

2010

Reference Measurement Technology for Industry





Reference measurement technology for industry

Measuring tasks in industry place a variety of complex demands on the measuring technology used. It is in light of this challenging task that Testo places a great deal of importance on quality, operating reliability and security of results. For highly accurate measurements with reference quality, Testo offers measuring instruments, selected probes and calibration services from the standard program, which are described according to measurement parameter. In addition to this, the possibility of producing customized measuring probes for individual applications.

Many years of experience gained from industrial applications are incorporated into Testo's in-house research activities, thus ensuring a practical approach to new developments and, in turn, a technological advantage. As such, Testo has assumed a pacesetting role in the market. Real innovations in sensor systems as well as advances made in microelectronics, measurement data storage or communication with other media such as a PC benefit all Testo customers.

This combination of long-time practical experience and close customer proximity as well as theoretical examination – including the area of basic research – increases the utility of Testo measurement solutions for all users and commits to the future.

Testo provides sophisticated measuring instrument variants and services to meet a wide application spectrum. With 1700 employees and 27 subsidiaries, Testo has representation on all continents.

Accuracy requirements

Demands placed on accuracy and quality, especially for reference measurement systems, can be assured/confirmed via calibration. This is why Testo industrial services offers certified calibrations in accordance with all applicable standards (e.g. ISO 9000ff, QS 9000, DKD, ÖKD, Cofrac, NIST, GMP, HACCP, FDA etc.) as well as various services.

Calibration takes place in accredited, in-house high-tech laboratories.

Qualified service

Testo offers professional, fair consultation for all questions pertaining to measuring technology. We provide users quick assistance also after the purchase is made – worldwide. Our products have a 10-year service warranty, translating into a long-term and safe investment for our customers.

We are the market leader because we also take all product-related services very seriously:

service, support and availability. We set the standard, both before and after the purchase as well as in all application phases.

Continuing education and qualification

Being a market leader requires not only top-class products, but also the ability to react quickly to changes. In this context, continuing education and qualification play a prominent role at Testo - both internally and externally.

Staying at the cutting edge of knowledge: that is one of the most critical conditions that must be satisfied if complex measuring tasks and increasing quality requirements are to be met.

To this end, our own employees are promoted and advanced in their capacity as much as possible, while users are offered practically-oriented knowledge. Testo imparts knowledge to customers in the areas of measuring technology and application know-how in the form of training courses, seminars and field guides.

Highly recommended

Renowned companies from many different industry sectors utilize decisive productivity and quality advantages by choosing Testo right from the beginning.

Take advantage of a successful partnership as well! More than 100,000 users have already done so.





www.testo.com

The international Testo portal provides quick access to our products and services in 86 countries around the world.

Up-to-date information is at your fingertips. Our internet website has many features:

- Convenient product search
- Configuration of your individual measuring system
- Many application examples
- Online ordering

- The international Testo portal pro- Querying a Testo dealer in your vides quick access to our pro- neighbourhood
 - Service advice for Testo measuring instruments
 - Current trade fair and seminar dates
 - Download centre
 - Specialised library
 - Press releases
 - Job offers

Our internet presence gives visitors of the Testo sites access to comprehensive product information. Online queries and orders are possible, as are downloads of application and press information all about measuring technology. A concise navigation and a list of current topics on the homepage ensure fast entry.



Global entry point: www.testo.com

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Detailed product information incl. direct ordering option



Country-specific websites incl. all product catalogues

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A multitude of additional information such as trade fair dates

Product overview according to instrument classes, with specifications

Measuring system testo 454 (from page 57)

testo 400 reference multi-function measuring instru (from page 48)	ment						
reference temperature and humidity measuring inst (from page 12), testo 650 (from page 30)	rument testo 950)					
Highly accurate temperature measurement testo 735 (from page 6)							
Data loggers testostor 171, testo 177 for temperatu dity (from page 38)	re (from page 20) and humi-		2238 1 2211	testo 650		
reference/precision pressure measuring instruments testo 521, testo 526, testo 525 (page 70 to 75)	S			ě			
Calibrators huminator (page 45), mini wind tunnel (page 67)							
Precision temperature	0			X	X	X	X
Air temperature		Х	Х	Х	Х	Х	Х
Surface temperature		Х	Х	Х	Х	Х	Х
Differential temperature				Х	Х	Х	Х
Air humidity	Х		Х		X (testo 650 only)	Х	Х
Precision humidity					X (testo 650 only)	Х	Х
Vane	Х					Х	Х
Thermal probe	Х					Х	Х
Pitot tube		Х				Х	Х
VAC module						Х	
Differential pressure		Х			X (testo 650 only)	Х	Х
External differential pressure probe		Х			X (testo 650 only)	Х	Х
Absolute pressure		Х			X (testo 650 only)	Х	Х
CO ₂					Х	Х	Х
rpm/voltage/current (0 to 20 mA, 0 to 1/10 V)		Х			Х	Х	Х
Number of probe inputs		3	4 max.	3+3	2	2	200 max.
Wireless probe (radio)				Х			
Databus							Х
Analog output							Х
Printout of readings (infrared printer)		Х	Х	Х	Х	Х	Х
Processing of measurement data on PC		Х	Х	Х	Х	Х	Х
Reading memory		Х	Х	10,000	500,000	500,000	from 250,00

testo 735, highly accurate alarm and logger thermometer - with measurement site management

testo 735

testo

Measuring several temperatures simultaneously

testo 735 – the highly versatile multi-channel measuring instrument. Fully equipped, up to 6 temperature probes can be recorded and displayed: Three radio probes and three attachable probes. For classical probes with wire, two inputs for fast thermocouple probes (Type K/T/J/S) and one input for highly precise Pt100 probes are available. The highly precise immersion/penetration probe reaches an accuracy of up to 0.05 °C via the Pt100 probe input. The resolution of the probe is 0.001 °C.

Versatility with radio probes

Readings can be transmitted to the testo 735 over a distance of up to 20 m (without obstruction) by radio. This takes place using the optional radio module and the corresponding probes. Damage to the wire or hindrances in usage are thus eliminated.

Documentation provides security

The software for presenting the data on a PC is included as standard. Individual measurements as well as measurement series are stored in the testo 735-2 (10,000 readings) and then presented as a table or graph via the PC software. The readings can alternatively also be transferred to the PC software online. On site, the testo 735 transfers the data wirelessly to the testo report printer by infrared interface. In addition to the measurement readings, the date and time are also documented on the printout. Data can be printed cyclically on the testo report printer at a measurement rate from 1 minute to 24 hours via the function "cyclic printing". This means that you can document measurement series on paper with the testo 735-1, even without a data memory



Wireless measurement

with radio probes for air,

immersion and penetra-

tion measurement

Evaluate and document readings by measurement location with PC software (included with testo 735-2)





Print readings on site on testo report printer

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Highly accurate temperature measurement with accuracy up to 0.05 °C, testo 735

Highly accurate temperature measurement with accuracy up to 0.05 $^\circ\text{C}$

A highly accurate measurement system is required especially in the areas of quality assurance, calibration services and laboratories.

The highly accurate immersion/penetration probe (see illustration right) achieves a system accuracy of up to 0.05 $^{\circ}$ C in a measuring range from -40 to +300 $^{\circ}$ C via the Pt100 probe input.

The resolution of the probe is 0.001 $^{\circ}\text{C}.$ This makes it ideal for use as a working standard.



PC software for filing and documenting measurement data (included) testo 735-2



Common advantages

- Connection of 3 attachable probes and three radio probes
- Data printout on the testo printer
- Audible alarm when limit values are exceeded
- System accuracy up to 0.05 °C
- Display of Delta T, min., max. and mean values
- Backlit display
- Protection class IP 65

Further advantages testo 735-1

• Cyclic printing of readings on testo printer, e.g. once per minute

Further advantages testo 735-2

- Instrument store for 10,000 readings
- PC software for archiving and documenting measurement data
- Storage of single measurements or measurement series by measurement location,
- Quick access to the most important functions via user profiles
- Accuracy ove the entire measurement range thanks to system adjustment

With the ISO/DKD certificates(0520 0142/0520 0241, an additional optimization takes place for probe 0614 0235due to a highly accurate fine adjustment over the entire measurement range.

The accuracy of the probe is confirmed with the DKD certificate 0520 0241 with a measurement inaccuracy of 0.01 $^{\circ}$ C (0 to 100 $^{\circ}$ C) and of 0.02 to 0.03 $^{\circ}$ C in the remaining range.

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testo 735-1

testo 735-1, 3 channel temperature measuring instrument T/C Type K/T/J/S/Pt100, audible alarm, connection for max. 3 optional radio probes, incl. battery and calibration protocol

Part no. 0560 7351

testo 735-2

testo 735-2, 3 channel temp. meas. instr. T/C Type K/T/J/S/Pt100, audible alarm, connection for max. 3 optional radio probes, with readings memory, PC software and USB data transmission cable, with battery and calibration protocol

Part no. 0563 7352

Recommended Set: Highly accurate temperature measurement with accuracy up to 0.05 $^{\circ}\mathrm{C}$

testo 735-2, 3 channel temp. meas. instr. T/C Type K/T/J/S/Pt100, audible alarm, connection for max. 3 optional radio probes, with readings memory, PC software and USB data transmission cable, with battery and calibration protocol	0563 7352
Highly accurate Pt100 immersion/penetration probe incl. factory certificate (test points 0 $^\circ C$ and +156 $^\circ C$)	0614 0235
4-point adjustment, incl. DKD calibration certificate, calibration points freely selectable (for probe 0614 0235)	0520 0241

System adjustment

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Precision over the entire measurement range due to system adjustment

The system adjustment of testo 735-2 offers precise measurement results at critical temperature points. Due to a system calibration, the testo 735-2, including probe, can be adjusted at up to six user-defined temperature points across the entire measurement range. The adjustment takes place in the course of an ISO or DKD calibration by the Testo calibration laboratory Testo industrial services, or can be carried out individually by the user via an optional adjustment software.

This results in the following advantages.

Very accurate measurements at critical temperature points

Customers appreciate the broad measurement range of thermocouple probes, however they are often dissatisfied with the accuracy according to EN. Thanks to a system adjustment on the testo 735-2, system deviations up to the accuracy of the reference system can be achieved even with thermocouples!

In the course of a DKD calibration of thermocouple probes and testo 735-2 by the Testo calibration laboratory, deviations from 0.2 K from the reference value can be achieved after adjustment has taken place.

Flexible handling

Up to 6 probes can be operated simultaneously from the testo 735-2:

- 2 plug-in thermocouple probes
- 1 plug-in Pt100 probe

- 3 wireless probes: Option of thermocouple and NTC probes The complete range of probes of the testo 735-2 can be adjusted to the testo 735-2. This allows flexible handling.

Traceability of the adjustment

The adjustment data recorded and the probe identifiaction (e.g. the number of the calibration certificate) are stored in the hand instrument. If a thermocouple probe is adjusted to the testo 735-2 on channel 3, for example, the recorded adjustment data are stored in channel 3 of the hand instrument.

The adjustment data and the probe identification can be viewed in testo 735-2 at any time, and can be matched with the corresponding calibration certificates and connected probes. This guarantees the traceability of the data. The adjustment data stored in the testo 735-2, the probe identification and the date of the adjustment can be printed out on site with the optional Testo fast printer.



Manipulation-proof

The adjustment data stored in the testo 735-2 and the probe identification cannot be manipulated in the instrument. An alteration or update of the data is carried out by the Testo calibration laboratory in the course of a new system adjustment, or can be done by the user with the optional adjustment software.

Assurance in measurement

Probes with stored adjustment data are identified with "adj." in the instrument's display. This allows the user to see immediately in which channels adjustment data are stored. This clear referencing provides assurance in measurement.

Adjustment by the Testo calibration laboratory

The adjustment takes place on request in the course of a DKD or ISO calibration in the Testo calibration laboratory. You select the temperature points at which the measurement system (probe and instrument) is to be adjusted. You have the option of a two-point or a four-point adjustment. The ISO/DKD certificate documents the system accuracy recorded, including certificate number, date of adjustment and the instrument and probe serial numbers. The certificate number and the adjustment data are stored in the hand instrument. They can be viewed there at any time. This guarantees the traceability of the data.

Example of s	ystem deviation before	and after adjustment wit	th a TC probe.	
Temperature	Accuracy probe 0602 1293, TC class 2	Deviation testo 735-2	System accuracy be- fore adjustment	System deviation from the reference value after adjust- ment by Testo industrial services
+60 °C	±2.5 °C	±0.3 °C	±2.8 °C	from 0.2 K
+400 °C	±3.0 °C	±1.4 °C	±4.4 °C	from 0.4 K

Example of system deviation before and after adjustment with a Pt100 probe.									
Temperature	Deviation probe 0609 1273, Pt100	Deviation testo 735-2	System accuracy be- fore adjustment	System deviation from the reference value after adjust- ment by Testo industrial services					
+60 °C	±0.27 °C	±0.3 °C	±0.57 °C	from 0.02 K					
+400 °C	±0.95 °C	±1.4 °C	±2.34 °C	from 0.03 K					

System adjustment / Ordering data testo 735

Adjustment by the user

The adjustment can be carried out individually by the user himself, using the optional adjustment software. Up to six adjustment points per probe can be recorded during the course of a system calibration and entered into the software. You also have the option of documenting a probe identification and the date of the adjustment in the software. The data are transferred to the testo 735-2 via a USB cable. They can be viewed there at any time. This guarantees the traceability of the data.



Ordering data testo 735

Printer and Accessories	Part no.
Testo fast printer with wireless infrared interface, 1 roll thermal paper and 4 AA batteries	0554 0549
Spare thermal paper for printer (6 rolls), measurement data do- cumentation legible for up to 10 years	0554 0568
Spare thermal paper for printer (6 rolls)	0554 0569
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
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Additional accessories	Part no.
Additional accessories Plug-in mains adapter, 5 VDC 500 mA with European adapter, 100-250 VAC, 50-60 Hz	Part no. 0554 0447
Additional accessories Plug-in mains adapter, 5 VDC 500 mA with European adapter, 100-250 VAC, 50-60 Hz Extension cable, 5m, for thermocouple probe Type K	Part no. 0554 0447 0554 0592
Additional accessories Plug-in mains adapter, 5 VDC 500 mA with European adapter, 100-250 VAC, 50-60 Hz Extension cable, 5m, for thermocouple probe Type K Silicone heat paste (14g), Tmax = +260°C, improves heat transfer in surface probes	Part no. 0554 0447 0554 0592 0554 0004

Transport and Protection	Part no.			
Service case for basic equipment of measuring instrument and probes, dimensions: 400 x 310 x 96 mm	0516 0035			
Service case for measuring instrument, probes and accessories, dimensions 520 x 380 x 120 mm	0516 0735			
Adjustment software for testo 735-2	Part no.			
Software for adjustment testo 735-2 with user management, incl. USB data transfer cable	0554 0823			
Calibration certificates incl. adjustment for testo 735-2				
2-point adjustment incl. ISO calibration certificate, calibration points freely selectable	0520 0178			
4-point adjustment , incl. ISO calibration certificate , calibration points freely selectable (for probe 0614 0235)	0520 0142			
2-point adjustment incl. DKD calibration certificate, calibration points freely selectable	0520 0278			
4-point adjustment , incl. DKD calibration certificate, calibration points freely selectable (for probe 0614 0235)	0520 0241			

Further calibration certificates see page 28/29

Properties of the highly accurate immersion/penetration probe 0614 0235

Intelligent probes

The complete processing of the measurement value from the analog sensor signal to the digital measurement value takes place in the probe. The entire measurement inaccuracy of the instrument is eliminated.

System accuracy at nominal tem-
perature +22 °C:

Accuracy	Range
±0.05 °C	+0.01 to +100 °C
±(0.05 °C	-40 to 0 °C /
+0.05 % of mv)	+100.1 to +300
	°C

Individual probe adjustment Since the measurement value processing takes place entirely in the probe, each probe is individually calibrated. The adjustment is made using highly accurate fixed point cells.



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III.: Adjustment with fixed point cells

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Suitable probes at a glance / Radio module, testo 735

Immers./penetr. probes	Illustration		Meas. range	Accuracy	t99	Part no.
Highly accurate Pt100 immersion/pene- tration probe incl. factory certificate (tes points 0 °C and +156 °C)	295 mm 0 4 mm		-40 to +300 °C	±0.05 °C (+0.01 to +100 °C) ±(0.05 °C +0.05% of mv) (remaining range)	60 s	0614 0235 Conn.: Fixed cable
Laboratory probe Pt100, glass- coated, exchangeable glass pipe (Duran 50), resistant to corrosive substances	200 mm Ø 6 mm	30 mm Ø 5 mm	-50 to +400 °C	Class A (-50 to +300 °C), Class B (remai- ning range) * Without protective glass	45 s 12 s*	0609 7072 Conn.: Fixed cable
Robust, waterproof Pt100 immer- sion/penetration probe	114 mm Ø 5 mm	50 mm Ø 3.7 mm	-50 to +400 °C	Class A (-50 to +300 °C), Class B (remai- ning range)	12 s	0609 1273 Conn.: Fixed cable
Efficient and fast-action immersion probe, waterproof, TC Type K	300 mm Ø 1.5 mm)	-60 to +1000 °C	Class 1	2 s	0602 0593 Conn.: Fixed cable
Fast-action, waterproof immer- sion/penetration probe, TC Type K	60 mm Ø 5 mm	14 mm Ø 1.5 mm	-60 to +800 °C	Class 1	3 s	0602 2693 Conn.: Fixed cable
Waterproof immersion/penetration probe, TC Type K	■ 1 14 mm Ø 5 mm	50 mm	-60 to +400 °C	Class 2	7 s	0602 1293 Conn.: Fixed cable
Flexible, low-mass immersion measurement tip, ideal for measurements in small volumes	500 mm	<u></u>	-200 to +1000 °C	Class 1	1 s	0602 0493
ments (e.g. attached with adhesive tape), TC Type K	Ø 0.25 mm		Conn.: 2 m, FEP insul with dimensions: 2.2 r	ated thermal wire, tempera mm x 1.4 mm	ture pro	oof up to 200 °C, oval wire
Immersion tip, flexible, TC Type K	500 mm	\supset	-200 to +1000 °C	Class 1	5 s	0602 5792
Thermocouple with TC adapter, flexi- ble, 800mm long, fibre glass, TC Type K	800 mm	Ø 1.5 mm	-50 to +400 °C	Class 2	5 s	0602 0644
T/C, 1500 mm, fibre glass						0602 0645
Thermocouple with TC adapter, flexi- ble, 1500mm long, PTFE, TC Type K	1500 mm	Ø 1.5 mm	-50 to +250 °C	Class 2	5 s	0602 0646
Robust, Pt100 stainless steel food probe (IP65)	125 mm Ø 4 mm	15 mm Ø 3 mm	-50 to +400 °C	Class A (-50 to +300 °C), Class B (remai- ning range)	10 s	0609 2272 Conn.: Fixed cable
Surface probes	Illustration		Meas. range	Accuracy	t99	Part no.
Fast-action surface probe with sprung ther- mocouple strip, also for uneven surfaces, measurement range short-term to +500°C, TC Type K	115 mm	Ø 12 mm	-60 to +300 °C	Class 2	3 s	0602 0393 Conn.: Fixed cable
Efficient, waterproof surface probe with small measurement head for flat surfaces, TC Type K	150 mm Ø 2.5 mm	Ø 4 mm	-60 to +1000 °C	Class 1	20 s	0602 0693 Conn.: Fixed cable
Fast-action surface probe with sprung ther- mocouple strip, bent, also for uneven surfa- ces, measurement range short-term to +500°C, TC Type K	80 mm 0 5 mm	Ø 12 mm	-60 to +300 °C	Class 2	3 s	0602 0993 Conn.: Fixed cable
Air probes	Illustration		Meas. range	Accuracy	t99	Part no.
Robust air probe, T/C Type K	115 mm Ø 4 mm		-60 to +400 °C	Class 2	25 s	0602 1793 Conn.: Fixed cable
Efficient, robust air probe, Pt100	114 mm Ø 5 mm		-50 to +400 °C	Class A (-50 to +300 °C), Class B (remai- ning range)	70 s	0609 1773 Conn.: Fixed cable

Radio module for upgrading measuring instrument with radio option						
Country versions	Radio freq.	Part no.				
Radio module for measuring instrument, 869.85 MHz, approval for the countries: DE, FR, UK, BE, NL, ES, IT, SE, AT, DK, FI, HU, CZ, PL, GR, CH, PT, SI, MT, CY, SK, LU, EE, LT, IE, LV, NO	869.85 MHz FSK	0554 0188				
Radio module for measuring instrument, 915.00 MHz FSK, approval for USA, CA, CL	915.00 MHz FSK	0554 0190				

Option: Radio / Technical data, testo 735

Radio prob	pes for immersion/penet	ation measurements					
Radio immersio	on/penetration probes		Meas. range	Accuracy		Resolution	t99
Radio immersio	n/penetration probe, NTC	0 5 mm 0 3.4 mm	-50 to +275 °C	±0.5 °C (-20 to +8 ±0.8 °C (-50 to -20 ±0.8 °C (+80.1 to ±1.5 °C (remaining	0 °C) D.1 °C) +200 °C) j range)	0.1 °C	t ₉₉ (in water) 12 s
Country versions					Radio freq.	Part no.	
Radio immersion CZ, PL, GR, CH,	/penetration probe, NTC, approval for PT, SI, MT, CY, SK, LU, EE, LT, IE, LV	the countries: DE, FR, UK, BE, NO	NL, ES, IT, SE, AT, D	K, FI, HU,	869.85 MHz FSK	0613 1001	
Radio immersion	/penetration probe, NTC, approval for	USA, CA, CL			915.00 MHz FSK	0613 1002	
Assembled	d for you: Radio handles	with probe head					
Radio handles	with probe head for air-/ immersior	-penetration-meas.	Meas. range	Accuracy		Resolution	t99
Radio handle fo heads with TC p sion/penetratior	r attachable TC probe probe head for air/immer- n measurement	0 5 mm 0 3.4 mm	-50 to +350 °C Short-term to +500 °C	Radio handle: ±(0.5 °C +0.3% of ±(0.7 °C +0.5% of TC probe head: Cl	mv) (-40 to +500 °C) mv) (remaining range) ass 2	0.1 °C (-50 to +199.9 °C) 1.0 °C (remainir range)	t ₉₉ (in water) ng 10 s
Country versions					Radio freq.	Part no.	
Radio handle for DK, FI, HU, CZ, F T/C probe head f	plug-in probe heads, incl. T/C adapte PL, GR, CH, PT, SI, MT, CY, SK, LU, E for air/immersion/penetration measure	r, approval for the countries: DE, E, LT, IE, LV, NO ment, attachable to radio handle	FR, UK, BE, NL, ES e, T/C Type K	s, IT, SE, AT,	869.85 MHz FSK	0554 0189 0602 0293	
Radio handle for	plug-in probe heads, incl. T/C adapte	r, approval for USA, CA, CL		!	915.00 MHz FSK	0554 0191	
T/C probe head f	or air/immersion/penetration measure	ment, attachable to radio handle	e, T/C Type K	•		0602 0293	100
Radio handles v	vith probe head for surface measur	ement 120 mm	Meas. range	Badio handle:		0.1 °C (-50 to	199
with T/C probe I ment	head for surface measure-	0.5 mm 0.12 mm	-50 to +350 °C Short-term to +500 °C	±(0.5 °C +0.3% of ±(0.7 °C +0.5% of TC probe head: Cl	mv) (-40 to +500 °C) mv) (remaining range) ass 2	+199.9 °C) 1.0 °C (remainir range)	5 s ng
Country versions					Radio freq.	Part no.	
Radio handle for DK, FI, HU, CZ, F	plug-in probe heads, incl. T/C adapte PL, GR, CH, PT, SI, MT, CY, SK, LU, E	r, approval for the countries: DE, E, LT, IE, LV, NO a radia bandla T/C Type K	FR, UK, BE, NL, ES	s, IT, SE, AT,	869.85 MHz FSK	0554 0189	
Radio handle for	plug-in probe heads, incl. T/C adapte	r. approval for USA. CA. CL			915.00 MHz FSK	0554 0191	
T/C probe head f Radio han	or surface measurement, attachable t dles, separate	o radio handle, T/C Type K				0602 0394	
Radio handles	for attachable T/C probes		Meas. range	Accuracy		Resolution	
Radio handle fo incl. adapter for K)	r attachable probe heads attaching TC probes (Type		-50 to +1000 °C	±(0.5 °C +0.3% of ±(0.7 °C +0.5% of	mv) (-40 to +900 °C) mv) (remaining range)	0.1 °C (-50 to + 1.0 °C (remainir	-199.9 °C ng range)
Country versions					Radio freq.	Part no.	
Radio handle for DK, FI, HU, CZ, F	plug-in probe heads, incl. T/C adapte PL, GR, CH, PT, SI, MT, CY, SK, LU, E	r, approval for the countries: DE, E, LT, IE, LV, NO	FR, UK, BE, NL, ES	s, IT, SE, AT,	869.85 MHz FSK	0554 0189	
Radio handle for	plug-in probe heads, incl. T/C adapte	r, approval for USA, CA, CL		!	915.00 MHz FSK	0554 0191	
Radio probes:	General technical data						
Probe type Battery type	Radio immersion/penetration probe, NTC 2 x 3V button cell (CR 2032)	Radio handle2 AAA micro batteries	Measuring rate	0.5 s or 10 s, adju stable on handle	- Radio transmi sion	s- Unidirectio	onal
Battery life	150 h (meas. rate 0.5 s) 2 months (meas. rate 10 s)	215 h (meas. rate 0.5 s) 6 months (meas. rate 10 s)	Radio coverage	Up to 20 m (witho obstructions)	ut Storage temp.	-20 to +50 -40 to +70	0°C 0°C
Toobpical data							
Prohe type*	Pt100	Pt100 with probe 0614 0235	Type K (NiCr-Ni)		Type T (Cu-C	uNi)	
Meas range	-200 to +800 °C	-40 to +300 °C	-200 to ±1370 °C		-200 to ±400	°C	
Accuracy ±1 digit	±0.2 °C (-100 to +199.9 °C) ±0.2% of my (remaining range)	See probe data	±0.3 °C (-60 to +60 ° ±(0.2 °C + 0.3% of m	C) Iv) (remaining range)	±0.3 °C (-60 to - ±(0.2 °C + 0.3%	-60 °C) of mv) (remaining	g range)
Resolution	0.05 °C	0.001 °C (-40 to +199.999 °C) 0.01 °C (remaining range)	0.1 °C		0.1 °C		5-7
Probe type*	Type J (Fe-CuNi)	Type S (Pt10Rh-Pt)					
Meas. range	-200 to +1000 °C	0 to +1760 °C					
Accuracy ±1 digit	±0.3 °C (-60 to +60 °C) ±(0.2 °C + 0.3% of mv) (remaining range)	±1 °C (0 to +1760 °C)					
Resolution	0.1 °C	1 °C					
riesolution							
Oper. temp.	-20 to +50 °C	Battery type	Alkali manganese,	mignon, Type AA	Weight	428 g	
Oper. temp. Storage temp.	-20 to +50 °C -30 to +70 °C	Battery type Dimensions	Alkali manganese, 220 x 74 x 46 mm	mignon, Type AA 1	Weight Protection clas	428 g s IP65	

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Temperature

testo 950, temperature measuring instrument with up to 0.05 °C system accuracy

testo 950

testo

Precision reference class measuring instruments have everything the professional user needs to complete complicated measurement tasks efficiently, accurately and conveniently.

testo 950 includes the basic parameters temperature, CO2, current and voltage. testo 950 can be upgraded to the multi-function measuring instrument, testo 400.

The measuring instrument can keep up with the measurement tasks at hand thanks to upgrades. Intelligent electronics ensure the latest technology is used thanks to software updates.

Upgradable and teachable, highly reliable and of the highest quality - they are the properties which guarantee that the customer is equipped for the future.



Part no. 0563 9501

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testo 950, temperature measuring instrument with up to 0.05 °C system accuracy

Highest precision

testo 950 combines user-friendly, menu-driven operation with the highest precision. In addition to fast and efficient thermocouple probes, Pt100 probes corresponding to EN 60751 (previously IEC 751) or selected high precision probes on a Pt100 basis with 1/10 DIN accuracy can be connected.

The immersion/penetration probe 0614 0240 provides a system accuracy of 0.05 °C in the measuring range from 0 to 100 °C and a resolution of up to 0.001 °C.

Useful instrument functions

- Stores a surface addition for EEPROM probes
- The system can be adjusted for each EEPROM probe to "zero error" at an adjustment point via precision adjustment, e.g. system adjustment in a highly accurate adjustment bath to "zero error".
- Adjustment of a quick-action EEPROM temperature probe to a highly accurate precision probe ensuring fast and highly accurate measurement.
- Fast temperature measurement with extrapolation to fullscale value

Long-term measurement

For the monitoring of processes, a measurement program can conveniently be defined with the PC software and the simply loaded into the hand instrument. Extensive data criteria regarding measurement cycles, number of readings or program termination are available for this.

The measurement program is started, for example, as follows:

- At a defined date/time
- When a measurement value is exceeded
- When a measurement value is fallen short of
- Manually, by pressing a button.

Measurement data processing

After the measurement program is finished, the data can be transferred to a PC..

The software offers convenient functions regarding:

- Archiving
- Display/presentation
- Analysis
- Documentation

The right probe for every application

Highly accurate immersion/penetration probe with a system accuracy of 0.05 $^\circ C$ in the measuring range from 0 to 100 $^\circ C$ and a resolution of up to 0.001 $^\circ C$

Fast reaction surface probe for measuring surface temperature

Robust surface probe for measurements on objects with high heat conductivity, e.g. large metal objects







Flexible precision immersion probe for the measurement of liquids



Robust immersion/penetration probe in V4A stainless steel, waterproof and heatproof for measurements in liquids, semi-solids or pastes.



Current/voltage cable (\pm V, \pm 10 V, 20 mA) for example for checking stationary measurement transmitters



Ambient CO, for the detection of CO in buildings and rooms



CO2 probe for determining indoor air quality and monitoring the workplace





Highly accurate probe/ordering suggestion testo 950

Highly accurate temperature measurement

testo

The demand for a highly accurate temperature measurement system came mainly from sectors involved with quality assurance, calibration services and laboratories. This demand is accommodated by a revolutionary highly accurate

immersion/penetration probe with a system accuracy of up to 0.05°C.

The overall system measurement uncertainty of temperature measurement in conventional measuring instruments is made up of the measurement uncertainty of both the instrument and the probe. The instrument measurement uncertainty results mainly from the analog measurement technology to analyse the probe signal, analog-to-digital conversion, linearisation and resolution. The probe measurement uncertainty is determined by the precision of the temperature sensor used.

The new, highly accurate measurement system from Testo eliminates instrument uncertainty and reduces probe measurement uncertainty. Technologically, it is based on the following components:

Intelligent probe

The reading is processed completely in the probe from the analog sensor signal to the digital reading. The overall instrument measurement uncertainty therefore does not apply.

Individual probe adjustment

Since each reading is processed completely in the probe, each probe is adjusted separately using highly accurate fixed point cells.

At the melting/solidification point, the fixed point cells used keep the temperature constant over a longer time period in the 0.0005 K range. The immersion/penetration probe is adjusted in this phase.

Platinum sensor

A specially developed platinum wire, installed in an extremely pure aluminium oxide tube, ensures highest accuracy, mechanical stability and good consistancy even when exposed to acceleration and vibration. Due to the individual parameterization of the sensor's characteristics curve, exemplary

malfunctions are almost completely eliminated.

Owing to the lack of instrument inaccuracy and the reduced probe measurement inaccuracy, the total system measurement inaccuracy is thus extremely decreased. There are other system advantages in addition to highly accurate temperature measurement:

 System accuracy independent of instrument and socket: the highly accurate immersion/penetration probe achieves full accuracy regardless of the probe socket used.

 Highly accurate differential temperature measurements are thus possible with all multi-channel measuring instruments.



System accuracy at rated temperature of 22 °C: -40 °C to 0 °C: ±(0.05 °C + 0.05 % of reading) 0.01 °C to +100 °C: ±0.05 °C 100.1 °C to +300 °C:

±(0.05 °C + 0.05 % of reading)



We recommend: with the ISO/DKD certificates (0520 0142/0520 0241) you get additional probe optimisation via a high accuracy 4 point fine adjustment over the whole measurement range.

295 mm

The accuracy of the probe is confirmed by the DKD certificate 0520 0241 with a measurement inaccuracy of 0.01 $^{\circ}$ C (0 - 100 $^{\circ}$ C) and from 0.02 to 0.03 $^{\circ}$ C in the remaining range.

