



testo 549 - testo 550 . Digital manifold

Instruction manual



1 Contents

1	Contents	3
2	Safety and the environment	4
	2.1. About this document.....	4
	2.2. Ensure safety.....	4
	2.3. Protecting the environment.....	5
3	Specifications	5
	3.1. Use	5
	3.2. Technical data	6
	3.2.1. Bluetooth module (testo 550).....	6
	3.2.2. General technical data	7
4	Product description	9
	4.1. Overview	9
5	First steps	10
6	Using the product	12
	6.1. Preparing for measurement.....	12
	6.1.1. Switching the instrument on.....	12
	6.1.2. Connecting the temperature sensor	13
	6.1.3. Switching Bluetooth® on and off (testo 550)	15
	6.1.4. Selecting the measuring mode	15
	6.2. Performing the measurement	16
7	Maintaining the product	18
8	Tips and assistance	19
	8.1. Questions and answers	19
	8.2. Measurement parameters	19
	8.3. Error reports	20
	8.4. Accessories and spare parts	20
9	EC declaration of Conformity	21



2 Safety and the environment

2.1. About this document

Use

- > Please read this documentation through carefully and familiarize yourself with the product before putting it to use. Pay particular attention to the safety instructions and warning advice in order to prevent injuries and damage to the products.
- > Keep this document to hand so that you can refer to it when necessary.
- > Hand this documentation on to any subsequent users of the product.

Symbols and writing standards

Representation	Explanation
	Warning advice, risk level according to the signal word: Warning! Serious physical injury may occur. Caution! Slight physical injury or damage to the equipment may occur. > Implement the specified precautionary measures.
	Note: Basic or further information.
Menu	Elements of the instrument, the instrument display or the program interface.
[OK]	Control keys of the instrument or buttons of the program interface.

2.2. Ensure safety

- > Do not operate the instrument if there are signs of damage at the housing, mains unit or feed lines.
- > Do not perform contact measurements on non-insulated, live parts.
- > Do not store the product together with solvents. Do not use any desiccants.

- > Carry out only the maintenance and repair work on this instrument that is described in the documentation. Follow the prescribed steps exactly. Use only original spare parts from Testo.
- > Dangers may also arise from the systems being measured or the measuring environment: Note the safety regulations valid in your area when performing the measurements.
- > If the measuring instrument falls or another comparable mechanical load occurs, the pipe sections of the refrigerant hoses may break. The valve positioners may also be damaged, whereby further damage to the interior of the measuring instrument may occur that cannot be identified from the outside. The refrigerant hoses must therefore be replaced with new, undamaged refrigerant hoses every time the measuring instrument falls or following any other comparable mechanical load. Send the measuring instrument to Testo Customer Service for a technical check for your own safety.
- > Make sure that your refrigeration system is properly earthed, as otherwise the measuring instrument might get damaged.

2.3. Protecting the environment

- > Dispose of faulty rechargeable batteries/spent batteries in accordance with the valid legal specifications.
- > At the end of its useful life, send the product to the separate collection for electric and electronic devices (observe local regulations) or return the product to Testo for disposal.
- > Refrigerant gases can harm the environment. Please note the applicable environmental regulations.

3 Specifications

3.1. Use

testo 549 and testo 550 are digital manifolds for maintenance and service work on refrigeration systems and heat pumps. They may only be used by qualified authorized personnel.

The functions of the testo 549 and testo 550 mean they can replace mechanical manifolds, thermometers and pressure/temperature charts. Pressures and temperatures can be applied, adapted, tested and monitored.

testo 549 and testo 550 are compatible with most non-corrosive refrigerants, water and glycol. testo 549 and testo 550 are not compatible with refrigerants containing ammonia.

The instruments must not be used in explosive environments!

3.2. Technical data

3.2.1. Bluetooth module (testo 550)

i The Bluetooth® option may only be operated in countries in which it is type approved.

Feature	Values
Bluetooth	Range > 20 m (free field)
Bluetooth type	LSD Science & Technology Co., Ltd L Series BLE module (08 May 2013) based on TI CC254X chip
Qualified Design ID	B016552
Bluetooth radio class	Class 3
Bluetooth company	10274

Certification

Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

EFTA countries

Island, Suisse, Norway, Lichtenstein.

Other countries

USA, Canada, Turkey, Hong Kong, Australia, New Zealand.

Information from the FCC (Federal Communications Commission)

This device complies with part 15 of the FCC Rules. Its commissioning is subject to the following two conditions: (1) This device may not cause harmful interference and (2) this device must be able to accept interference, even if this could have undesired effects on the operation.

Changes

The FCC demands that the user be informed that any changes or modifications to the instrument that are not explicitly approved by testo AG may void the user's right to use this instrument.

