 40 s	less than 40 s	less than 40 s
Response factor <sup>2</sup>	1	1.5	2

<sup>1</sup> Lower explosion limit must be adhered to.<sup>2</sup> The HC gas sensor is adjusted to methane in the factory. It can be adjusted to another gas (propane or butane) by the user.

## Additional Technical data

Dimensions: 395 x 275 x 95 mm	Pump flow: 1 l/min. with flow monitoring
Weight: 3200 g	Max. dust load: 20 g/m <sup>3</sup> dust in flue gas
Storage temperature: -20 to +50 °C	Max. humidity load: +70 °C
Operating temperature: -5 to +45 °C	Dewpoint temperature at sample gas inlet of analyzer box
Housing material: ABS	Trigger input: Voltage 5 to 12 Volt (rising or falling edge)
Memory: 250 000 readings	Pulse width > 1 s
Power supply: Via built-in mains unit (90 V to 260 V, 47 to 63 Hz) or exchangeable rechargeable batteries	Load: 5 V/max. 5 mA, 12 V/max. 40 mA
Electrical power consumption: 0.5 A (110 V AC), 0.3 A (230 V AC)	Warranty: Analyzers 2 years (excluding working parts, e.g. gas sensors...); CO/NO/NO <sub>2</sub> : 1 year; O <sub>2</sub> gas sensor: 1 1/2 years; CO <sub>2</sub> IR gas sensor: 2 years. The warranty applies for average sensor load.
Dewpoint calculation: 0 to 99 °C td	
Maximum positive pressure/flue gas: 50 hPa (500 mm water column)	
Maximum negative pressure: 200 hPa (2000 mm water column)	

## testo 350-MARITIME

### Fast and easy measurement according to MARPOL Annexe VI and NO<sub>x</sub> Technical Code

The certified testo 350-MARITIME is the first portable exhaust gas analyzer for the measurement of exhaust gas emissions according to MARPOL Annexe VI and the MEPC.103(49)-guideline in the world.

The system carries the Germanische Lloyd (GL) certificate no. 59 488 – 08 HH according to MARPOL 73/78 Annexe VI, NO<sub>x</sub> Technical Code and the MEPC.103(49) guideline.

Gas sampling is carried out using a special sampling probe which can be installed with the help of a flange. The certified and durable electrochemical gas sensors (ECS) provide a highly accurate and long-term stable determination of the concentration of the exhaust gas components O<sub>2</sub>, CO und NO<sub>x</sub> (NO + NO<sub>2</sub> separately!). CO<sub>2</sub> is recorded using the certified IR measurement principle. In order to meet the tough conditions at sea, the complete exhaust gas analyzer is housed in a robust protective case.

## The portable exhaust gas analyzer for marine diesel engines

- Certified by Germanischer Lloyd, certificate no. 59 488 – 08 HH
- The complete exhaust gas analysis set is delivered in a practical trolley

### On-board verification examination according to NO<sub>x</sub> Technical Code

The testo 350-MARITIME can be used to measure the gaseous exhaust gas concentrations of O<sub>2</sub>, CO, CO<sub>2</sub> and NO<sub>x</sub> as a system component for the following procedures:

- Periodical examinations and for intermediary examinations for direct measurement and monitoring on board
- Simplified test and measurement procedures

### Testing NO<sub>x</sub> limit values stipulated in MARPOL Annexe VI

- Official NO<sub>x</sub> control measurements on board

### NO<sub>x</sub> measurements as proof in special regional zones

- e.g. as proof of NO<sub>x</sub> reduction for NO<sub>x</sub> tax purposes in Norway



Illustration max differ from original!



### testo 350-MARITIME

Exhaust gas analysis box testo 350-MARITIME, equipped with: O<sub>2</sub>, CO, CO<sub>2</sub>-(IR), NO and NO<sub>2</sub>, gas preparation, integrated battery and measurement data store ( (SO<sub>2</sub> measurement on request); Control Unit testo 350-MARITIME; connection line (2m) between exhaust gas analyzer and control unit; gas sampling probe with probe pre-filter; installation flange for gas sampling probe; robust protective case with trolley function; cable with battery clamps for connection to the testo 350-MARITIME; Germanischer Lloyd (GL) certificate no. 59488 –08 HH

Part no.