Ordering suggestion: Precision measuring instrument up to 0.05°C system accuracy testo 950, reference temperature meas. instr., with battery, Li cell and calibration protocol, 2 channel instrument (thermocouple, Pt100, NTC) with option of con-0563 9501

necting CO, CO2, rpm and mV/mA transmitter	
Highly accurate immersion/penetration probe incl. certificate, plug-in head, con- nection cable 0430 0143 or 0430 0145 required	0614 0240
Cable, 1.5 m long, connects probe with plug-in head to meas. instrument, PUR coating material	0430 0143
Attachable printer (securely attached) including 1 roll of thermal paper and bat- teries, quickly prints readings on location	0554 0570
System case (plastic) for measuring instrument, probes and accessories, probes in lid make it easy to find parts in case (540 x 440 x 130 mm)	0516 0400

We recommend:	Part no.
4-point adjustment , incl. ISO calibration certificate , calibra- tion points freely selectable (for probe 0614 0240)	0520 0142
4-point adjustment , incl. DKD calibration certificate, calibration points freely selectable (for probe 0614 0240)	0520 0241
ComSoft 3 - Professional with data management, incl. data- base, analysis and graphics function, data analysis, trend curve (without interface)	0554 0830
RS232 cable, connects instrument to PC (1.8 m) for data transfer	0409 0178



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Accessories, testo 950

ComSoft 3 Professional

 ComSoft 3 - Professional with data manage

ment

incl. database, analysis and graphics function, data analysis, trend curve

Part no. 0554 0830

Ethernet adapter



Ethernet adapter, RS232 - Ethernet incl. software driver, mains unit

facilitates data communication in network

Part no. 0554 1711

Attachable printer



Attachable printer (securely attached) including 1 roll of thermal paper and batteries

quickly prints readings on location

Part no. 0554 0570

Fast report printer



infrared-controlled thermal printer, adjustable contrast, graphic-capable						
Testo printer	Part no. 0554 0549					
testo 575 fast printer	Part no. 0554 1775					

Part no. 0554 0549 Part no. 0554 1775

SoftCase



SoftCase for measuring instrument (impact protection) incl. carrying strap, magnetic and probe holder Part no. 0516 0401

SoftCase for attachable printer (protects printer from dirt/impact) Part no. 0516 0411

Part no. 0516 0401

Part no. 0516 0411

Transport and protection	Part no.
SoftCase (protects instrument from impact) with carrier strap, magnetic holder and probe holder, protects against impact and falls	0516 0401
SoftCase for attachable printer (protects printer from dirt/impact), protects from impact and falls	0516 0411
System case (plastic) for measuring instrument, probes and accessories, probes in lid make it easy to find parts in case (540 x 440 x 130 mm)	0516 0400
System case (aluminium) for measuring instrument, probes and accessories, probes in lid make it easy to find parts in case	0516 0410
Printer and Accessories	Part no.
Attachable printer (securely attached) including 1 roll of thermal paper and batteries, quickly prints readings on location	0554 0570
Testo fast printer with wireless infrared interface, 1 roll thermal paper and 4 AA batteries	0554 0549
Fast testo 575 printer, incl. 1 roll of thermal paper and batteries, infrared thermal line printer with graphics function	0554 1775
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), measurement data do- cumentation legible for up to 10 years	0554 0568
Label thermal paper (Testo patent) for testo 575 printer (6 rolls), can be applied directly	0554 0561
Further accessories and spare parts	Part no.
Mains unit 230 V/ 8 V/ 1 A, for instrument (European plug), for mains operation and battery recharging	0554 1084
Rech. batt. set for instr. (2 rech. 2.4V/1100mAh)	0554 0196
Lithium battery, button cell, type CR 2032	0515 0028
Update	Part no.
Humidity/pressure module , Upgrade via service (updates testo 950 to testo 650)	0450 4002
Velocity module, incl. volume flow, degree of turbulence , upgrade via service (updates testo 650 to testo 400)	0450 4003
Software (see page 79) and accessories	Part no.
ComSoft 3 - Professional with data management, incl. database, analysis and graphics function, data analysis, trend curve	0554 0830
RS232 cable, connects instrument to PC (1.8 m) for data trans- fer	0409 0178
Ethernet adapter, RS232 - Ethernet incl. software driver, mains unit, facilitates data communication in network	0554 1711
Calibration Certificates	Part no.
ISO calibration certificate/temperature, for air/immersion probes, calibration points -18°C; 0°C; +60°C	0520 0001
ISO calibration certificate/temperature, meas. instr. with surface probe; calibration points +60°C; +120°C; +180°C	0520 0071
DKD calibration certificate/temperature, meas. instr. with air/immersion probe; calibration points -20°C; 0°C; +60°C	0520 0211
4-point adjustment , incl. ISO calibration certificate , calibration points freely selectable	0520 0142
4-point adjustment , incl. DKD calibration certificate, calibration points freely selectable	0520 0241

Further calibration certificates see page 28/29

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Selecting the right temperature sensor testo 950

The measurement task determines the probe type

The probe type is determined by the measurement task. The selection of the most suitable temperature sensor is made according to the following criteria:

Measurement range

testo

- Accuracy
- Measurement site design
- Reaction time
- Durability

In order to be able to provide the right probe for your requirements, Testo offers a large selection of sensor elements and temperature measuring instruments:

- Thermocouples
- Resistance sensor (Pt100)
- Thermistors (NTC)

Thermocouples

Temperature measurement with thermocouples is based on the thermoelectric effect. Thermocouples consist of two wires spot-welded to each other and made of different metals or metal alloys. The basic values of the thermoelectric voltages and the permitted tolerances of thermocouples are defined in the norms IEC 584. The most common thermoelement is NiCr-Ni (type designation K).

Accuracy data

Resistance sensors (Pt100)

When measuring temperature with resistance sensors, use is made of the temperature sensitive resistance change in the platinum "resistance".

The measurement resistance is supplied with a constant current and the voltage drop, which changes with the resistance value via the temperature, is measured. Basic values and tolerances for resistance thermometers are defined in the IEC 751.

Thermistors (NTC)

Temperature measurement with thermistors is also based on a temperature-dependent change of resistance in the sensor element. Contrary to resistance thermometers, thermistors have a negative temperature coefficient (resistance becomes smaller with increasing temperature). Characteristic curves and tolerances are not normed.



Resistance sensor

Temperature measurement thermocouples

Thermistors

Measurement	Temperature range	Class	s Permitted tolerances			
value sensor			fixed value	Referred to temperature		
Thermocouple	-40 +1000 °C	1	±1.5 °C	±0.004 • Itl		
Typ K (NiCr-Ni)	-40 +1200 °C	2	±2.5 °C	±0.0075 • Itl		
	-200 +40 °C	3	±2.5 °C (-167 +40 °C)	±0.015 • Itl (-200 to -167.1 °C		
Тур Т	-40 +350 °C	1	±0.5 °C	±0.001 • Itl		
Тур Ј	-40 +750 °C	1	±1.5 °C	±0.004 • Itl		
Pt100	-200 +600 °C	В	± (0.3 + 0.005 • Itl)			
	-200 +600 °C	А	± (0.15 + 0.002 • Itl)			
NTC	-5025.1 °C		±0.4 °C			
(Standard)	-25 +74.9 °C	_	±0.2 °C			
	+75 +150 °C		±0.5 % of full scale value			
NTC	-3020.1 °C		±1 °C			
(High temp.)	-20 0 °C	_	±0.6 °C			

±0.5 °C ±0.5 % of full scale value

− °C

Data for thermocouples according to EN 60584-2 (formerly IEC 584-1).

Thermocouple sensor

Data for Pt100 according to EN 60751 (formerly IEC 751). No standardization exists for NTC sensors.

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Temperature

Itl = measurement temperature value

+75.1 ... +275 °C

Suitable probes at a glance, testo 950

l	mmers./penetr. probes							
Ρ	robes Pt100	Illustration			Meas. range	Accuracy	t99	Part no.
	Highly accurate immersion/penetration probe incl. certificate		295 mm Ø 4 mm	Stainless Steel	-40 to +300 °C	±0.05 °C (+0.01 to +100 ' ±(0.05 °C ±0.05% of mv) (-40 to 0 °C) ±(0.05 °C ±0.05% of mv) (+100.01 to +300 °C)	°°60 s	0614 0240 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
	Standard immersion/penetration probe		200 mm Ø 3 mm	Stainless Steel	-200 to +400 °C	Class A	20 s	0604 0273 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
	Standard immersion/penetration probe		200 mm Ø 3 mm	Nickel	-200 to +600 °C	Class A	20 s	0604 0274 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
	Highly accurate immersion/penetration probe		200 mm Ø 3 mm		-100 to +400 °C	1/10 Class B (0 t 100°C) 1/5 Class B (rem. range) to EN 60751	°30 s	0628 0015 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
	Flexible precision immersion probe, cable heat-proof up to +300°C		1000 mm Ø 3.5 mm	50 mm Ø 6 mm	-100 to +265 °C	1/10 Class B (0 t 100°C) 1/5 Class B (rem. range) to EN 60751	°80 s	0628 0016 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
	Robust immersion/penetration probe with sharpened measuring tip, waterproof and oven-proof	-@	150 mm Ø 3.5 mm	Ø 3 mm	-200 to +400 °C	Class A	30 s	0604 2573 Conn.: Fixed cable
Ρ	robes Type K (NiCr-Ni)	Illustration			Meas. range	Accuracy	t99	Part no.
	Fast response immersion/penetration probe		150 mm		-200 to +400 °C	Class 1	3 s	0604 0293
					Conn.: Plug-	in head. connectio	n cable 04	30 0143 or 0430 0145 required
	Super quick-action immersion/penetration probe for measurements in liquids		150 mm Ø 1.5 mm		-200 to +600 °C	Class 1	1 s	0604 0493
_	Conn.: Plug-in head. connection cable 0430 0143 or 0430 0145 requir						30 0143 or 0430 0145 required	
	Super quick-action immersion/penetration probe for high temperatures		470 mm Ø 1.5 mm		-200 to +1100 °C	Class 1	1 s	0604 0593
					Conn.: Plug-	in head. connectio	n cable 04	30 0143 or 0430 0145 required
	Robust immersion/penetration probe made of V4A stainless steel, waterproof and oven-proof, e.g. for the food sector	-@	150 mm Ø 3.5 mm	Ø 3 mm	-200 to +400 °C	Class 1	3 s	0600 2593 Conn.: Fixed cable

Plug-in measuring tips

<u> </u>					
Probes Type K (NiCr-Ni)	Illustration	Meas. range	Accuracy	t99	Part no.
Plug-in measuring tip, 750mm long, flexi- ble, for high temperatures, outer casing: stainless steel 1.4541	750 mm 0 3 mm Please order handle with Part no. 0600 5593	200 to +900 ℃	Class 1	4 s	0600 5393
Plug-in measuring tip, 550mm long, flexi- ble, for high temperatures, outer casing: In- conel 2.4816	550 mm Ø 3 mm Please order handle with Part no. 0600 5593	-200 to +1100 °C	Class 1	4 s	0600 5793
Plug-in measuring tip, 1030mm long, flexi- ble, for high temperatures, outer casing: In- conel 2.4816	1030 mm 0 3 mm Please order handle with Part no. 0600 5593	-200 to +1100 °C	Class 1	4 s	0600 5893

Air probes

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Ρ	robes NTC	Illustration			Meas. range	Accuracy	t99	Part no.
	Highly accurate air probe for air and gas tempe- rature measurements with bare, mechanically protected sensor		150 mm Ø 9 mm		-40 to +130 °C	To UNI curve	60 s	0610 9714 Conn.: Fixed cable
Ρ	robes Pt100	Illustration			Meas. range	Accuracy	t99	Part no.
	Standard air probe		150 mm Ø 3 mm	= <u>1 000</u> Ø 9 mm	-200 +600 °C	Class A	75 s	0604 9773 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
	Precision air probe		150 mm Ø 3 mm	= □[000 Ø9mm	-100 to +400 °C	1/10 Class B (0 to 100°C) 1/5 Class B (rem. range) to EN 60751	75 s	0628 0017 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required

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Temperature

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Suitable probes at a glance / Accessories, testo 950

4	Air probes		
	Probes Type K (NiCr-Ni)	Illustration	Meas. range Accuracy t99 Part no.
l	Super quick-action immersion/penetration probe for measurements in gases and li- quids with a low-mass tip	150 mm 20 mm 0 1.4 mm 0 0.5 mm	n -200 to +600 °C Class 1 1 s 0604 9794 m Conn.: Plug-in head. connection cable 0430 0143 or 0430 0145 require
	Thermocouple, made of fibre-glass insula- ted thermal pipes, pack of 5	2000 mm Please order adapter 0600 1693	-200 to +400 °C Class 1 5 s 0644 1109 Insulation: twin conductor, flat, oval, opposed and covered with fibre-glass, both conductors are wrapped together with fibre-glass and soaked with lacquer, pleas order adapter 0600 1693

Surface probes							
Probes Type K (NiCr-Ni)	Illustration		Meas. range	Accuracy	t99	Part no.	
Quick-action surface probe with sprung thermocouple strip, measuring range short- term to +500°C	150 mm	Ø 10 mm	-200 to +300 °C	Class 2	3 s	0604 0194	
			Conn.: Plug-	in head. connecti	on cable 04	30 0143 or 0430 0145 required	
Super quick-action surface probe, probe tip at 90° angle, with sprung thermocouple		Ø 10 mm	-200 to +300 °C	Class 2	3 s	0604 0994	
strip	100 mm		Conn.: Plug-	Conn.: Plug-in head. connection cable 0430 0143 or 0430 0145 required			
Deburt en fee en be	150 mm		-200 to +600 °C	Class 1	25 s	0604 9993	
Robust surface probe	Ø 4 mm	Ø 4 mm					
			Conn.: Plug-	in head. connecti	on cable 04	30 0143 or 0430 0145 required	
Robust surface probe with sprung thermo-	200 mm		-200 to +700 °C	Class 2	3 s	0600 0394	
couple strip for high temperature range up to +700°C		Ø 15 mm				Conn.: Fixed cable, coiled	
Adhesive thermocouple, pack of 2, carrier material: aluminium foil		Diameter extension 2 x 0.2 mm, 0.1 mm thick	² -200 to +200 °C	Class 1		0644 1607	
Is fixed at the measuring point using conventional adhesiv	ves or silicone heat paste 0554 0004	Please order adapt	er 0600 1693				

N	/lore probes	Illustration	Meas. range	Accuracy	Part no.
	Ambient CO probe, for detecting CO in buildings and rooms		0 to +500 ppm CO	±5% of mv (+100.1 to +500 ppm CO) ±5 ppm CO (0 to +100 ppm CO)	0632 3331 Conn.: Fixed cable, 1.5 m
l	CO2 probe measures indoor air quality and monitors the workplace. With plug-in head, connection cable 0430 0143 or 0430 0145 required		0 +1 Vol. % co ² 0 +10000 ppm CO ₂	\pm (50 ppm CO ₂ \pm 2% of mv)(0 to +5000 ppm CO ₂) \pm (100 ppm CO ₂ \pm 3% of mv)(+5001 to +10000 ppm CO ₂)	0632 1240 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
I	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
	4 to 20 mA interface for connection and in- termittent power supply to transmitters (sca- ling via hand-held instrument), in robust metal housing with impact protection, incl. magnet for fast attachment		0/4 to 20 mA Channels: 1 channel, via terminal board Auxiliary energy output max. connection load	±0.04 mA transmitter connection .t: 18V DC ± 20% : 30 mA	0554 0528 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required

	Accessories	Part no.	Accessories	Part no.
	Cable, 1.5 m long, connects probe with plug-in head to meas. instrument, PUR coating material	0430 0143	Adapter to connect NiCr-Ni thermocouples and probes with open wire ends	0600 1693
C ir E s	Cable, 5 m long, connects probe with plug-in head to measuring instrument, \ensuremath{PUR} coating material	0430 0145	Handle for plug-in measuring tip	0600 5593
	Extension cable, 5 m long, between plug-in head cable and in- strument, PUR coating material	0409 0063	Silicone heat paste (14g), Tmax = +260°C, improves heat transfer in surface probes	0554 0004
	Telescopic handle, max. 1 m, for probe with plug-in head, cable: 2.5 m long, PUR coating material	0430 0144		

Technical data testo 950

Technical data						
Probe type	NTC	Pt100	Type K (NiCr-Ni)	Type S (Pt10Rh-Pt)	Type J (Fe-CuNi)	
Measurement range temp.	-40 to +150 °C	-200 to +800 °C	-200 to +1370 °C	0 to +1760 °C	-200 to +1000 °C	
Accuracy ±1 digit	±0.2 °C (-10 to +50 °C) ±0.4 °C (-40 to -10.1 °C) ±0.4 °C (+50.1 to +150 °C)	±0.1 °C (-49.9 to +99.9 °C) ±(0.1 °C + 0.1% of mv) re- maining range	±(0.3 °C + 0.1% of mv)	±1 °C	±0.4 °C (-150 to +150 °C) ±1 °C (-200 to -150.1 °C) ±1 °C (+150.1 to +1000 °C)	
Resolution	0.1 °C	0.01 °C (-99.9 to +300 °C) 0.1 °C (-200 to -100 °C) 0.1 °C (+300.1 to +800 °C)	0.1 °C (-200 to +1370 °C)	1 °C	0.1 °C	

Probe type	CO2 probe	CO probe	Current measurement	Voltage measurement
Meas. range	0 to +1 Vol. % CO ₂ 0 to +10000 ppm CO ₂	0 to +500 ppm CO	0 to +20 mA (0554 0007) 0/4 to +20 mA (0554 0528)	0 to +10 V (0554 0007)
Accuracy ±1 digit	See probe data	$\pm 5\%$ of mv (0 to +500 ppm CO)	±0.04 mA (0554 0007) See probe data 0554 0528	±0.01 V
Resolution			0.01 mA	0.01 V

Oper. temp.	0 to +50 °C	Memory space: 1 MB, corresponds to approx, 500,000 readings
Storage temp.	-25 to +60 °C	Other features: automatic recognition of all connected probes
Battery type	1,5 V AA	Power supply: Battery/rech. batt., alternatively 8V mains unit
Battery life	18 h	Battery life in continuous operation with 2 TC probes: 18 h
Weight	500 g	
PC	RS232 interface	
Warranty	3 years	

testostor 171, documenting temperature sequences with professional data loggers

testostor 171-1

testo

With the data logger testostor 171-1, the temperature can be monitored using an external probe, for example in temperature cabinets. The room temperature can additionally be recorded with an internal sensor. If required, the air humidity can be monitored with an external probe.

testostor 171-4

testostor 171-4 with up to 4 external temperature probe connections, for recording temperature simultaneously in different places.

- 2-channel: Internal °C or %RH/°C (testostor 171-1)
- 4-channel: 4 x external °C NTC (testostor 171-4)
- Recording of up to 55,000 readings
- Probe can be positioned quickly and easily
- Tamperproof measured data

testostor 171-1

Int.: °C + Ext.: °C or %RH/°C

testostor 171-1, temperature data logger with "C/%RH probe connection, incl. starting magnet, battery and calibration protocol; calbration certificates (ISO/DKD) must be ordered separately **Part no. 0577 1715**

testostor 171-4

4 x external °C

testostor 171-4, temperature data logger, 4 channels, with starting magnet, battery and calibration protocol; calbration certicates (ISO/DKD) must be ordered separately

Part no. 0577 1714





testostor 171-4, max. 4 external temperature probe outputs



Data analysis on your PC/notebook with easyto-use Windows® software



The long-termers with external probes/testostor 171-1/-4

0520 0261

Recommended Set: testostor 171-4, 4 x temperature measu-				
rement at different locations				
testostor 171-4, temperature data logger, 4 channels, with starting magnet, battery and calibration protocol; calbration certicates (ISO/DKD) must be ordered separately	0577 1714			
Robust immersion/air probe, quick-action, 6m cable, IP68 probe tip	0610 1720			
Robust immersion/air probe, quick-action, 6m cable, IP68 probe tip	0610 1720			
Robust immersion/air probe, quick-action, 6m cable, IP68 probe tip	0610 1720			
Robust immersion/air probe, quick-action, 6m cable, IP68 probe tip	0610 1720			
ComSoft 3 - Professional with data management, incl. database, analysis and graphics function, data analysis, trend curve (without interface)	0554 0830			
Interface, attachable to testostor 171 data logger	0554 1781			

We recommend:

4 x DKD calibration certificate/temperature Temperature probe; cal. points -20°C; 0°C; +60°C (-4 °F, 92 °F, 140 °F); per channel/instrument







R)

Temperature probes (NTC)	Illustration		Meas. range	Accuracy	Reaction time	Part no.
Robust immersion/air probe, quick-ac- tion, 6m cable, IP68 probe tip	40 mm		-50 to +80 °C	±0.2 °C (-25 to +80 °C) ±0.4 °C (-50 to -25.1 °C)	5 s t ₉₉ (in water)	0610 1720 Conn.: Fixed cable, 6 m
Robust, accurate, waterproof food probe (IP65), made of stainless steel	€125 mm Ø 4 mm	Ø 3 mm	-50 to +120 °C	±0.2 °C (-25 to +80 °C) ±0.4 °C (-50 to -25.1 °C) ±0.5 °C (+80.1 to +120 °C)	10 s t ₉₉ (in water)	0610 2217 Conn.: Fixed cable, 2 m
Humidity/temperature probes 171-1	Illustration	Meas. range	Accuracy		t90	Part no.
Humidity/temperature probe with stan- dard plastic protection cap	180 mm 0 12 mm Cable/length 3 m	0 to +100 %RH -20 to +70 °C	±2 %RH (+2 to %RH)	+98 ±0.4 °C (-10 to +4 ±0.5 °C (remainin range)	50 °C) 12 s g	0636 9717
Mini humidity/temperature module for measurements at inaccessible points, module cable 1.5m long, probe tip 49x18x7mm	49x18x7 mm Cable/length 1.5 m	0 to +100 %RH -20 to +120 °C	±2 %RH (+2 to %RH)	+98 ±0.5 °C (-20 to +	120 °C) 20 s	0628 0008

Software (see page 79) and accessories	Part no.
ComSoft 3 - Professional with data management, incl. database, ana- lysis and graphics function, data analysis, trend curve (without inter- face)	0554 0830
ComSoft 3 - For requirements to CFR 21 Part 11, incl. database, analysis and graphics function, data analysis, trend curve (w/o interface)	0554 0821
Interface, attachable to testostor 171 data logger	0554 1781
Ethernet adapter, RS232 - Ethernet incl. software driver, mains unit, facilitates data communication in network	0554 1711
Further accessories and spare parts	Part no.
Spare battery for testostor 171, quick and easy battery replacement	0515 0018
Accessories Ordering data	Part no.
Transport case (plastic) for measurement data storage instruments (max. 6 off) and accessories, for safe transport	0516 0117
Holder with lock for data logger, theft-proof	0554 1782

Technical data, testostor 171-1						
Probe type	NTC (int.)	Testo humid. sensor, cap.	NTC (ext.)			
Meas. range	s. range -35 to +70 °C 0 to +100 %RH		-50 to +120 °C			
Accuracy ±1 digit	ccuracy ±0.2 °C (-35 to +39.9 °C) ±2 %RH (+2 to +98 1 digit ±0.4 °C (+40 to +70 °C) %RH)		±0.2 °C (-34.9 to +39.9 °C) ±0.4 °C (+40 to +120 °C) ±0.6 °C (-50 to -35 °C)			
Resolution	0.1 °C	0.1 %RH	0.1 °C			
Technical data, testostor 171-4						
Probe type	NTC (ext.)	Accuracy ±	0.2 °C (-34.9 to +39.9 °C)			
Meas. range	-50 to +120 °C	±1 digit ±	0.4 °C (+40 to +120 °C) 0.6 °C (-50 to -35 °C)			
Resolution	0.1 °C					
Common tec	hnical data					
Oper. temp.	-35 to +70 °C	Dimensions	131 x 68 x 26 mm			
Storage temp.	-40 to +85 °C	Warranty	2 years			
Battery type	Lithium battery	Meas. rate: 2 s to 24	h, selectable			
Material/Housing	g Aluminium, anodized	Software: menu-drive	n from Microsoft Wind-			
Protection class	IP65	ows 95 / ME / 2000 /	XP / Vista			
Memory	55000					
Weight	305 a					

Further calibration certificates see page 27, 28, 46

Professional long-term monitoring, data logger with 4 probe sockets



With the testo 177-T4, the temperature or temperature distribution can be monitored consistently in, for example, refrigerators, deep-freezers or ovens, and the data archived on a PC. The optionally attachable alarm switch output testo 581 allows the forwarding of limit value exceedances to external components such as horns,



• 4-channel:external °C

lamps (horns/lamps not available from Testo).

- Specially for use in higgh and low temperatures
- Data readout withut interruption of the measurement series
- Data analysis as a table or graph, with e-mail function
- Memory up to 48,000 readings

testo 177-T4 4 x external °C

The professional data logger testo 177-T4 with up to 4 external thermocouple temperature connections serves to monitor temperature simulta-

> A eXternal C
> testo 177-14, temperature data logger, 4 channels,
> with 4 probe inputs, wall holder and calibration proto col; calibration certificates (ISO/DKD) must be orderd
> separately; calibration certificates (ISO/DKD) must be
> ordered separately Part no. 0563 1774

Ordering data Accessories see page 23



Fast recording of high temperatures, e.g. in a kiln

Temperature probes (thermocouples)	Illustration	Meas. range	Accuracy	t99	Part no.
Stationary probe with stainless steel sleeve, TC Type K	40 mm	-50 to +205 °C	Class 2	20 s	0628 7533 Conn.: Fixed cable
Thermocouple with TC adapter, flexi- ble, 800mm long, fibre glass, TC Type K	800 mm Ø 1.5 mm	-50 to +400 °C	Class 2	5 s	0602 0644
Thermocouple with TC adapter, flexible, 1500mm long, fibre glass, TC Type K	1500 mm Ø 1.5 mm	-50 to +400 °C	Class 2	5 s	0602 0645
Thermocouple with TC adapter, flexible, 1500mm long, PTFE, TC Type K	1500 mm Ø 1.5 mm	-50 to +250 °C	Class 2	5 s	0602 0646
Measurement tip with TC plug Type T	500 mm Ø 1.5 mm	-50 to +350 °C	Class 1	5 s	0628 0023
Immersion tip, flexible, TC Type K	500 mm Ø 1.5 mm	-200 to +1000 °C	Class 1	5 s	0602 5792
Immersion tip, flexible, TC Type K	500 mm Ø 1.5 mm	-200 to +40 °C	Class 3	5 s	0602 5793
Flexible, low-mass immersion measurement tip, ideal for measurements in small volumes such as petri dishes, or for surface measure- ments (e.g. attached with adhesive tape), TC Type K	500 mm Ø 0.25 mm	-200 to +1000 °C Conn.: 2 m, FEP in wire with dimensior	Class 1 Isulated thermal wire, ns: 2.2 mm x 1.4 mm	1 s temperat	0602 0493 ture proof up to 200 °C, oval
Magnetic probe, adhesive force ap- prox. 10 N, with magnets, for higher temp., for measurements on metal surfaces, TC Type K	75 mm 021 mm	-50 to +400 °C	Class 2		0602 4892 Conn.: Fixed cable
Waterproof immersion/penetration probe, TC Type K	114 mm 50 mm 03.7 mm	-60 to +400 °C	Class 2	7 s	0602 1293 Conn.: Fixed cable
Robust air probe, T/C Type K	115 mm	-60 to +400 °C	Class 2	25 s	0602 1793 Conn.: Fixed cable, 1.2 m

The specified tightness class of the data loggers is achieved with these probes.

22

lesto

testo 177-T4

neously at different sites.

Ordering suggestions, testo 177-T4

Set 1: Monitoring temperature distribution in refrigerators

Temperature data logger (4 channel) with display	0563 1774
Lock for wall holder for testo 175/177 data loggers	0554 1755
Measurement tip with TC plug Type T	0628 0023
Measurement tip with TC plug Type T	0628 0023
Measurement tip with TC plug Type T	0628 0023
Measurement tip with TC plug Type T	0628 0023
testo 581 alarm signal output	0554 1769
ComSoft 3 Set - Basic with USB interface	0554 1767

Set 2: Monitoring temperature distribution in deep-freezers

Temperature data logger (4 channel) with display	0563 1774
Lock for wall holder for testo 175/177 data loggers	0554 1755
Immersion tip, flexible, TC Type K	0602 5793
Immersion tip, flexible, TC Type K	0602 5793
Immersion tip, flexible, TC Type K	0602 5793
Immersion tip, flexible, TC Type K	0602 5793
testo 581 alarm signal output	0554 1769
ComSoft 3 Set - Basic with USB interface	0554 1767

Set 3: Monitoring temperature distribution in ovens, e.g. muffle kilns

Temperature data logger (4 channel) with display	0563 1774
Lock for wall holder for testo 175/177 data loggers	0554 1755
Immersion tip, flexible, TC Type K	0602 5792
Immersion tip, flexible, TC Type K	0602 5792
Immersion tip, flexible, TC Type K	0602 5792
Immersion tip, flexible, TC Type K	0602 5792
testo 581 alarm signal output	0554 1769
ComSoft 3 Set - Basic with USB interface	0554 1767

We recommend:

4 x ISO calibration certificate/temperature, temperature probe; 0520 0151 calibration points -18°C; 0°C; +60°C per channel/instrument

We recommend: 4 x ISO calibration certificate/temperature , meas. instr. 0520 0031 with air/immersion probe; calibration points 0°C; +300°C; 6520 0031



0520 0261

We recommend:

4 x DKD calibration certificate/temperature, Temperature probe; cal. points -20°C; 0°C; +60°C (-4 °F, 92 °F, 140 °F); per channel/instrument

We recommend:

4 x DKD calibration certificate/temperature, Meas. instr. with air/immersion probe; cal. points 0°C; +100°C; +200°C

echnical data							
Chann. external (var.)	4			Memory	48000	Measuring rate	2 s to 24 h
Probe type	Type T (Cu-CuNi)	Type K (NiCr-Ni)	Type J (Fe-CuNi)	Oper. temp.	0 to +70 °C	Protection class	IP43
Meas. range	-200 to +400 °C	-200 to +1000 °C	-100 to +750 °C	Storage temp.	-40 to +85 °C	Weight	129 g
Accuracy	Accuracy ±0.5% of mv (+70.1 to +1000 °C) ±1 digit ±1.5% of mv (-200 to -100.1 °C) ±0.3 °C (-100 to +70 °C)			Battery type	Lithium battery	Dimensions	103 x 64 x 33 mm
±1 digit				Battery life	5 years at meas. cycle 15 min (-10 to +50 $^{\circ}\text{C})$		
Resolution	0.1 °C			Analysis software	MS Windows 95b	/ 98 / ME / 2000 /	XP / Vista





The data logger with 2 temperature probe sockets and event logging



testo 177-T3

CSU

The testo 177-T3 data logger simultaneously documents 3 temperatures and an event.

The measuring rate of the event can be set independently of the measuring rate of the temperature channels.

- 3 channel: Internal °C, 2x external °C, event input
- Temperature logging of up to 48,000 readings
- Reads out data without interrupting measurement
- Data analysis as table or graph, with e-mail function



testo 177-T3

Internal °C + 2 x external °C + event contact

testo 177-T3, temperature data logger, 3 channels, with internal sensor, 2 probe sockets, door contact connection cable, wall holder and calibration protocol; calibration certificates (ISO/DKD) must be ordered separately **Part no. 0563 1773** Collects data on site which is uploaded to your PC for analysis



Simultaneous temperature monitoring at 3 different locations

Ordering data acciessories see page 25

T	emperature probes (NTC)	Illustration	Meas. range	Accuracy t99	Part no.
	Stub probe, IP 54	35 mm Ø 3 mm	-20 to +70 °C	±0.2 °C (-20 to +40 °C) ±0.4 °C (+40.1 to +70 °C) 15	s 0628 7510
	Stationary probe with aluminium sleeve, IP 65	40 mm	-30 to +90 °C	±0.2 °C (0 to +70 °C) 19 ±0.5 °C (remaining range) S	0 0628 7503* Conn.: Fixed cable
	Accurate imm./pen. probe, 6m cable, IP 67 Accurate immersion/penetration probe, cable: 1.5 m long, IP 67	40 mm Ø 3 mm Ø 3 mm	-35 to +80 °C	±0.2 °C (-25 to +74.9 °C) 5 s ±0.4 °C (remaining range)	0610 1725* Conn.: Fixed cable, 6 m 0628 0006* Conn.: Fixed cable, 1.5 m
	Pipe wrap probe with Velcro for pipe diameter to max. 75 mm, Tmax. +75°C, NTC	300 mm	-50 to +70 °C	±0.2 °C (-25 to +70 °C) ±0.4 °C (-50 to -25.1 °C)	0613 4611 Conn.: Fixed cable
	Stainless steel NTC food probe (IP65) with PUR cable	125 mm 15 mm 15 mm 15 mm	-50 to +150 °C	±0.5% of mv (+100 to +150 8 °C) ±0.2 °C (-25 to +74.9 °C) ±0.4 °C (remaining range)	6 0613 2211* Conn.: Fixed cable, 1.6 m

The specified seal class of the data loggers is achieved with these probes.