3.2.2. General technical data

Characteristic	Values
Parameters	Pressure: kPa / MPa / bar / psi Temperature: °C/°F/K
Sensor	Pressure: 2 x pressure sensor, temperature: 2 x NTC
Meas. cycle	0,5 s
Measurement channels	Quantity: 4
Interfaces	Pressure connections: 3 x 7/16" UNF NTC measurement
Measuring ranges	HP/LP pressure measuring range: -100 to 6000 kPa / -0.1 to 6 Mpa / -1 to 60 bar (rel) / -14.7 to 870 psi Temperature measuring range: -50 to +150 °C / -58 to 302°F Vacuum measuring range (rel): -1 to 0 bar / -14.7 to 0 psi
Overload	65 bar, 6500 kPa, 6,5 Mpa, 940 psi
Resolution	Pressure resolution: 0.01 bar/0.1 psi/ 1 kPa/0.001 MPa Temperature resolution: 0.1 °C/0.1 °F
Accuracy (nominal temperature 22 °C/71.6 °F)	Pressure: ±0,5 % of full scale (±1 digit) Temperature (-40...150°C): ±0.5 °C (±1 digit) /0,9°F (±1 Digit)
No. of refrigerants	60

Characteristic	Values
Selectable refrigerants	No refrigerant, R11, R12, R22, R123, R1234ze, R125, R13B1, R134a, R14, R142B, R152a, R161, R23, R227, R290, R32, R401A, R401B, R401C, R402A, R402B, R404A, R406A, R407A, R407B, R407C, R407D, R407F, R408A, R409A, R410A, R411A, R412A, R413A, R414B, R416A, R417A, R420A, R421A, R421B, R422A, R422B, R422C, R422D, R424A, R426A, R427A, R434A, R437A, R438A, R502, R503, R507, R508A, R508B, R600, R600a, R718 (H ₂ O), R744 (CO ₂) (only in measuring range up to 60 bar), R1234yf
Measurable media	Measurable media: All media that are stored in the testo 549 and testo 550 Not measurable: Ammonia (R717) and other refrigerants which contain ammonia
Ambient conditions	Operating temperature: -20 to 50 °C/ -4 to 122 °F Storage temperature: -20 to 60 °C/ -4 to 140 °F
Housing	Material: ABS/PA/TPU Dimensions: 265 x 135 x 75 mm Weight: approx. 1000 g (without batteries)
IP class	42
Power supply	Current source: Rechargeable batteries/batteries 4x 1.5 V, type AA/mignon/LR6 Battery life: approx. 250h (display light off, Bluetooth off)
Display	Type: Illuminated LCD Response time: 0.5 s
Directives, standards and tests	EC Directive: 2014/30/EC
Warranty	Duration: 2 years Warranty conditions: see website www.testo.com/warranty

4 Product description

4.1. Overview


Display and control elements



- 1 Mini-DIN probe socket for NTC temperature probe, with socket cover
- 2 Foldable suspension device (on rear)
- 3 Display. Instrument status icons:

Icon	Significance
	Battery capacity
	Bluetooth®, (see Switching Bluetooth® on and off (testo 550), page 15)
	Select measuring mode (see Selecting the measuring mode, page 15)

- 4 Battery compartment. It is not possible to charge rechargeable batteries in the instrument!
- 5 Control keys:

Key	Function
[Set]	Set units
[R, ►, ■]	Select refrigerant/ Start/stop / Tightness test
[Mode]	Switching measuring mode
[Min/Max/Mean]	Display min./max./mean values
[▲]	Up key: Change display view
[P=0]	Pressure zeroing
Esc	Switches to the measurement/home view
[▼]	Down key: Change display view
	Switching the instrument on/off Switch the display illumination on/off.

- 6 Sight glass for refrigerant flow
- 7 2 x valve positioner
- 8 3 x hose parkers for refrigerant hoses
- 9 3 x connections 7/16" UNF, brass
Left/right: Low pressure/high pressure, for refrigerant hoses with quick connect fitting, passage can be locked via valve positioner. Centre: for refrigerant bottles, for example, with sealing cap.
- 10 On the back below the battery compartment cover, mini-USB connection for firmware update.

5 First steps

Inserting batteries/rechargeable batteries

1. Fold out the suspension device and open the battery compartment (clip lock).
2. Insert batteries (included in delivery) or rechargeable batteries (4x 1.5 V, type AA/Mignon/LR6) in the battery compartment. Observe the polarity!
3. Close the battery compartment.
 - After inserting the batteries, the instrument switches on automatically and goes into the settings menu.



When not in use for long period: Remove batteries/rechargeable batteries.




Performing settings

1. Press **[Set]** repeatedly,
2. Press **[▲]** or **[▼]** to select the unit/parameter.
 - The settings will be accepted once the last selection has been made.