**0563 3500**

### Technical data

Parameters	Meas. range	Tolerance
°C, exhaust gas	-40 to +1000 °C	max. ±5 K
O <sub>2</sub>	0 to 25 Vol. %	Corresponding to MARPOL Annexe VI and NO <sub>x</sub> Technical Code
CO	0 to 3000 ppm	
NO	0 to 3000 ppm	
NO <sub>2</sub>	0 to 500 ppm	
SO <sub>2</sub>	0 to 3000 ppm	
CO <sub>2</sub> (IR)	0 to 40 Vol. %	
P <sub>abs</sub>	600 to 1150 hPa	±5 hPa at +22 °C ±10 hPa at -5 to +42 °C
Oper. temp.	+5 to +50 °C	
Storage temp.	-10 to +50 °C	
Voltage supply	11 to 40 V DC or 110 to 230 V AC 50/60 Hz buffer battery NiMH 8.4 V/4.5 A	
Electrical power consumption	max. 40 W	
Max. positive pressure at gas input	50 hPa	
Max. negative pressure at gas input	-200 hPa	
Weight	Approx. 17 kg	
Dimensions	56.5 x 45.5 x 26.5 cm	

### Accessories

Standard ambient air probe up to +70°C

### Part no.

0636 9740

Cable, 1.5 m long, connects probe with plug-in head to meas. instrument

0430 0143

Additional information at

## testo 360

Today, official emission measurements on industrial flue gases are ideally carried out using a compact, portable analyser of robust design. Advantage: Easy to transport by car and easy to handle.

When monitoring thermal processes, the aim is to maintain and improve quality. Often conditions are extreme with a high gas concentration, dust load, high ambient temperatures and long-term measurements are required.

When monitoring emissions, **testo 360** can determine even extreme values thanks to a switchable measuring range extension and it can withstand high ambient temperatures and radiant heat.

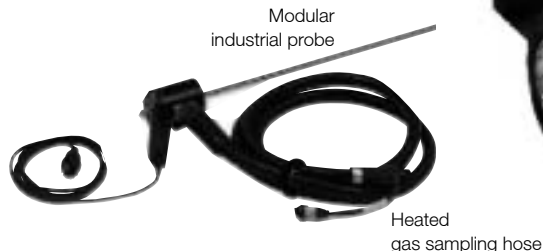
For service on industrial furnaces, total accuracy is required of portable multi-function analysers because of the numerous subsequent emission inspections; the analyser should also be robust to withstand continuous measurements for the optimum adjustment of burners. A high efficiency level and low subsequent costs are also a priority.

- Data logger function for several days or weeks
- Maintenance-friendly design reduces costs

Industrial flue gas inspections require flexible analysers which are easy to transport and correspond to stationary systems in terms of accuracy levels.

## Portable reference analyser for industrial flue gases

- Accuracy fully compatible with stationary measuring technology
- All in one analyser: NO<sub>x</sub>, CO, CO<sub>2</sub>, SO<sub>2</sub>, O<sub>2</sub>, HC
- Water level in flue gas, velocity and differential pressure, temperature
- Long-term stable sensor, calibration gas on site is not necessary
- Integrated, low-absorption Peltier gas penetration unit (patented)
- Can be used in extreme conditions
- Data logger operation for several days and weeks without staff supervision
- Extreme measurement ranges in % range with high precision at low concentrations
- Easy maintenance reduces follow up costs