* Probe tested to EN 12830 for suitability in the transport and storage sectors

Recommended Set: Temperature monitori alarm	ng with on site
testo 177-T3, temperature data logger, 3 channels, with internal sensor, 2 probe sockets, door contact connection cable, wall holder and calibration protocol; calibration certificates (ISO/DKD) must be ordered separately	0563 1773
Accurate imm./pen. probe, 6m cable, IP 67	0610 1725
Accurate imm./pen. probe, 6m cable, IP 67	0610 1725
testo 581 alarm signal output, floating, for testo 175/177, forwards information efficiently when limits are exceeded to e.g. horns, lamps, PLC etc.*	0554 1769
ComSoft 3 Set - Basic with USB interface, Basic software with diagram and table function, incl. desk-top holders, PC con- nection cable	0554 1767
ISO calibration certificate/temperature, temperature probe; calibration points -18°C; 0°C; +60°C per channel/instrument	0520 0151
ISO calibration certificate/temperature, temperature probe; calibration points -18°C; 0°C; +60°C per channel/instrument	0520 0151

Technical data								
Chann. intern	1	Chann. extern	nal (var.) 2					
Meas. range	-40 to +70 °C	Meas. range	-40 to +120 °C					
Accuracy ±1 digit	±0.4 °C (-25 to +70 °C) ±0.8 °C (-40 to -25.1 °C)	Accuracy ±1 digit	±0.2 °C (-25 to +70 °C) ±0.4 °C (remaining range)					
Resolution	0.1 °C	Resolution	0.1 °C					
Memory	48000	Battery type	Lithium battery					
Oper. temp.	-40 to +70 °C	Weight	127 g					
Storage temp.	-40 to +85 °C	Dimensions	103 x 64 x 33 mm					
External: Event logging e.g. door contact Battery life: 5 years with meas. rate of 15 min (-10 to +50°C) Measuring rate: 2 s to 24 h Software: Microsoft Windows 95b / 98 /ME / NT4-Sp4 / 2000 / XP / Vista								

*Horns, lamps not available as Testo accessories

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Accessories for testo 177

testo 575 fast printer

- Fast-action print mechanism, 6 lines/s
- Prints tables/graphics
- Brief info. or full memory can be printed as required
- Determine section to be printed
- Your language can be set
- Self-adhesive Testo paper can also be used

Part no. 0554 1775



Fast printout and logger rebooting with testo 575

testo 581 alarm signal output

- Transmission of alarm messages

 e.g. when programmed limit
 values in the data logger are exceeded to external components such as horns, lamps,
 PLC etc.
- Signal transfer via floating signal output

Part no. 0554 1769



Alarm signal output for reliable notification of limits exceeded

testo 580 data collector

- Can read out up to 25 full testo 175 loggers or 10 full testo 177 loggers
- Displays all status informationDownload collected data to PC
- using Testo ComSoft 3

RS232 Version

Part no. 0554 1778

USB version Part no. 0554 1764



esto

The testo 580 data collects data on site for upload to PC and analysis

Ethernet adapter

- Fast transfer of readings
- Use of an existing network without additional cabling
- Long transmission paths
- Identification of measuring instruments in system network
- In connection with ComSoft 3

Part no. 0554 1711



Read out the data stored in the logger via the PC network using the Ethernet adapter

Printer and Accessories	Part no.
Fast testo 575 printer, incl. 1 roll of thermal paper and batteries, infrared thermal line printer with graphics function	0554 1775
Spare thermal paper for printer (6 rolls)	0554 0569
Spare thermal paper for printer (6 rolls), measurement data do- cumentation legible for up to 10 years	0554 0568
Label thermal paper (Testo patent) for testo 575 printer (6 rolls), can be applied directly	0554 0561
Additional accessories	Part no.
Additional accessories testo 580 data collector set with RS232, readout holders inclu- ded, for testo 175/177 data loggers	Part no. 0554 1778
Additional accessories testo 580 data collector set with RS232, readout holders inclu- ded, for testo 175/177 data loggers testo 580 data collector set with USB, readout holders inclu- ded, for testo 175/177 data loggers	Part no. 0554 1778 0554 1764
Additional accessories testo 580 data collector set with RS232, readout holders inclu- ded, for testo 175/177 data loggers testo 580 data collector set with USB, readout holders inclu- ded, for testo 175/177 data loggers testo 581 alarm signal output, floating, for testo 175/177, forwards information efficiently when limits are exceeded to e.g. horns, lamps, PLC etc.	Part no. 0554 1778 0554 1764 0554 1769

Transport and Protection	Fart no.
Lock for wall holder for testo 175/177 data loggers	0554 1755
Transport case for up to 6 testo 177 data loggers, testo 575 printer, testo 580 data collector and accessories	0516 1770
Software (see page 78/79) and accessories	Part no.
For testo 177: ComSoft 3 Set - Basic with RS232 interface, Basic software with diagram and table function, incl. desk-top holder, PC connection cable	0554 1774
For testo 177: ComSoft 3 Set - Basic with USB interface, Basic software with diagram and table function, incl. desk-top holders, PC connection cable	0554 1767
ComSoft 3 - Professional with data management, incl. data- base, analysis and graphics function, data analysis, trend curve (without interface)	0554 0830
ComSoft 3 - For requirements to CFR 21 Part 11, incl. data- base, analysis and graphics function, data analysis, trend curve (w/o interface)	0554 0821
RS232 interface for testo 175/177 incl. desk-top holders, PC connection cable, (please also order for ComSoft 3 - Professional)	0554 1757
USB interface, for testo 175/177 incl. desk-top holders, PC conn. cable, (Please order with ComSoft 3 - Professional)	0554 1768
Ethernet adapter, RS232 - Ethernet incl. software driver, mains unit, facilitates data communication in network	0554 1711
Calibration Certificates	Part no.
ISO calibration certificate/temperature, temperature probe; cali- bration points -18°C; 0°C; +60°C per channel/instrument	0520 0151
DKD calibration certificate/temperature, Temperature probe; cal. points -20°C; 0°C; +60°C (-4 °F, 92 °F, 140 °F); per chan- nel/instrument	0520 0261

Further calibration certificates see page 28/29

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Overview: Temperature pro data logger in robust housing testostor 171

Type name	testostor 171-0	Ex 171-0	testostor 171-4	testostor 171-1	testostor 171-8
Description	Internal °C NTC	Internal °C NTC with Ex approval	4 x external °C NTC	Internal °C NTC + ex- ternal °C NTC or %RH/°C	High temperature data logger 4 x external °C T/C
Illustration					
All data loggers can be validated1			0000		
	NITO	NEO	NITO		
Sensor	NIC	NIC	NIC	NTC (Combi-probe °C/%RH)	Type K (NiCr-Ni) Type T (Cu-CuNi)
Meas. range	-35 to +70 °C	-35 to +70 °C	-50 to +120 °C	-50 to +120 °C (ext.) -35 to +70 °C (int.) 0 to +100 %RH	-200 to +1000 °C Type K -50 to +350 °C Type T
Resolution	0.1 °C	0.1 °C	0.1 °C	0.1 °C 0.1 %RH	0.1 °C (-200 to +249.9 °C) 1 °C (+250 to +1000 °C) Type K 0.1 °C (-50 to +249.9 °C) 1 °C (+250 to +350 °C) Type T
Accuracy	±0.5 °C (-35 to +39.9 °C)	±0.5 °C (-35 to +39.9 °C)	±0.2 °C (-34.9 to +39.9 °C)	±0.2 °C (-35 to +39.9 °C)	±(0.4 °C ±0.2% of mv)
±1 digit	±0.6 °C (+40 to +70 °C)	±0.6 °C (+40 to +70 °C)	±0.4 °C (+40 to +120 °C) ±0.6 °C (-50 to -35 °C)	±0.4 °C (+40 to +70 °C) (int.) ±0.2 °C (-34.9 to +39.9 °C) ±0.4 °C (+40 to +120 °C) ±0.6 °C (-50 to -35 °C) (ext.) ±2 %RH (+2 to +98 %RH)	
Memory	55000	55000	55000	55000	55000
Oper. temp.	-35 to +70 °C	-35 to +70 °C	-35 to +70 °C	-35 to +70 °C	0 to +70 °C
Storage temp.	-40 to +85 °C	-40 to +85 °C	-40 to +85 °C	-40 to +85 °C	-40 to +85 °C
Battery type	Lithium battery	Lithium battery	Lithium battery	Lithium battery	Lithium battery
Battery life	> 5 years*	> 5 years*	> 5 years*	> 5 years*	> 5 years*
Dimensions	131 x 68 x 26 mm	131 x 68 x 26 mm	131 x 68 x 26 mm	131 x 68 x 26 mm	131 x 68 x 26 mm
Weight	305 g	305 g	305 g	305 g	305 g
Protection class	IP68	IP68	IP65	IP65	IP42
Warranty	2 years	2 years	2 years	2 years	2 years
Part no.	0577 1719	0577 1730	0577 1714	0577 1715	0577 1718

*at a measuring rate of 15 mins. (-10 to +50 $^{\circ}\text{C})$

Detailed information on all data loggers can be found in the brochure: "Measurement Solutions for Climate Applications in Industry"

Overview: Temperature compact/pro data logger testo 175/177

Type name	testo 175-T1	testo 175-T2	testo 175-T3	testo 175-S1	testo 175-S2
Description	1 channel temperature logger with internal sensor	2 channel temperature logger with internal sensor and external probe socket	2-channel temperature logger for external ther- mocouples	1 channel current/vol- tage logger, e.g. 4 to 20 mA	1 channel current/vol- tage logger with dis- play
Illustration	1100 227.00	THERE			
All data loggers can be validated1	- 185. 				435
Sensor	NTC (internal)	NTC (internal + external)	Type T (Cu-CuNi) or Type K (NiCr-Ni)	Probe: Built-in screwed con- tact socket	Probe: Built-in screwed con- tact socket
Meas. range	-35 to +70 °C	-35 to +70 °C (int.) -40 to +120 °C (ext.)	-50 to +1000 °C (Type K) -50 to +400 °C (Type T)	0 to 1 V / 0 to 10 V 0 to 20 mA / 4 to 20 mA	0 to 1 V / 0 to 10 V 0 to 20 mA / 4 to 20 mA
Resolution	0.1 °C (-20 to +70 °C) 0.3 °C (-35 to -20.1 °C)	0.1 °C (-20 to +70 °C) (int.) 0.1 °C (-25 to +70 °C) (ext.) 0.3 °C (remaining range)	0.1 °C	1 mV (0 to 1 mV) 10 mV (1 to 10 mV) 0.01 mA (0 to 20mA)	1 mV (0 to 1 mV) 10 mV (1 to 10 mV) 0.01 mA (0 to 20mA)
Accuracy	System internal	System internal	Instrument without probes	System	System
±1 digit	±0.5 °C (-20 to +70 °C) ±1 °C (-35 to -20.1 °C)	±0.5 °C (-20 to +70 °C) ±1 °C (remaining range) Instrument external ±0.3 °C (-25 to +70 °C) ±0.5 °C (remaining range)	Type K: ±0.7% of mv (+70.1 to +1000 °C) ±0.5 °C (-50 to +70 °C) Type T: ±0.7% of mv (+70.1 to +400 °C) ±0.5 °C (-50 to +70 °C)	± 2 mV (0 to 1 V) ± 20 mV (1 to 10 V) ± 0.05 mA (0 to 20 mA)	± 2 mV (0 to 1 V) ± 20 mV (1 to 10 V) ± 0.05 mA (0 to 20 mA)
Memory	7800	16000	16000	16000	16000
Oper. temp.	-35 to +70 °C	-35 to +70 °C	0 to +70 °C	-10 to +50 °C	-10 to +50 °C
Battery life	> 2.5 years*	> 2.5 years*	> 2.5 years*	> 2.5 years*	> 2.5 years*
Measuring rate	10 s 24 n	10 s to 24 h	10 s to 24 h	1 s to 24 h	1 s to 24 h
Protection class	0563 1754	0563 1755	0563 1756	0563 1759	0563 1761
Description	1 channel temperature logger with internal sensor for long-term monitoring	1 channel temperature logger with internal sensor for long-term monitoring	3 channel temperature logger with internal sen- sor, 2 external ptobe in- puts and 1 event input	4 channel temperature logger for external ther- mocouples	
Illustration					
All data loggers can be validated1	da da		208, 183, 184, -		
Sensor	NTC (internal)	NTC (internal)	NTC (int. + ext.) Event logging e.g. door con- tact	T/C-Type K, T or J (4 x external)	
Meas. range	-40 to +70 °C	-40 to +70 °C	-40 to +70 °C (int.) -40 to +120 °C (ext.)	Type K (NiCr-Ni): -200 to +1000 °C Type T (Cu-CuNi): -200 to +400 °C Type J (Fe-CuNi): -100 to +750 °C	
Resolution	0.1 °C	0.1 °C	0.1 °C	0.1 °C	
±1 digit	System internal ±0.4 °C (-25 to +70 °C) ±0.8 °C (-40 to -25.1 °C)	System internal ±0.4 °C (-25 to +70 °C) ±0.8 °C (-40 to -25.1 °C)	System internal ±0.4 °C (-25 to +70 °C) ±0.8 °C (-40 to -25.1 °C) Instrument external ±0.2 °C (-25 to +70 °C) ±0.4 °C (remaining range)	System ±0.5% of mv (+70.1 to +1000 °C) ±1.5% of mv (-200 to -100.1 °C) ±0.3 °C (-100 to +70 °C)	
Memory	48000	48000	48000	48000	
Oper. temp.	-40 to +70 °C	-40 to +70 °C	-40 to +70 °C (int.)	0 to +70 °C	
Battery life	> 5 years*	> 5 years*	> 5 years*	> 5 years*	
Measuring rate	2 s to 24 h	2 s to 24 h	2 s to 24 h	2 s to 24 h	
Protection class	IP68	IP68	IP67	IP43	
Part no.	0563 1771	0563 1772	0563 1773	0563 1774	

testo

Temperature

*at a measuring rate 15 min (-10 to +50 °C)

Calibration certificates temperature

Testo received the first accreditation for its temperature lab as early as 1994. The range of accreditation services has been continuously expanding ever since. For all calibrations, traceability to a national standard and the calculation of measurement uncertainty is guaranteed.

testo



Air and immersion probe

Select the suitable calibration points for the working range of your instruments in the range from -196 to +1300 °C. All electronic temperature measuring instruments, resistance thermometers and thermocouples are calibrated in a saline bath (Hart Scientific 2016), in a liquid bath (Lauda UB 40 J, Lauda K 6 RS, Heto KB 25, Julabo F25) or heat-pipe oven (Gero WRO 100-380). The systems and methods are designed for the reliable and economic creation of DKD/ISO calibration certificates and are contantly under development. The reference systems consist of several precision Pt100 probes, a Prema 6048 multimeter and several testo 950 reference measuring instruments.



Calibration object	DKD/ ISO	Calibration	points/range	Part no.		
Electronic thermome- ters, electric resistance thermometers, with air/immersion pro- bes/thermocouples	DKD	Selective Standard Standard Standard	-196 to +1000°C -20/0/+60°C 0/+100/+200°C 5-PtAdj. f. probes 0614 0240 incl. cert. -40/0/+100/+200/+300°C Accur.: 0.05°C	0520 0201 0520 0211 0520 0221 0520 0241		
	ISO	Selective Standard Standard Standard Standard Standard Standard Standard Standard Standard	-196 to +1300°C -18/0/+60°C -8/0/+40°C -18/0°C 0/+60°C -18/+60°C -18/+60°C 0/*150/+300°C 0/+300/+600 5-PtAdj. f. probes 0614 0240 incl. cert. -40/0/+100/+200/+300°C	0520 0101 0520 0001 0520 0181 0520 0042 0520 0043 0520 0061 0520 0062 0520 0063 0520 0021 0520 0031 0520 0142		

Calibration certificates temperature

Contact surface temperature probes

The calibration bench for surface temperature developed by Testo in cooperation with the PTB and the University of Ilmenau sets new standards in the calibration of surface temperature probes. Select the suitable calibrationpoints for your instruments in the range from +50 to +500 °C. Contact surface temperature probes are calibrated using a certain method according to your choice on different surfaces (steel, copper, aluminium). The reference is created with a Prema 3040 precision thermometer combined with several reference thermocouples.



Calibration object	DKD/ ISO	Calibration	points/range		Part no.		
Contact surface tem- perature probes	DKD	Selective Selective Selective Standard	Steel Aluminium Copper Alum./steel	+50 to +480°C +50 to +300°C +50 to +200°C +100/+200/+300°C	0520 0291 0520 0291 0520 0291 0520 0291		
	ISO	Selective Standard Standard Standard	Aluminium Aluminium Aluminium Aluminium	-15 to +480°C +60/+120/+180°C +60°C +120°C	0520 0121 0520 0071 0520 0072 0520 0073		

Data loggers

The best method for calibrating a data logger with an internal sensor is provided by circulating air, as found in a temperature or climate cabinet. The spatial temperature distribution in the testing room must be determined based on extensive measurements. Several programmable CTS tem-

perature cabinets (CTS T-40/25) are used in Testo's temperature laboratory. Pt100 probes in combination with a testo 400 or testo 950 reference measuring instrument are used as a reference.



Calibration object		DKD/ ISO	Calibration points/range	Part no.	
Temperature data log- gers, measurement transmitters, probes without display, trans- mitters		DKD	Selectiveext. probes:-196 to +1000°CSelectiveint. probes:-30 to +120°CStandard-20/0/+60°C	0520 0281 0520 0281 0520 0261	
	ISO	ISO	Selectiveext. probes:-196 to +13260°CSelectiveint. probes:-40 to +180°CStandard-18/0/+60°CStandard-8/0/+40°CStandard0/+60°CStandard0/+60°CStandard-18/+60°CStandard-18/+60°CStandard-18°CStandard0°CStandard+60°C	0520 0141 0520 0141 0520 0151 0520 0151 0520 041 0520 0442 0520 0443 0520 0461 0520 0461 0520 0462 0520 0463	

esto

testo 650, modular humidity measurement system

testo 650

testo

The precision reference class measuring instruments offer the professional user everything he needs to fulfil complex measurement tasks efficiently, securely and conveniently. testo 650 contains the basic parameters temperature, CO_2 , rpm, current and voltage.

The testo 650 additionally has the possibility of measuring humidity and pressure. testo 650 can be retrofitted to the multi-function instrument testo 400 by update.

The instrument can thus keep pace with additional measuring tasks. Via a software update, the intelligent electronics furthermore allow it always to be at the cutting edge of technology.

Adaptive and updatable, extremely reliable and highest quality these are the properties which give all users the certainty of being ready to face the future.

Useful instrument functions

- integrated measurement value store up to 500,000 readings
- all functions of the testo 950
- calulation of all parameters of the Mollier diagram
- relative humidity %RH, dewpoint and pressure dewpoint (td, tpd)
- absolute humidity, g/m³, psychrometric wet bulb temperature
- degree of humidity (g/kg), water vapour partial pressure in bar/hPa
- enthalpy kcal/kg
- aw.value measurement with trend display
- barometric air pressure

Data communication by PC

LONDON 1

%RH

MEAN

41.3

Attachable printer (optio-

Print readings in se-

conds on site

nal)

Clear graphics

display

3 user defined

Saves or prints at the touch of a

button

function buttons

User-friendly operation with cursor via menu structure

Mains connection/fast recharging

testo 650

2 user-defined

probe inputs

testo 650, reference humidity meas. instr., readings memory included (up to 500,000 readings), battery, Li cell and calibration protocol

Applicable for:

- humidity/pressure
- temperature
- CO₂, rpm and current/voltage

Part no. 0563 6501



testo 650, modular humidity measurement system

Pressure measurement

pressure measurement

Humidity measurement

- The first DKD laboratory for air humidity and dewpoint temperature accredited by the PTB guarantees secure measurement values
- Worldwide patented (capacitive) Testo humidity sensor
- Inter-labortory tests in national and international institutes confirms a sensor accuracy of ±1 %RH
- 2 years guaranteed long-term stability of the Testo humidity sensor under normal conditions
- Easy calibration or adjustment of the humidity probe (on site) with defined saline solutions (11.3 %RH, 33 %RH and 75.3 %RH)

Temperature measurement

- DKD laboratory for temperature accredited by the PTB guarantees secure measurement values
- First DKD laboratory for surface temperature accredited by the PTB, developed together with the PTB and the University of IImenau
- Cross-band probe for fast surface measurements
- Customized temperature probes for your application
- System accuracy up to 0.05 °C with precision probe 0614 0240

Current-voltage measurement

 Additional connection of external measurement transmitters such as particle counters and pressure transmitters, and scaling in the instrument

CO and CO₂ measurement

• Long-term stable 2 beam method for measuring the reference and the measurement channel for CO₂

The right probe for every application



Humidity

Measurements with an accuracy of ± 1%RH/ordering suggestion testo 650

Reference humidity probe

testo

The precision humidity probe fulfils measurement tasks with the highest accuracy requirements, such as the calibration of climate cabinets or humidity probes. For the Testo humidity sensor, which has now been used for over 10 years, and continually improved, the focus from the beginning was on the two accuracy parameters measurement inaccuracy and long-term stability. For the highly accurate humidity probe, only humidity sensors are used which have been tested several times. Each probe is put through an extensive adjustment and test procedure. This guarantees that the measurement tolerance on site of \pm 1%RH in the range +10 to +90 %RH is maintained (referring to a temperature range of +15 °C to +30 °C).

The accuracy and the high long-term stability were proven in an interlaboratory test in which several humidity sensors were passed through a number of international calibration laboratories (PTB, NIST etc.), and the limit of 1 %RH was not exceeded without re-adjustment.

Inter-laboratory test

Three precision probes were tested in an extensive inter-laboratory test

Country	Institute	Arrival	Departure	
j Germany	РТВ	04/96	08/96	
k France	CETIAT	10/96	10/96	
I USA	NIST	12/96	05/97	
m Italy	IMGC	07/97	10/97	
n Great Britain	NPL	09/98	09/98	
o Spain	INTA	10/98	10/98	
p Japan	JQA	03/99	04/00	
q Korea	KRISS	05/00	09/00	
r ChineaGermany	NRCCRM	10/00	12/00	
S	РТВ	03/01	08/01	





The precision set for air humidity measurement

testo 650, reference humidity meas. instr., readings memory in- cluded (up to 500,000 readings), battery, Li cell and calibration protocol	0563 6501
Attachable printer (securely attached) including 1 roll of thermal paper and batteries	0554 0570
Cable, 1.5 m long, connects probe with plug-in head to meas. instrument	0430 0143
Highly accurate reference humidity/temp. probe	0636 9741
SoftCase (protects instrument from impact) with carrier strap, magnetic holder and probe holder	0516 0401
SoftCase for attachable printer (protects printer from dirt/impact)	0516 0411
System case (plastic) for measuring instrument, probes and accessories	0516 0400



Measurements in a climate cabinet with the highly accurate reference humidity/temperature probe. Advantage: exact monitoring of air humidity fluctuations with an accuracy of 1 %RH

Humidity

We recommend: DKD calibration certificate/humidity, cal. poi

DKD calibration certificate/humidity, cal. points freely selectable 0520 0216 from 5 to 95%RH at +25°C or -18°C to +70°C

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Water activity influences product quality/ordering suggestion testo 650

Water activity is one of the decisive parameters for product quality in the area of the production of pharmaceutical products and in the food industry.



The processing of granulates, the important properties of pellets and especially the storage life are decisively influenced by the aw-value.

Water activity aw-value

The aw-value provides information about chemically unbonded water. The measurement is based on equilibrium moisture. In a closed space with a proportionally smaller quantity of air than solid, the free water contained in the solid determines the relative humidity of the air. The water activity (aw-value) is in practical terms the same as the equilibrium moisture in a closed space. However, it is not expressed in ranges from 0 to 100 %RH, but from 0 to 1 aw. Thus aw = 0 indicates water-free substances, aw = 1 pure water. Since water activity is temperature-dependent, the reference temperature must always be aiven.

Product quality in pharmaceuticals

The aw-value provides information about chemically unbonded water. It is thus an important parameter in establishing the product quality of many medicaments. Certain properties of pills are directly determined by the aw-value. Pills with a high water activity, for example, are in danger of microbe contamination. Mould growth is generally possible from an aw-value = 0.7upwards. Minimum values for bacteria hitherto observed are in the range from 0.86 to 0.99 - depending on the microorganism. Other important criteria: granulate processing, most importantly the compressability, properties of the pellets such as hardness, disintegration time and perishability.

Product quality in the food industry

The water activity in food determines, among other things, the stability of colours, the flavour and the perishability. A potential danger is present when the foodstuffs have a very high water activity and are not sufficiently cooled.

The reference measurement system sets standards in aw-measurement

Accuracy of the measurement

± 0.01 aw. Reproducability of the measurement ± 0,003 aw. The accuracy of the sensor has been proven in international, inter-laboratory tests!

• Long-term stability of the measurement over years, i.e. frequent, time-consuming re-adjustments are eliminated.

 Measurement system based on national standards! If desired, supplied with DKD calibration certicficate. This provides assurance, also in litigation

• Easy and secure documentation of measurement results with plugon printer or by PC.

Highly accurate water activity measurement

(**C**S10

The goods to be tested are sealed pressure-tight in a measurement chamber together with a highly accurate humidity and temperature probe

For this probe only specially selected humidity sensors with a proven accuracy of ± 1 %RH are used. Each probe is put through an extensive adjustment and test process. It is tested in the Testo laboratory before delivery and receives a precision certificate. This guarantees that the measurement tolerance of ±1 % RH is adhered to.



The trend display in the testo 650 automatically informs when the equilibrium status is reached, and the measurement completed. Constant monitoring is thus not necessarv.

The reference set for aw value measurement	
testo 650, reference humidity meas. instr., readings memory in- cluded (up to 500,000 readings), battery, Li cell and calibration protocol	0563 6501
aw value set: pressure-tight precision humidity probe with certi- ficate, measurement chamber and 5 sample bowls (plastic)	0628 0024
Attachable printer (securely attached) including 1 roll of thermal	0554 0570

paper and batteries					
SoftCase (protects instrument from impact) with carrier strap, magnetic holder and probe holder	0516 0401				
SoftCase for attachable printer (protects printer from dirt/im- pact)	0516 0411				

Monitoring product quality in pharmaceuticals.

Advantage: Measurement results are based on national standards. The trend display in the testo 650 automatically informs when the equilibrium status is reached, and the measurement completed. Constant monitoring is thus not necessary. Calibration possibility on site via control and adjustment set, on request with DKD calibration certificate

Advantage: This provides additional security.

We recommend:

The referenc testo 650, refe cluded (up to 5 protocol aw value set: pi ficate, measure

DKD calibration certificate/humidity, cal. points freely selectable from 5 to 95%RH at +25°C or -18°C to +70°C 0520 0216

Accessories testo 650

testo



ComSoft 3 - Professional (see page 79)

ComSoft 3 - Professional with data management incl. database, analysis and graphics function, data analysis, trend curve

Part no. 0554 0830

Ethernet adapter



Ethernet adapter, RS232 - Ethernet incl. software driver, mains unit, facilitates data communication in network

Part no. 0554 1711

Attachable printer



Attachable printer (securely attached) including 1 roll of thermal paper and batteries, quickly prints readings on location

Part no. 0554 0570

Fast report printer



printer, adjustable con-
Part no. 0554 0549
Part no. 0554 1775

Part no. 0554 0549 Part no. 0554 1775

SoftCase



SoftCase (protects instrument from impact) with carrier strap, magnetic holder and probe holder

Part no. 0516 0401 SoftCase for attachable printer (protects printer from dirt/impact) . Part no. 0516 0411

Part no. 0516 0401 Part no. 0516 0411

Update from testo 650 to testo 400	Part no.
Velocity module, incl. volume flow, degree of turbulence upgrade via service (updates testo 650 to testo 400)	0450 4003
Accessories for measuring instrument	Part no.
Mains unit 230 V/ 8 V/ 1 A, for instrument (European plug), for mains operation and battery recharging	0554 1084
Rech. batt. set for instr. (2 rech. 2.4V/1100mAh) selected for quick recharging in instrument	0554 0196
Lithium battery, button cell, type CR 2032	0515 0028
Printer and Accessories	Part no.
Attachable printer (securely attached) including 1 roll of thermal paper and batteries	0554 0570
Testo fast printer with wireless infrared interface, 1 roll thermal paper and 4 AA batteries	0554 0549
Fast testo 575 printer, incl. 1 roll of thermal paper and batteries, infrared thermal line printer with graphics function	0554 1775
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) measurement data documentation legible for up to 10 years	0554 0568
Label thermal paper (Testo patent) for testo 575 printer (6 rolls), can be applied directly	0554 0561
SoftCase for instrument and printer	Part no.
SoftCase (protects instrument from impact) with carrier strap, magnetic holder and probe holder	0516 0401
SoftCase for attachable printer (protects printer from dirt/impact) protects from impact and falls	0516 0411
Software (see page 79) and accessories	Part no.
ComSoft 3 - Professional with data management, incl. database, analysis and graphics function, data analysis, trend curve	0554 0830
RS232 cable connects instrument to PC (1.8 m) for data transfer	0409 0178
Ethernet adapter, RS232 - Ethernet incl. software driver, mains unit, facilitates data communication in network	0554 1711
System case	Part no.
System case (plastic) for measuring instrument, probes and accessories probes in lid make it easy to find parts in case (540 x 440 x 130 mm)	0516 0400
System case (aluminium) for measuring instrument, probes and accessories probes in lid make it easy to find parts in case	0516 0410
Calibration certificates/humidity	Part no.
ISO calibration certificate humidity Calibration points 11.3 %RH and 75.3 %RH at +25°C	0520 0006
ISO calibration certificate/humidity cal. points freely selectable from 5 to 95%RH at +15 to +35°C or at -18 to +80°C	0520 0106
DKD calibration certificate/humidity cal. points freely selectable from 5 to 95%RH at +25°C or - 18°C to +70°C	0520 0216

Further calibration certificates see page 28, 46, 76

Suitable probes and protective caps at a glance, testo 650

umidity probe with accuracy ±1 %R	H Illustration		Meas. range	Accuracy		t99 Part no.	
Highly accurate reference humi- dity/temp. probe		Ø 21 mr	0 to +100 %RH n -20 to +70 °C	±1 %RH (+10 to +90 %RH)* ±2 %RH (remai- ning range)	±0.2 °C (+10 to +40 °C) ±0.4 °C (remaining range)	12 s 0636 974 Conn.: Plug-i nection cable 0430 0145 re	1 n head. con- 0430 0143 or quired
aw value set: pressure-tight precision humidi probe with certificate, measurement chambe and 5 sample bowls (plastic)	ity ar Reproducibility of aw value ±0.0	03	0 to +1 aW 0 to +100 %RH -20 to +70 °C	±0.01 aW (+0.1 to +0.9 aW) ±0.02 aW (+0.9 to +1 aW)	±0.4 °C (-10 to +50 °C) ±0.5 °C (remaining range)	0628 002	4
	III		M	A = =	* in the tempe	rature range from +1:	5°C to +30°C
umidity probes	lilustration		0 to +100 %BH	+2 %BH (+2 to	+0.4 °C (-10 to +50 °C)	¹² S occo oz 4	0
Standard ambient air probe up to +70°C		0 12 mm (F	-20 to +70 °C	+98 %RH)	±0.5 °C (remaining range)	Conn.: Plug-i nection cable 0430 0145 re	U n head. con- 0430 0143 or quired
Duct humidity/temperature probe, can be co nected to telescopic handle 0430 9715	²ⁿ⁻	180 mm Ø 12 mm	0 to +100 %RH -20 to +70 °C	±2 %RH (+2 to +98 %RH)	±0.4 °C (-10 to +50 °C) ±0.5 °C (remaining range)	12 \$ 0636 971 Conn.: Fixed	5 cable
Thin humidity probe incl. 4 attachable pro-		250 mm	0 to +100 %RH -20 to +70 °C	±2 %RH (+2 to +98 %RH)	±0.4 °C (-10 to +50 °C) ±0.5 °C (-20 to -10.1 °C)	15 s 0636 213	0
measurements in exhaust air fineasurements, brium moisture measurements		Ø 4 mm			±0.5 °C (+50.1 to +70 °C)	Conn.: Plug-in nection cable 0430 0145 re	n head. con- 0430 0143 or quired
Humidity/temperature probe		Ø 21 mr	0 +100 %RH n -20 to +70 °C	±2 %RH (+2 +98 %RH)	±0.4 °C (+0.1 to +50 °C) ±0.5 °C (-20 to 0 °C)	12 s 0636 974	2
rianially temperatore probe					±0.5 °C (+50.1 to +70 °C)	Conn.: Plug-ii nection cable 0430 0145 re	n head. con- 0430 0143 or quired
robes process humidity	Illustration		Meas. range	Accuracy		t99 Part no.	
High humidity level probe w/ heated sensor		300 mm	0 to +100 %RH -20 to +85 °C	±2.5 %RH (0 to +100 %RH)	±0.4 °C (-10 to +50 °C) ±0.5 °C (-20 to -10.1 °C)	30s 0636214	2
element, no humidity on sensor		Ø 12 mm		1100 /0111	±0.5 °C (+50.1 to +100 °C	Conn.: Plug-ii nection cable 0430 0145 re	n head. con- 0430 0143 or quired
robes material and equilibrium moist	ture Illustration		Meas. range	Accuracy		t99 Part no.	
Flexible humidity probe with mini module for meas. e.g. on material testing rigs, module cable length 1500mm, probe tip 50x19x7mm	n III		0 to +100 %RH -20 to +125 °C	±2 %RH (+2 to +98 %RH)	±0.4 °C (-10 to +50 °C) ±0.5 °C (remaining range)	20 s 0628 001 Conn.: Plug-ii nection cable 0430 0145 re	3 n head. con- 0430 0143 or quired
aps for humidity probes Ø 12m and a Metal protection cage, Ø 12 mm for humidity V4A, fast adjustment time, robust and tempe velocities under 10 m/s	21mm Pa y probes, material stainless steel arature-proof, application for flow	art no. 0554 0755	d Covering caps f Sintered PTFE fil densation, water Compressed air ments), high flow	or humidity pr er, Ø 12 mm mate repellent, high res measurements, hi velocities.	obes Ø 5, 12 and 21 n erial PTFE. Favourable beh istance to aggressive mec gh humidity range (long-te	mm Part aviour in con- ia. Applications: m measure-	no. 554 0756
Cap with wire mesh filter, Ø 12 mm		0554 0757	e PTFE sintered filt pellent, resistant surements, high	er, Ø 12 mm, PTF to corrosive subst numidity range (co	E. Not affected by conden ances. Applications: comp ontinuous measurements),	sation, water-re- 0 pressed air mea- high	554 0758
PTFE sintered filter, Ø 21 mm, PTFE. Not affe pellent, resistant to corrosive substances. Ap surements, high humidity range (continuous	ected by condensation, water-re- oplications: compressed air mea- measurements), high flow	0554 0666	flowvelocities Stainless steel si f bust, suitable for	ntered cap, Ø 21 i penetration, clear	mm, made of stainless ster	el V2A. Highly ro- 0	554 0640
VEIOCILIES			tection of sensor	Applications: high	h mechanical loads, high fl	ow velocities.	
			g ged, suitable for sensor protection	ntered cap, Ø 12 r penetration, can b n. Applications: Hi	mm, material: stainless ste be cleaned with compresse gh mechanical loads, high	el V2A. Very rug- 0 d air, mechanical flow velocities.	554 0647
			h PTFE cap, Ø 5 n tection, high hun	nm, attachable, P1 nidity level measur	FE material, (5 off). Application ements, high flow velocitie	ations: dust pro- 0 s	554 1031
	b 🍊		с. 		d		
			0		ŭ	-	
tal protection cage, Ø 12 n, stainless steel V4A, for 66 9740, 0636 9715	Cap with wire mesh filter, & mm, for humidity probes Ø mm) 12 12	Sintered PTF PTFE, for hui mm	E filter, Ø 21 mm, nidity probes Ø 2	1 Si	ntered PTFE filter, Ø IFE for 0636 9740, 0	12 mm, 636 9715
	f 🧥		g		h		

Sintered PTFE filter, Ø 12 mm, PTFE for 0636 2142

Sintered stainless steel cap, Ø 21 mm, stainless steel V2A, for humidity probes Ø 21 mm

Stainless steel sintered cap, Ø 12 mm, stainless steel V2A for 0636 9740, 0636 9715

PTFE cap, Ø 5 mm, PTFE for 0636 2130

35

testo

Humidity

- testo

36

Suitable probes at a glance testo 650

Pressure probes	Illustration	Meas. range	Accuracy	Part no.
Precision pressure probe, 100 Pa, in robust metal housing with impact protection, incl. magnet for fast attachment, to measure diffe- rential pressure and flow speeds (in combina- tion with Pitot tube)	\square	0 to +100 Pa	±(0.3 Pa ±0.5% of mv)	0638 1347 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
Pressure probe, 2000 hPa, measures abso- lute pressure, in robust metal housing with impact protection, incl. quick-closing coup- ling (M8 x 0.5), magnet for fast attachment	D	0 to +2000 hPa	±5 hPa (0 to +2000 hPa)	0638 1847 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
Temperature probes	Illustration		Meas. range Accuracy t99	Part no.

Quick-action surface probe with sprung thermocouple strip, measuring range short-term to +500°C	150 mm -200 to +300 °C Class 2 3 s 0604 0194 Conn.: Plug-in head. connection cable 0430 0143 or 0430 0145 required -200 to +300 °C Class 2 3 s 0604 0194		
Fast response immersion/penetration probe	150 mm -200 to +400 °C Class 1 3 s 0604 0293 Conn.: Plug-in head. connection cable 0430 0143 or 0430 0145 required -200 to +400 °C Class 1 3 s 0604 0293		
Standard air probe			
FURTHER TEMPERATURE PROBES SEE PAGE 17, 18			

More probes	Illustration	Meas. range	Accuracy	Part no.
Ambient CO probe, for detecting CO in buil-		0 to +500 ppm CO	±5% of mv (+100.1 to	0632 3331
dings and rooms			±5 ppm CO (0 to +100 ppm CO)	Conn.: Fixed cable, 1.5 m
CO2 probe measures indoor air quality and		0 +1 Vol. % CO ₂	\pm (50 ppm CO ₂ \pm 2% of	0632 1240
monitors the workplace. With plug-in head, connection cable 0430 0143 or 0430 0145 required		0 +10000 ppm CO ₂	$\pm (100 \text{ ppm CO}_2 \pm 3\% \text{ of } \text{mv})(+5001 \text{ to } +10000 \text{ ppm CO}_2)$	Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
		0 to +1000 mV	±1 mV (0 to +1000 mV)	0554 0007
Current/voltage cable (± 1 V, ± 10 V, 20		0 to +10 V	±0.01 V (0 to +10 V)	
		0 to +20 mA	±0.04 mA (0 to +20 mA)	
4 to 20 mA interface for connection and inter-	0	0/4 to 20 mA	±0.04 mA	0554 0528
mittent power supply to transmitters (scaling		Channels: 1 channel, tra	nsmitter connection	Conn.: Plug-in head. con-
via hand-held instrument), in robust metal		Via terminal board	19/ DC + 200/	nection cable 0430 0143 or 0430 0145 required
housing with impact protection, incl. magnet		max connection load: 3	10V DO ± 2070) mΔ	
for fast attachment		max. connection load. of	51107	

Accessories: Humidity probes	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 in- strument, PUR coating material	0409 0063
Telescopic handle, max. 1 m, for probe with plug-in head, cable: 2.5 m long, PUR coating material	0430 0144
testo saline pots for control and humidity adjustment of humidity probes, 11.3 %RH and 75.3 %RH with adapter for humidity probe	0554 0660

Accessories: Pressure probes	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
Connection hose, silicone, 5m long, max. load 700 hPa (mbar)	0554 0440
Connection hose set, 2 x 1 m, coiled, incl. 1/8" screw connection, Pressure-tight up to 20 bar	0554 0441
Technical data for testo 650

Technical data					
Probe type	Testo humid. sensor, cap.	aw value	Pressure		
Meas. range	0 to +100 %RH	0 to +1 aW	0 to +2000 hPa		
Accuracy ±1 digit	See probe data	See probe data	Probe 0638 1347 Probe 0638 1847 ±0.1% or fsv		
Resolution	0.1 %RH (0 to +100 %RH)	0.001 aW	0.001 hPa (probe 0638 1347) 0.1 hPa (probe 0638 1847)		
Probe type	NTC	Pt100	Type K (NiCr-Ni)	Type S (Pt10Rh-Pt)	Type J (Fe-CuNi)
Measurement range temp.	-40 to +150 °C	-200 to +800 °C	-200 to +1370 °C	0 to +1760 °C	-200 to +1000 °C
Accuracy ±1 digit	±0.2 °C (-10 to +50 °C) ±0.4 °C (-40 to -10.1 °C) ±0.4 °C (+50.1 to +150 °C)	±0.1 °C (-49.9 to +99.9 °C) ±(0.1 °C + 0.1% of mv) re- maining range	±(0.3 °C + 0.1% of mv)	±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 +1000 °C
Resolution	0.1 °C (-40 to +150 °C)	0.01 °C (-99.9 to +300 °C) 0.1 °C (-200 to -100 °C) 0.1 °C (+300.1 to +800 °C)	0.1 °C (-200 to +1370 °C)	1 °C (0 to +1760 °C)	0.1 °C (-200 to +1000 °C)
Probe type	CO2 probe	CO probe	Current measurement	Voltage measurement	
Meas. range	0 to +1 Vol. % CO ₂ 0 to +10000 ppm CO ₂	0 to +500 ppm CO	0 to +20 mA (0554 0007) 0/4 to +20 mA (0554 0528)	0 to +10 V (0554 0007)	
Accuracy ±1 digit	See probe data	±5% of mv (0 to +500 ppm CO)	±0.04 mA (0 (0554 0007) to +20 mA) See probe (0554 0007) data	±0.01 V (0 to +10 V)	
Resolution			0.01 mA (0 to +20 mA)	0.01 V (0 to +10 V)	
Oper. temp.	0 to +50 °C		Storage capacity: 1 MB	corresponds to approx	500.000 readings
Storage temp.	-25 to +60 °C		Storage capacity. FMB, corresponds to approx. 300,000 readings Misc.: Automatic recognition of all connected probes Current supply: Battery/rech. battery, alternatively 8V mains unit		
Battery type	1,5 V AA				
Battery life	18 h		battery life in permanent use with 2 TC probes: 18 h		
Weight	500 g				
PC	RS232 interface				

testo

Humidity

testostor 171-6, electronic thermohygrograph with external probes



testostor 171-6

testo

The measurement data storage instrument testostor 171-6 has 2 probe inputs, for example for the simultaneous monitoring of room and ambient humidity

The Testo humidity sensor is PTB approved and guarantees a constant high measuring accuracy over a wide temperature range. Analysis of the humidity data can be expressed in %RH, dewpoint, g/m³ water level.