Key functions

Representation	Explanation
[▲] or [▼]	Change parameter, select unit
[Set]	Select units/parameters

Adjustable parameters

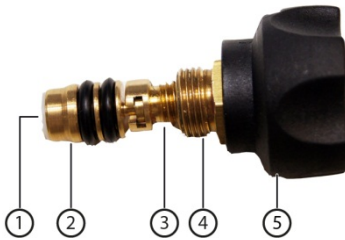
Representation	Explanation
°C, °F	Set temperature unit.
bar, kPa, MPa, psi	Set unit of pressure.
Pabs, Prel or psig	Depending on the selected unit of pressure: Switch between absolute and relative pressure display.
14.7 psi 1.013 bar	Set current absolute pressure
 /  / 	Select measuring mode
AUTO OFF	Automatic switch-off time, instrument switches off after 30 minutes if no temperature probe is connected and there is no pressure apart from ambient pressure.
T_{fac}	Temperature compensation factor, icon is shown on the display if the function is disabled.

- Settings will be applied following the final selection.

Operating valve positioner

The digital manifold acts like a conventional two-way manifold with regard to the refrigerant path: The passages are opened by opening the valves. The adjacent pressure is measured with valves closed as well as with them open.

- > Open valve: Turn valve positioner anticlockwise.
- > Close valve: Turn valve positioner clockwise.



⚠ WARNING

Valve positioner tightened too tightly.

- Damage to the PTFE seal (1).
- Mechanical deformation of the valve piston (2) leading to the PTFE seal (1) falling out.
- Damage to the thread of the threaded spindle (3) and the valve screw (4).
- Broken valve knob (5).

Tighten the valve positioner only hand-tight. Do not use any tools to tighten the valve positioner.

6 Using the product

6.1. Preparing for measurement

6.1.1. Switching the instrument on

- > Press **[⏻]**.

Zeroing the pressure sensors

Zero the pressure sensors before every measurement.

- ✓ There must be ambient pressure at all connections. >
- > Press for 3 seconds key **[P=0]** and execute zeroing.

6.1.2. Connecting the temperature sensor

- i** Sensors must be connected before the measuring instrument is switched on, so that they are recognised by the instrument.
-

Surface temperature sensor

An NTC temperature sensor (accessory) must be connected for measuring the pipe temperature and for automatic calculation of superheating and subcooling.

Deactivating the surface compensation factor for insertion and air temperature sensor

A surface compensation factor has been set in the measuring instrument to reduce the measuring errors in the main field of applications. This reduces measuring errors when using surface temperature sensors.

If the measuring instrument testo 550 is used in combination with insertion or air temperature sensors (accessories), this factor must be deactivated:

1. Press **[Set]** repeatedly until T_{fac} is displayed.
 2. Press **[▲]** or **[▼]** to set T_{fac} to Off.
 3. Press **[Set]** to continue through the settings menu until the measurement/home view is displayed.
- T_{fac} is shown on the display if T_{fac} is disabled.

Connecting the refrigerant hoses

- i** Before each measurement check whether the refrigerant hoses are in flawless condition.
-

- ✓ The valve actuators are closed.
1. Connect the refrigerant hoses for low-pressure side (blue) and high-pressure side (red) to the measuring instrument.
 2. Connect the refrigerant hoses to the system.

 **WARNING**

The measuring instrument dropping down or any other comparable mechanical load can cause breakage of the pipe pieces in the refrigerant hoses. The valve actuators may also suffer damage, which in turn could result in further damage inside the measuring instrument, which may not be detectable from outside.

- > For your own safety you should return the measuring instrument to the Testo Service for technical inspection.
- > You should therefore always replace the refrigerant hoses with new ones after the measuring instrument has dropped down or after any comparable mechanical loading.

Setting the refrigerant

1. Press **[R, ►, ■]**.
 - This opens the refrigerant menu and the currently selected refrigerant flashes.
2. Setting the refrigerant:

Key functions

Representation	Explanation
[▲] or [▼]	Changing the refrigerant
[R, ►, ■]	Confirm the setting and exit the refrigerant menu.

Available refrigerants

Representation	Explanation
R...	Refrigerant number of refrigerant acc. to ISO 817
---	no refrigerant selected.

Example: Setting refrigerant R401B

1. Press **[▲]** or **[▼]** several times, until **R401B** flashes.
2. Press **[R, ►, ■]** to confirm the setting.

Quitting the refrigerant selection

- > Press **[R, ►, ■]** or automatically after 30 s, if no other key has been pressed.

6.1.3. Switching Bluetooth® on and off (testo 550)






In order to be able to establish a connection via Bluetooth, you need a tablet or smartphone with the Testo app **Refrigeration** already installed on it.

You can get the App for iOS instruments in the App Store or for Android instruments in the Play Store.