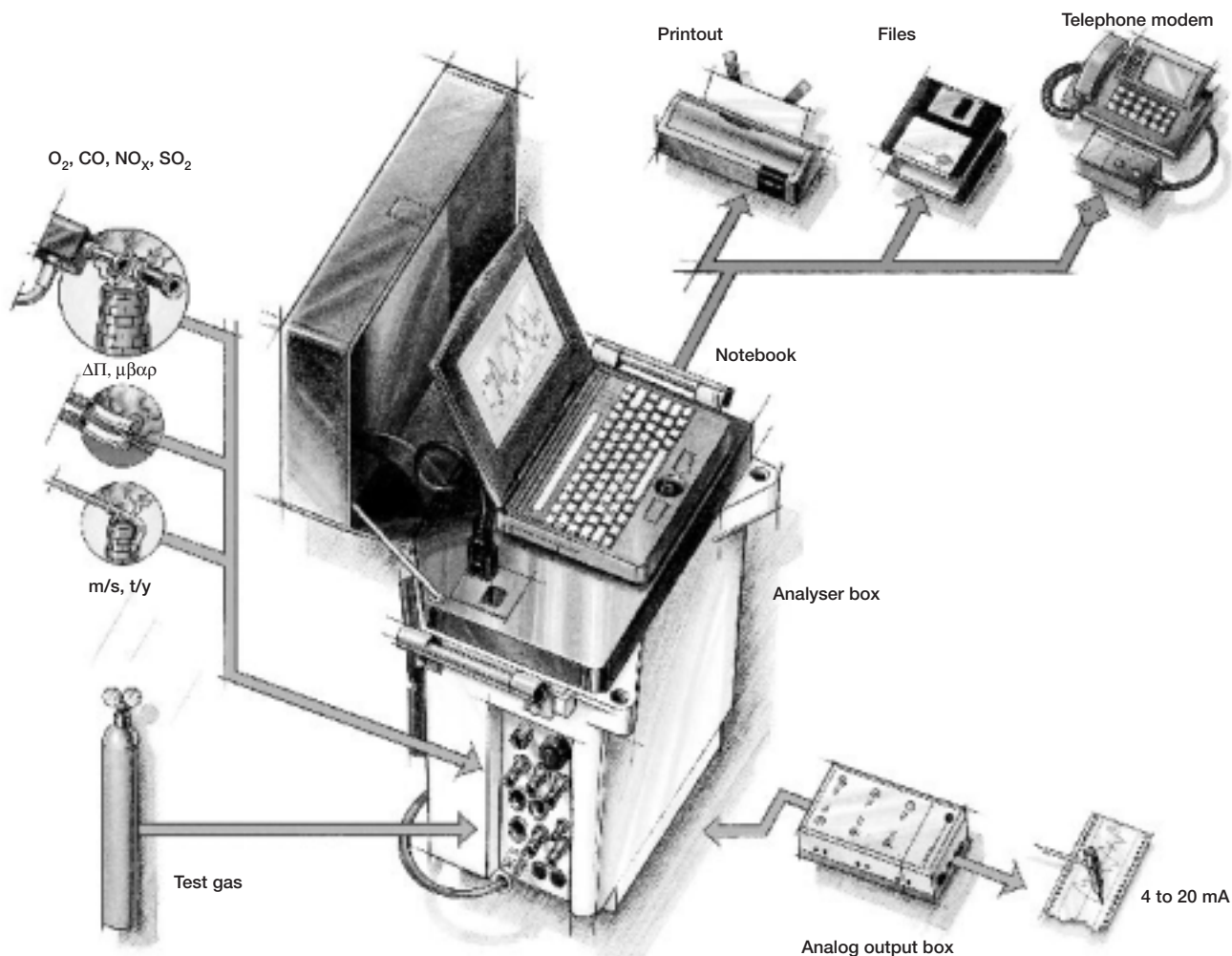


The approval for long-term emission measurements was carried out by RWTÜV Anlagentechnik GmbH in Essen, Germany. The NO, NO<sub>2</sub>, SO<sub>2</sub>, CO and O<sub>2</sub> components were tested. Unlimited approval of **testo 360** for use on TA Luft systems was confirmed.

**USA**  
**testo 360** meets US EPA's Performance Specifications for measuring NO<sub>x</sub>, CO and O<sub>2</sub>. Also fulfills CTM-030 and -034 as well as US EPA's 40 CFR, Part 60, App. A and B and Part 75 Subpart C. (**testo 360** is also approved by California South Coast Air Quality Management District for measuring NO<sub>x</sub>.)

**Russia**  
**testo 360** has GOS standard approval for all parameters.

**Switzerland**  
**testo 360** is approved by BUWAL for official emission measurements.



#### Design and function

The testo 360 reference measuring system consists of an analyser unit, a notebook and the flue gas probe. All of the sensors (max. 7 gas sensors), the flue gas moisture measurement unit (optional), the measuring range extension unit (gas dilution, optional), velocity measurement (optional) as well as a low absorption gas preparation Peltier cooling unit are located in the analyser box.

The option of an external additional probe unit is available for parallel measurement of temperatures or mA/mV signals (e.g. from FID) and the output of analog signals (4-20 mA).

The flue gas probe is connected to the heated hose with built-in filter: either the modular industrial probe or any non-Testo or special probes via an adapter.

#### Handling

**testo 360** is easily transported by the operator. The fold-up trolley on which the analyser is placed when working is ideal for this purpose.