- 2-channel, external %RH, °C, or °C, °Ctd
- Wide range of probes
- Probes can be positioned quickly and easily
- Data analysis via PC

testostor 171-6

separately

Part no.

External: %RH/°C or °C, °Ctd

testostor 171-6, humidity data logger for %RH, °C, td, incl. starting magnet, bat-

tery and calibration protocol; calibration certificates (ISO/DKD) must be ordered

0577 1716

• Large memory for 55,000 readings





Graphic proof of humidity/temperature fluctuations



Data analysis on your PC/laptop with easy-touse Windows® software



Humidity

38

testostor 171-6, electronic thermohygrograph with external probes

Recommended Set: Monitoring air humidity/ temperature fluctuations in a climate cabinet	
testostor 171-6, humidity data logger for %RH, °C, td, incl. starting magnet, battery and calibration protocol; calibration certificates (ISO/DKD) must be ordered separately	0577 1716
Humidity/temperature probe with standard plastic protection cap	0636 9717
Humidity/temperature probe with standard plastic protection cap	0636 9717
ComSoft 3 - Professional with data management, incl. database, analy- sis and graphics function, data analysis, trend curve (without interface)	0554 0830
Interface, attachable to testostor 171 data logger	0554 1781
We recommend:	
we recommend.	
DKD calibration cert./humidity, humidity data logger; cal. points 11.3%BH and 75.3%BH at +25°C; per channel/instrument	0520 0246



Monitoring air humidity/temperature fluctuations in climatic cabinet

Humidity/temperature probes	Illustration	Meas. range	Accuracy		t90	Part no.
Humidity/temperature probe with standard plastic protection cap	180 mm Cable/length 3 m	0 to +100 %RH -20 to +70 °C	±2 %RH (+2 to +98 %RH)	±0.4 °C (-10 to +50 °C) ±0.5 °C (remaining range	12 s e)	0636 9717
Mini humidity/temperature module for measu- rements at inaccessible points, module cable 1.5m long, probe tip 49x18x7mm	49x18x7 mm Cable/length 1.5 m	0 to +100 %RH -20 to +120 °C	±2 %RH (+2 to +98 %RH)	±0.5 °C (-20 to +120 °C	i) 20 s	0628 0008
Temperature probes (NTC)	Illustration		Meas. range	Accuracy F	Reaction time	Part no.
Robust immersion/air probe, quick-action, 6m cable, IP68 probe tip	40 mm		-50 to +80 °C	±0.2 °C (-25 to +80 °C) ±0.4 °C (-50 to -25.1 °C)	5 s t _{gg} (in water)	0610 1720 Conn.: Fixed cable, 6 m
Robust, accurate, waterproof food probe (IP65), made of stainless steel	125 mm	Ø 3 mm	-50 to +120 °C	±0.2 °C (-25 to +80 °C) ±0.4 °C (-50 to -25.1 °C) ±0.5 °C (+80.1 to +120 °C	10 s t ₉₉ (in water)	0610 2217 Conn.: Fixed cable, 2 m
Wall surface temperature probe, e.g. provides proof of damage to building material, cable 6.1m long, probe tip 40x15x0.2 mm			-50 to +120 °C	±0.5 °C (-50 to +120 °C)	20 s t ₉₀	0628 0007 Conn.: Fixed cable, 6 m

Accessories, Transport and Protection	Part no.
Transport case (plastic) for measurement data storage instruments (max. 6 off) and accessories, for safe transport	0516 0117
Holder with lock for data logger	0554 1782
Stainless steel sintered cap, Ø 21 mm, can be screwed onto humidity probe, protection in case of high mechanical load and high velocities	0554 0640

Additional accessories and spare parts

 Spare battery for testostor 171, quick and easy battery replacement
 0515 0018

 testo saline pots for control and humidity adjustment of humidity probes
 0554 0660

 11.3 %RH and 75.3 %RH with adapter for humidity probe
 0554 0660

Software (see page 79) and accessories	
ComSoft 3 - Professional with data management, incl. database, analy- sis and graphics function, data analysis, trend curve (without interface)	0554 0830
ComSoft 3 - For requirements to CFR 21 Part 11, incl. database, analy- sis and graphics function, data analysis, trend curve (w/o interface)	0554 0821
Interface, attachable to testostor 171 data logger	0554 1781
Ethernet adapter, RS232 - Ethernet incl. software driver, mains unit, facilitates data communication in network	0554 1711

Further calibration certificates see page 47

Technical data							
Probe type	NTC	Testo humid. sensor, cap.	Calc. parameter				
Meas. range	-50 to +120 °C	0 to +100 %RH	-30 to +50 °C td				
Accuracy ±1 digit	±0.4 °C (-10 to +50 °C) ±0.6 °C (-50 to -10.1 °C) ±0.6 °C (+50.1 to +120 °C)	±2 %RH (+2 to +98 %RH)					
Resolution	0.1 °C	0.1 %RH					
Oper. temp.	-20 to +70 °C	Dimensions 1	31 x 68 x 26 mm				
Storage temp.	-40 to +85 °C	Warranty 2	years				
Battery type	Lithium battery (2032)	Meas. cycle: 2s to 24h	freely selectable				
Protection class	IP65	Software: menu-driven	from Microsoft Wind-				
Memory	55000	ows 95 / ME / 2000 / >	P / Vista				
Weight	305 g	Battery life: 5 years					

testo

Humidity

testo 177-H1, testo 177-H1, Long-term monitoring of ambient climate - Professional and non-stop

testo 177-H1

restu

Climate cabinets are dependent on stable humidity and temperature measuement values. Reliable recording and documentation of climate values (%RH, °C and °Ctd) are possible with the data logger 177-H1

An additional surface, immersion or air probe can be connected to the data logger. • 1 x internal %RH/°C/°Ctd + 1 x external °C

- Long-term stable humidity sensor with fast response time
- Memory for 48,000 readings
- Control and adjustment option
- with adjustment setProtection caps for dirt-ingres-
- sed or corrosive gases

testo 177-H1

Intern. %RH, °C, °C td + extern. °C testo 177-H1, humidity/temperature logger, 4 channels, with internal sensors and additional external temp. probe socket, wall holder and calibration protocol; calibration certificates (ISO/DKD) must be ordered separately Part no. 0563 1775



11.1





Alarm message, reliable notification when limits are exceeded

testo 177-H1 for monitoring humidity in a climate cabinet

Technical data					
Chann. intern	3				
Meas. range	0 to +100 %RH	-20 to +70 °C	-40 to +70 °C td		
Accuracy ±1 digit	±2 %RH	±0.5 °C			
Resolution	0.1 %RH	0.1 °C	0.1 °C td		
Reaction time	12 s				
Chann. external (var.)	1				
Meas. range	-40 to +120 °C				
Accuracy ±1 digit	±0.2 °C (-25 to +70 °	°C) ±0.4 °C	(remaining range)		
Resolution	0.1 °C				
Memory	48000				
Measuring rate	2 s to 24 h	Protection clas	ss IP54		
Oper. temp.	-20 to +70 °C	Storage temp.	-40 to +85 °C		
Dimensions	103 x 64 x 33 mm	Weight	130 g		
Battery life	5 years at meas. rate of 15 min (-10 to +50 °C)				
Analysis software	MS Windows 95b / 98 / ME / NT4-Sp4 / 2000 / XP				

Recommended Set: Set for recording ambient conditions in a climate cabinet

testo 177-H1, humidity/temperature logger, 4 channels, with Internal sensors and additional external temp. probe socket, wall holder and calibration protocol; calibration certificates (ISO/DKD) must be ordered separately ComSoft 3 Set - Basic with USB interface, Basic software with diagram and table function, incl. desk-top holders, PC connection cable

ISO calibration certificate humidity, Calibration points 11.3 %RH $\,$ 0520 0006 and 75.3 %RH at +25°C $\,$

Accessories Ordering data see page 41

Temperature probes (NTC) Illustration Meas. range Accuracy tac Part no. ±0.2 °C (-20 to +40 °C) ±0.4 °C (+40.1 to +70 °C) -20 to +70 °C 15 s 0628 7510 35 mm Stub probe, IP 54 Ø3mm ±0.2 °C (0 to +70 °C) ±0.5 °C (remaining range) -30 to +90 °C 190 s 0628 7503* 40 mm Stationary probe with aluminium sleeve, IP 65 Conn.: Fixed cable Ø6mm ±0.2 °C (-25 to +74.9 °C) 5 s ±0.4 °C (remaining range) -35 to +80 °C 0610 1725* 40 mm Accurate imm./pen. probe, 6m cable, IP 67 Conn.: Fixed cable Ø 3 mm Ø3mm Accurate immersion/penetration probe, cable: 1.5 m long, IP 67 0628 0006* ±0.2 °C (0 to +70 °C) -50 to +80 °C 20 s 0628 7507 Wall surface temperature probe Conn.: Fixed cable ±0.5% of mv (+100 to +150 °C) ±0.2 °C (-25 to +74.9 °C) ±0.4 °C (remaining range) -50 to +150 °C 0613 2211* 8 s 125 mm 15 mm Stainless steel NTC food probe (IP65) with Long-term meas. range +125°C, short-term +150°C (2 minutes) Conn.: Fixed cable PUR cable Ø4mm Ø3mm -50 to +125 °C ±0.2 °C (-25 to +80 °C) ±0.4 °C (remaining range) 60 s 0613 1712 115 mm 50 mm Long-term meas. range +125 °C, short-term +150 °C Efficient, robust NTC air probe 10 Conn.: Fixed cable Ø5mm Ø4mm

 $\hfill \Box$ The specified leakage class for data loggers is achieved with these probes.

Humiditv

* Probe tested for suitability in transport and storage applications in accordance with EN 12830

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Accessories for testo 177

testo 575 fast printer

- Fast-action print mechanism, 6 lines/s
- Prints tables/graphics
- Brief info. or full memory can be printed as required
- Determine section to be printed
- Your language can be set
- Self-adhesive Testo paper can also be used

Part no. 0554 1775



Fast printout and logger rebooting with testo 575

testo 581 alarm signal output

- Transmission of alarm messages – e.g. when programmed limit values in the data logger are exceeded – to external components such as horns, lamps, PLC etc.
- Signal transfer via floating signal output



Part no. 0554 1769

Alarm signal output for reliable notification o mits exceeded

Printer and Accessories	Part no.
Fast testo 575 printer, incl. 1 roll of thermal paper and batteries, infrared thermal line printer with graphics function	0554 1775
Spare thermal paper for printer (6 rolls)	0554 0569
Spare thermal paper for printer (6 rolls), measurement data do- cumentation legible for up to 10 years	0554 0568
Label thermal paper (Testo patent) for testo 575 printer (6 rolls), can be applied directly	0554 0561
Additional accessories	Part no.
testo 580 data collector set with RS232, readout holders inclu- ded, for testo 175/177 data loggers	0554 1778
testo 580 data collector set with USB, readout holders inclu- ded, for testo 175/177 data loggers	0554 1764
testo 581 alarm signal output, floating, for testo 175/177, forwards information efficiently when limits are exceeded to e.g. horns, lamps, PLC etc.	0554 1769
Battery, 3.6 V/1.9 Ah 1AA, for testo 175-T1/175-T2 and all testo 177 loggers	0515 0177
Transport and Protection	Part no.
Lock for wall holder for testo 175/177 data loggers	0554 1755
Transport case for up to 6 testo 177 data loggers, testo 575 printer, testo 580 data collector and accessories	0516 1770
Accessories for humidity probes	Part no.
testo saline pots for control and humidity adjustment of humi- dity probes, 11.3 %RH and 75.3 %RH with adapter for humi- dity probe	0554 0660
Metal protection cage, Ø 12 mm for humidity probes, for measurement in flow velocities of less than 10 m/s	0554 0755
Cap with wire mesh filter, Ø 12 mm	0554 0757
Sintered PTFE filter, Ø 12 mm, for corrosive media, High humi- dity range (long-term measurements), high flow velocities.	0554 0756
Stainless steel sintered cap, Ø 12 mm, is screwed onto humi- dity probe, for measurements at higher flow velocities or in con- taminated air	0554 0647

testo 580 data collector

- Can read out up to 25 full testo 175 loggers or 10 full testo 177 loggers
- Displays all status information
- Download collected data to PC using Testo ComSoft 3

RS232 Version Part no. 0554 1778 USB version Part no. 0554 1764

Ethernet adapter

- Fast transfer of readings
- Use of an existing network without additional cabling
- Long transmission paths
- Identification of measuring instruments in system network
- In connection with ComSoft 3

Part no. 0554 1711



The testo 580 data collects data on site for

upload to PC and analysis

Read out the data stored in the logger via the PC network using the Ethernet adapter

Software (ComSoft from p. 78)	Part no.
For testo 177: ComSoft 3 Set - Basic with RS232 interface, Basic software with diagram and table function, incl. desk-top holder, PC connection cable	0554 1774
For testo 177: ComSoft 3 Set - Basic with USB interface, Basic software with diagram and table function, incl. desk-top hol- ders, PC connection cable	0554 1767
ComSoft 3 - Professional with data management, incl. data- base, analysis and graphics function, data analysis, trend curve (without interface)	0554 0830
ComSoft 3 - For requirements to CFR 21 Part 11, incl. data- base, analysis and graphics function, data analysis, trend curve (w/o interface)	0554 0821
RS232 interface for testo 175/177 incl. desk-top holders, PC connection cable, (please also order for ComSoft 3 - Professional)	0554 1757
USB interface, for testo 175/177 incl. desk-top holders, PC conn. cable, (Please order with ComSoft 3 - Professional)	0554 1768
Ethernet adapter, RS232 - Ethernet incl. software driver, mains unit, facilitates data communication in network	0554 1711
Calibration Certificates	Part no.
ISO calibration certificate humidity , calibration points 11.3 %RH and 75.3 %RH at +25 $^{\circ}\text{C}/+77$ $^{\circ}\text{F};$ per channel/instrument	0520 0076
DKD calibration cert./humidity, humidity data logger; cal. points 11.3% BH and 75.3% BH at +25°C; per channel/instrument	0520 0246

Further calibration certificates see page 47

CS10

Overview: Pro humidity data logger testostor 171

Туре	testostor 171-1	testostor 171-6	testostor 171-2	testostor 171-3	Ex 171-3
Description	Internal °C NTC + ex- ternal °C NTC or %RH/°C	2 x external %RH / °C or °C, td	Internal: %RH, °C, td	Internal %RH / °C 20,000 readings	Internal %RH / °C with Ex approval
Illustration					
Measurement value sensor	NTC (Temperature probe) NTC (Combi-probe °C/%RH)	NTC (temperature probe) NTC (combi-probe °C/%RH)	NTC	NTC	NTC
Meas. range	0 to +100 %RH -35 to +70 °C (int.) -50 to +120 °C (ext.)	0 to +100 %RH -50 to +120 °C (ext.) -30 to +50 °C td	0 to +100 %RH -20 to +70 °C -20 to +70 °C td	0 to +100 %RH -10 to +50 °C	0 to +100 %RH -10 to +50 °C
Resolution	0.1 %RH 0.1 °C 0.1 °C	0.1 %RH 0.1 °C	0.1 %RH 0.1 ℃	0.1 %RH 0.1 ℃	0.1 %RH 0.1 °C
Accuracy ±1 digit	System ±2 %RH (+2 to +98 %RH) (int.) ±0.2 °C (-35 to +39.9 °C) ±0.4 °C (+40 to +70 °C) (ext.) ±0.2 °C (-34.9 to +39.9 °C) ±0.4 °C (+40 to +120 °C) ±0.6 °C (-50 to -35 °C)	System ±2 %RH (+2 to +98 %RH) ±0.4 °C (-10 to +50 °C) ±0.6 °C (-50 to -10.1 °C) ±0.6 °C (+50.1 to +120 °C)	System ±2 %RH (+2 to +98 %RH) ±0.4 °C (-10 to +50 °C) ±0.5 °C (-20 to -10.1 °C) ±0.5 °C (+50.1 to +70 °C)	System ±3 %RH (+2 to +98 %RH) ±0.5 °C (-10 to +39.9 °C) ±0.6 °C (+40 to +50 °C)	System ±2 %RH (+2 to +98 %RH) ±0.4 °C (-10 to +50 °C)
Memory	55000 Readings	55000 Readings	55000 Readings	20000 Readings	20000 Readings
Measuring rate	2 s to 24 h	2 s to 24 h	2 s to 24 h	2 s to 24 h	2 s to 24 h
Oper. temp.	-35 to +70 °C	-20 to +70 °C	-20 to +70 °C	-20 to +70 °C	-10 to +50 °C
Storage temp.	-40 to +85 °C	-40 to +85 °C	-40 to +85 °C	-40 to +85 °C	-40 to +85 °C
Battery type	Lithium battery	Lithium battery (2032)	Lithium battery (2032)	Lithium battery	Lithium battery
Battery life	up to 5 years	up to 5 years	up to 5 years	up to 5 years	up to 5 years
Dimensions	131 x 68 x 26 mm	131 x 68 x 26 mm	131 x 68 x 84 mm	131 x 68 x 84 mm	131 x 72 x 68 mm
Weight	305 g	305 g	320 g	320 g	320 g
Protection class	IP65	IP65	IP65	IP65	IP65
Warranty	2 years	2 years	2 years	2 years	2 years
Other features					
Part no.	0577 1715	0577 1716	0577 1712	0577 1713	0577 1733

Detailed information on all data loggers can be found in the brochure:

"Measurement Solutions for Climate Applications in Industry"

Humidity

Overview: Temperature compact/pro humidity logger testo 175/177

Туре	testo 175-H1	testo 175-H2	testo 177-H1
Description	2 channel humidity/temperature logger with internal sensors	2 channel humidity/temperature logger with internal sensors and display	4-channel humidity/ temperature logger with internal sensors and ext. probe input
Illustration			
Measurement	Testo humid. sensor.	Testo humid, sensor.	Testo humid, sensor.
value sensor	cap. NTC (internal)	cap. NTC (internal)	cap. NTC (internal) (external)
Meas. range	0 to +100 %RH -10 to +50 °C	0 to +100 %RH -20 to +70 °C	0 to +100 %RH -20 to +70 °C (int.) -40 to +120 °C (ext.) -40 to +70 °C td
Resolution	0.1 %RH 0.1 °C	0.1 %RH 0.1 °C	0.1 %RH 0.1 ℃ 0.1 ℃ 0.1 ℃ td
Accuracy	System	System	System
±1 digit	±3 %RH	±3 %RH	±2 %RH
	±0.5 °C	±0.5 °C	±0.5 °C Instrument ±0.2 °C (-25 to +70 °C) ±0.4 °C (remaining range)
Memory	3700 Readings	16000 Readings	48000 Readings
Measuring rate	10 s to 24 h	10 s to 24 h	2 s to 24 h
Oper. temp.	-10 to +50 °C	-20 to +70 °C	-20 to +70 °C
Storage temp.	-40 to +70 °C	-40 to +85 °C	-40 to +85 °C
Battery type	Lithium battery	Lithium battery	Lithium battery
Battery life	>2.5 years*	>2.5 years*	>5 years*
Dimensions	82 x 52 x 30 mm	82 x 52 x 30 mm	103 x 64 x 33 mm
Weight	80 g	85 g	130 g
Protection class			IP54
Warranty	2 years	2 years	2 years
Other features			
Part no.	0563 1757	0563 1758	0563 1775

* at a measurement rate of 15 mins. (-10 to +50 °C)

Compact data logger testo 175



esto

- Memory up to 3,700 measurement values
- Measurement rate 10 sec to 24 h freely selectable
- Battery life more than 2.5 years*

Pro

data logger testo 177



- Memory up to 48,000 measurement values
- Measurement rate 2 sec to 24 h freely selectable
- Battery life more than 5 years*

Pro-

sing

data logger testostor 171



• Large selection of probes

· Robust metal hou-

- Memory up to 55,000 readings
- Measurement rate freely selectable 2 s to 24 h



On-site calibration and adjustment of humidity probes/calibration certificates

Two-point calibration and adjustment with reusable testo saline solution pots

The humidity probes of the data loggers testo 177 H1 and testostor 171 and of the hand instruments testo 650, testo 400 and testo 454 can be checked, and if necessary adjusted, on site with the help of the testo saline solution pots.

6510

In the outer chamber of these "adjustment pots" is a saturated saline solution. The air in the inner chamber, into which the sensor is immersed, forms an equilibrium humidity after an adjustment period. In the standard solutions, this is 11.3 % und 75.3 % relative humidity. The humidity probes can be checked, and if necessary adjusted at these points. The testo saline solution pots have a specified accuracy of

 \pm 2 %RH in a temperature range between +20 °C and +30 °C. The accuracy can be improves to \pm 1.0 %RH with a DKD calibration certificate.

The testo saline solution pots can be reused many times, thus minimizing costs.



Checking humidity probes on site with testo saline solution pots



Set: for checking and adjusting humidity 11.3 %RH and 75.3 %RH, incl. adapter for humidity probes

Set: testo saline solution pots, 11.3 %rRH / 75.3 %RH

testo saline pots for control and humidity adjustment of humidity probes, 11.3 %RH and 75.3 %RH with adapter for humidity probe

Part no. 0554 0660

Calibration certificates/saturated saline solutions

Calibration object	DKD/ ISO	Calibration points/range		Part no.		
Saturated saline soluti- ons	DKD	Standard Standard	11.3 %RH 75.3 %RH	0520 0213 0520 0283		
	ISO	Standard Standard	11.3 %RH 75.3 %RH	0520 0013 0520 0083		

Huminator, accurate humidity generator for climate calibrations

Huminator

The Huminator is one of the smallest and therefore one of the most suitable climate chambers available on the market for mobile as well as stationary applications. Humidity readings in the range from 5 to 95%RH can be determined quickly and efficiently stabilised. The built-in temperature control function generates temperatures in the range from 15° to 40°C. Using an appropriate reference, it is possible to carry out fast and easy humidity calibrations on the measuring instruments, probes and data loggers from Testo and other manufacturers. The desk-top instrument is ideally suitable for testing the performance of all types of material, electronic components and instruments under special climatic conditions. The timed programming function facilitates extensive automation of test runs and calibrations, since up to 3 humidity/temperature readings can be activated one after the other. The time for this can be defined by the user.

r Fort and easy burgids

Fast and easy humidity calibration of measuring instruments, probes and data loggers

Preparation of a logger calibration (testostor 171)

Huminator

Huminator with Testo sensor incl. 15 probe adapters (5 of each: 12mm, 21mm, flexible)

Part no. 0519 0801

• Can be programmed individually

- User-friendly
- LCD display
- High adjustment speed
- RS232 interface

Accessories Ordering data	Part no.
testo 650, reference humidity meas. instr., readings memory in- cluded (up to 500,000 readings), battery, Li cell and calibration protocol	0563 6501
2 channel humidity and temperature meas. instrument with aw valu measurement with option of connecting pressure probes, CO, CO2	e measurement, pressure 2, rpm, mV/mA transmitters
Highly accurate reference humidity/temp. probe	0636 9741
Cable, 1.5 m long, connects probe with plug-in head to meas. instrument PUR coating material	0430 0143
Case for Huminator	0519 0820
Calibration Certificates	Part no.
DKD calibration certificate humidity Electronic hygrometer; calibration points 11.3 %RH, 50 %RH and 75.3 %RH at +25 °C	0520 0266

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RE.

Application, simulation, calibration

Recommended Set: Huminator Kit

Huminator	0519 0801
Case for Huminator	0519 0820
Reference humidity measuring instrument	0563 6501
Highly accurate reference humidity/temperature probe	0636 9741
Connection cable, 1.5 m long	0430 0143
DKD calibration certificate humidity	0520 0266

Technical data	a		
Meas. range	+15 to +40 °C +5 to +95 %RH	Measurement chamber	Diameter: approx. 147 mm Probe imm. depth: app.
Accuracy	0.5 °C (10 to 85 %RH at		170 mm
±1 digit 25 °C) 2 %RH (10 to 85 %RH at 25 °C)		Dimensions	350 x 470 x 200 mm
		Dieplay	LCD graphics display
Stability	0.2 °C (10 to 85 %RH at	Display	Lob graphics display
	25 °C) 1 %RH (10 to 85 %RH at 25 °C)	Conn.	RS232 interface
Power supply	85 to 264 VAC, 47 to 63 Hz	Weight	14.5 kg

Humidity

Calibration certificates humidity

DKD calibration laboratory at Testo

DKD laboratories work under the supervision of the German Calibration Service (DKD). They are therfore "semi-official" bodies which are regularly audited. The calibration results obtained in these laboratories have the highest reliability - after those of the Physikalisch Technische Bundesanstalt PTB (German Federal Physical and Technical Institute) and are admissible in court. The first DKD laboratory for air humidity and dewpoint temperature accredited by the PTB sets standards in industrial calibration technology. Testo calibrates its electronic hygrometers with an accuracy from 0.2 % of relative humidity. Dewpoint mirrors also no longer have to be sent to the PTB. Testo offers DKD calibrations with an absolute accuracy of 0.05 K.

The two-pressure humidity generator used in the humidity laboratory is divided into a high-pressure section (up to 8 bar) and a low-pressure section (atmospheric pressure). The compressed, dry air flows into a humidifier, in which it is saturated to 100% with water. After this, excess water is withdrawn from the air in the saturator at exactly known temperature and pressure values. The water content of the air can now be exactly determined and adjusted. The compressed air with the exactly known quantity of water is then depressurized to atmospheric pressure and fed into a measurement chamber. The relative pressure is therefore determined by the pressure and the temperature in the saturator and the measurement box.



Calibration object	Calibration range	Measurement inaccuracy	Measurement method
Electronic hygrometers for the direct recording of relative humidity, no psy- chrometers	5 to 39.9 %RH 40 to 79.9 %RH 80 to 95 %RH	0.2 %RH (abs. MI) 0.3 %RH (abs. MI) 0.4 %RH (abs. MI)	in the temperature range -18 to +90 °C
Hygrometers with direct recording of dewpoint temperature (dewpoint mirrors)	-20 to +85 °C	0.05 K (abs. Ml)	in the temperature range -25 to +85 °C
Fixed point cells for the presentation of humidity values	according to manufacturer's information	±1.5 %RH	

The DKD calibration is recognized in the following countries:

- Belgium
- Bulgaria
- Denmark
- Germany
- Estonia
- Finland
- France
- Greece
- Great Britain
- Ireland
- Italy
- Latvia
- Lithuania
- Malta

- Netherlands
- Norway
- Austria
- Poland
- Portugal
- Romania
- Sweden Switzerland
- Slowakia
- Slovenia
- Spain
- Czech Republic
- Turkey Hungary

DEUTSCHER KALIBRIERDIENST DKD pratisment für die Mellignfilten Ten etzy for eingenetisk fremenik und af satisf demage af fersjonalsk afternetik, obere th die / at of by the erungsstelle des DKD bei der KALISCH-TECHNISCHEN BUNDESANSTALT (PTB) 100

Humidity calibration certificates

testo

Calibration certificates humidity

Electronic hygrometers

With a hygrometer, relative air humidty is measured. This value describes the quantity of water contained in the air. This value is referred to as relative, because this quantity is dependent on the temperature. The warmer the air, the more water it can hold. The relative humidity RH is defined as a quotient of water vapour partial pressure pw and saturated vapour pressure pws (over water) at the respective gas temperature t. For the calibration of relative humidity, the TIS Huminator, testo 650 with the highly accurate 1% humidity probe as well as the Thunder 2500 are used, with a reference system consisting of various pressure and temperature sensors.



Calibration object	DKD/ ISO	Calibration poir	nts/range	Part no.		
Electronic hygrometers	DKD	Selective Selective Selective Standard Standard	5 to 95%RH at +25°C 5 to 95%RH at -18 to +70°C 5 to 95%RH at >+70 to +90°C 11.3/75.3%RH at +25°C 11.3 /50.0/ 75.3%RH at +25°C	0520 0216 0520 0216 0520 0216 0520 0206 0520 0266		
	ISO	Selective Selective Standard Standard Standard Standard	5 to 95%RH at +15 to +35°C 5 to 95%RH at -18 to +70°C 5 to 95%RH at >+70 to +90°C 11.3/75.3%RH at +25°C 75.3%RH at +25°C 11.3%RH at +25°C 11.3/50.0/ 75.3%RH at +25°C	0520 0106 0520 0106 0520 0106 0520 0006 0520 0096 0520 0086 0520 0166		

Data loggers

Calibration object	DKD/ ISO	Calibration point	s/range	Part no.		
Humidity data loggers, hygrometers/probes without display	DKD	Selective Selective Selective Standard Standard	5 to 95%RH at +25°C 5 to 95%RH at -18 to +70°C 5 to 95%RH at >+70 to +90°C 11.3/75.3%RH at +25°C 11.3 /50.0/ 75.3%RH at +25°C	0520 0236 0520 0236 0520 0236 0520 0246 0520 0276		
	ISO	Selective Selective Standard Standard	5 to 95%RH at +25°C 5 to 95%RH at -18 to +70°C 5 to 95%RH at >+70 to +90°C 11.3/75.3%RH at +25°C 11.3 /50.0/ 75.3%RH at +25°C	0520 0066 0520 0066 0520 0066 0520 0076 0520 0176		

esto

The reference testo 400

testo 400

testo

testo 400 contains the measurement parameters flow velocity and volume flow, temperature, CO₂, current, voltage humidity and pressure.

Useful instrument functions testo 400

- Input of cross-sections for volume flow calculation
- Absolute pressure compensation in thermal probes
- · Density calculation for flow velocity measurement, taking temperature, humidity and absolute pressure into account
- Degree of turbulence measurement according to DIN 13779
- · Evaluation of volume flow measurements with calculation of the total measurement inaccuracy according to EN 12599 with VAC module
- System accuracy up to 0.05 °C and up to a resolution of 0.001 °C
- Calculation of all parameters of the Mollier diagram
- relative humidity %RH, dewpoint and pressure dewpoint (td, tpd)
- absolute humidity g/m^{3,} psychrometric wet bulb temperature
- degree of humidity (g/kg), water vapour partial pressure in mbar/hPa
- enthalpy kcal/kg
- aw-value measurement with trend display
- barometric air pressure



LONDON 1

tery recharge

button

Multi-function

48

Part no. 0563 4001

module (determination of volume flow

with error calculation), battery, Li-cell

and calibration protocol Applications for: • Flow velocity, volume flow • Humidity, pressure • Temperature • CO₂, current/voltage

The reference testo 400

The right probe for every application

Flow velocity measurement

- First laboratory for flow velocity accredited by the PTB ensures secure measurement values
- Reference laser-Doppler anemometer ensures calibration accuracy from 0.05 % of reading
- Thermal probes for a high accuracy up to ± (0.03 m/s + 5% of reading) in the measuring range up to 20 m/s
- Density-independent measurement from 500 hPa absolute pressure or to 350 °C ambient temperature with vane probes in the measuring range from 0.4 m/s to 60 m/s

Temperature measurement

- DKD laboratory for temperature accredited by the PTB guarantees secure measurement values
- First DKD laboratory for surface temperature accredited by the PTB, developed together with the PTB and the University of Ilmenau
- Cross-band probe for fast surface measurements
- Customized temperature probes for your application
- System accuracy up to 0.05 °C with precision probe 0614 0240

Humidity measurement

- The first DKD laboratory for air humidity and dewpoint temperature accredited by the PTB guarantees secure measurement values
- Worldwide patented (capacitive) Testo humidity sensor
- Inter-labortory tests in national and international institutes confirms a sensor accuracy of ±1 %RH
- 2 years guaranteed long-term stability of the Testo humidity sensor under normal conditions
- Easy calibration or adjustment of

· Straight Pitot tubes with considerably improved accuracy compared to Prandtl Pitot tubes through a Pitot tube facto of 0.67

Comfort level measurement

strument

CO and CO₂ measurement

Pressure measurement

sure measurement

(0.3 Pa + 0.5 % of reading)

• high accuracy for determining the degree of turbulence of \pm (0.03 m/s +4% of reading)

 $\square \oplus$ Vane probes 60/100 mm for integrating measurements at outlets Thermal anemometer probe, Ø 10 mm, w. telescopic handle, measures air flow in lab fume cupboards to DIN EN 14175 Robust hot bulb probe for direction-independent flow measurement Comfort probe for measurements of degree of turbulence according to EN 13779 Straight and Prandtl Pitot tubes for measuring the flow velocity in dirty air and temperatures up to +600 °C Highly accurate immersion/penetration probe with a system accuracy of 0.05 $^\circ\mathrm{C}$ in the measuring range from 0 to 100 °C and a resolution of up to 0.001 °C Current-voltage measurement Fast reaction surface probe for measuring surface temperature Additional connection of external measurement transmitters such Precision air probe for measuring the air temperature as particle counters and pressure transmitters, and scaling in the in---[000] Current/voltage cable (± V, ± 10 V, 20 mA) for example for checking stationary measurement transmitters • Long-term stable 2 beam method for measuring the reference and CO2 probe for determining indoor air quality and monitoring the workplace the measurement channel for CO₂ the humidity probe (on site) with Highly accurate reference humidity/temperature probe for highest accuracy requidefined saline solutions (11.3 rements 1 %RH %RH, 33 %RH and 75.3 %RH) aw-value set: pressure-tight precision humidity probe for determining awvalue · Very high accuracy in the lower Thin humidity probe incl. 4 attachable protection caps for ambient air measurements, measuring range (100 Pa) of ± measurements in exhaust air ducts and equilibrium moisture measurements • Temperature-compensated pres-Flexible humidty probe with mini-module for measurements e.g. at material test benches // (Precision differential pressure probe 0 to 100 Pa Absolute pressure probe 0 to 2000 Pa

12/16/25 mm - vane probes for measurement in ducts with temperature measurement



The pro set for cleanroom technology/ordering suggestion testo 400



Example of layout of a clean room



testo 400 display during the calibration of a stationary transmitter:

Left display half: Reference humidity probe

Right display half: 4-20 output measurement in a transmitter using current/voltage cable (scaling 0-100%RH)

The Pro Set for clean room technology

testo 400, multi-functional measuring instrument, incl. measurement 0563 4001 value store up to 500,000 readings, VAC-module (determination of volume flow with error calculation), battery, Li-cell and calibration protocol

Precision pressure probe, 100 Pa (differential pressure)	0638 1347
Precision air probe	0628 0017
Highly accurate reference humidity/temp. probe	0636 9741
Connection cable, length 1.5 m, for probes with plug-in heads	0430 0143
Connection cable, length 1.5 m, for probes with plug-in heads	0430 0143
Thermal anemometer probe, Ø 10 mm, w. telescopic handle, measures air flow in lab fume cupboards to DIN EN 14175	0635 1047
Bendable vane probe (90° bend radius) \varnothing 100 mm, attachable to handle or telescope	0635 9340
Pro telescope for plug-in vane probes, length max. 1 m	0430 0941
Current/voltage cable (±1 V, ±10 V, 20 mA)	0554 0007
System case (aluminium) for measuring instrument, probes and accessories	0516 0410
ComSoft 3 - Professional with data management	0554 0830
RS232 cable	0409 0178

We recommend:

DKD calibration certificates for temperature, humidity, velocity, pressure (See page 45, 67, 75)

Defined process ambient conditions must be assured for the qualification and validation of the high quality standards of production units in clean rooms. actly the fluctuations in air moisture

with an accuracy of up to $\pm 1\%$ RH.

testo 400 sets new standards in

terms of accuracy and long-term

stability. The worldwide inter-laboratory test with the patented humidity

sensor in leading, international insti-

tutes confirm the stated values.