#### Operation and Analysis

The notebook is protected from ambient influences during long-term measurements by the lid which can be locked. Measurements are taken using WINDOWS® software. The measured data is saved as ASCII on the notebook's hard disk and can be integrated into any analysis program.




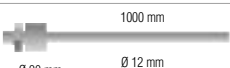

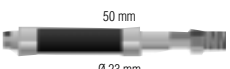
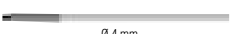

The analyser can be operated and data can be transmitted via telephone modem or computer network.

#### Continuous measurements


Calibration gas can be automatically supplied to the probe for accuracy checks by means of a calibration gas switchover unit (accessory) or directly to the analyser by means of a calibration gas inlet (optional).



#### Maintenance and Service



**testo 360** has been designed so that the user can easily change the sensors – also without calibration gases.

Industrial gas sampling probes – modular system			Part no.
Heated handle, power supply 115 to 230 V, 50/60 Hz		Power consumption: 200 watts; Temp. gas path: > 180 °C; Ready to operate: after approx. 20 min; Length of mains cable: 3 m; Protection class: IP54; Ambient temp.: -20 to +50 °C; gas inlet: G1/4"; gas outlet: M 10x1 outer thread; weight: 1.7 kg	0600 7920
Adapter, non-heated		Ambient temp.: -20 to +50 °C; Protection class: IP54; Gas inlet: G1/4"; Gas outlet: M 10x1 outer thread; Weight: 0.4 kg	0600 7911
Non-heated sampling pipe to +600 °C, stainless steel 1.4571		Connection: G1/4" Weight 0.4 kg	0600 7801
Non-heated sampling pipe to +1200 °C, Inconel 625			0600 7803
Non-heated sampling pipe to +1800 °C, Al-Oxide		Connection: G1/4" Weight 0.4 kg	0600 7805
Heated sampling pipe, power supply 230 V / 50 Hz, stainless steel 1.4571		Heating: > +180 °C; power consumption: 650 watts; Connection: electr. connection to heated handle, connection adapter with thread connection/screw socket G1/4"; Max. flue gas temp.: +600 °C	0600 7820
Extension pipe to +600 °C, stainless steel 1.4571		Connection: Thread screw/screw socket G1/4"; Weight: 0.45 kg	0600 7802
Extension pipe to +1200 °C, Inconel 625			0600 7804
Preliminary filter for dusty flue gases, ceramic		Dust load: max. 20 g / m <sup>3</sup> ; filter fineness: 20 µm; Temperature: max. 1000 °C; Material: ceramic; Connection: G1/4" thread nipple; Weight: 0.2 kg	0554 0710
Preliminary filter can only be mounted on extension pipe 0600 7802 or 0600 7804.			
Thermocouple, NiCr-Ni, -200 to +1000 °C, Inconel 625, length 1.2 m		Connection: to analyzer via 4 m connection cable with 8-pin plug; weight: 0.15 kg. The length depends on the number of sampling/extension pipes used.	0430 0361
Thermocouple, NiCr-Ni, -200 to +1000 °C, inconel 625, length 2.2 m			0430 0362
Thermocouple, NiCr-Ni, -200 to +1000 °C, Inconel 625, length 3.2 m			0430 0363
Mounting flange, stainless steel 1.4571, adjustable quick-action fitting suitable for all sampling/extension pipes			0554 0760

Transport case for industry probes	Part no.
Transport case for industrial probes, aluminium, space for: handle, probes, flange and accessories	0516 7900







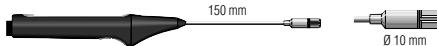
Heated hose		Part no.
For accurate NO <sub>x</sub> and SO <sub>2</sub> measurements – avoids absorption		
<b>Voltage supply:</b> 115/230 V; 50 to 60 Hz (2.2 m and 4 m) 230 V/50 Hz (8.0 m) <b>Inner temperature:</b> approx. 180 °C <b>Material inner hose:</b> PTFE <b>Material outer hose:</b> PTE (max. 150 °C) <b>Max. bend radius:</b> 0.2 m <b>Diameter:</b> 28 mm <b>Ambient temperature:</b> -25 to +0 °C <b>Inner filter part no.:</b> 0554 0393 (5 in pack) <b>Material:</b> PTFE <b>Filter fineness:</b> 5 µm <b>Dimensions:</b> Ø 12 mm, 55 mm length		Heated gas sampling hose, length 2.2 m, 115 V/60 Hz, 230V/50 Hz (not for multi-function probe) 0401 0398 Heated gas sampling hose, 4 m long, (also for multi-function probe) 0401 0399 Heated gas sampling hose, length 8 m, however only for 230V/50Hz (not for multi-function probe) 0401 0394



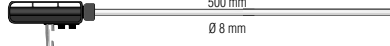


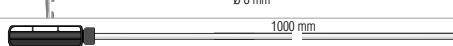
Couplings/adapters	Part no.
 Hose adapter for connecting test gas to thermocouple input, Material Hose PTFE Plug/screw connection, Length 0.3 m, Weight 0.3 kg	0699 2757-4
 Quick-action coupling for dP inputs and test gas at the test gas input. Material stainless steel, Hose connection Ø 4 mm	0699 2832/3

Couplings/adapters	Part no.
 Screw adapter for connecting non-Testo probes to the heated hose, Material stainless steel, Thread Swagelock	0699 3412
 Connection plug for the alarm output, Conn. 4-pin	0699 2816

Accessories	Part no.
<b>Trolley, dismantlable</b> For analyzer box testo 360 and accessories, Dimensions 610 x 430 x 1060 mm (W x D x H), Weight 14 kg, Material Aluminium	0554 3600
<b>Transport case</b> For testo 360 incl. accessories, Outer dim. 770 x 440 x 480 mm (W x D x H), Empty weight 11.4 kg, 2 transport rollers, 2 carrying handles, 3 lid locks	0516 0360

Accessories	Part no.
Voltage cable	0699 2757/1
Mains/charger unit for analog output, 220 V, for testo 350	0554 0085

Temperature probes and accessories	Illustration	Meas. range	Accuracy	t <sub>99</sub>	Part no.
Combustion air temperature probe, immersion depth 300 mm		0 to +100 °C		30 s	0600 9791
Combustion air temperature probe, immersion depth 190 mm		0 to +100 °C			0600 9787
Combustion air temperature probe, immersion depth 60 mm		0 to +100 °C		30 s	0600 9797
Mini ambient air probe, T <sub>max</sub> +80 °C, for separate ambient air temperature measurement		0 to +80 °C			0600 3692
Pipe wrap probe for pipes with diameter of up to 2", for flow/return temp. meas. in hydronic systems	 Conn.: Fixed cable	-60 to +130 °C	Class 2	5 s	0600 4593
Spare meas. head for pipe wrap probe, TC Type K		-60 to +130 °C	Class 2	5 s	0602 0092
Fast-action surface probe with sprung thermocouple strip, for measurements on floor heating, radiators, insulations...	 Conn.: Plug-in head, connection cable 0430 0143 or 0430 0145 required	-200 to +300 °C	Class 2	3 s	0604 0194
Cable, 1.5 m long, connects probe with plug-in head to meas. instrument, PUR coating material					0430 0143
Cable, 5 m long, connects probe with plug-in head to measuring instrument, PUR coating material					0430 0145

Pitot tubes and accessories	Illustration	Meas. range	Part no.
Pitot tube, 350 mm long, stainless steel, for measuring flow velocity in connection with 0638 1347/..1447 pressure probes		Oper. temp. 0 to +600 °C	0635 2145
Pitot tube, 1000 mm long, stainless steel, measures flow speed with pressure probes 0638 1347/..1447		Oper. temp. 0 to +600 °C	0635 2345
Pitot tube, stainless steel, 500 mm long, measures flow speed with temperature, for pressure probes 0638 1347/..1447		-40 to +600 °C	0635 2140
Pitot tube, stainless steel, 350 mm long, measures flow speed with temperature, 3 x hoses (5 m long) and heat protection plate		-40 to +1000 °C	0635 2041
Pitot tube, stainless steel, 750 mm long, measures flow speed with temperature, 3 x hoses (5 m long) and heat protection plate		-40 to +1000 °C	0635 2042
Pitot tube, stainless steel, 1000 mm, measures flow speed with temperature, for pressure probes 0638 1347/..1447		-40 to +600 °C	0635 2240
Connection hose, silicone, 5m long, max. load 700 hPa (mbar)			0554 0440

testo 360-3, analyzer	Part no.
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**A notebook is required for the operation of the testo 360!**

testo 360-3 analyzer, approved, without notebook, fitted with O<sub>2</sub> gas sensor, gas preparation, housing heating