Measurement of ideal air supply

testo 400, with its thermal, vane

and pitot tube measurements, has

all the technology available to mea-

sure air flow. A calibration accuracy

from 0.5% of the reading is assured thanks to the first PTB accredited

The probe 0635 1047 for testing la-

boratory exhaust fans and for mea-

suring laminar flow is new. Owing to

its optimum flow impact characteri-

twist angle (20°) and an accuracy of

 \pm (0.02 m/s +5 % of reading), the

measurement of laminar flow.

Stationary transmitters

parameters.

probe is optimally designed for the

The check is carried out using the

current/voltage cable (0 to 20 mA,

0 to 1 V, 0 to 10 V) and there is a

possibility of integrating additional

stics with a direction-independent measurement within a possible

DKD laboratory for flow.

Measuring laminar flow

Air exchange and the resulting air flow are linked directly to air temperature and air moisture. Specified air flows produce defined positive pressures which prevent the ingress of impurities from outside.

Testo's measurement technology has proven to be ideal for testing process ambient conditions.

With the testo 400 reference measuring instrument, you have the possibility of connecting 2 probes simultaneously. The measuring instrument can then be used to monitor measurements on-site or for long-term measurements thanks to the integrated readings memory with capacity for 500,000 data.

Typical measurement tasks: differential pressure monitoring using the 100 Pa probe

The testo 100 Pa probe with an accuracy of $\pm(0.3 \text{ Pa} + 0.5 \%)$ of the reading) is the ideal solution.

Position dependencies are completely eliminated thanks to the revolutionary double membrane technology and fluctuations in temperature no longer have any influence on the measured result thanks to temperature compensation.

Accurate air temp. measurement

testo 400 achieves a system accuracy of 0.1°C and a resolution of 0.01°C when used together with the precision air probe (Pt100 Class B 1/10).

Accurate air moisture measurement

The task at hand is to monitor ex-



Checking the flow speed using the hot wire probe Part no.: 0635 1041

testo

On-site test procedure according to DIN EN 14175/ordering suggestion testo 400

The thermal anenmometer probe is used for measurements and monitoring of fume cupboards. The probe corresponds to the new DIN EN 14175.

The advantages of the new thermal anemometer probe are the optimum flow impact behaviour and the easy handling. testo 400 provides necessary calculation such as mean value and standard deviation.

The objective of the on-site test procedure is to test the correct setup of the fume cupboard, and to establish the performance of the fume cupboard under the prevailing conditions (indoor air flow/outgoing air system). For this purpose, the inflow as well as the outflow is measured.

For commissioning test (Part 4), the requirements of the measuring instrument are identical to those in the design check (Part 3).

- Direction-dependent, however measurement must be possible within ± 20 °
- Time constant (t63) 0.5 s
- Accuracy ± (0.02 m/s + 5% of reading) in measuring range 0.2 to 1 m/s
- Anemometers must be calibrated

For the repetition test (Part 3), the anemometer must show an accuracy of 10% of reading for the inflow velocity test, and \pm (0.02 m/s +5% of reading) for the outflow velocity test in the range from 0.3 m/s. The new laboratory fume cupboard probe here fulfils the requirements from Parts 3 and 4.

General indoor air conditions during air tests, including temperature, air pressure, air humidity and pressure difference between indoor air input and indoor air output, must continue to be measured. According to DIN EN 14175-3: 2003, the anemometer must be able to measure indoor air velocity independently of direction.

With additional probes testo 400 offers the possibility of measuring the general indoor conditions.

testo 400

- Multi-function instrument testo 400 for measuring temperature, humidity, ΔP , flow velocity, absolute pressure
- PC interface and ComSoft 3

Advantages of the laboratory exhaust probe

- optimum flow impact characteristics
- robust probe with protective cap
 corresponds to norm DIN EN
- 14175



On-site testing of a laboratory fume cupboard with testo 400



Optimum flow impact behaviour of the laboratory fume cupboard probe (0635 1047)

Hot wire probe (0635 1041) optimized for duct measurement with direction recognition

we recommend:	
ComSoft 3 - Professional with data management	0554 0830
RS232 cable	0409 0178
Attachable printer (securely attached) including 1 roll of thermal paper and batteries	0554 0570
SoftCase (protects instrument from impact) with carrier strap, magnetic holder and probe holder	0516 0401
SoftCase for attachable printer (protects printer from dirt/im- pact)	0516 0411
System case (aluminium) for measuring instrument, probes and accessories	0516 0410
DKD calibration certificate/velocity, hot wire anemometer; calibration points 0.1; 0.2; 0.5; 0.8; 1 m/s	0520 0224
ISO calibration certificate velocity, hot wire, vane anemometer; calibration points 0.5; 0.8; 1; 1.5 m/s	0520 0024

Ordering suggestion

testo 400, multi-functional measuring instrument, incl. measurement value store up to 500,000 readings, VAC-module (determination of vo- lume flow with error calculation), battery, Li-cell and calibration protocol	0563 4001
Rech. batt. set for instr. (2 rech. 2.4V/1100mAh)	0554 0196
Thermal anemometer probe, \emptyset 10 mm, w. telescopic handle, measures air flow in lab fume cupboards to DIN EN 14175	0635 1047
Standard ambient air probe up to +70°C	0636 9740
Pressure probe, 2000 hPa, measures absolute pressure, in robust metal housing with impact protection, incl. quick-closing coupling (M8 \times 0.5), magnet for fast attachment	0638 1847
Precision pressure probe, 100 Pa, measures differential pres- sure, in robust metal housing with impact protection, incl. mag- net for fast attachment	0638 1347
Cable, 1.5 m long, connects probe with plug-in head to meas. instrument	0430 0143
Comfort level probe for measuring degree of turbulence, with telescopic handle and stand. Fulfills EN 13779 requirements	0628 0009

Multi-function

esto

Accessories testo 400

testo



+

3 -	Professional	(see page 79)
	ComSoft 3 - Professional ment	with data manage-
	incl. database, analysis an data analysis, trend curve	nd graphics function,

79)

Part no. 0554 0830

Ethernet adapter



Ethernet adapter, RS232 - Ethernet incl. software driver, mains unit

facilitates data communication in network

Part no. 0554 1711

Attachable printer



Attachable printer (securely attached) including 1 roll of thermal paper and batteries

quickly prints readings on location

Part no. 0554 0570

Fast report printer



infrared-controlled therma	l printer, adjustable
contrast, graphic-capable	
Tooto printor	Dort no. 0554 0540
lesto printer	Fait 110, 0554 0549
testo 575 fast printer	Part no. 0554 1775

Part no. 0554 0549 Part no. 0554 1775

SoftCase



SoftCase (protects instrument from impact) with carrier strap, magnetic holder and probe holder Part no. 0516 0401

SoftCase for attachable printer (protects printer from dirt/impact) Part no. 0516 0411

Part no. 0516 0401

Part no. 0516 0411

VAC module (now included with testo 400)	Part no.
Update of mass store to 500,000 readings, retroactive update of me- mory capacity (by service)	
Update VAC module, determination of volume flow in ducts incl. error calculation in instrument	
Accessories for measuring instrument	Part no.
Mains unit 230 V/ 8 V/ 1 A, for instrument (European plug), for mains operation and battery recharging	0554 1084
Rech. batt. set for instr. (2 rech. 2.4V/1100mAh) selected for quick recharging in instrument	0554 0196
Lithium battery, button cell, type CR 2032	0515 0028
Printer and Accessories	Part no.
Attachable printer (securely attached) including 1 roll of thermal paper and batteries	0554 0570
Testo fast printer with wireless infrared interface, 1 roll thermal paper and 4 AA batteries $% \left(1,1,2,2,2,3,2,3,3,3,3,3,3,3,3,3,3,3,3,3,$	0554 0549
Fast testo 575 printer, incl. 1 roll of thermal paper and batteries, infrared thermal line printer with graphics function	0554 1775
External fast charger for 1-4 AA rech. batteries, incl. 4 Ni-MH rech. bat- teries with individual cell charging and charge control display, incl. im- pulse 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) measurement data documentation legible for up to 10 years	0554 0568
Label thermal paper (Testo patent) for testo 575 printer (6 rolls), can be applied directly	0554 0561
SoftCase for instrument and printer	Part no.
SoftCase (protects instrument from impact) with carrier strap, magnetic holder and probe holder	0516 0401
SoftCase for attachable printer (protects printer from dirt/impact) protects from impact and falls	0516 0411
Software (see page 79) and accessories	Part no.
ComSoft 3 - Professional with data management incl. database, analysis and graphics function, data analysis, trend curve (without interface)	0554 0830
Update VAC module, PC software (for software ComSoft 3), printout of normed measurement protocols (now included in delivery of testo 400)	
RS232 cable connects instrument to PC (1.8 m) for data transfer	0409 0178
Ethernet adapter, RS232 - Ethernet incl. software driver, mains unit facilitates data communication in network	0554 1711
System case	Part no.
System case (plastic) for measuring instrument, probes and accessories, probes in lid make it easy to find parts in case (540 x 440 x 130 mm)	0516 0400
System case (aluminium) for measuring instrument, probes and acces- sories, probes in lid make it easy to find parts in case	0516 0410

Calibration certificates see page 28/46/68/76

Suitable probes for testo 400

Vane probes	Illustration		Probe type	Meas. range	Accuracy	Part no.
Vane probe, Ø 12 mm, can be attached to handle 0430 3545 or telescopic handle 0430 0941	180 mm	Ø 12 mm	Vane	+0.6 to +20 m/s Oper. temp. -30 to +140 °C	±(0.2 m/s ±1% of mv) (+0.6 to +20 m/s)	0635 9443
Vane/temperature probe, Ø 16 mm, attacha- ble to 0430 3545 handle or 0430 0941 teles- copic handle	180 mm	Ø 16 mm	Vane) Type K (NiCr-Ni)	+0.4 to +60 m/s -30 to +140 °C	±(0.2 m/s +1% of mv) (+0.4 to +40 m/s) ±(0.2 m/s +2% of mv) (+40.1 to +50 m/s)	0635 9540
Vane/temperature probe, Ø 25 mm, can be at- tached to 0430 3545 handle or 0430 0941 te- lescopic handle	180 mm	Ø 25 mm	Vane Type K (NiCr-Ni)	+0.4 to +40 m/s -30 to +140 °C	±(0.2 m/s ±1% of mv) (+0.4 to +40 m/s)	0635 9640
Bendable vane probe (can be bent by 90°), Ø 60 mm, attachable to handle 0430 3545 or te- lescopic handle 0430 0941, for meas. on venti- lation outlets	0 60 mm		Vane	+0.25 to +20 m/s Oper. temp. 0 to +60 °C	±(0.1 m/s ±1.5% of mv) (+0.25 to +20 m/s)	0635 9440
Bendable vane probe (can be bent by 90°), Ø 100 mm, attachable to handle 0430 3545 or telescopic handle 0430 0941, for measure- ments on ventilation outlets	Ø 100 mm		Vane	+0.2 to +15 m/s Oper. temp. 0 to +60 °C	±(0.1 m/s ±1.5% of mv) (+0.1 to +15 m/s)	0635 9340
Accessories: Vane probes	Part no.					
Professional telescopic handle for plug-in vane pro	obes, max. 1 m long 0430 0941					
Extension for telescopic handle, 2 m long please also order the 0409 0063 extension cable	0430 0942					
Handle for plug-in vane probes	0430 3545	-				
Thermal probes	Illustration	_	Probo tupo	Mooo rongo	Acquiració	Part no
Robust bot bulb probe @ 3 mm with bandle	Indstration			Nieas. range	Accuracy	Part 10.
and telescopic handle for measurements in the lower velocity range	850 mm	Ø 3 mm	NTC	-20 to +70 °C	±(0.03 m/s ±5% of mv) (0 to +10 m/s)	0635 1049
Quick-action hot wire probe, Ø 10 mm, with telescopic handle, for measurements in the lower velocity range with direction recognition	760 mm	Ø 10 mm	Hot wire NTC	0 to +20 m/s -20 to +70 °C	±(0.03 m/s ±4% of mv) (0 to +20 m/s)	0635 1041
Thermal anemometer probe, Ø 10 mm, w. te- lescopic handle, measures air flow in lab fume cupboards to DIN EN 14175		Ø 10 mm	Hot wire NTC	0 to +5 m/s 0 to +50 °C	±(0.02 m/s ±5% of mv) (0 to +5 m/s)	0635 1047
Differential pressure probe for Pitot tube	e measurement Illustrat	tion Meas. r	ange Accura	cy Conn	1.	Part no.
Precision pressure probe, 100 Pa, in robust me tection, incl. magnet for fast attachment, to me flow speeds (in combination with Pitot tube)	etal housing with impact pro- asure differential pressure and	0 to +10	00 Pa ±(0.3 Pa ± mv)	0.5% of Plug-ir cable (0145 r	head. connection 0430 0143 or 0430 equired	0638 1347
Pressure probe, 10 hPa, in robust metal housin magnet for fast attachment, to measure differer (in combination with Pitot tube)	ig with impact protection incl. Initial pressure and flow speeds	0 to +10	0 hPa ±0.03 hPa	a Plug-ir cable (0145 r	head. connection 0430 0143 or 0430 equired	0638 1447
Pressure probe, 100 hPa, in robust metal hous incl. magnet for fast attachment, to measure di speeds (in combination with Pitot tube)	ing with impact protection, fferential pressure and flow	0 to +10	00 hPa ±0.5% of +100 hPa ±0.1 hPa hPa)	mv (+20 to Plug-in) cable ((0 to +20 0145 n	head. connection 0430 0143 or 0430 equired	0638 1547
Accessories: Pressure probes	Part no.	Accessor	ries: Pressure pro	obes		Part no.
Connection hose, silicone, 5m long, max. load 70	0 hPa (mbar) 0554 0440	Cable, 1.5 ment, PUR	m long, connects pro coating material	bbe with plug-in he	ad to meas. instru-	0430 0143
Prandtl's Pitot tubes	Illustration				Accuracy	Part no.
Pitot tube, 300 mm long, stainless steel, mea-					Oper. temp.	
sures flow speed, Length 300 mm. Ø 4 mm		l c	1 mm/ (1 7 mm		0 to +600 °C	0635 2245
Length 350 mm, Ø 7 mm) °.	4 mm/ @ 7 mm			0635 2145
Length 500 mm, Ø 7 mm	300 mm/ 350 mm / 500 mm / 1000 mm					0635 2045
Length 1000 mm, Ø 7 mm						0635 2345
Straight Pitot tubes	Illustration		Probe type	Mea <u>s. range</u>		Part no.
Pitot tube, stainless steel, 360 mm long, mea- sures velocity with temperature, for pressure probes 0638 1345/1445/1545	360 mm	Ø 8 mm	Type K (NiCr-Ni)	-40 to +600 °C		0635 2040
Pitot tube, stainless steel, 500 mm long, mea- sures velocity with temperature, for pressure probes 0638 1345/1445/1545	500 mm	Ø 8 mm	Type K (NiCr-Ni)	-40 to +600 °C		0635 2140
Pitot tube, stainless steel, 1000 mm long, measures velocity with temperature, for pres- sure probes 0638 1345/1445/1545	1000 mm	Ø 8 mm	Type K (NiCr-Ni)	-40 to +600 °C		0635 2240

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testo

Suitable probes and protective caps for testo 400

Comfort level measurement	Illustration			Probe type	e Meas	range	Accuracy		Part no.
3-function probe for simultaneous measure- ment of temperature, humidity and velocity. With plug-in head, 0430 0143 connection cable required) mm	2 21 mm	Hot bulb Testo humid. sor, cap. NTC	0 to +1 -20 to -	0 m/s 00 %RH ⊦70 °C	±(0.03 m/s ±5% of m 10 m/s) ±2 %RH (+2 to +98 % ±0.4 °C (0 to +50 °C) ±0.5 °C (remaining ra	iv)(0 to %RH) inge)	0635 1540
Comfort level probe for measuring degree of turbulence, with telescopic handle and stand. Fulfills EN 13779 requirements	- 890 mm	Ø 90 mm		Hot wire NTC	0 to +5 0 to +5	m/s 0 °C	±(0.03 m/s ±4% d mv) (0 to +5 m/s) ±0.3 °C (0 to +50	of °C)	0628 0009
Wet Bulb Globe temperature probe to assess workplaces subjected to heat, in accordance with ISO 7243 or DIN 33403, incl. WBGT cas	Ø 150 mm				0 to +1	20 °C	In accordance wit ISO 7243 or DIN 33403	h	0635 8888 ID No. 0699 4239/1
Accessories: 3-Function probe Cable, 1.5 m long, connects probe with plug- ment, PUR coating material	Part n in head to meas. instru- 0430 0	1 0. 143							
Humidity probe with accuracy ±1 %RH	Illustration		Meas. ra	ange Acc	uracy		t	99	Part no.
Highly accurate reference humidity/temp. probe		Ø 21 m	0 to +100 m -20 to +70	%RH ±1 % °C %RH ±2 % range	RH (+10 to +90)* RH (remaining 2)	±0.2 °C (+ ±0.4 °C (r range)	-10 to +40 °C) 1 emaining	2s (0636 9741 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
							* in the temperatu	re rang	ge from +15°C to +30°C
Humidity probes	Illustration		Meas. ra	ange Acc	uracy		ť	99	Part no.
Standard ambient air probe up to +70°C		Ø 12 mm	0 to +100 -20 to +70	%RH ±2 % °C +98	5RH (+2 to ± %RH) ±	0.4 °C (-1) 0.5 °C (rer	0 to +50 °C) 1 maining range)	2s (0636 9740 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
Duct humidity/temperature probe, can be cor nected to telescopic handle 0430 9715	- 0	180 mm Ø 12 mm	0 to +100 -20 to +70	%RH ±2 % °C +98	5RH (+2 to ± %RH) ±	0.4 °C (-1 0.5 °C (rer	0 to +50 °C) 1 maining range)	2s (0636 9715 Conn.: Fixed cable
Thin humidity probe incl. 4 attachable pro- tection caps for ambient air measurements, measurements in exhaust air ducts and equili brium moisture measurements		250 mm Ø 4 mm	0 to +100 -20 to +70	%RH ±2 % °C +98	%RH (+2 to ± %RH) ± ±	0.4 °C (-10 0.5 °C (-20 0.5 °C (+5	0 to +50 °C) 1 0 to -10.1 °C) 0.1 to +70 °C)	5s (D636 2130 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
Humidity/temperature probe		Ø 21 m	0 +100 % -20 to +70	%RH ±2 % °C +98	5RH (+2 ± %RH) ± ±	0.4 °C (+0 0.5 °C (-2 0.5 °C (+5	1.1 to +50 °C) 1 0 to 0 °C) 0.1 to +70 °C)	2s (0636 9742 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
Caps for humidity probes Ø 12m and 2	1mm Pa	art no.	Covering	caps for hu	midity prob	es Ø 5,	12 and 21 mm		Part no.
a Metal protection cage, Ø 12 mm for humidity V4A. Quick adjustment time, robust and temp suring velocities of less than 10 m/s.	probes, material: stainless steel erature-proof. Used when mea-	0554 0755	d Sintered densatio Compres ments), h	PTFE filter, Ø 1 n, water repelle ssed air measu high flow veloci	12 mm materia ent, high resist rements, high ties.	I PTFE. F ance to a humidity	avourable behavio ggressive media. A range (long-term n	ur in c Applica neasu	con- 0554 0756 ations: re-
b Cap with wire mesh filter, Ø 12 mm		0554 0757	e Stainless bust, sui tection o	steel sintered table for peneti f sensor. Applic	cap, Ø 21 mm ration, clean w cations: high n	i, made c ith comp nechanica	of stainless steel V2 ressed air, mechar al loads, high flow	2A. Hiç iical pi /elocit	ghly ro- 0554 0640 ro- ies.
PTFE sintered filter, Ø 21 mm, PTFE. Not affe c ellent, resistant to corrosive substances. Ap surements, high humidity range (continuous n velocities	ted by condensation, water-re- lications: compressed air mea- leasurements), high flow	0554 0666	f ged, suit sensor p	s steel sintered able for penetr rotection. Appl	cap, Ø 12 mm ation, can be o ications: High	i, materia cleaned w mechanic	I: stainless steel V2 vith compressed ai cal loads, high flow	2A. Ve r, mec veloc	ry rug- 0554 0647 hanical ities.
			g PTFE cal	p, Ø 5 mm, att high humidity le	achable, PTFE evel measurem	material, ents, high	(5 off). Application flow velocities	ns: du	_{st pro-} 0554 1031

Multi-function

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Metal protection cage, Ø 12 mm, stainless steel V4A, for 0636 9740, 0636 9715



Sintered stainless steel cap, Ø 21 mm, stainless steel V2A, for humidity probes Ø 21 mm

b

Cap with wire mesh filter, Ø 12 mm, for humidity probes Ø 12 mm



f

Stainless steel sintered cap, Ø 12 mm, stainless steel V2A for 0636 9740, 0636 9715

С

Sintered PTFE filter, Ø 21 mm, PTFE, for humidity probes Ø 21 mm



PTFE cap, Ø 5 mm, PTFE for 0636 2130



Sintered PTFE filter, Ø 12 mm, PTFE for 0636 9740, 0636 9715

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Suitable probes for testo 400

Pressure probes	Illustration	Meas. range	Accuracy			Part no.
Precision pressure probe, 100 Pa, in robust metal housing with impact protection, incl. magnet for fast attachment, to measure diffe- rential pressure and flow speeds (in combina- tion with Pitot tube)	D	0 to +100 Pa	±(0.3 Pa ±0.5% of m	V)		0638 1347 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
Pressure probe, 2000 hPa, measures abso- lute pressure, in robust metal housing with impact protection, incl. quick-closing coup- ling (M8 x 0.5), magnet for fast attachment	D	0 to +2000 hPa	±5 hPa (0 to +2000) hPa)		0638 1847 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
emperature probes	Illustration		Meas. range	Accuracy	t99	Part no.
Quick-action surface probe with sprung thermocouple strip, measuring range short- term to +500°C	150 mm Conn.: Plug-in head. connection cable 0430 014:	Ø 10 mm 3 or 0430 0145 required	-200 to +300 °C	Class 2	3 s	0604 0194
Fast response immersion/penetration probe	150 mm Ø 3 mm Conn.: Plug-in head. connection cable 0430 014:	3 or 0430 0145 required	-200 to +400 °C	Class 1	3 s	0604 0293
Standard air probe	Conn.: Plug-in head, connection cable 0430 014	000 =] -200 +600 °C	Class A	75 s	0604 9773
lore probes		I NODEO GEETA	leas, range	Accuracy		Part no.
Ambient CO probe, for detecting CO in buil- dings and rooms		0	to +500 ppm CO	±5% of mv (+100. +500 ppm CO) ±5 ppm CO (0 to ppm CO)	.1 to +100	0632 3331 Conn.: Fixed cable, 1.5 m
CO2 probe measures indoor air quality and monitors the workplace. With plug-in head, connection cable 0430 0143 or 0430 0145 required		0 0	+1 Vol. % CO ₂ +10000 ppm CO ₂	±(50 ppm CO ₂ ±2 mv)(0 to +5000 pp ±(100 ppm CO ₂ ± mv)(+5001 to +100 CO ₂)	% of m CO ₂) 3% of 000 ppm	0632 1240 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
Current/voltage cable (±1 V, ±10 V, 20 mA)		0 0 0	to +1000 mV to +10 V to +20 mA	±1 mV (0 to +100 ±0.01 V (0 to +10 ±0.04 mA (0 to +2	0 mV) V) 20 mA)	0554 0007
4 to 20 mA interface for connection and inter- mittent power supply to transmitters (scaling via hand-held instrument), in robust metal housing with impact protection, incl. magnet for fast attachment		0) C Vi A m	4 to 20 mA hannels: 1 channel, trar a terminal board uxiliary energy output: 1 ax. connection load: 30	±0.04 mA nsmitter connection 8V DC ± 20% 0 mA		0554 0528 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
Accessories: Humidity probes	Part no.	Accessories: Pr	essure probes			Part no.
able, 1.5 m long, connects probe with plug-in head to i strument, PUR coating material	neas. 0430 0143	Cable, 1.5 m long, o instrument, PUR co	connects probe with p ating material	olug-in head to me	eas.	0430 0143
able, 5 m long, connects probe with plug-in head to me strument, PUR coating material	easuring 0430 0145	Cable, 5 m long, co instrument, PUR co	nnects probe with plu ating material	ug-in head to meas	suring	0430 0145
ktension cable, 5 m long, between plug-in head cable a rument, PUR coating material	^{ind in-} 0409 0063	Connection hose, s	licone, 5m long, max	. load 700 hPa (ml	bar)	0554 0440
elescopic handle, max. 1 m, for probe with plug-in head 5 m long, PUR coating material sto seline pots for control and humidity adjustment of photo 11 4 20 PU and 25 2 00 PU with operator for humi	I, cable: 0430 0144	Connection hose se Pressure-tight up to	et, 2 x 1 m, coiled, inc 20 bar	I. 1/8" screw conr	ection,	0554 0441



Technical data for testo 400

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Technical data							
Probe type	Vane	Thermal	Testo humid. sensor, cap.	aw value	Pressure		
Meas. range	0 to +60 m/s	0 to +20 m/s	0 to+100 %RH	0 to +1 aW	0 to +2000 hPa		
Accuracy ±1 digit	See probe data for sys- tem accuracy	See Probes data for system accuracy	See probe data	See probe data	Probe 0638 1347 Probe 0638 1847 ±0.1% of fsv		
Resolution	0.01 m/s (for Ø 60/100 mm), 0.1 m/s (for rem. probes)	0.01 m/s (0 to +20 m/s)	0.1 %RH (0 to +100 %RH)		0.001 hPa (Probe 0638 1347) 0.1 hPa (Probe 0638 1847)		
Probe type	NTC	Pt100	Type K (NiCr-Ni)	Type S (Pt10Rh-Pt)	Type J (Fe-CuNi)		
Measurement range temp.	-40 to +150 °C	-200 to +800 °C	-200 to +1370 °C	0 to +1760 °C	-200 to +1000 °C		
Accuracy ±1 digit	±0.2 °C (-10 to +50 °C) ±0.4 °C (-40 to -10.1 °C) ±0.4 °C (+50.1 to +150 °C)	±0.1 °C (-49.9 to +99.9 °C) ±(0.1 °C + 0.1% of mv) (re- maining range)	±(0.3 °C + 0.1% of mv)	±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 +1000 °C)		
Resolution	0.1 °C (-40 to +150 °C)	0.01 °C (-99.9 to +300 °C) 0.1 °C (-200 to -100 °C) 0.1 °C (+300.1 to +800 °C)	0.1 °C (-200 to +1370 °C)	1 °C (0 to +1760 °C)	0.1 °C (-200 to +1000 °C)		
Probe type	CO2 probe	CO probe	Current measurement	Voltage measurement	t		
Meas. range	^{0 to +1 Vol. % CO² 0 to +10000 ppm CO₂}	0 to +500 ppm CO	0 to +20 mA (0554 0007) 0/4 to+20 mA (0554 0528)	0 to +10 V (0554 0007)			
Accuracy ±1 digit	See probe data	±5% of mv (0 to +500 ppm CO)	±0.04 mA (0 (0554 0007) to +20 mA) See probe (0554 0007) data) ±0.01 V (0 to +10 V)			
Resolution			0.01 mA (0 to +20 mA) 0.01 V (0 to +10 V)				
Oper. temp.	0 to +50 °C		Memory space: 1 MB corres	ponding to approx 500 (200 readings		
Storage temp.	-25 to +60 °C		Other features: automatic pro Power: Battery/rech. battery,	bbe recognition alternatively 8 V mains u	init		
Battery type	1,5 V AA		Battery life in continuous operation with 2 T/C probes				
Battery life	18 h						
Weight	500 g						
PC	RS232 interface						
Warranty	3 years						

testo 454, from measuring instrument to measuring system

testo 454

The modular system - testo 454

Now you can measure many different parameters in one or many locations simultaneously using one portable system.

testo 454 is a compact, portable measuring instrument and can be upgraded to a modular measuring system with more than 200 measurement channels.

The control unit

The control unit is a robust hand-held instrument for measuring temperature, humidity, pressure, velocity, CO_2 , rpm, current and voltage.

Efficient measurement

Our easily read graphics display allows simultaneous tracking of 6 parameters, simple menu driven operation and 4 user defined function buttons. Touch pen operation is available as an option.

Variable number of probe sockets

4 additional, user defined probe sockets can be added to the control unit with each attachable logger. Giving you the proper number of probes for your application.

Simultaneous measurement at several locations with the control unit

Simultaneous measurement of data at several locations is carried out by "slave" loggers. Measured data is transmitted via the Testo data bus. The control unit is able to control the entire measuring system.

Simultaneous measurement at several locations with the Testo data bus controller

Alternatively the Testo data bus controller for the laptop/PC can be used instead of the control unit for reading out and control of the decentralised loggers. The Testo data bus controller is connected via USB interface of the laptop/PC. Online measurement allows the readings from multiple loggers to be displayed easily and cleary on the screen. System-relevant data and readings are stored in the laptop/PC and in the loggers.

In connection with the Testo data bus controller and the ComSoft 3 software, the testo 454 loggers are validatable i. a. w. 21 CFR P11.

Connection option for up to 4 probes of your choice per logger

Comprehensive range of probes for temperature, humidity, pressure, velocity, CO₂, rpm, current and voltage



Analysis, documentation and filing of measurement data on PC



ESC

50 M/XL . testo 454

Large system case (aluminium) for control unit, up to 6 loggers, probes and accessories testo



testo 454, on-site measurement



Measuring on site

Efficient on site spot and control measurements require a mobile instrument with enough measuring channels.

The control unit

The control unit is a portable and robust measuring instrument with a user defined probe socket and an integrated differential pressure probe.

Convenient measuring functions such as timed/multi-point mean calculations and measurement programs simplify the measuring task.

You can save up to 250,000 readings directly in the selected locations and then print them on location on the built-in printer.

The logger

4 additional probe sockets are added with each clip-on logger attached to the control unit. Each logger provides 250,000 additional readings via the memory integrated in the logger. Up to 20 loggers can be connected to the control unit in this way.

Parameters

- A wide range of probes are available for accurate measurement in a variety of applications:
- Temperature with surface, immersion, penetration, air or precision probes
- Humidity with room climate, duct and reference probes
- Velocity and volume flow with vanes, hot wire, hot bulb probes and Pitot tubes
- Indoor Air Quality using CO₂ probe and comfort level probe
- Pressure with differential/absolute/ low/high pressure probes
- Current, voltage

Scheduling

Scheduling allows for efficient on-site measurement. All scheduled locations of a tour are stored using the Com-Soft software in the tour plan and transferred to the measuring instrument. This allows e.g. the channel cross section or nominal value of a location to be conveniently defined right in the office. It goes without saying that the **testo 454** can be used to correct or recreate definitions on site.

Definition of measurement programs

Measuring tasks require a structured process. ComSoft software offers comprehensive options for program starting/closing and measuring cycles. For example, measurement programs can be started at a specific time, manually, value undershooting/ exceeding or by way of an external trigger signal. Simplified user guidance ensures proper operation of the logger.

Online measurement

For online measurement, it is not only possible to display readings in diagrams, tables and histograms; visualisation is also possible based on a plant diagram (e.g. flowchart or plant photo) created by the user.

Analysis of measurement data

For data analysis, there is an extensive range of graphical representations with calculation capabilities such as mathematical smoothing, statistic functions and limit value display.

Documentation

Protocols for the individual applications can be separately compiled. Only document relevant readings.

Archiving

A tree structure and free creation of directories and locations provide easy and clear management of measurement data.

testo 454, simultaneous measurement at different sites



Concept

The **testo 454** is the measuring system for flexible recording of multiple measurement data. Particular advantages:

- Simultaneous measurement at several measuring locations
- Freely assignable probe inputs
- 1 to over 200 measurement channels
- Data transmission with the Testo databus
- Modular design of system components

Parameters

A wide range of probes is available for accurate measurement in the respective applications:

- Temperature with surface, immersion, penetration, air or precision probes
- Humidity with room climate, duct and reference probes
- Velocity and volume flow with vanes, hot wire, hot bulb probes and Pitot tubes
- Indoor Air Quality using CO₂ probe and comfort level probe
- Pressure with differential/absolute/ low/high pressure probes
- Current, voltage

Logger

The data logger measures and saves readings without any connection to the control unit. Up to 4 more probes of your choice can be connected to this logger. Additional probe connection options are made possible by connecting more loggers. The following features give you flexibility when measuring data:

- Variable program start
- Adjustable measuring cycle
- Number of readings
- Program cancel can be defined The measurement program can be started as follows:
- At a certain time or date
- Manually using function buttonsIf certain values are exceeded or un-
- dershotVia an event trigger socket signal

The exceeded alarm values can be evaluated for display or control via a relay.