0563 3600

Options	Part no.
NO gas sensor	0440 0068
CO <sub>2</sub> gas sensor (incl. absolute pressure measurement)	0440 0084
HC gas sensor	0440 0099
NO <sub>2</sub> gas sensor	0440 0069
SO <sub>2</sub> gas sensor	0440 0070
CO gas sensor (with CO flushing), up to 10,000 ppm, H <sub>2</sub> -comp.	0440 0065
CO gas sensor up to 40,000 ppm	0440 0067
Measuring range extension (gas dilution)	0440 0059
Flue gas moisture measurement to determine water level	0440 0063
Manual flow measurement (differential pressure measurement) for using Pitot tubes	0440 0016
Option automatic velocity measurement	0440 0088
Automatic calibration gas supply for 1 calibration gas bottle in instrument, (Connection for 1 calibration gas bottle, max. pressure 30 hPa)	0440 0061
Quick-action coupling for calibration gas connection	0699 2832/3

Information about instrument upgrades and prices available on request.

Software	Part no.
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Automatic software, for programming and long-term measurement

0554 0378

Analysis software, for professional presentation of measurement results

0554 0380

Basic software

0554 0364

**Recommended set**
**testo 360: Typical Set for Official Measurements\***

testo 360-3 analyzer, approved, without notebook, fitted with O2 gas sensor, gas preparation, housing heating	0563 3600
CO2 gas sensor (incl. absolute pressure measurement)	0440 0084
SO2 gas sensor	0440 0070
Manual flow velocity measurement (deltaP measurement) with Pitot tube	0440 0016
Basic software	0554 0364
Heated gas sampling hose, 4 m long	0401 0399
Hose filter insert	0554 0393
Trolley	0554 3600
Transport case	0516 0360
Heated handle	0600 7920
Heated sampling pipe	0600 7820
Extension pipe to +600 °C, stainless steel 1.4571	0600 7802
Preliminary filter for dusty flue gases, ceramic	0554 0710
Mounting flange, stainless steel 1.4571	0554 0760
Transport case for industrial probes, aluminium	0516 7900

**Recommended set**
**testo 360: Typical Set for Thermal Process Measurement\***

testo 360-3 analyzer, approved, without notebook, fitted with O2 gas sensor, gas preparation, housing heating	0563 3600
CO2 gas sensor (incl. absolute pressure measurement)	0440 0084
Measuring range extension (gas dilution)	0440 0059
Flue gas moisture measurement to determine water level	0440 0063
Basic software	0554 0364
Automatic software	0554 0378
Analysis software	0554 0380
Heated gas sampling hose, 4 m long	0401 0399
Hose filter insert	0554 0393
Trolley	0554 3600
Adapter, non-heated	0600 7911
Non-heated sampling pipe to +1800 °C, Al-Oxide	0600 7805

**Recommended set**
**testo 360: Typical Set for Service and Adjustment\***

testo 360-3 analyzer, approved, without notebook, fitted with O2 gas sensor, gas preparation, housing heating	0563 3600
NO gas sensor	0440 0068
NO2 gas sensor	0440 0069
CO gas sensor (with CO flushing)	0440 0065
CO2 gas sensor (incl. absolute pressure measurement)	0440 0084
Basic software	0554 0364
Automatic software	0554 0378
Analysis software	0554 0380
Heated gas sampling hose, 4 m long	0401 0399
Hose filter insert	0554 0393
Trolley	0554 3600
Transport case	0516 0360
Heated handle	0600 7920
Heated sampling pipe	0600 7820
Extension pipe to +600 °C, stainless steel 1.4571	0600 7802
Preliminary filter for dusty flue gases, ceramic	0554 0710
Mounting flange, stainless steel 1.4571	0554 0760
Transport case for industrial probes, aluminium	0516 7900

**Recommended set**
**testo 360: Typical Set for Research and Development\***

testo 360-3 analyzer, approved, without notebook, fitted with O2 gas sensor, gas preparation, housing heating	0563 3600
NO gas sensor	0440 0068
NO2 gas sensor	0440 0069
CO gas sensor (with CO flushing)	0440 0065
CO2 gas sensor (incl. absolute pressure measurement)	0440 0084
SO2 gas sensor	0440 0070
HC gas sensor	0440 0099
Measuring range extension (gas dilution)	0440 0059
Flue gas moisture measurement to determine water level	0440 0063
Manual flow velocity measurement (deltaP measurement) with Pitot tube	0440 0016
Basic software	0554 0364
Heated gas sampling hose, 4 m long	0401 0399
Hose filter insert	0554 0393
Trolley	0554 3600
Transport case	0516 0360
Heated handle	0600 7920
Heated sampling pipe	0600 7820
Extension pipe to +600 °C, stainless steel 1.4571	0600 7802
Preliminary filter for dusty flue gases, ceramic	0554 0710
Mounting flange, stainless steel 1.4571	0554 0760
Transport case for industrial probes, aluminium	0516 7900

\* A notebook is required for the operation of the testo 360!





## General measuring ranges

In testo 360 the measuring range end value is determined by the choice of test gases. Example: CO desired measuring range up to 300 ppm => test gas concentration approx. 240-260 ppm (approx. 80 % of measuring range end value). However, the recording of measurement values over the measuring range thus defined is possible.

Parameter	Greatest measuring range	Greatest measuring range with measuring range extension	Permitted accuracy at 6 m gas path <sup>1)</sup>	Accuracy achieved in the test DIN 33962 <sup>1)</sup>
O <sub>2</sub>	0 to +21 Vol. % O <sub>2</sub>	0 to 21 Vol. % O <sub>2</sub>	<5% of MR end value	≤ 1.2 % of MR end value
NO	0 to +3000 ppm NO 0 to +6160 mg/m <sup>3</sup> NO	0.1 to 6.0 Vol. % NO	<5% of MR end value	≤ 2.8 % of MR end value
NO <sub>2</sub>	0 to +500 ppm NO <sub>2</sub> 0 to +1030 mg/m <sup>3</sup> NO <sub>2</sub>	0.1 to 1.0 Vol. % NO <sub>2</sub>	<5% of MR end value	≤ 1.0 % of MR end value
NO <sub>x</sub> (NO+NO <sub>2</sub> )	0 to +3500 ppm NO <sub>x</sub> 0 to +7190 mg/m <sup>3</sup> NO <sub>x</sub>	0.1 to 7.0 Vol. % NO <sub>x</sub>	<5% of MR end value	≤ 3.8 % of MR end value
SO <sub>2</sub>	0 to +5000 ppm SO <sub>2</sub> 0 to +14650 mg/m <sup>3</sup> SO <sub>2</sub>	0.1 to 10.0 Vol. % SO <sub>2</sub>	<5% of MR end value	≤ 2.5% of MR end value
CO <sub>2</sub>	0 to +25 Vol. % CO <sub>2</sub>	0.1 to 100 Vol. % CO <sub>2</sub>	<5% of MR end value	–
with integr. absolute pressure measurement	+40 to +1200 hPa	+400 to +1200 hPa	≤ ±14 hPa (+40 to +1200 hPa)	–
CO	0 to +10000 ppm CO 0 to +12560 mg/m <sup>3</sup> CO	0.1 to 20 Vol. % CO	<5% of MR end value	≤ 2.0 % of MR end value*
Exhaust gas humidity	+2 to +31 % H <sub>2</sub> O +15 to +70 °C td	–	≤ 4 Vol. % H <sub>2</sub> O absolute	–
Temperature FT	-40 to +1200 °C	–	≤ 0.5 °C (0 to +100 °C) 0.5% of mv (> 100 °C)	–
Flow velocity calculated from pressure difference	+5 to +40 m/s 0 to +50 hPa	–	≤ 1.5 m/s (at +200 °C FT and 950 hPa (absolute pressure)) ≤ 0.05 hPa plus 1 % of meas. value*	–

<sup>1)</sup> All accuracies stated without the option "measuring range extension". With measuring range extension, a fixed value of ±2 % must be added.

Parameter HC	Smallest measuring range	Largest measuring range <sup>1)</sup>	Accuracy	Resolution	Min. O <sub>2</sub> requirement in exhaust gas	Reaction time t <sub>90</sub>
Methane	80 to 3000 ppm (explosion threshold)	to 5 % (= lower explosion threshold)	<10 % of MREV	0.001 Vol. % = 10 ppm	2 % + (2 x m.v. methane)	20sec.
Propane	80 to 3000 ppm (explosion threshold)	to 2.1 % (= lower explosion threshold)	<10 % of MREV	0.001 Vol. % = 10 ppm	2 % + (5 x m.v. propane)	20sec.
Butane	80 to 3000 ppm (explosion threshold)	to 1.8 % (= lower explosion threshold)	<10 % of MREV	0.001 Vol. % = 10 ppm	2 % + (6.5 x m.v. butane)	20sec.