Control unit

The control unit displays the measurement data and controls the **testo 454** measuring system. The following parameters are programmed in the control unit:

- Locations
- Measurement programs
- Limits
 - Precision adjustment
 - System configuration

Efficient operation of the measuring system is guaranteed by the probedependent menu guide, for example, or the clear display of readings with names. The control unit is connected via the serial interface in the laptop/PC.

Additionally the control unit has all options for mobile use of a hand-held instrument.

Testo databus controller

Alternatively, the Testo databus controller for the laptop/PC can be used in place of the control unit for reading out and control of the decentralised loggers. The Testo databus controller is connected via the USB interface of the PC/laptop.

Online measurement allows the readings from multiple loggers to be displayed easily and clearly on one screen. System-relevant data and readings are stored in the laptop/PC and in the loggers.

Testo databus

Communication between control unit/logger, Testo databus controller/ logger and other boxes takes place via the Testo databus. Using the Testo databus, you have the option of operating loggers at different locations. Distances of up to several hundred metres pose no problem for the Testo databus. In combination with the Testo databus controller and the software ComSoft 3, the testo 454 data loggers can be validated for requirements according to 21 CFR Part 11.

Analog output box

The logger readings are output as a current signal (4-20 mA signal) for display units or output on an analog recorder.

Power box

The power box is used to supply power to the loggers, control unit, analog output box and the Testo databus thus increasing operating life in the field. 59

Ordering suggestions testo 454



Data logging at several sites

The control unit can be connected with several loggers via connection cables for the Testo databus. This provides an overview of the measurement data from several measurement sites.



Data measurement at several sites with a laptop/PC

The loggers are directly, (i.e. without control unit), connected to the databus controller via the USB connection for the laptop/PC. The recording of the measurement data takes place as an online measurement with the laptop/PC, or the loggers store the measurement data

Recommended Set: Data logging at severa	li sites
Control unit displays measurement data and controls the mea- surement system, incl. built-in printer, pressure measurement 40/200 hPa, 1 user defined probe socket, programmable mea- surements and memory space for 250,000 readings, con- nection for Testo data bus, incl. terminal plug	0563 0353
Touch screen with pen (available only with original order)	0440 0559
Testo rechargeable battery pack NiMH for control unit, logger	0515 0097
Connection cable, 2 m, for Testo data bus	0449 0042
Logger, measures and saves (max. 250,000 readings), incl. 4 user defined probe sockets, alarm output/event trigger socket, stand/wall holder	0577 4540
Connection cable, 5 m, for Testo data bus	0449 0043
Logger, measures and saves (max. 250,000 readings), incl. 4 user defined probe sockets, alarm output/event trigger socket, stand/wall holder	0577 4540
Power box, connected to control unit to increase field operating life and supply power to Testo data bus	0554 1045
Power supply for power box (110/230 V; 50/60 Hz, 12 V, 3 A)	0554 1143
ComSoft 3 for data management, incl. RS 232 connection cable	0554 0841
Selection of probes and accessories	

DKD calibration certificates for temperature, humidity, flow velocity, pres-sure (see Calibration Services

independently via a user-defined measurement program.

Recommended Set: Data measurement at s laptop/PC	several sites with a
Databus controller with USB connection incl. software ComSoft 3, cable for Testo databus, USB cable and terminal plug	0554 0589
Logger, measures and saves (max. 250,000 readings), incl. 4 user defined probe sockets, alarm output/event trigger socket, stand/wall holder	0577 4540
Logger, measures and saves (max. 250,000 readings), incl. 4 user defined probe sockets, alarm output/event trigger socket, stand/wall holder	0577 4540
Logger, measures and saves (max. 250,000 readings), incl. 4 user defined probe sockets, alarm output/event trigger socket, stand/wall holder	0577 4540
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
Power box, connected to control unit to increase field operating life and supply power to Testo data bus	0554 1045
Power supply for power box (110/230 V; 50/60 Hz, 12 V, 3 A)	0554 1143

Selection of probes and accessories

Accessories, we recommend:

DKD calibration certificates for temperature, humidity, flow velocity, pres-sure (see Calibration Services

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Calibration of a climate chamber/ordering suggestions testo 454

Calibration of a climate cabinet

The calibration of a climate chamber serves the following purposes:

- Determination of inaccuracy regarding temperature and relative humidity in use under defined conditions
- Determination of deviation of the cabinet display
- Determination of the spatial inhomogeneity within the examined cabinet volume
- Determination of the time stability within the examined cabinet volume

According to DIN EN 6068-3-5:2002, depending on the useable volume of a climate cabinet, a measurement point number of at least 9 measurement sites (useable volume



- Variable program start
- Measurement cycle can be set
- Number of measurement values
- Definable program termination
- Testo databus controller

The readout and control of the data loggers takes place via the Testo databus controller for a PC/laptop. The connection of the databus controller is via the USB interface of the PC/laptop. In online measurement, a convenient and clear presentation of the measurement values from several loggers in one view is possible. The system-relevant data and measurement values are stored in the PC/laptop and the data loggers.

Examples for probe selection/certificates

Humidity probes	Part no.
Highly accurate reference humidity/temp. probe	0636 9741
Cable, 1.5 m long, connects probe with plug-in head to meas. instrument	0430 0143
Duct humidity/temperature probe, can be connected to teles- copic handle 0430 9715	0636 9715

Temperature probes	Part no.
Plug-in measuring tip, 1030mm long, flexible, for high tempera- tures, outer casing: Inconel 2.4816	0600 5893
Adapter to connect NiCr-Ni thermocouples and probes with open wire ends	0600 1693

Calibration certificates/humidity	Part no.
ISO calibration certificate/humidity, cal. points freely selectable from 5 to 95%RH at +15 to +35°C or at -18 to +80°C	0520 0106
ISO calibration certificate humidity, Calibration points 11.3 %RH and 75.3 %RH at +25°C	0520 0006
DKD calibration certificate/humidity, cal. points freely selectable from 5 to 95%RH at +25°C or -18°C to +70°C	0520 0216
DKD calibration certificate/humidity, electronic hygrometers; calibration points 11.3%RH and 75.3%RH at +25°C	0520 0206
System order suggestion for max. 12 sensors (sensors see above)	Part no.
Databus controller with USB connection incl. software ComSoft 3, cable for Testo databus, USB cable and terminal plug	0554 0589
3 x Logger, measures and saves (max. 250,000 readings), incl. 4 user defined probe sockets, alarm output/event trigger so- cket, stand/wall holder	0577 4540
$3\ x$ Testo rechargeable battery pack NiMH for control unit, log-ger	0515 0097
Power box, connected to control unit to increase field operating life and supply power to Testo data bus	0554 1045
Power supply for power box (110/230 V; 50/60 Hz, 12 V, 3 A)	0554 1143

Calibration certificates/temperature	Part no.
ISO calibration certificate/temperature, for air/immersion probes, calibration points -18°C; 0°C; +60°C	0520 0001
ISO calibration certificate/temperature, Meas. instr. with air/immersion probe; cal. points 0°C; +150°C; +300°C	0520 0021
DKD calibration certificate/temperature, meas. instr. with air/immersion probe; calibration points -20°C; 0°C; +60°C	0520 0211
DKD calibration certificate/temperature, Meas. instr. with air/immersion probe; cal. points $0^\circ C;$ +100°C; +200°C	0520 0221
System order suggestion for max. 4 sensors (sensors see above)	Part no.
Databus controller with USB connection incl. software ComSoft 3, cable for Testo databus, USB cable and terminal plug	0554 0589
Logger, measures and saves (max. 250,000 readings), incl. 4 user defined probe sockets, alarm output/event trigger socket, stand/wall holder	0577 4540
Testo rechargeable battery pack NiMH for control unit, logger	0515 0097
Power box, connected to control unit to increase field operating life and supply power to Testo data bus	0554 1045
Power supply for power box (110/230 V; 50/60 Hz, 12 V, 3 A)	0554 1143

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Accessories testo 454



Control unit

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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

Logger



Logger, measures and saves (max. 250,000 readings), incl. 4 user defined probe sockets, alarm output/event trigger socket, stand/wall holder

Part no. 0577 4540

Analog output box (mA out)



Analog output box, 6 channels, 4 to 20 mA, for output on an analog recorder

Part no. 0554 0845

Power box



Power box, connected to control unit to increase field operating life and supply power to Testo data bus

Part no. 0554 1045

Databus controller



Databus controller with USB connection incl. software ComSoft 3, cable for Testo databus, USB cable and terminal plug

Part no. 0554 0589

Databus controller with USB connnection incl. software ComSoft 3 for requirements according to 21 CFR 11, cable for Testo databus, USB cable and terminal plug

Part no. 0554 0599

Control Unit + Logger	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
Touch screen with pen (available only with original order) for easy input of text and values	0440 0559
Logger, measures and saves (max. 250,000 readings), incl. 4 user defi- ned probe sockets, alarm output/event trigger socket, stand/wall holder	0577 4540
External fast charger for 1-4 AA rech. batteries, incl. 4 Ni-MH rech. bat- teries with individual cell charging and charge control display, incl. im- pulse trickle charging, integrated discharge function, with built-in international mains plug, 100-240 V, 300 mA, 50/60 Hz	0554 0610
Testo rechargeable battery pack NiMH for control unit, logger	0515 0097
Analog output box + Power box	Part no.
Analog output box, 6 channels, 4 to 20 mA for output on an analog recorder	0554 0845
Power box, connected to control unit to increase field operating life and supply power to Testo data bus	0554 1045
Power supply for power box (110/230 V; 50/60 Hz, 12 V, 3 A)	0554 1143
testo databus	Part no.
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
Mains unit (110/230 V; 50/60 Hz, 12 V, 3 A) supplies power to Testo data bus	0554 1145
Terminal plug for Testo data bus	0554 0119
Software (see page 79) and accessories	Part no.
ComSoft 3 for data management, incl. RS 232 connection cable Incl. database, analysis and graphics function, data analysis, trend curve	0554 0841
Databus controller with USB connection incl. software ComSoft 3, cable for Testo databus, USB cable and terminal plug	0554 0589
Databus controller with USB connection incl. software ComSoft 3 for requirements according to 21 CFR 11, cable for Testo databus, USB cable and terminal plug	0554 0599
Accessories	Part no.
Spare thermal paper for printer (6 rolls)	0554 0569
Spare thermal paper for printer (6 rolls) measurement data documentation legible for up to 10 years	0554 0568
Holder/theft-proof protection with lock for logger wall mounting device	0554 1782
Connection hose, silicone, 5m long max. load 700 hPa (mbar)	0554 0440
System case	Part no.
System case (aluminium) for measuring instrument, probes and accessories, probes in lid make it easy to find parts in case	0516 0410
Large system case (aluminium) for control unit, up to 6 loggers, probes and accessories 1 section for velocity probes, ample space in lid for probes and large section in base for accessories	0516 0420

Calibration certificates see page 28, 46, 68, 76

Suitable probes for testo 454

	Illustration			Probe type	Meas. range	Accuracy	Part no.
Vane probe, Ø 12 mm, can be attached to handle 0430 3545 or telescopic handle 0430 0941		180 mm	Ø 12 mm	Vane	+0.6 to +20 m/s Oper. temp. -30 to +140 °C	±(0.2 m/s ±1% of mv) (+0.6 to +20 m/s)	0635 9443
Vane/temperature probe, Ø 16 mm, attacha- ble to 0430 3545 handle or 0430 0941 teles- copic handle		180 mm	Ø 16 mm	Vane) Type K (NiCr-Ni)	+0.4 to +60 m/s -30 to +140 °C	±(0.2 m/s +1% of mv) (+0.4 to +40 m/s) ±(0.2 m/s +2% of mv) (+40.1 to +50 m/s)	0635 9540
Vane/temperature probe, Ø 25 mm, can be at tached to 0430 3545 handle or 0430 0941 te- lescopic handle		180 mm	Ø 25 mm	Vane Type K (NiCr-Ni)	+0.4 to +40 m/s -30 to +140 °C	±(0.2 m/s ±1% of mv) (+0.4 to +40 m/s)	0635 9640
Bendable vane probe (can be bent by 90°), Ø 60 mm, attachable to handle 0430 3545 or te- lescopic handle 0430 0941, for meas. on vent lation outlets		9 60 mm		Vane	+0.25 to +20 m/s Oper. temp. 0 to +60 °C	±(0.1 m/s ±1.5% of mv) (+0.25 to +20 m/s)	0635 9440
Bendable vane probe (can be bent by 90°), Ø 100 mm, attachable to handle 0430 3545 or telescopic handle 0430 0941, for measure- ments on ventilation outlets		Ø 100 mm		Vane	+0.2 to +15 m/s Oper. temp. 0 to +60 °C	±(0.1 m/s ±1.5% of mv) (+0.1 to +15 m/s)	0635 9340
Accessories: Vane probes	F	Part no.					
Professional telescopic handle for plug-in vane pr	robes, max. 1 m long C	430 0941					
Extension for telescopic handle, 2 m long blease also order the 0409 0063 extension cable	(}	430 0942	Ī.				
-landle for plug-in vane probes	C	430 3545					
Thermal probes	Illustration			Probe type	Meas range	Accuracy	Part no.
Robust hot bulb probe, Ø 3 mm, with handle				Hot bulb	0 to +10 m/s	±(0.03 m/s ±5% of	0635 1049
and telescopic handle for measurements in the lower velocity range		850 mm	Ø 3 mm	NTC	-20 to +70 °C	mv) (0 to +10 m/s)	
Quick-action hot wire probe, Ø 10 mm, with telescopic handle, for measurements in the lower velocity range with direction recognition		760 mm	Ø 10 mm	Hot wire NTC	0 to +20 m/s -20 to +70 °C	±(0.03 m/s ±4% of mv) (0 to +20 m/s)	0635 1041
Thermal anemometer probe, Ø 10 mm, w. te- lescopic handle, measures air flow in lab fume cupboards to DIN EN 14175		760 mm	Ø 10 mm	Hot wire NTC	0 to +5 m/s 0 to +50 °C	±(0.02 m/s ±5% of mv) (0 to +5 m/s)	0635 1047
Differential pressure probe for Pitot tub	e measurement	Illustra	tion Meas. r	range Accur	acy Conr	n.	Part no.
Precision pressure probe, 100 Pa, in robust m tection, incl. magnet for fast attachment, to m flow speeds (in combination with Pitot tube)	ietal housing with impact p easure differential pressure	ro- and	0 to +10	00 Pa ±(0.3 Pa mv)	±0.5% of Plug-ir cable 0145 i	n head. connection 0430 0143 or 0430 required	0638 1347
Pressure probe, 10 hPa, in robust metal housi magnet for fast attachment, to measure differe (in combination with Pitot tube)	ing with impact protection ential pressure and flow sp	incl. eeds	0 to +10	0 hPa ±0.03 hl	Pa Plug-ir cable 0145	n head. connection 0430 0143 or 0430 required	0638 1447
Pressure probe, 100 hPa, in robust metal hou: incl. magnet for fast attachment, to measure d speeds (in combination with Pitot tube)	sing with impact protection differential pressure and flow		0 to +1	00 hPa ±0.5% (+100 hF ±0.1 hP hPa)	of mv (+20 to Plug-ir Pa) cable a (0 to +20 0145 r	n head. connection 0430 0143 or 0430 required	0638 1547
Pressure probe, 100 hPa, in robust metal hour incl. magnet for fast attachment, to measure c speeds (in combination with Pitot tube) Accessories: Pressure probes	sing with impact protection differential pressure and flo	h, w D	0 to +1	00 hPa ±0.5% c +100 hF ±0.1 hP hPa) ies: Pressure p	of mv (+20 to Plug-ii ² a) cable a (0 to +20 0145 r robes	n head. connection 0430 0143 or 0430 required	0638 1547 Part no.
Pressure probe, 100 hPa, in robust metal hour incl. magnet for fast attachment, to measure of speeds (in combination with Pitot tube) Accessories: Pressure probes Connection hose, silicone, 5m long, max. load 70	sing with impact protection differential pressure and flo F 00 hPa (mbar) C	n, w Part no. 554 0440	O to +11 Accessor Cable, 1.5 r ment, PUR	00 hPa ±0.5% (+100 hF ±0.1 hP hPa) ies: Pressure p m long, connects p coating material	of mv (+20 to Plug-i cable a (0 to +20 0145 r robes robe with plug-in he	n head. connection 0430 0143 or 0430 required ad to meas. instru-	0638 1547 Part no. 0430 0143
Pressure probe, 100 hPa, in robust metal hou- incl. magnet for fast attachment, to measure of speeds (in combination with Pitot tube) Accessories: Pressure probes Connection hose, silicone, 5m long, max. load 70 Prandtl's Pitot tubes	sing with impact protection differential pressure and flo F 00 hPa (mbar) C Illustration	n, w D Part no. 654 0440	0 to +1	00 hPa ±0.5% +100 hF ±0.1 hP hPa) ties: Pressure p m long, connects p coating material	of mv (+20 to Plug-i ³ a) cable a (0 to +20 0145 i robes rrobe with plug-in he	n head. connection 0430 0143 or 0430 required ead to meas. instru-	0638 1547 Part no. 0430 0143 Part no.
Pressure probe, 100 hPa, in robust metal hou incl. magnet for fast attachment, to measure of speeds (in combination with Pitot tube) Accessories: Pressure probes Connection hose, silicone, 5m long, max. load 70 Prandtl's Pitot tubes Pitot tube, 300 mm long, stainless steel, mea- sures flow speed,	ising with impact protection differential pressure and flo F 00 hPa (mbar) C Illustration	n, w Part no. 554 0440	0 to +1 Accessor Cable, 1.5 r ment, PUR	00 hPa ±0.5% (+100 hF ±0.1 hP hPa) ries: Pressure p m long, connects p coating material	of mv (+20 to Plug-i Pa) cable a (0 to +20 0145 n probes probe with plug-in ha	n head. connection 0430 0143 or 0430 required add to meas. instru- Accuracy Oper. temp. 0 to +600 °C	0638 1547 Part no. 0430 0143 Part no.
Pressure probe, 100 hPa, in robust metal hou incl. magnet for fast attachment, to measure of speeds (in combination with Pitot tube) Accessories: Pressure probes Connection hose, silicone, 5m long, max. load 70 Prandtl's Pitot tubes Pitot tube, 300 mm long, stainless steel, mea- sures flow speed, Length 300 mm, Ø 4 mm Length 350 mm, Ø 7 mm	ising with impact protection differential pressure and flo 60 hPa (mbar) C Illustration	n, w Part no. 1554 0440	0 to +1	00 hPa ±0.5% (+100 hF ±0.1 hP hPa) ries: Pressure p m long, connects p coating material	of mv (+20 to Plug-i Pa) cable Ia (0 to +20 0145) probes	n head. connection 0430 0143 or 0430 required aad to meas. instru- Accuracy Oper. temp. 0 to +600 °C	0638 1547 Part no. 0430 0143 Part no. 0635 2245 0635 2145
Pressure probe, 100 hPa, in robust metal hou incl. magnet for fast attachment, to measure of speeds (in combination with Pitot tube) Accessories: Pressure probes Connection hose, silicone, 5m long, max. load 70 Prandtl's Pitot tubes Pitot tube, 300 mm long, stainless steel, mea- sures flow speed, Length 300 mm, Ø 4 mm Length 300 mm, Ø 7 mm	ising with impact protection differential pressure and flo pressure and fl	n, w 22 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0 to +1 Accessor Cable, 1.5 ment, PUR	00 hPa ±0.5% (+100 hf ±0.1 hP hPa) ries: Pressure p m long, connects p coating material	of mv (+20 to Plug-i Pa) cable a (0 to +20 0145 probes probe with plug-in he	n head. connection 0430 0143 or 0430 required ead to meas. instru- Accuracy Oper. temp. 0 to +600 °C	0638 1547 Part no. 0430 0143 Part no. 0635 2245 0635 2145 0635 2045
Pressure probe, 100 hPa, in robust metal hou incl. magnet for fast attachment, to measure of speeds (in combination with Pitot tube) Accessories: Pressure probes Connection hose, silicone, 5m long, max. load 7(Prandtl's Pitot tubes Pitot tube, 300 mm long, stainless steel, mea- sures flow speed, Length 300 mm, Ø 4 mm Length 350 mm, Ø 7 mm Length 500 mm, Ø 7 mm	ising with impact protection differential pressure and flo 60 hPa (mbar) C 111ustration 300 mm/ 350 mm	n, w Part no. 1554 0440 / 500 mm / 1000 mm	0 to +1 Accesso Cable, 1.5 i ment, PUR	00 hPa ±0.5% (+100 hf ±0.1 hP hPa) ries: Pressure p m long, connects p coating material	of mv (+20 to Plug-i Pa) cable Ia (0 to +20 0145) probes	n head. connection 0430 0143 or 0430 required aad to meas. instru- Accuracy Oper. temp. 0 to +600 °C	0638 1547 Part no. 0430 0143 Part no. 0635 2245 0635 2145 0635 2045 0635 2345
Pressure probe, 100 hPa, in robust metal hou incl. magnet for fast attachment, to measure of speeds (in combination with Pitot tube) Accessories: Pressure probes Connection hose, silicone, 5m long, max. load 70 Prandtl's Pitot tubes Pitot tube, 300 mm long, stainless steel, mea- sures flow speed, Length 300 mm, Ø 4 mm Length 350 mm, Ø 7 mm Length 1000 mm, Ø 7 mm Straight Pitot tubes	Illustration	n, w D Part no. 1554 0440	0 to +1	00 hPa ±0.5% (+100 hF ±0.1 hP hPa) ties: Pressure p m long, connects p coating material 4 mm/ Ø 7 mm	of mv (+20 to Plug-i Pa) cable a (0 to +20 0145) probes probe with plug-in he Meas. range	n head. connection 0430 0143 or 0430 required ead to meas. instru- Accuracy Oper. temp. 0 to +600 °C	0638 1547 Part no. 0430 0143 Part no. 0635 2245 0635 2145 0635 2045 0635 2345 Part no.
Pressure probe, 100 hPa, in robust metal hou incl. magnet for fast attachment, to measure of speeds (in combination with Pitot tube) Accessories: Pressure probes Connection hose, silicone, 5m long, max. load 70 Prandtl's Pitot tubes Pitot tube, 300 mm long, stainless steel, mea- sures flow speed, Length 300 mm, Ø 4 mm Length 350 mm, Ø 7 mm Length 1000 mm, Ø 7 mm Straight Pitot tubes Pitot tube, stainless steel, 360 mm long, mea- sures velocity with temperature, for pressure probes 0638 1345/1445/1545	Illustration	n, Part no. 1554 0440 / 500 mm / 1000 mm 360 mm	0 to +1	00 hPa ±0.5% (+100 hF ±0.1 hF hPa) ries: Pressure p m long, connects p coating material 4 mm/ Ø 7 mm Probe type Type K (NiCr-Ni)	of mv (+20 to Plug-i Pa) cable a (0 to +20 0145) probes probe with plug-in he with plug-in he -40 to +600 °C	n head. connection 0430 0143 or 0430 required ead to meas. instru- Accuracy Oper. temp. 0 to +600 °C	0638 1547 Part no. 0430 0143 Part no. 0635 2245 0635 2145 0635 2045 0635 2345 Part no. 0635 2040
Pressure probe, 100 hPa, in robust metal hou incl. magnet for fast attachment, to measure of speeds (in combination with Pitot tube) Accessories: Pressure probes Connection hose, silicone, 5m long, max. load 70 Prandtl's Pitot tubes Pitot tube, 300 mm long, stainless steel, mea- sures flow speed, Length 300 mm, Ø 4 mm Length 350 mm, Ø 7 mm Length 1000 mm, Ø 7 mm Straight Pitot tubes Pitot tube, stainless steel, 360 mm long, mea- sures velocity with temperature, for pressure probes 0638 1345/. 1445/. 1545	sing with impact protection differential pressure and flo 00 hPa (mbar) 0 Illustration 300 mm/ 350 mm	n, w 2271 no. 1554 0440 / 500 mm / 1000 mm 360 mm 500 mm	0 to +1	00 hPa ±0.5% (+100 hF ±0.1 hP hPa) ries: Pressure p m long, connects p coating material 4 mm/ Ø 7 mm Probe type Type K (NiCr-Ni)	of mv (+20 to Plug-i Pa) cable a (0 to +20 0145) probes probe with plug-in he -40 to +600 °C -40 to +600 °C	n head. connection 0430 0143 or 0430 required ead to meas. instru- Accuracy Oper. temp. 0 to +600 °C	0638 1547 Part no. 0430 0143 Part no. 0635 2245 0635 2145 0635 2045 0635 2345 Part no. 0635 2040 0635 2140

testo

Suitable probes and protective caps for testo 454

	Comfort level measurement	Illustration			Proho typo	Moas rango	Acouracy	Part no
	3-function probe for simultaneous measure- ment of temperature, humidity and velocity. With plug-in head, 0430 0143 connection cable required) mm Ø:	21 mm	Hot bulb Testo humid. sen- sor, cap. NTC	0 to +10 m/s 0 to +100 %RH -20 to +70 °C	±(0.03 m/s ±5% of mv)(0 to 10 m/s) ±2 %RH (+2 to +98 %RH) ±0.4 °C (0 to +50 °C) ±0.5 °C (remaining range)	9 0635 1540
2203	Comfort level probe for measuring degree of turbulence, with telescopic handle and stand. Fulfills EN 13779 requirements	- 890 mm	Ø 90 mm		Hot wire NTC	0 to +5 m/s 0 to +50 °C	±(0.03 m/s ±4% of mv) (0 to +5 m/s) ±0.3 °C (0 to +50 °C)	0628 0009
	Wet Bulb Globe temperature probe to assess workplaces subjected to heat, in accordance with ISO 7243 or DIN 33403, incl. WBGT case	Ø 150 mm 560 mm				0 to +120 °C	In accordance with ISO 7243 or DIN 33403	0635 8888 ID No. 0699 4239/1
	Accessories: 3-Function probe Cable, 1.5 m long, connects probe with plug-in h ment, PUR coating material	Part n nead to meas. instru- 0430 0	10. 143					
ดห	Humidity probe with accuracy ±1 %RH	Illustration		Meas. ra	inge Accurac	у	t99	Part no.
	Highly accurate reference humidity/temp. probe		Ø 21 mm	0 to +100 % -20 to +70	6RH ±1 %RH (+ °C %RH)* ±2 %RH (re range)	10 to +90 ±0.2 °C (±0.4 °C (maining range)	+10 to +40 °C) 12 s remaining	0636 9741 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
							* in the temperature rar	nge from +15°C to +30°C
× •	Humidity probes	Illustration		Meas. ra	inge Accurac	у	t99	Part no.
	Standard ambient air probe up to +70°C		Ø 12 mm	0 to +100 % -20 to +70	%RH ±2 %RH (+ ℃ +98 %RH)	+2 to ±0.4 °C (-1 ±0.5 °C (re	0 to +50 °C) 12 s maining range)	0636 9740 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
	Duct humidity/temperature probe, can be con nected to telescopic handle 0430 9715	- 61	180 mm Ø 12 mm	0 to +100 % -20 to +70	%RH ±2 %RH (+ ℃ +98 %RH)	+2 to ±0.4 °C (-1 ±0.5 °C (re	0 to +50 °C) 12 s maining range)	0636 9715 Conn.: Fixed cable
	Thin humidity probe incl. 4 attachable pro- tection caps for ambient air measurements, measurements in exhaust air ducts and equili- brium moisture measurements		250 mm	0 to +100 % -20 to +70	6RH ±2 %RH (+ ℃ +98 %RH)	+2 to ±0.4 °C (-1 ±0.5 °C (-2 ±0.5 °C (+4	0 to +50 °C) 15 s 10 to -10.1 °C) 50.1 to +70 °C)	0636 2130 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
+	Humidity/temperature probe	<u> </u>	Ø 21 mm	0 +100 % -20 to +70	5RH ±2 %RH (+ ℃ +98 %RH)	+2 ±0.4 °C (+1 ±0.5 °C (-2 ±0.5 °C (+1	0.1 to +50 °C) 12 s 10 to 0 °C) 50.1 to +70 °C)	0636 9742 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
	Caps for humidity probes Ø 12m and 2	1mm Pa	art no.	Covering	caps for humidi	ty probes Ø 5	, 12 and 21 mm	Part no.
	A Metal protection cage, Ø 12 mm for humidity V4A. Quick adjustment time, robust and temp suring velocities of less than 10 m/s.	probes, material: stainless steel erature-proof. Used when mea-	0554 0755	Sintered F densation Compres ments), h	PTFE filter, Ø 12 mr n, water repellent, hi sed air measuremen igh flow velocities.	n material PTFE. I igh resistance to a nts, high humidity	Favourable behaviour in aggressive media. Applic range (long-term measu	con- 0554 0756 ations: Jre-
	b Cap with wire mesh filter, Ø 12 mm		0554 0757	Stainless bust, suita tection of	steel sintered cap, able for penetration sensor. Application	Ø 21 mm, made , clean with comp is: high mechanic	of stainless steel V2A. H ressed air, mechanical p al loads, high flow veloci	ighly ro- 0554 0640 pro- ties.
	c pellent, resistant to corrosive substances. App surements, high humidity range (continuous m velocities	ted by condensation, water-re- plications: compressed air mea- neasurements), high flow	0554 0666	f ged, suita sensor pr	steel sintered cap, able for penetration, otection. Applicatio	Ø 12 mm, materia can be cleaned v ns: High mechani	al: stainless steel V2A. Vi vith compressed air, me cal loads, high flow velo	ery rug- 0554 0647 chanical cities.
			e	PTFE cap	o, Ø 5 mm, attachat iah humidity level m	ole, PTFE materia neasurements, hio	l, (5 off). Applications: du	ust pro- 0554 1031

а

Metal protection cage, Ø 12 mm, stainless steel V4A, for 0636 9740, 0636 9715



Sintered stainless steel cap, Ø 21 mm, stainless steel V2A, for humidity probes Ø 21 mm

b

Cap with wire mesh filter, Ø 12 mm, for humidity probes Ø 12 mm



f

Stainless steel sintered cap, Ø 12 mm, stainless steel V2A for 0636 9740, 0636 9715

С

Sintered PTFE filter, Ø 21 mm, PTFE, for humidity probes Ø 21 mm



PTFE cap, Ø 5 mm, PTFE for 0636 2130



Sintered PTFE filter, Ø 12 mm, PTFE for 0636 9740, 0636 9715

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Suitable probes for testo 454

Pressure probes	Illustration	Meas. range	Accuracy			Part no.
Precision pressure probe, 100 Pa, in robust metal housing with impact protection, incl. magnet for fast attachment, to measure diffe- rential pressure and flow speeds (in combina- tion with Pitot tube)	D	0 to +100 Pa	±(0.3 Pa ±0.5% of m	V)		0638 1347 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
Pressure probe, 2000 hPa, measures abso- lute pressure, in robust metal housing with impact protection, incl. quick-closing coup- ling (M8 x 0.5), magnet for fast attachment	D	0 to +2000 hPa	±5 hPa (0 to +2000) hPa)		0638 1847 Conn.: Plug-in head. con- nection cable 0430 0143 of 0430 0145 required
emperature probes	Illustration		Meas. range	Accuracy	t99	Part no.
Quick-action surface probe with sprung thermocouple strip, measuring range short- term to +500°C	150 mm Conn.: Plug-in head. connection cable 0430 01-	Ø 10 mm	-200 to +300 °C	Class 2	3 s	0604 0194
Fast response immersion/penetration probe	150 mm Ø 3 mm		-200 to +400 °C	Class 1	3 s	0604 0293
Standard air probe	150 mm Ø 3 mm	2000 = 1000 Ø 9 mm 13 or 0430 0145 required] -200 +600 °C	Class A	75 s	0604 9773
fore probes	Illustration	Λ	leas range	Accuracy		Part no
Ambient CO probe, for detecting CO in buil- dings and rooms		0	to +500 ppm CO	±5% of mv (+10 +500 ppm CO) ±5 ppm CO (0 to ppm CO)	0.1 to 0 +100	0632 3331 Conn.: Fixed cable, 1.5 m
CO2 probe measures indoor air quality and monitors the workplace. With plug-in head, connection cable 0430 0143 or 0430 0145 required		0 0	+1 Vol. % CO ₂ +10000 ppm CO ₂	\pm (50 ppm CO ₂ \pm mv)(0 to +5000 p \pm (100 ppm CO ₂ \pm mv)(+5001 to +10 CO ₂)	2% of pm CO ₂) ±3% of 0000 ppm	0632 1240 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
Current/voltage cable (±1 V, ±10 V, 20 mA)		0 0 0	to +1000 mV to +10 V to +20 mA	±1 mV (0 to +10 ±0.01 V (0 to +1 ±0.04 mA (0 to +	00 mV) 0 V) -20 mA)	0554 0007
4 to 20 mA interface for connection and inter- mittent power supply to transmitters (scaling via hand-held instrument), in robust metal housing with impact protection, incl. magnet for fast attachment		0. C vi A m	/4 to 20 mA hannels: 1 channel, trar a terminal board uxiliary energy output: 1 pax. connection load: 30	±0.04 mA nsmitter connection 8V DC ± 20% 0 mA	n	0554 0528 Conn. Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
Accessories: Humidity probes	Part no.	Accessories: Pr	essure probes			Part no.
able, 1.5 m long, connects probe with plug-in head to strument, PUR coating material	meas. 0430 0143	Cable, 1.5 m long, instrument, PUR co	connects probe with p ating material	olug-in head to m	ieas.	0430 0143
able, 5 m long, connects probe with plug-in head to m strument, PUR coating material	easuring 0430 0145	Cable, 5 m long, co instrument, PUR co	nnects probe with plu ating material	ug-in head to mea	asuring	0430 0145
xtension cable, 5 m long, between plug-in head cable a trument, PUR coating material	and in- 0409 0063	Connection hose, s	ilicone, 5m long, max	. load 700 hPa (n	nbar)	0554 0440
elescopic handle, max. 1 m, for probe with plug-in head .5 m long, PUR coating material	l, cable: 0430 0144	Connection hose se Pressure-tight up to	et, 2 x 1 m, coiled, inc 20 bar	I. 1/8" screw con	nection,	0554 0441
esto saline pots for control and humidity adjustment of h robes, 11,3 %RH and 75,3 %RH with adapter for humi	umidity dity probe 0554 0660					



Technical data testo 454



Technical Gala					
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 ac- curacy	±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 1347 Probe 0638 1447 Probe 0638 1547 Probe 0638 1547 ±0.1% of fsv	
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 1347) 0.001 hPa (Probe 0638 1447) 0.01 hPa (Probe 0638 1547) 0.1 hPa (Probe 0638 1847)	

Probe type	Ptiou	Type K (NICF-NI)			
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 probeProbes	CO2 probeProbes	
Meas. range	-40 to +150 °C	0 to +500 ppm CO	0 to +1 Vol. % CO ₂	0 to +10000 ppm CO ²	

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)				
Probe type	Current measurement	Voltage measurement	Control unit, integ. press. sensor	Control unit, integ. press. sensor	
Meas. range	0 to +20 mA (0554 0007) 0/4 to +20 mA (0554 0528)	0 to +10 V(0554 0007)	-200 to +200 hPa	-40 to +40 hPa	
Accuracy ±1 digit	±0.04 mA (0 to +20 mA) See probe data (0554 0007) (0554 0528)	±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	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)	

	testo 454, control unit	Logger, measures and saves readings	Analog output box (mA out)	Power box	
Oper. temp.	-5 to +45 °C	-10 to +50 °C	-10 to +50 °C	0 to +40 °C	
Storage temp.	-20 to +50 °C	-25 to +60 °C	-25 to +60 °C	-20 to +50 °C	
Battery type	4 AA batteries	Alkali manganese			
Battery life	8 h *1	24 h *2		35 h	
Memory	250000 readings	250000 readings			
Weight	850 g	450 g	305 g	700 g700 g	
Dimensions	252 x 115 x 58 mm	200 x 89 x 37 mm	200 x 89 x 37 mm	200 x 89 x 37 mm	
Warranty	2 years	3 years	3 years	3 years	

 $^{\rm *1}$ Battery life in continuous operation with 1 T/C probe

 $^{\rm *2}$ Battery life in continuous operation with a logger/4 T/C probes

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Mini wind tunnel

Mini wind tunnel

You can draw up your own ISO certificates using the wind tunnel and a certified Testo measuring instrument. All of Testo's velocity probes can be checked and calibrated using the mini wind tunnel (except Ø 100 mm vane probes).

Draw up your own ISO calibration certificates! The Testo mini wind tunnel can be used for regular checks on velocity probes and measuring instruments in your company.

Mini wind tunnel

You already have a Testo measuring instrument with velocity probe and calibration certificate and you want to calibrate more probes of the same type using the wind tunnel. Mini wind tunnel incl. power con-

Part no. 0554 0450

nection cable

- 3 speed levels can be set: 2.5/5/10 m/s
- The readings are traceable to the PTB standard if Testo's DKD certified testo 400 reference instrument is used
- Accuracy of wind tunnel: ±1 % of reading (at least 0.1 m/s) plus calibration uncertainty of the respective reference instrument's certificate

Exact positioning of the probe in the wind tunnel



Mini wind tunnel for creating in-house ISO certificates

Recommended Set: Testo mini wind tunnel with reference measuring system

Mini wind tunnel incl. power connection cable	0554 0450
testo 400, multi-functional measuring instrument, incl. measurement value store up to 500,000 readings, VAC-module (determination of volume flow with error calculation), battery, Li-cell and calibration protocol, 2 channel multi-function measuring instrument	0563 4001
Vane/temperature probe, Ø 16 mm, attachable to 0430 3545 handle or 0430 0941 telescopic handle	0635 9540
Cable, 1.5 m long, for connecting vane probes with plug-in head to the measuring instrument	0409 0045
DKD calibration certificate/velocity	0520 0254

Technical data Length: 610 mm

Ø meas. tunnel: approx. 100 mm (interior)

Velocities: 2.5/5/10 m/s, can be switched

Probe holder: For all of Testo's velocity probes except vane probes with \varnothing 100 mm

Motor: Direct current fan

Power supply: 230 V/50 Hz or 110 V can be switched, built-in IEC socket

Warranty: 2 years

Calibration certificates flow velocity

Industrial calibration methods

testo

One basic requirement for calibrating velocity measuring instruments is a defined air stream. Calibration takes place in the centre of a free jet in a specially developed wind tunnel using the most accurate and efficient measurement method currently available, Laser Doppler Anemometry (LDA). LDA is a non-contact - therefore flow-free - measurement procedure used in ranges with low mm/s flow velocity at high accuracy levels. The laser beam is split into two parallel beams using a beam splitter. A lens is used to make an intersection. The intersection volume is right in the centre of the free jet. The measurement volume as an intersection of two jets is crossed by a light-dark strip (similar to a light barrier) which develops on account of the interference from the two jets which cross each other. Tiny particles of between 1 and 5 µm in size are added to the flow. When a particle crosses the "light barrier", light is dispersed in all directions. One part of the light is

focussed and registered on a photodiode using a receiving lens. When a particle goes through the light barrier system, a series of scattered light pulses is developed whose frequency is converted into particle or flow velocity. An average of approximately 50 particles per second fly through the light barrier system. Each particle emits approximately one flash per micro second (at 4 m/s). If there are approximately 30 light barriers in the measurement volume of the laser beams, the signal generator of the LDA systems has to process approximately 1.6 million flashes in one second. A modern LDA system carries out this calculation in the space of a few seconds at highest accuracy.



Calibration in the Testo DKD wind tunnel

The first PTB accredited laboratory for velocity enables the retraceable calibration of anemometers.

Extract from the accreditation range of the DKD laboratory 11201							
Parameter or item to be calibrated	Measurement range	Measurement conditions	Measurement inaccuracy				
Flow velocity of gases Calibration of anemometers	0.1 m/s to 50 m/s	With free jet calibrated by Laser Doppler Anemometer	0.5 %; but not less than 0.01 m/s				

Calibration certificates flow velocity, CO/CO2

Anemometer/Pitot tubes/calibration certificates



Item to be calibrated	DKD/ ISO	Accuracy	Calibration points/range	Part no.		
Hot wire, vane, hot bulb, shell anemometer, Pitot tube	DKD	Standard Standard Standard Standard	0,5/1/2/5/10 m/s 2/5/10/15/20 m/s 0.1/0.2/0.5/0.8/1 m/s 2.5/5/10 m/s	0520 0244 0520 0204 0520 0224 0520 0254		
	ISO	Standard Standard Standard Standard Standard	1/2/5/10 m/s 0.3/0.5/0.8/1.5 m/s 5/10 m/s 5/10/15/20 m/s 0.3/0.6/1/2/4/6 m/s	0520 0004 0520 0024 0520 0094 0520 0034 0520 0444		

Individual calibration points on request

CO/CO₂

Item to be calibrated	DKD/ ISO		Calibration points/range	Part no.		
CO ₂ probes	ISO	Standard	0/1000/5000 ppm	0520 0033		
CO probe		Standard	0/80 ppm	0520 0039		

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testo 521/526 reference pressure meters for all measurement ranges

testo 521

testo

testo 521-1/-2 with internal sensor 0 to 100 hPa/0.1%/0.2%

The testo 521-1/-2 is designed for precise differential pressure measurements, for example on filters, checking ventilators and exhaust fans. Use the testo 521-1/-2 for Pitot tube measurements in the range 5 to 100 m/s.

testo 521-3 with internal sensor 0 to 2.5 hPa

The smallest differential pressures up to 2.5 hPa are measured with the testo 521-3. high accuracy and a resolution of 0.1 Pa make the instrument ideal for measurements in cleanrooms. For Pitot tube measurements in the range 1 to 20 m/s, you can measure precisely with the testo 521-3.

testo 526

testo 526-1 with internal sensor 0 to 2000 hPa / 0.1%

testo 526 is the ideal differential pressure meter for industrial applications. Processes can be accurately measured and monitored with an accuracy of 0.1% of the fullscale value.

testo 526-2 with highly accurate internal sensor 0 to 2000 hPa, 0.05%

testo 526 is the ideal differential pressure meter for sensitive industrial applications. Critical processes can be efficiently measured and monitored at an accuracy of up to 0.05% of the full-scale value.

Pressure test

Specially for leak tests on containers, uninterrupted recording is possible via the built-in test menu in testo 526-1 and testo 526-2. Subsequent processing of measurement data via software or printouts ensure that the pressure test is documented.

testo 521 and 526 - documentation at the measurement site. Individual measurement protocols can be printed out on the fast printer



Monitoring filters with an external 100 Pa probe



Store data by measurement site and analyze on



Checking measurement transmitters with 4 to 20 mA interface

• Two user-defined probe inputs allow the connection of external probes for pressure, temperature, current/voltage

1 0 ... 100 hPa / ±0.2 % of fsv

testo 521-1, differential pressure meter 0 to 100 hPa incl. battery and calibration protocol

Part no. 0560 5210

2 0 to 100 hPa / ±0.1 % of fsv

testo 521-2, differential pressure meter 0 to 100 hPa incl. battery and calibration protocol

Part no. 0560 5211

3 0 to 2.5 hPa

testo 521-3, differential pressure meter 0 to 2.5 hPa, battery and calibration protocol included

Part no. 0560 5213

Wide selection of probes

4 0 to 2000 hPa / ±0.1 % of fsv testo 526-1, differential pressure meter

0 to 2000 hPa incl. fast coupling connections, battery and calibration protocol

Part no. 0560 5280

5 0 to 2000 hPa / ±0.05 % of fsv

testo 526-2, differential pressure meter 0 to 2000 hPa incl. fast coupling connections, battery and calibration protocol

Part no. 0560 5281

Wide selection of probes



Common advantages, testo 521/526

and Mean

· Fast measurement rate of

0.04 seconds is ideal for re-

tection from impact) with car-

rier strap and magnetic plate

cognising pressure peaks

• Hands-free: Top-Safe (pro-

as practical accessory for

measuring instrument

Advantages during measurement

- The brief text menu greatly facilitates navigation
- Two measurement channels are depicted in the large two line LCD display; use the arrow buttons to switch to the calculated parameters
- Initialisation of the relative and differential pressure probes is directly via the P=O button
- You can select from the following units when measuring pressure: mbar, hPa, bar, Pa, kPa, inH₂0, mmH₂0, torr and psi
- Button for Hold, Max, Min

Long-term monitoring made easy

- Measurement data can be saved separately or as a measurement series. The measurement rate (0.04 seconds, 1 second to 24 hours) and the number of values to be saved are freely selectable. The maximum memory size is 25,000 readings.
- separate names for the sites (max. 99 sites) - with retracing guarantee.
- Online measurement for large quantities of data can be activated via PC.

paper ensures that measure-

ment data documentation

can be stored for up to 10

years.

Wide selection of probes

The differential pressure sensor is built into testo 521 and testo 526. Up to two additional probes can be connected via user-defined probe sockets.

- Differential pressure probes to 2000 hPa
- Absolute pressure probes to 2000 hPa
- Relative pressure probes to
 400 bar
- Temperature probes from -200 to +1250 °C

power; it is supplied by the testo

521 or testo 526 pressure meter.

- Probes for measuring current/voltage

sy Inspection of transmitters with 4 to 20 mA interface

All transmitters or non-Testo probes (in 2 or 4 wire systems, 18 V) can be connected to the 4 to 20 mA interface. Scaling is carried out on the hand-held measuring instrument.

Major benefit: The transmitter connected does not need its own

Easy data management

- The saved measurement data can be easily analysed and processed using the software available.
- Readings are taken by the instrument and can be depicted online by the software.
- Pressure peaks can be protocolled online in cycles of 0.05 seconds in the Fast Measurement menu.

Since pressure peaks are usually unforeseen, a rule can be defined via the trigger function, which filters out pressure peaks and archives them separately fot the user in corresponding register

pages.

• The readings are saved under

Documentation on site

- Measurement protocols can be printed on site. No awkward cables required thanks to the infrared interface.
- Long-term legible thermal

Recommended Set: testo 526 set – monitor pipeline pressure in a production process

testo 526-1, differential pressure meter 0 to 2000 hPa incl. fast coupling connections, battery and calibration protocol	0560 5280
Low pressure probe, refrigerant-proof stainless steel, up to 10 bar	0638 1741
Connection cable, 2.5 m long, for pressure probes 0638 1741/1841/1941/2041/2141	0409 0202
ComSoft 3 - Professional with data management, incl. database, analysis and graphics function, data analysis, trend curve	0554 0830
RS232 cable, connects instrument to PC (1.8 m) for data transfer	0409 0178
Transport case, for measuring instrument, probes, Prandtl Pitot tube, accessories	0516 0527

Pressure

	Differential pressure probe	Illustration	Meas. range	Accuracy	Conn.	Part no.
	Precision pressure probe, 100 Pa, in robust metal housing with impact pro tection, incl. magnet for fast attachment, to measure differential pressure and flow speeds (in combination with Pitot tube)	\mathbb{D}	0 to +100 Pa	±(0.3 Pa ±0.5% of mv)	Plug-in head. connection cable 0430 0143 or 0430 0145 required	0638 1347
	Pressure probe, 10 hPa, in robust metal housing with impact protection inc magnet for fast attachment, to measure differential pressure and flow speeds (in combination with Pitot tube)		0 to +10 hPa	±0.03 hPa	Plug-in head. connection cable 0430 0143 or 0430 0145 required	0638 1447
	Pressure probe, 100 hPa, in robust metal housing with impact protection incl. magnet for fast attachment, to measure differential pressure and flo speeds (in combination with Pitot tube)		0 to +100 hPa	±0.5% of mv (+20 to +100 hPa) ±0.1 hPa (0 to +20 hPa)	Plug-in head. connection cable 0430 0143 or 0430 0145 required	0638 1547
<u>ρ</u> κ	Pressure probe, 1000 hPa, measures differential pressure, in robust met housing with impact protection, incl. quick-closing coupling (M8 x 0.5), magnet for fast attachment		0 to +1000 hPa	±1 hPa (0 to 200 hPa) ±0.5% of mv (200 to 1000 hPa)	Plug-in head. connection cable 0430 0143 or 0430 0145 required	0638 1647
N ⁱⁿ	Pressure probe, 2000 hPa, measures differential pressure, in robust met housing with impact protection, incl. quick-closing coupling (M8 x 0.5), magnet for fast attachment		0 to +2000 hPa	±2 hPa (0 to 400 hPa) ±0.5% of mv (400 to 2000 hPa)	Plug-in head. connection cable 0430 0143 or 0430 0145 required	0638 1747
	Absolute pressure probe	Illustration	Meas. range	Accuracy	Conn.	Part no.
	Pressure probe, 2000 hPa, measures absolute pressure, in robust metal housing with impact protection, incl. quick-closing coupling (M8 x 0.5), magnet for fast attachment	\mathbb{D}	0 to +2000 hPa	±5 hPa (0 to +2000 hPa)	Plug-in head. connection cable 0430 0143 or 0430 0145 required	0638 1847
	Relative pressure probe (media compatible) Illustration	Overload	Meas. range	Accuracy	Conn.	Part no.
	Low pressure probe, refrigerant-proof stainless steel, up to 10 bar	25 bar ^{6"}	-1 to +10 bar	±1% of fsv	Plug-in head, connection cable 0409 0202 required	0638 1741
	High pressure probe, refrigerant-proof stainless steel, up to 30 bar	120 bar ^{6"}	-1 to +30 bar	±1% of fsv	Plug-in head, connection cable 0409 0202 required	0638 1841
	High pressure probe, refrigerant-proof stainless steel, up to 40 bar	120 bar ^{6"}	-1 to +40 bar	±1% of fsv	Plug-in head, connection cable 0409 0202 required	0638 1941
	High pressure probe, refrigerant-proof stainless steel, up to 100 bar	250 bar ^{6"}	-1 to +100 bar	±1% of fsv	Plug-in head, connection cable 0409 0202 required	0638 2041
	High pressure probe, refrigerant-proof stainless steel, up to 400 bar	600 bar 6"	-1 to +400 bar	±1% of fsv	Plug-in head, connection cable 0409 0202 required	0638 2141
	Current/voltage measurement Illustration		Meas. range	Accuracy	Conn.	Part no.
	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 m ¹ ±0.01 V (0 to +10 V) ±0.04 mA (0 to +20 m	Л) А)	0554 0007
	4 to 20 mA interface for connection and intermittent power supply to transmitters (scaling via hand-held instrument), in robust metal housing with impact protection, incl. magnet for fast attachment	\square	0/4 to 20 mA Channels: 1 channel via terminal board Auxiliary energy outp max. connection loa	±0.04 mA , transmitter connection ut: 18V DC ± 20% 1: 30 mA	Plug-in head. connection cable 0430 0143 or 0430 0145 required	0554 0528
	Pilot tube	Illustration			Oper. temp.	Part no.
	Pitot tube, 350 mm long, Ø 7 mm, stainless steel, measures flow speed In conjunction with 0638 1347 / 0638 1447 / 0638 1547 pressure probe or testo 521, with internal sensor		350 mm	Ø 7 mm	0 to +600 °C	0635 2145
	Pitot tube, length 500 mm, Ø 7 mm, stainless steel, for meassuring flow velocity, in combination with pressureprobes 0638 1347 / 0638 1447 / 0638 1547 or testo 521 with internal sensor		500 mm	0 7 mm	0 to +600 °C	0635 2045
	Temperature probes Illustration			Meas. range	Accuracy t99	Part no.
	Quick-action surface probe with sprung thermocouple strip, measuring range short-term to +500°C	0 mm	Ø 10 mm	-200 to +300 °C	Class 2 3 s	0604 0194 Conn.: Plug-in head. con- nection cable 0430 0143 or 0430 0145 required
	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 Conn.: Fixed cable
	FURTHER TEMPERATU	JRE PROE	ES TC, N <u>TC,</u>	SEE TESTO	950	

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 measu- ring instrument, PUR coating material	0430 0145
Connection hose, silicone, 5m long, max. load 700 hPa (mbar)	0554 0440

Accessories	Part no.
Connection hose set, 2 x 1 m, coiled, incl. 1/8" screw con- nection, Pressure-tight up to 20 bar	0554 0441
Connection cable, 2.5 m long, for pressure probes 0638 1741/1841/1941/2041/2141	0409 0202

Pressure
Accessories, testo 521/526

Further accessories and spare parts	Part no.
9V rech. battery for instrument, instead of battery	0515 0025
Desk-top power supply with international connection options	0554 1143
Recharger for 9V rechargeable battery	0554 0025
Transport and protection	Part no.
TopSafe (protection case), incl. carrier strap, bench stand and magnet. Protects instrument from dust, impact, scratches	0516 0446
Transport case, for measuring instrument, probes, Prandtl Pitot tube, accessories	0516 0527
System case, For measuring instrument, probes, straight or Prandtl Pitot tube, accessories	0516 0526
Printer and Accessories	Part no.
Testo fast printer with wireless infrared interface, 1 roll thermal paper and 4 AA batteries, for printing out measurements on site	0554 0549
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), measurement data do- cumentation legible for up to 10 years	0554 0568
Software (see page 79) and accessories	Part no.
ComSoft 3 - Professional with data management, incl. database, analysis and graphics function, data analysis, trend curve	0554 0830
RS232 cable, connects instrument to PC (1.8 m) for data transfer	0409 0178
Ethernet adapter, RS232 - Ethernet incl. software driver, mains unit, facilitates data communication in network	0554 1711

Technical data	
Probe type	testo 521-1 Piezoresistive pressure sensor (integr. sen-
Meas. range	0 100 hPa
Accuracy ±1 digit	±0.2 % of fsv
Resolution	0.01 hPa
Static pressure	2000 hPa
Overload	300 hPa
Probe type	testo 521-2 Piezoresistive pressure sensor (integr. sen- Sor)
Meas. range	0 to 100 hPa
Accuracy ±1 digit	±0.1 % of fsv
Resolution	0.01 hPa
Static pressure	0 to 2000 hPa
Overload	300 hPa
Probe type	testo 521-3 Piezoresistive pressure sensor (integr. sensor)
Meas. range	0 to 2.5 hPa
Accuracy ±1 digit	±0.5 Pa (0 to 20 Pa) ±0.5 Pa ±0.5% of mv (20.1 to 250 Pa)
Resolution	0.1 Pa
Static pressure	100 hPa
Overload	50 hPa
Probe type	testo 526-1 Piezoresistive pressure sensor (integr. sensor)
Meas. range	0 to 2000 hPa
Accuracy ±1 digit	±0.1 % of fsv
Resolution	0.1 hPa
Static pressure	2000 hPa
Overload	3000 hPa
Probe type	testo 526-2 Piezoresistive pressure sensor (integr. sensor)
Meas. range	0 to 2000 hPa
Accuracy ±1 digit	±0.05 % of fsv
Resolution	0.1 hPa
Static pressure	2000 hPa
Overload	3000 hPa

Calibration Certificates	Part no.
DKD calibration certificate/Pressure, Differential pressure, accuracy a 0.1 ($\%$ of full scale value)	0520 0205
DKD calibration certificate/pressure, differential pressure, ac- curacy 0.1 to 0.6 (% of full-scale value)	0520 0215
DKD calibration certificate/pressure, differential pressure, accuracy > 0.6 (% of full-scale value)	0520 0225
DKD calibration certificate/pressure, absolute pressure, ac- curacy 0.1 to 0.6 (% of full-scale value)	0520 0212
ISO calibration certificate/Pressure, Differential pressure, ac- curacy a 0.1 (% of full scale value)	0520 0035
ISO calibration certificate/pressure, differential pressure, ac- curacy 0.1 to 0.6 (% of fsv)	0520 0025
ISO calibration certificate/Pressure, Differential pressure, accuracy > 0.1 (% of fsv) for testo 521-3	0520 0405
ISO calibration certificate/absolute pressure, 5 measurement points distributed over meas. range, absolute pressure, accuracy 0.1 to 0.6 (% of fsv)	0520 0125
ISO calibration certificate/temperature, for air/immersion probes, calibration points -18°C; 0°C; +60°C	0520 0001
ISO calibration certificate/temperature, Meas. instr. with air/immersion probe; cal. points $0^\circ C;$ +150°C; +300°C	0520 0021
ISO calibration certificate/temperature, meas. instr. with surface probe; calibration points +60°C; +120°C; +180°C	0520 0071
DKD calibration certificate/temperature, meas. instr. with air/immersion probe; calibration points -20°C; 0°C; +60°C	0520 0211
DKD calibration certificate/temperature, contact surface temperature probes; calibration points +100°C; +200°C; +300°C	0520 0271

Further calibration certificates see page 28, 29, 77

Common data testo 521	/ testo 526					
Probe type	Ceramic sensor for externa	al relative pressure probes				
Meas. range	-1 to 400 bar					
Accuracy* ±1 digit	±0.2 % of mv					
Resolution	0.01 bar					
Temperature application range	-40 to +100 °C					
Temperature compensation	n0 to +70 °C					
Probe type	Piezoresistive pressure ser rential and absolute pressu	nsor for external diffe- ure probes				
Meas. range	0 to 2000 hPa					
Accuracy* ±1 digit	±0.1 % of mv	±0.1 % of mv				
Resolution	0.1 Pa (0638 1347) 0.001 hPa (0638 1447) 0.01 hPa (0638 1547) 0.1 hPa (0638 1647; 0638 1747;	0638 1847)				
Temperature application range	0 to +50 °C (compensated)					
Probe type	NTC	Type K (NiCr-Ni)				
Meas. range	-40 to +150 °C	-200 to +1370 °C				
Accuracy* ±1 digit	±0.2 °C (-10 to +50 °C) ±0.4 °C (remaining range)	±0.4 °C (-100 to +200 °C) ±1 °C (remaining range)				
Resolution	0.1 °C	0.1 °C				
Probe type	Current/voltage measurement	Current measurement				
Meas. range	0 10 V, 0 to 20 mA	0 to 20 mA				
Accuracy* ±1 digit	±0.01 V, ±0.04 mA, Cable 0554 0007	Probe 0554 0528				
Resolution	0.01 V, 0.01 mA	0.01 mA				
Oper temp	0 to +50 °C	Weight 200 g				
Storage temp.	-20 to +70 °C	Warranty 2 years				
Power supply	Battery/rech. batt. (9 V block), mains unit 12 V				
Battery life	in continuous operation with interr alkali-manganese / 10 h with rech	al pressure sensor: 30 h with batt. / 18 h with zinc carbon				
Conn.	Hose: inner Ø 4 mm, outer Ø	0 6 mm				
Display	LCD display with symbol, 7-s matrix	segment display and dot				
Refresh rate (display)	2x per second, in fast measu	irement 4x per second				
Dimensions	219 x 68 x 50 mm					
PC	RS232 interface Ma	aterial/Housing ABS				
Memory	100 kB (corresponds to appr	rox. 25,000 readings)				
Other features	Mains connection and battery charging in the instrument					

* Accuracies valid only for instruments without connected probe





testo

Pressure

testo 525, highly accurate pressure gauge

testo 525

testo

The highly accurate pressure gauge testo 525 offers all the functions expected by a professional in this class of instrument.

The temperature compensation ensures that temperature fluctuations have no influence on the measurement in testo 525. It allows measurements in the ranges of positive/negative pressure, differential and absolute pressure and is thus the optimum reference measuring instrument for calibrations.

- Accurate internal pressure sensor
- 11 different meas. units to select from
- Measures leak rate (pressure drop over time)
- Min/Max value
- Hold button
- Data memory for single values or series of measurements
- Auto-Off/Low Bat display

• One touch zero

testo 525

testo 525, pressure gauges incl. battery and calibration protocol. Different instrument versions for every application, see below.

Absolute pressure measurement in an autoclave in medicine

testo 525 positive pressure meters (media-compatible)

Accuracy ±0.2% of fsv					
Meas. range	Resolution	Overload	Part no.		
0 to 30 bar	0.01 bar	70 bar	0560 5258		

testo 525 absolute pressure meters

Accuracy ±0.2% of fsv						
Meas. range	Resolution	Overload	Part no.			
0 to 1100 hPa	0.1 hPa	±3000 hPa	0560 5256			
0 to 2000 hPa	0.1 hPa	±3000 hPa	0560 5257			
Accuracy ±0.1% of fsv						
Meas. range	Resolution	Overload	Part no.			
0 to 1100 hPa	0.1 hPa	±2000 hPa	0560 5266			
0 to +2000 hPa	0.1 hPa	±3000 hPa	0560 5267			
Accuracy ±0.05% of fsv						
Meas. range	Resolution	Overload	Part no.			
0 to +2000 hPa	0.1 hPa	±3000 hPa	0560 5273			

Common data	
Sensor	Piezoresistive pressure sensor
Measuring medium	All non-corrosive gases
Conn.	Hose 4 mm (up to 7 bar), NPT 1/8" (from 10 bar)
PC	RS232 interface
Display	LCD, 1 line
Storage interval	Manually, 1 second60 min selectable
Memory	984
Oper. humidity	30 to 95 %RH
Oper. temp.	-5 to +50 °C
Storage temp.	-30 to +85 °C
Protection class	IP54
Battery type	9V block battery
Battery life	50 h
Dimensions	152 x 83 x 34 mm
Weight	270 g
Warranty	2 years
Other features	11 different measuring units can be set: bar, mbar, kPa, hPa, MPa, mmH2O, mH2O, mmHg, psi, inchH2O, inchHg



Software for instrument control and measurement data management

Configuration settings in instrument

All of the important parameters in the instrument can be easily adapted on your PC using the PC software for testo 525; regardless of whether you wish to change a unit or measuring rate or wish to activate smoothing. No problem. Simply select the required value using the pull-down menu and it is transmitted to your instrument straightaway.

Readout memory

Data is transferred to a file on your hard disk, where it is permanently filed, when the "Readout memory" button is pressed. The data can also be shown in a table. Important information such maximum/minimum and mean value appear in the top lines. The data can also be printed or transferred to Excel.

Online Measurement

All of the measurement data can be read straightaway from the graphic appearing in the initial screen. The data is automatically saved during online measurement.

High speed

testo 525 carries out 10/20 measurements per second. Fast measurement is necessary so that pressure drops can be recognised and recorded. In the case of high speed measurements, the user can select when the measurement is to be started.

The following can be selected: *immediately* Measurement starts running *ad hoc Overshooting* Measurement starts once a specific limit value is overshot *Undershooting* Measurement starts once a specific limit value is undershot. A trigger mode can also be set up. If a limit value is exceeded, you can determine how long af-

you can determine now long atterwards measurements can continue. Recording stops once the specified time has been reached. If the limit value is again exceeded, recording begins again. This mode is ideal for troubleshooting systems.

Accessories Transport and protection	Part no.
Case made of leather with shoulder strap, For secure storage of measuring instrument	0554 5251
Transport case (plastic) for measuring instrument and accesso- ries, For safe transport	0516 5200
Software and accessories for testo 525	Part no.
Software set incl. RS232 data transfer cable, Software for instru- ment control and data management	0554 5256
Software, for instrument control and data management	0554 5255
Data transfer cable RS 232, Connects measuring instrument to PC for data transfer	0554 5250
Further accessories and spare parts	Part no.
9V rech. battery for instrument, instead of battery	0515 0025
Recharger for 9V rechargeable battery, for external rechar- ging of 0515 0025 battery	0554 0025
Connection hose, silicone, 5m long, max. load 700 hPa (mbar)	0554 0440
Connection hose set, 2 x 1 m, coiled, incl. 1/8" screw con- nection	0554 0441
Adapter 1/8", for connection hoses	0554 5200
Calibration pump, positive pressure , Max. 5 bar	0554 5252
Pressure transmitter 0 to 10 bar, to measure pressure in liquid substances	0554 5254
Calibration Certificates	Part no.
ISO calibration certificate/pressure, differential pressure; 5 points distributed over meas. range	0520 0005
DKD calibration certificate/pressure, diff. and pos. pressure; 11 measuring points distributed over the instr. meas. range	0520 0215
DKD calibration certificate/Pressure, Absolute pressure 11 points distributed over the whole measuring range (less than 0.1% of fsv)	0520 0222
ISO calibration certificate/pressure, differential pressure, accuracy 0.1 to 0.6 (% of fsv)	0520 0025
ISO calibration certificate/Pressure, Calibration points freely se- lectable from 0 to 70 bar absolute and 0 to 250 bar positive pressure	0520 0105

Calibration certificates see page 77

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Calibration certificates pressure

Pressure balances as reference norms

One of the most accurate industrial methods is pressure calibration with a pressure balance. For this reason, many different designs of pressure balance are used as reference norms in DKD/ÖKD laboratories.

CS10

In piston pressure balances, the pressure acts on a certain area of the piston, and is compared with the weight force of calibrated weights or a sprung element. The constructive challenge in the instruments is the gasket on the piston. It must have as pressure-tight and as friction-free a fit in the cylinder as possible.

Testo industrial services uses several pressure balances in the accredited laboratories. The calibration range lies between -1 bar and 70 bar.

There are three different processes for DKD calibration (described as A, B and C), which are dependent on the accuracy class of the test objects (see table). First a pre-load of the calibration object at the final value takes place. The 11 or 6 measurement points (depending on the corresponding procedure) are then distributed evenly over the measuring range.

proces-(descrich are acy class able). alibration takes surement e corree then he mea-

Extract from the accredi	Calibration procedure				
Measurement parameter or calibration object	Measuring range	Measurement conditi- ons	Measurement inaccuracy	<á 0.1 (á 0.1% of fsv, however	Calibration according to pro- cess A: 11 measurement points
Negative and positive over-pressure p _e	-1 bar to 0 bar	Pressure medium: Gas DIN EN 837	1·10 ⁻⁴ p _e ; however not less than 20 µbar	not less than \pm 0,2 Pa)	evenly distributed over the mea- suring range of the instrument.
	0.2 mbar to 160 mbar	DKD-R 6-1	2·10 ⁻⁴ p _e ; however not less than 1.0 μbar		Additional repeated measure- ment in second pressurization
	>160 mbar to 20 bar		7·10 ⁻⁵ p _e ; however not less than 0.012 mbar	<á 0,1 to 0,6 (á 0.1 to 0.6% of fsv,	Calibration according to process B: 11 measurement points
	>20 bar to 70 bar		8·10 ⁻⁵ p _e	10 Pa)	suring range of the instrument.
Absolute pressure p _{abs}	0.03 bar to 20 bar		7·10 ⁻⁵ p _{abs} ; however not less than 0.0012 mbar	> 0.6 (> 0.6% of fsv, however	Calibration according to pro- cess C: v6 measurement points
	>20 bar to 70 bar		8·10 ⁻⁵ p _{abs}	not less than ± 1 mbar)	evenly distributed over the mea- suring range of the instrument.

Differential and over-pressure instruments

The most commonly measured pressure in the field of technology is atmospheric differential pressure p_e (e=excendens=exceeding). It is the difference between an absolute pressure p_{abs} and the respective (absolute) atmospheric pressure.

Over-pressures are created in the Testo industrial services pressure laboratory using highly accurate piston manometers and precision weights (Wika V 1600/1, Wika 6100, Wika M 2800, Wika HD 5000). Alternatively reference measuring instruments with electronic pressure sensors (Druck DPI 605, Wika CPG 8000) are used.

Absolute pressure meters

The clearest reference pressure is zero pressure, which exists in the airless space of the universe. A pressure which refers to this reference pressure is called absolute pressure. In order to distinguish it from other types of pressure, it is identified by the index abs. The reference pressure of 0 mbar is created in the Testo industrial services pressure laboratory with the help of a vacuum pump and an under-pressure chamber. Highly accurate piston manometers (Wika A 6100) with a corresponding set of weights guarantee the smallest measurement inaccuracies. Alternatively reference measuring instruments with electronic pressure sensors (Druck DPI 605, Wika CPG 8000) are used.