<sup>2)</sup> Lower explosion limit (LEL) must be observed.

<sup>3)</sup> The HC module is adjusted to methane in the factory. It can be adjusted to another gas by the user.

## Technical data from suitability tests

Suitable for the measurement of the parameters below in exhaust gas in systems according to TI air, 13. BImSchV (large furnace systems) and 17. BImSchV (waste combustion systems).

Parameter	Max. measuring range acc. to suitability test	Smallest tested measuring range
O <sub>2</sub>	0 to +21 Vol. % O <sub>2</sub>	0 to +21 Vol. % O <sub>2</sub>
CO	0 to 3750 mg/m <sup>3</sup> 0 to 3000 ppm	0 to 75 mg/m <sup>3</sup> 0 to 60 ppm
NO	0 to 2055 mg/m <sup>3</sup> 0 to 1000 ppm	0 to 300 mg/m <sup>3</sup> 0 to 146 ppm
NO <sub>2</sub>	0 to 410 mg/m <sup>3</sup> 0 to 200 ppm	0 to 100 mg/m <sup>3</sup> 0 to 49 ppm
SO <sub>2</sub>	0 to 4410 mg/m <sup>3</sup> 0 to 1500 ppm	0 to 75 mg/m <sup>3</sup> 0 to 26 ppm

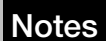
Availability:	96.1 % for all components
Maintenance interval:	14 days (in constant operation)
Proof limit: (mean values, of display ranges)	CO: 0.92 %, NO <sub>2</sub> : 0.04 % O <sub>2</sub> : 0.01 Vol %, NO: 0.24 %, SO <sub>2</sub> : 2.1 %
Influence of barometric air pressure changes on the measurement signal	
Test gas flow:	no influence
Permitted ambient temperature:	-20 °C to +50 °C
Temperature dependency of zero point:	0%
Temperature dependency of sensitivity:	maximum 2.8 %

Time change during the maintenance interval

Parameter	Zero point	Reference point
CO	< 0.1 %	< +3.1 %
SO <sub>2</sub>	< +0.3 %	< -1.1 %
NO	< 0.1 %	< 2.0 %
NO <sub>2</sub>	< +1.3 %	< +1.2 %
O <sub>2</sub>	< 0.02 Vol. %	< 0.02 Vol. %

Time change of zero point and sensitivity:	<2 % of target value
Adjustment time t <sub>90</sub> :	maximum 30 seconds
Cross-sensitivity (to CO <sub>2</sub> , NO, NO <sub>2</sub> , HCL, SO <sub>2</sub> , CH <sub>4</sub> , NH <sub>3</sub> and H <sub>2</sub> O in percent of display range):	<1.3 % reading
Discrepancy of current/target value of instrument characteristic curve:	<2 % displ. range, max. 0.13 Vol. % O <sub>2</sub>
Reproduceability:	NO: R = 56; SO <sub>2</sub> : R = 92 (70*) O <sub>2</sub> : R = 434; NO <sub>2</sub> : R = 81; CO: 111 (69*)

\* Note: Measuring range 17. BImSchV







## Testo: At Your Service

Please send for more information:

Monitoring Instruments for Food Production, Transport and Storage

Measurement Engineering for Restaurants, Catering and Supermarkets

Measurement Engineering for Air Conditioning and Ventilation

Measurement Engineering for Heating and Installation

Measurement Solutions for Emissions, Service and Thermal Processes

Measurement Solutions for Refrigeration Technology

Stationary Solutions for Air Conditioning and Process

Measurement Solutions for Production, Quality Control and Maintenance

Measurement Solutions for Climate Applications in Industry

Reference Measurement Technology for Industry

Measuring Instruments For Temperature

Measuring Instruments for Humidity

Measuring Instruments For Velocity

Measuring Instruments for Pressure and Refrigeration

Multi-Function Measuring Instruments

Measuring Instruments for Flue Gas and Emissions

Measuring Instruments for RPM, Analysis, Current/Voltage

Measuring Instruments For Indoor Air Quality, Light And Sound

Stationary Measurement Technology Humidity / Differential Pressure / Temperature

Stationary Measurement Technology Compressed Air

Stationary Measurement Technology Process Displays / Online Monitoring / General Information