Calibration certificates pressure

Reference measuring instruments testo 521/526							
Differential	Part no.	DKD/		Accuracv	Calibration points/ra	inge	Part no.
pressure meters		ISO		, , , , ,			
testo 521-1	0560 5210	DKD	Standard	0.1 to 0.6	11 cal. points	0.2 mbar	0520 0215
0 100 hPa		ISO	Standard	0.1 to 0.6	5 cal. points	0 to 5000 bar	0520 0025
testo 521-2	0560 5211	DKD	Standard	0.1 to 0.6	11 cal. points	0.2 mbar	0520 0215
0 to 100 hPa		ISO	Standard	0.1 to 0.6	5 cal. points	0 to 5000 bar	0520 0025
testo 521-3	0560 5213	DKD	Standard	>0.6	6 cal. points	0.2 mbar	0520 0225
0 to 2.5 hPa		ISO	Standard	>0.6	5 cal. points	0 to 5000 bar	0520 0005
testo 526-1	0560 5280	DKD	Standard	0.1 to 0.6	11 cal. points	0.2 mbar	0520 0215
0 to 2000 nPa		ISO	Standard	0.1 to 0.6	5 cal. points	0 to 5000 bar	0520 0025
testo 526-2	0560 5281	DKD	Standard	á0.1	11 cal. points	0.2 mbar	0520 0205
0 to 2000 NPa		ISO	Standard	á0.1	5 cal. points	0 to 5000 bar	0520 0035
Highly accurate pressu	ire measuring i	nstrumer	nt testo 525				
Differential/over /sheelute	Deutara	DKD/		A			Dentere
pressure measuring instru-	Part no.	ISO		Accuracy	Calibration points/ra	inge	Part no.
ments	0560 5250	DKD	Standard	0.1 to 0.6	11 cal points	0.2 mbar	0520 0215
0 to 25 hPa	0300 3230		Standard	0.1 to 0.6	5 cal points	0.2 mbai	0520 0215
testo 525	0560 5251	חאם	Standard	0.1 to 0.6	11 cal points	0.2 mbar	0520 0215
0 to 200 hPa	00000201	ISO	Standard	0.1 to 0.6	5 cal points	0 to 5000 bar	0520 0025
testo 525	0560 5252	DKD	Standard	0.1 to 0.6	11 cal. points	0.2 mbar	0520 0215
0 to 1000 hPa	000000202	ISO	Standard	0.1 to 0.6	5 cal. points	0 to 5000 bar	0520 0025
testo 525	0560 5254	DKD	Standard	0.1 to 0.6	11 cal. points	0.2 mbar	0520 0215
0 to 7 bar		ISO	Standard	0.1 to 0.6	5 cal. points	0 to 5000 bar	0520 0025
testo 525	0560 5255	DKD	Standard	0.1 to 0.6	11 cal. points	0.2 mbar	0520 0215
0 to 10 bar		ISO	Standard	0.1 to 0.6	5 cal. points	0 to 5000 bar	0520 0025
testo 525	0560 5260	DKD	Standard	0.1 to 0.6	11 cal. points	0.2 mbar	0520 0215
0 to 25 hPa		ISO	Standard	0.1 to 0.6	5 cal. points	0 to 5000 bar	0520 0025
testo 525	0560 5261	DKD	Standard	0.1 to 0.6	11 cal. points	0.2 mbar	0520 0215
0 to 200 hPa		ISO	Standard	0.1 to 0.6	5 cal. points	0 to 5000 bar	0520 0025
testo 525	0560 5262	DKD	Standard	0.1 to 0.6	11 cal. points	0.2 mbar	0520 0215
0 to 1000 hPa		ISO	Standard	0.1 to 0.6	5 cal. points	0 to 5000 bar	0520 0025
testo 525	0560 5264	DKD	Standard	0.1 to 0.6	11 cal. points	0.2 mbar	0520 0215
U to 7 bar		ISO	Standard	0.1 to 0.6	5 cal. points	0 to 5000 bar	0520 0025
testo 525 O to 10 bor	0560 5265	DKD	Standard	0.1 to 0.6	11 cal. points	0.2 mbar	0520 0215
	0500 5070	ISO	Standard	0.1 to 0.6	5 cal. points	0 to 5000 bar	0520 0025
testo 525 0 to 1000 hPa	0560 5270	DKD	Standard	á0.1	11 cal. points	0.2 mbar	0520 0205
tosto 525	0560 5070	150	Standard	a0.1	11 col pointo	0.2 mbor	0520 0035
0 to 7 bar	0500 5272		Standard	a0.1	5 col pointe	0.2 mbai	0520 0205
testo 525	0560 5258		Standard	0.1 to 0.6	11 cal points	0.2 mbar	0520 0000
0 to 30 bar	0000 0200	ISO	Standard	0.1 to 0.6	5 cal points	0 to 5000 bar	0520 0025
testo 525	0560 5256	DKD	Standard	0.1 to 0.6	11 cal. points	0.03 to 70 bar / -1 to 70 bar	0520 0212
0 to 1100 hPa		ISO	Standard	0.1 to 0.6	5 cal. points	0 to 70 bar / -1 to 70 bar	0520 0125
testo 525	0560 5257	DKD	Standard	0.1 to 0.6	11 cal. points	0.03 to 70 bar / -1 to 70 bar	0520 0212
0 to 2000 hPa		ISO	Standard	0.1 to 0.6	5 cal. points	0 to 70 bar / -1 to 70 bar	0520 0125
testo 525	0560 5266	DKD	Standard	0.1 to 0.6	11 cal. points	0.03 to 70 bar / -1 to 70 bar	0520 0212
0 to 1100 hPa		ISO	Standard	0.1 to 0.6	5 cal. points	0 to 70 bar / -1 to 70 bar	0520 0125
testo 525	0560 5267	DKD	Standard	0.1 to 0.6	11 cal. points	0.03 to 70 bar / -1 to 70 bar	0520 0212
0 to +2000 hPa		ISO	Standard	0.1 to 0.6	5 cal. points	0 to 70 bar / -1 to 70 bar	0520 0125
testo 525	0560 5273	DKD	Standard	á0.1	11 cal. points	0.03 to 70 bar / -1 to 70 bar	0520 0222
0 to +2000 nPa		ISO	Standard	á0.1	5 cal. points	0 to 70 bar / -1 to 70 bar	0520 0135
Differential pressure m	easuring instru	emt <u>n tes</u>	to 520				
Difforential	Dort ne			A	Collibration points (m		Bart no
pressure meters	Рап по.	ISO		Accuracy	Calibration points/ra	inge	Part no.
testo 520	0560 5200	DKD	Standard	0.1 to 0.6	11 cal. points	0.2 mbar	0520 0215
0 to +200 hPa		ISO	Standard	0.1 to 0.6	5 cal. points	0 to 5000 bar	0520 0025
testo 520	0560 5201	DKD	Standard	0.1 to 0.6	11 cal. points	0.2 mbar	0520 0215
0 to +1000 hPa		ISO	Standard	0.1 to 0.6	5 cal. points	0 to 5000 bar	0520 0025
testo 520	0560 5202	DKD	Standard	0.1 to 0.6	11 cal. points	0.2 mbar	0520 0215
0 10 +2000 hPa	0.505.55	ISO	Standard	0.1 to 0.6	5 cal. points	0 to 5000 bar	0520 0025
testo 520	0560 5203	DKD	Standard	0.1 to 0.6	11 cal. points	0.2 mbar	0520 0215
010+101001		150	Standard	0.1 to 0.6	5 cal. points	U to 5000 bar	0520 0025

testo

ComSoft 3 - Basic: Easy operation, convenient analysis

ComSoft 3 - Basic

este

The Basic version has all the functions needed to monitor, analyse, save and print data. The data loggers are programmed and read out using the instrument drivers supplied. The limit values to be monitored can be defined as required; short titles, text fields and channel names ensure clear allocation if several loggers are in use.

Once read out, data can be shown in table or line graphics and then analysed.

The recipient's e-mail address can be entered when programming so that data can be easily forwarded through your locally installed e-mail program by simply clicking on "Send...". The saved e-mail address is then entered in the address box.

- Axes can be scaled as required
- Frequently used scales can be saved for future use
- Min/Max and mean calculation in tables
- Printout as table or graphic on all printers compatible with Windows
- Data export to other applications via clipboard
- Automatic search for instrument driver during initial operation (Autodetect)
- Crosshair function, fast scanning in graphics with direct value display

Comsoft 3 -Basic for:

Data loggers from the testo 177 series

Messprogramm 掹 Startkuterium III meteretter 10.0 min * Medirate Shopkalenam. bis Speicher voll ٠ 5 54.2 d Daver Kuhhaut 2 Kuzztikel Into ware, Sol nt -18 °C 1 F Senden en Mustemann@Musterfirma.com Stop 101 Abbrechen



Algemein



Analyzing measurement data

Comfort-Sof Kuhiraum 3 Palettenwar	tware V3 e, Sollwert	-18 °C		_testo 175	-11
Kiihlhaus 2	Datum	Uhrzeit	PCI Kanal 1		
1	13.02.02	16:43:56	23.2		
2	13.02.02	16:53:56	23,1	- 8	
3	13.02.02	17:03:56	23,1		
4	13.02.02	17:13:56	22.9		
5	13.02.02	17:23:56	22.9		
6	13.02.02	17:33:56	22.9	10	
7	13.02.02	17:43:56	22.9		
0	13.02.02	17:53:56	22.9	12	
100	1		110		
				10	
					_

Basic software with diagram and table function, incl. desk-top holder, PC connection cable

ComSoft 3 Set - Basic with

RS232 interface for testo 177:

Part no. 0554 1774

function, incl. desk-top holders, PC connection cable

ComSoft 3 Set - Basic with

USB interface for testo 177

Basic software with diagram and table

Part no. 0554 1767

 Accessories
 Part no.

 RS232 interface for testo 175/177 incl. desk-top holders, PC connection cable, (please also order for ComSoft 3 - Professional)
 0554 1757

 USB interface, for testo 175/177 incl. desk-top holders, PC conn. cable, 0554 1768
 0554 1768

(Please order with ComSoft 3 - Professional)

Table view/documentation

ComSoft 3 - Professional: Professional Software including Data Filing

ComSoft 3 - Professional

In addition to all the functions of the Basic version, the Professional also has extra display options (e.g. digit box, bar chart, analog instrument, xy plot) and convenient data filing. Measurement data can be stored in their own folders so that, for example, several data loggers from different locations can be organised in a tree structure. It is particularly recommended for instruments, which can manage many measurement logs e.g. the testo 580 data collector. The driver in this instrument is set up such that the directory structure of the Professional software is supported. The result is clear and comprehensible data handling.

- Adapt menus and range of functions
- Select different print heads when printing tables and graphics
- Extended display options such as digit box, bar chart, analog instrument and xy plot
- Input of mathematical functions with calculation on a new measurement channel
- Compensation functions 0 (mean) to 7th degree
- Developer ToolBox with functions for integrating the instrument driver in non-Testo software

 SOftware
 analysis, trend curve

 Part no.
 0554 0841

 Accessories
 Part no.

 RS232 interface for testo 175/177 incl. desk-top holders, PC connection cable, (please also order for ComSoft 3 - Professional)
 0554 1757

 USB interface, for testo 175/177 incl. desk-top holders, PC conn. cable, 0554 1768 (Please order with ComSoft 3 - Professional)
 0554 1768

Comsoft 3 -Professional for: • Data loggers of the testo 177

and 171 series

management

(without interface)

Part no. 0554 0830

Reference measuring

950/650/400/521/526

ComSoft 3 - Professional with data

incl. database, analysis and graphics

ComSoft 3 - Professional with mea-

surement site management for testo

incl. connection line RS232, database,

0554 1781

analysis and graphic function, data

function, data analysis, trend curve

instruments testo

Interface, attachable to testostor 171 data logger

cfrfILES 93333 information information Stock 21_11 Lagerüberwachung 21. Lagerüberwachung CE E F T171 SN 508 1897 004 T171 SN 508 1897 0049 sar 20000629 M2 M1 testo 945 20000815 20000823

Structured filing of measured data and parameters in folders, locations, logs and channels

Software for requirements according to CFR 21 Part 11

CFR 21 Part 11

A validation-compatible ComSoft 3.4 Version 21 CFR 11 has been developed especially for the management and filing of process data. All FDA requirements can be fulfilled if used as part of a cohesive system:

- User management in User Groups by Administrator (using Windows 2000 Rights management and three additional ComSoft-specific user groups)
- Save raw data in tamper-proof file format
- Identification of damaged or modified raw data
- Recognition of transfer errors using proof totals
- Inactivity lockout to prevent unauthorised access
- Monitors logins and logouts, successful/failed use of digital signatures and modification of raw data with the aid of Audit Trail
- · Complete integration in the

Windows 2000 security system (certificates, rights management, user and password management, user authentification)

Option of data export in generally readable PDF file format e.g. to send to the FDA validation point responsible or to display during a company audit.

ComSoft 3.4 version 21CFR11 for loggers 177, 171 and reference measu-

ComSoft 3.4 version 21CFR11 for

0554 0599

Multiple licence on request

testo 454 with databus controller

Ordering data

ring instruments testo

950/650/400/521/526

Part no. 0554 0821

Part no.



User management in groups



Display: Limit value violation in table format





Graphic display of readings

esto

Measurement technology for measuring temperature

Sensor type selection

The probe type is determined by the measurement task. The selection of the most suitable temperature sensor is made according to the following criteria:

• Measurement range

C-10

- Accuracy
- Measurement site design
- Reaction time
- Durability

In order to be able to provide the right probe for your requirements, Testo offers a large selection of sensor elements and temperature measuring instruments:

- Thermocouples
- Resistance sensor (Pt100)
- Thermistors (NTC)

Thermocouples

Temperature measurement with thermocouples is based on the thermoelectric effect. Thermocouples consist of two wires spot-welded to each other and made of different metals or metal alloys. The basic values of the thermoelectric voltages and the permitted tolerances of thermocouples are defined in the norms IEC 584. The most common thermoelement is NiCr-Ni (type designation K).

Resistance sensors (Pt100)

Accuracy data

Measurement technology temperature

When measuring temperature with resistance sensors, use is made of the temperature sensitive resistance change in the platinum "resistance".

The measurement resistance is supplied with a constant current and the voltage drop, which changes with the resistance value via the temperature, is measured. Basic values and tolerances for resistance thermometers are defined in the IEC 751.

Thermistors (NTC)

Temperature measurement with thermistors is also based on a temperature-dependent change of resistance in the sensor element. Contrary to resistance thermometers, thermistors have a negative temperature coefficient (resistance becomes smaller with increasing temperature). Characteristic curves and tolerances are not normed.



Temperature measurement thermocouples

Measurement	Temperature range	Class	Permitted tolerances		
value sensor			fixed value	Referred to temperature	
Thermocouple	-40 +1000 °C	1	±1.5 °C	±0.004 • Itl	
Typ K (NiCr-Ni)	-40 +1200 °C	2	±2.5 °C	±0.0075 • Itl	
	-200 +40 °C	3	±2.5 °C (-167 +40 °C)	±0.015 • Itl (-200 to -167.1 °C)	
Тур Т	-40 +350 °C	1	±0.5 °C	±0.001 • ltl	
Тур Ј	-40 +750 °C	1	±1.5 °C	±0.004 • Itl	
Pt100	± (0.3 + 0.005 • Itl) ± (0.3 + 0.005 • Itl)				
	-200 +600 °C	А	± (0.15 + 0.002 • Itl)		
NTC	-5025.1 °C		±0.4 °C		
(Standard)	-25 +74.9 °C	_	±0.2 °C		
	+75 +150 °C		±0.5 % of full scale value		
NTC	-3020.1 °C		±1 °C		
(High temp.)	-20 0 °C	—	±0.6 °C		
	+0.1 +75 °C		±0.5 °C		
	+75.1 +275 °C	− °C	± 0.5 °C ± 0.5 % of full scale value		

Data for thermocouples according to EN 60584-2 (formerly IEC 584-1).

Data for Pt100 according to EN 60751 (formerly IEC 751). No standardization exists for NTC sensors.

Measurement technology for measuring temperature

Accuracy thermocouples

Data for thermocouples to EN 60584-2 (formerly IEC 584-1). Two values are given, one fixed value in °C and one formula. The larger value always applies.

For thermocouples of Class 1, the accuracies are specified for the measuring range -40 to +1000°C.

For thermocouples of Class 2, the accuracies apply for the measuring range -40 to +1200 °C

For thermocouples of Class 3, the accuracies apply for the measuring range -200 to +40.1 °C



Type J + Type K; Class 2 (Type J only up to +750 °C) --- Type T; Testo probe

Accuracies Pt100/NTC

Data for Pt100 according to EN 60751 (formerly IEC 751). No standardization exists for NTC measurement values sensors.

In addition to fast and reliable thermocouple probes, Pt100 probes according to EN 60751 (formerly IEC 751) or selected high-precision probes based on Pt100 with 1/10 DIN accuracy are also available. These wound precision sensors are 10 times more accurate than "normal" Pt100 sensors, which are already very accurate. Applied to Class B, whose error is $\pm 0.3 + 0.005 \text{ x}$ I temperature I, this means an error of only ±0.03

+ 0.0005 x I temperature I.



Measurement technology for measuring temperature

Probe design selection

Reaction time	
t ₉₉ -Time =	Time until probe shows
	99% of temperature
	change
t ₉₉ =	4.6 x t ₆₃ - Time
t ₉₉ =	2 x t ₉₀ - Time

Durability

The probe shaft of thermocouple probes is made of Inconel (2.4816). In all other designs, stainless steel V4A (1.4571) is used for the probe shaft. The high quality material used generally ensures sufficient resistance to corrosive substances. Testo offers glass-coated probes for applications in highly corrosive media.

Immersion-penetration probe



Immersion probe (NiCr-Ni, Pt100, NTC) for measurements in liquids, but also for measurements in powdery substances or in air.



Penetration probes (NiCr-Ni, Pt100, NTC) for measurements in plastic or paste-like media.

Information

- The specified reaction time t_{gg} is measured in moving liquid (water) at 60 °C.
- Generally, the thinner the probe, the faster it is and the shallower the necessary immersion depth into the measurement object.
- In order to be able to assume the real temperature of the measurement object, the probe must be immersed into the measurement object at least 10 x the diameter of the probe (better still 15 x diameter).
- However: The thinner the probe, the more carefully it has to be handled.
- Thermocouple probes can be manufactured with a very small diameter (0.25 mm) and are therefore ideal for fast measurements and measurements made on small objects.
- Resistance sensors can be manufactured at low cost with a diameter of 2 mm, but are usually more accurate than thermocouple probes.

Air probes



(NiCr-Ni, Pt100, NTC) In order to enable fast measurement, the sensor usually lies bare.

- \bullet The specified reaction time t_{gg} is measured in a wind tunnel at 2 m/s and 60 °C.
- Immersion/penetration probes can also be used for air measurements. However, the reaction time is 40 to 60 times higher than the specified value which was measured in water.

Surface probes



Design in NiCr-Ni, Cu-CuNi; Pt100; NTC probes. With a widened measurement tip for measurements on smooth, flat surfaces. For optimum heat transfer we recommend silicone conductive paste (Tmax 260 °C)

Advantage:

- Robust design
- Higher sensor accuracy

Disadvantage:

- Long reaction time
- Requires exact handling

Only suitable for smooth surfaces and objects with a high heat capacity, e.g. large metal objects.



Design in NiCr-Ni probes

Our recommendation for fast measurements, also on rough surfaces: Use the patented cross-band measurement head with a sprung thermocouple band. The cross-band takes on the actual temperature of the measurement object in only a few seconds:

- Easy handling (without silicon heat conductive paste)
- Fast measurement result

Information

- The specified reaction times t_{gg} are measured on polished steel or aluminium plates at 60 °C.
- The specified accuracies are sensor accuracies.
- The accuracy in your applicatiion is dependent on the surface texture (roughness), the material of the measurement object (heat capacity and heat transfer) as well as the sensor sccuracy. Testo provides the corresponding calibration certificate for the deviations of the measurement system in your application. For this purpose, Testo uses a surface test rig developed in cooperation with the German Federal Physical and Technical Institute (PTB).

Measurement technology for measuring pressure

urement

pressure 1

Different pressure types

Absolute pressure (P_{abs})

The pressure which applies to the airless space of the universe (zero pressure), is referred to as absolute pressure.

Absolute pressure is identified by the index "abs".

Differential pressure,

pressure difference (Δp) The difference between two pressures p1 and p2 is referred to as a pressure difference ($\Delta p = p_1 - p_2$). If the difference between two pressures represents the measurement parameter, it is referred to as differential pressure (p1,2).



Measurement

pressure 2

Atmospheric pressure difference, positive pressure

Atmospheric pressure difference (p_e) is the difference between an absolute pressure (p_{abs}) and the respective atmospheric pressure (pe = pabs - pamb). This is simply referred to as positive pressure.



Pressure sensitive element

Atmospheric air pressure (Pamb)

This is the most important pressure for life on earth. Atmospheric pressure is created by the weight of the atmosphere surrounding the earth. The atmosphere reaches an altitude height of approx. 500 km. Pressure decreases constantly up to this altitude (absolute pressure P_{abs} = zero). Atmospheric air pressure is also influenced by fluctuations in the weather. The average P_{amb} at sea level is 1023.25 hectopascal (hPa) or millibar (mbar/normal pressure according to DIN 1343). Typically this value can fluctuate by ±5 % if there are low or high pressure weather areas.

The measurement principle

In the construction of pressure measuring instruments, the principle of pressure influence on a defined area is almost always used. It is thus redused to a measurement of force. The following interrelationship then applies:

Pressure sensitive element

Pressure (p) =	Force (F)
	Area (A)

Pressure gauges

Advantages of electronic pressure gauges

In sprung-elastic pressure gauges, a deflection of 1-3 mm occurs. In electrical pressure sensors, the deformation amounts to inly a few µm. Because of this very slight mechanical deformation, electrical pressure gauges / sensors show excellent dynamic performance and very low wear. The result of this is high durability and long-term stability. The electrical pressure gauges are also available in verv small designs. A further advantage is the exact legibility of the display. An accurate measurement of pressure is becoming more and more important with today's state-oftechnology. Precision measuring instruments have an accuracy of 0.05& of the final value. In mechanical manometers, such accuracies cannot be read because of parallax error and the mechanical performance of the springs. Some of the electrical precision instrument with an LCD display have a resolution in the thousandth range of 0.001. Types of pressure gauge

Liquid pressure measuring instruments – U-tube manometer

Inclined tube manometer

- Multi-liquid manometer
- Float manometer

Pressure balances with sealing liquid

Piston pressure measuring instruments

- Piston pressure measuring instruments with spring-loaded piston
- Piston pressure balances

Elastic pressure measuring instruments

- Electric pressure sensors and pressure measuring instruments – Sensor principles with strain measuring instruments
- Sensor principles with path measurement
- Compression meter
- Ionisation pressure meter
- Friction meter
- Measurement technology pressure

Conversion table for the most important pressure units

	Pa	hPa/mbar	kPa	MPa	bar	psi	mmH ₂ O	inH ₂ O	mmHg	inHg
Pa	1	100	1.000	1.000.000	100.000	6.895	9.807	249.1	133.3	3.386
hPa/mbar	0.01	1	10	10.000	1.000	68.948	0.09807	2.491	1.333	33.864
kPa	0.001	0.1	1	1.000	100	6.895	0.009807	0.2491	0.1333	3.386
MPa	0.000001	0.0001	0.001	1	0.1	0.006895	0.000009807	0.0002491	0.0001333	0.003386
bar	0.00001	0.001	0.01	10	1	0.0689	0.00009807	0.002491	0.001333	0.0339
psi	0.0001451	0.0145	0.14505	145.05	14.505	1	0.001422	0.0361	0.0193	0.4912
mmH ₂ O	0.102	10.2	102	102.000	10.200	704.3	1	25.4	13.62	345.9
inH ₂ O	0.004016	0.4016	4.016	4.016	401.6	27.73	0.0394	1	0.5362	13.62
mmHg	0.007501	0.7501	7.501	7.501	750.1	51.71	0.0734	1.865	1	25.4
inHg	0.0002953	0.0295	0.2953	295.3	29.53	2.036	0.002891	0.0734	0.0394	1

Measurement technology for measuring humidity

Testo's humidity sensor

testo

With its humidity sensor, developed more than fifteen years ago and since then continually improved, our attention was focussed from the start on two accuracy parameters, measurement uncertainty and long-term stability. The basic design was developed by Testo and has since been reverse engineered by several manufacturers: a polymer sensitive to humidity serves as a dielectric between two condenser electrodes. However, its distinctive feature is the way in which the individual layers lie perfectly on top of each other. This is particularly clear in the top electrode which has to carry out two tasks which, at first glance, appear to be contradictory: it must be permeable for the water vapour which is to be fed to the polymer dielectric. But it must also be leak-proof, smooth and capable of repelling condensate, oil and dirt particles in order to protect the sensor. This combination has succeeded perfectly in Testo's

humidity sensor thanks to extensive research. On account of this design and Testo's highly stable manufacturing and adjustment, it is possible to guarantee a measurement inaccuracy of ±2 %RH or also of ± 1 %RH. In addition, the humidity sensor is also longterm stable. This was proven in inter-laboratory tests which involved sending several Testo humidity sensors to a number of international calibration laborato-

ries (PTB, NIST etc.) where the ±1 %RH limit was not exceeded, without the need for readjustment.



Dielectric layer Polymer, dielectric constant depends on relative humidity

Bottom electrode

Connection pins Special anti-corrosion design mechanical protection



Country	1 Germany	2 France	3 USA	4 Italy	5 England	6 Spain	7 Japan	8 Korea	9 China	10 Germany
Institute	PTB	CETIAT	NIST	IMGC	NPL	INTA	JQA	KRISS	NRCCRM	PTB
Arrival	04/96	10/96	12/96	07/97	09/98	10/98	03/99	05/00	10/00	03/01
Departure	08/96	10/96	05/97	10/97	09/98	10/98	04/00	09/00	12/00	08/01

Measurement technology for measuring humidity

Testo humidity sensor

With the humidity sensor developed by Testo's own experts, the company has succeeded in considerably extending the areas of application for capacitive sensors.

- Use in temperatures up to +180 °C
- Dewpoint determination from 50 °C to +100 °C
- Long-term drift-free measurement under extreme conditions
- Very accurate in the high humidity range (>95 %RH)

The excellent properties of the Testo humidity sensor are:

- Accuracy
- Long-term stability
- Temperature stability
- Robustness

Endurance test

More than 100 sensors were exposed to the stated test conditions. The sensors were measured before and after in a climate cabinet.

The technical data

Measuring range: 0 to 100 %RH

Temp. range: -40 to +180 °C

Hysteresis (3 h cycle 15...90...15 %RH): < 1.0 %RH

Reaction time t90: < 15 sec.

Temp. dependency: 0.03 %RH/°C

Dewpoint td: -50 to +100 °C

Reproduceability: < 0.03 %RH

Reference humidity probe for highest accuracy

- Accuracy: ± 1 %RH within 15-30 °C and 10-90 %RH, outside this range the accuracy ± 1 %RH + 0.03 %RH per degree of temperature difference from 25 °C applies.
- 2 years guaranteed long-term stability under normal conditions

The arguments for the Testo humidity sensor

- 1. 24h in cooled (20 °C) flue gas at 90 %RH: The flue gas from an oil burner ($O_2 = 5.9$ %, CO = 70 ppm, NO_x = 50 ppm, SO₂ = 70 ppm)was drawn out of the flue into a container with the sensors and automatically cooled
- 2. 2 h in the smoke from 3000 cigarettes/m³
- 3. 5 minutes in tap water
- 4. 12 months in a weather house, July '90 to July '91
- 5. 5 minutes immersion in isopropyl alcohol
- 6. 6 months in silica gel at 20 °C/0.1 %RH
- 7. 3 months at -25 °C/95 %RH
- 8. 3 months in 92 %RH (at 20 °C)
- 9. Shock test: 16 h at -20 °C -> 10 mins boiling water -> still wet in -20 °C for 1 h -> convection oven at +125 °C for 3 h
 - -> shocked in ice water at +4 °C and left immersed for 5 mins
 - -> 5 mins heating at 125 °C

- 10. 9 months in a cheese factory: 7 °C/70 %RH
- 11. 9 months in a chickencoop: 15 °C/80 %RH
- 12. 9 months in a pigsty: 17 °C/70 %RH
- 13. 5 h in an convection oven: 150 °C/10 %RH
- 14. 30 days in high humidity: 20 °C/98 %RH
- 15. 7 days wood drying process: 20 to 80 °C/90 to 15 %RH

The display performance was not influenced by more than $\pm 1\%$ RH by the endurance testo

Applications

Over 100,000 Testo humidity sensors are in use world-wide, in portable hand instruments, in measurement storage instruments and in stationary measurement transmitters

- In the tobacco industry
- For monitoring the room climate in IT rooms
- For the storage of sensitive goods
- In garden centres and greenhouses
- In the food sector
- In wood production
- In the pharmaceutical industry
- In drying processes
- and... and... and...

Determination of dewpoint td:

- In compressed air
- $-\ln CO_2$
- In natural gas
- In O₂

Measuring technology for flow velocity measurement

General

Probe selection

- The flow measuring range 0 to 100 m/s can be divided into three sections:
- Low-speed velocity 0 to 5 m/s
- Mid-speed velocity 5 to 40 m/s
- High-speed velocity 40 to 100 m/s.

Thermal probes are used for accurate measurements in the range 0 to 5 m/s. Vane probes are ideal for velocities ranging from 5 to 40 m/s. The measuring range of the Pitot tube depends on the differential pressure probe used. The new 100 Pa probe can therefore be used for the exact measurement of flow speed from approx. 1 m/s to 12 m/s. The Pitot tube yields optimum results in the higher velocity range. An additional criterion when selecting the right velocity probe is the temperature. Thermal sensors can normally be used at up to approx. +70 °C. Special design vane probes can be used to max. +350 °C. Pitot tubes are used for temperatures above +350 °C.

Measurement and application ranges of the velocity probes



Location selection

You should measure in a straight part of the duct, if possible. The duct part should have a minimum of ten diameters of straight run upstream the measuring point and four diameters of straight run downstream the measuring point. The flow profile should not be interrupted in any way by flaps, reducers, angles etc.



Thermal probes

Thermal probes

The principle of the thermal probe is based on a heated element from which heat is extracted by the colder impact flow. Temperature is kept constant via a regulating switch. The controlling current is directly proportional to the velocity. When thermal velocity probes are used in turbulent flows, the measured result is influenced by the flows impacting the heated body from all directions. In turbulent flows, a thermal velocity sensor indicates higher measured values than a vane probe. This can be observed especially during measurements in ducts. Depending on the design of the duct, turbulent flows can occur even at low velocities.



Thermal hot wire probe for measuring velocity, with direction recognition function

Vane probes

Vane probes

The measuring principle of the vane probe is based on the conversion of a rotation into electric signals. The flowing agent makes the vane rotate. An inductive proximity switch "counts" the revolutions of the vane and supplies a pulse sequence which is converted in the measuring instrument and is then indicated as a velocity value. Large diameters (Ø 60 mm, Ø 100 mm) are suitable for the measurement of turbulent flows (e.g. at outlet ducts) at smaller or medium velocities. Small diameters are more suitable for measurements in ducts; in which case the duct crosssection must be 100 times bigger than the probe cross-section being impacted.





Vane probes, advice on use

Positioning in the air flow

The vane probe is set exactly if the flow direction is parallel to the vane axis.

If the measuring probe is turned slightly in the air current, the value shown in the instrument changes. The measuring probe is positioned exactly in the air current if the value shown is at max.

When measuring in a duct there should also be a minimum of ten diameters of straight run upstream the measuring point and four diameters of straight run downstream the point for best results. By design, vanes are less influenced by turbulence than thermal probes or Pitot tubes.



Measuring flow velocities in ducts

As part of approval measurements, indirect measuring methods (grid measurements) are used to measure air flows.

The following methods are suggested in VDI 2080/EN 12599:

- Trivial method for grid measurements in square cross-sections.
- Centroidal axis methods for grid measurements in circular cross-sections
- Loglinear method for grid measurements in circular cross sections.

Please request! Detailed information on air flow measurement can be found in the informative Testo climate guide.

Measuring technology for flow velocity measurement

Vane probes, advice on use

Air vent/extraction

The air outlet grid greatly changes the relatively uniform flow inside the duct. Areas of higher flow velocity are created at the free vent surfaces and areas of low flow velocity and swirl at the grids. The flow profile steadies at a distance from the grid depending on the grid design but is usually 20 cm. For best accuracy, a large diameter vane is recommended. Large vane areas help to get an average reading of the turbulent flow from the grid.

Max. values Min. values Mean values

Taking measurements at intake openings using the volume flow measuring funnel

Even without the disturbing effects of a grid in an aperture, the lines of flow are not directional and the flow profile is irregular. Because a partial vacuum in the duct draws air out of the room in a funnel shape, even at a short distance from the aperture, there is no defined area in the room over which a volume flow measurement could be made.

Therefore, only the duct or funnel measurement yields reproducible results. Measuring funnels of various sizes are available for such applications.

These create defined flow conditions at some distance from the poppet valve in a fixed cross-section. A velocity probe is positioned centrally and secured at this point.

The extracted volume flow is calculated from the velocity probe reading multiplied by the funnel factor (e.g. funnel factor 22).



The Pitot tube

Flow velocity using a Pitot tube

The total pressure is transferred to connection (a) of the pressure probe via the Pitot tube aperture. The purely static pressure is taken on via the lateral slots and passed on the the connection (b). The differential pressure resulting from this is the velocity-dependent dynamic pressure. This is evaluated and displayed. Similarly to thermal probes, the Pitot tube is more likely to react to turbulent flows than a vane probe. It is therefore important to ensure uninterrupted inflow and outflow stretches in Pitot tube measurement.



Velocity in m/sPitot tube factor

= Air density in kg/m³

 Differential pressure in Pascal measured at Pitot tube



Measurement errors are often caused by calculating with a mean density of 1200 g/m³. When measuring outdoor air flows, the actual air density can deviate by up to \pm 10% of the above value. This results in an inaccuracy of the air flow of up to \pm 5%. Here you can make use of the possibilities of testo 400/testo 521 via the configura-

tion menu.

- Activate the automatic conversion of the Pitot tube pressure into the flow velocity.

 It is important that you first enter the correct air density or the absolute pressure, temperature and humidity in the configuration menu. The testo 400/testo 521 automatically calculates the density on the basis of the measured values.





CS10

Measuring technology flow velocity

Calibration Services / Certificates



Who needs DKD calibration certificates?

In Germany, laboratories have been working for approximately 30 years under the state-approved supervision of the German Calibration Service (DKD). The laboratories function in the name of the State in order to guarantee quality and efficiency in the measurement industry. DKD laboratories are therefore "semi-official" points which are monitored on a regular basis. The calibration results achieved in these laboratories have - in accordance with the German Federal Institute for Physics (PTB) - the highest reliability level and are legally recognised. They also apply internationally. DKD calibration certificates are for all users of measuring instruments requiring a particularly high efficiency level. For example, factory measurement standards, with which other testing equipment is calibrated, is often "backed up" by a DKD calibration certificate. DKD calibration certificates are also required for measuring instruments in medical technology or the pharmaceutical industry.

DKD calibration certificates for:

- Factory measurement standards
- Pharmaceutics
- Medical technology
- Specialists
- High accuracy

DKD calibration certificates are available in the following language versions:

German, English, FrenchGerman, Italian, Spanish

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ISO calibration certificates

The QS systems in industrial companies have been ISO 9000:2000 certified since 1987. Nowadays, even services such as banks, insurance companies and hospitals cannot avoid this trend. Other sector-specific quality guidelines are GMP, FDA (pharmaceutics / medical technology) and ISO TS 16949, QS 9000, VDA (vehicle industry)

The implementation and maintenance of testing equipment calibration and monitoring is required for all guidelines and standards. ISO calibration certificates are the lower-priced alternative to DKD calibration certificates.

Testo's ISO calibration certificates fulfil all the requirements of

- ISO 9000:2000
- •ISO 10012-1
- GMP
- FDA
- •QS 9000
- VDA
- ISO TS 16949
- HACCP

testo

Notes

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Notes

Notes

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Always at your service!

Please send for more information:

Monitoring Instruments for Food Production, Transport and Storage	Measuring Instruments For Temperature
Measurement Engineering for Restaurants, Catering and Supermarkets	Measuring Instruments for Humidity
Measurement Engineering for Air Conditioning and Ventilation	Measuring Instruments For Velocity
Measurement Engineering for Heating and Installation	Measuring Instruments for Pressure and Refrigeration
Measurement Solutions for Emissions, Service and Thermal Processes	Multi-Function Measuring Instruments
Measurement Solutions for Refrigeration Technology	Measuring Instruments for Flue Gas and Emissions
Stationary Measurement Solutions for Air Conditioning, Drying, Clean-	Measuring Instruments for RPM, Analysis, Current/Voltage
rooms and Compressed Air	Measuring Instruments For Indoor Air Quality, Light And Sound
Measurement Solutions for Production, Quality Control and Mainten-	Stationary Measurement Technology Humidity / Differential Pres-
ance	sure / Temperature / Process Displays
Measurement Solutions for Climate Applications in Industry	Stationary Measurement Technology Compressed Air Humidity /
Reference Measurement Technology for Industry	Compressed Air Consumption



Icon explanation







Multi-channel measuring instrument (number of probe inputs >1)

Measurement data store



Backlit display

User-friendly operation thanks to menu-guided processes

field use













Probe/sensor selection

integrated in the instrument

SoftCase or TopSafe for protecting the instrument in rough

Impact-proof



Infrared printer Reliable on-location paper docu-

mentation of measurement results

PC interface for analysis of measurement data on the PC

Battery and rechargeable battery operation possible

Rechargeable battery can be charged in instrument

Radio probe connectable



9		

testo

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