Information about compatibility can be found in the relevant app store.




1. Press **[▲]** and **[▼]** simultaneously and hold down for 3 seconds.
- Once the Bluetooth icon is shown on the display, Bluetooth is switched on.

Display	Explanation
 flashes	There is no Bluetooth connection, or a potential connection is being searched for.
 is permanently displayed	There is a Bluetooth connection.
 is not displayed	Bluetooth is disabled.

2. Press **[▲]** and **[▼]** simultaneously and hold down for 3 seconds.
- Once the Bluetooth icon is no longer shown on the display, Bluetooth is switched off.

6.1.4. Selecting the measuring mode

1. Press **[Set]** several times.
2. Select function with **[▲]** or **[▼]**.
3. Save setting: press **[Set]**.
- Measuring mode is displayed.

Display	Mode	Function
	Refrigeration system	Normal functionality of the digital manifold
	Heat pump	Normal functionality of the digital manifold
	Automatic mode	If the automatic mode is activated, the testo 549 und testo 550 digital manifold automatically changes the

Display	Mode	Function
		<p>display of the high and low pressure. This automatic change occurs when the pressure on the low-pressure side is 1 bar higher than the pressure on the high-pressure side. During the change, Load (2 s) is shown in the display.</p> <p>This mode is especially suited to air conditioning systems which cool and heat.</p>

6.2. Performing the measurement

WARNING

Risk of injury caused by refrigerant that is at high pressure, hot, cold, or poisonous!

- > Wear safety goggles and protective gloves.
- > Before pressurizing the measuring instrument: Always fasten the measuring instrument at the suspension device in order to prevent it from falling (risk of breakage)
- > Check if the refrigerant hoses are intact and connected correctly before each measurement. Do not use a tool to connect the hoses. Only tighten the hoses by hand (max. torque 5.0 Nm/3.7 ft*lb).
- > Maintain permissible measuring range (0 to 60 bar). Pay particular attention with systems with refrigerant R744, as these are often operated with higher pressures.

Measuring

1. Pressurize the measuring instrument.
2. Read off readings.

i With zeotropic refrigerants, the evaporation temperature t_{Ev} is displayed after the complete evaporation/the condensation temperature $t_{\text{c/Co}}$ is displayed after the complete condensation.

The measured temperature must be assigned to the superheating or the subcooling side ($t_{\text{oh}} \leftrightarrow t_{\text{cu}}$). Depending on this assignment, $t_{\text{oh}}/T1$ or $\Delta t_{\text{oh}}/\text{SH}$ or $t_{\text{cu}}/T2$ or $\Delta t_{\text{cu}}/\text{SC}$ is shown depending on the selected display.

- Reading and display illumination flash:
 - 1 bar before reaching the critical pressure of the refrigerant,
 - upon exceeding the max. permissible pressure of 60 bar.

Key functions

> **[▲]** or **[▼]**: Change the reading display.

Possible display combinations:

Evaporation pressure Refrigerant evaporation temperature t_{o}/Ev	Condensation pressure Refrigerant condensation temperature t_{c}/Co
--	--

or (only with connected temperature probe)

Evaporation pressure Measured temperature $t_{oh}/T1$	Condensation pressure Measured temperature $t_{cu}/T2$
--	---

or (only with connected temperature probe)

Evaporation pressure Superheating $\Delta t_{oh}/SH.$	Condensation pressure Subcooling $\Delta t_{cu}/SC$
--	--

With two connected NTC probes, Δt is also shown.

> **[Mean/Min/Max]**: Record readings, display min./max. readings, mean values (since switching on).

Tightness test/pressure drop test

i Systems can be tested for tightness with the temperature-compensated tightness test. The system pressure and the ambient temperature are measured over a defined period for this. A temperature probe can be connected that measures the ambient temperature for this (recommendation: NTC air probe, art. no. 0613 1712). Information about the temperature-compensated differential pressure and about the temperature at the beginning/end of the test exists as a result. If no temperature probe is connected, the tightness test can be performed without temperature compensation.

1. Press **[Mode]** (leakage test view).
 - Leakage test view is opened. **ΔP** is displayed.
2. Start the leakage test: Press **[R, ►, ■]**.
3. End the leakage test: Press **[R, ►, ■]**.
 - Result is displayed.
4. Confirm message: Press **[Mode]**.

7 Maintaining the product

Cleaning the instrument

- i** Do not use any aggressive cleaning agents or solvents! Mild household cleaning agents and soap suds may be used.
-

- > If the housing of the instrument is dirty, clean it with a damp cloth.

Keeping connections clean

- > Keep screw connections clean and free of grease and other deposits, clean with a moist cloth as required.

Removing oil residues

- > Carefully blow out oil residues in valve block using compressed air.

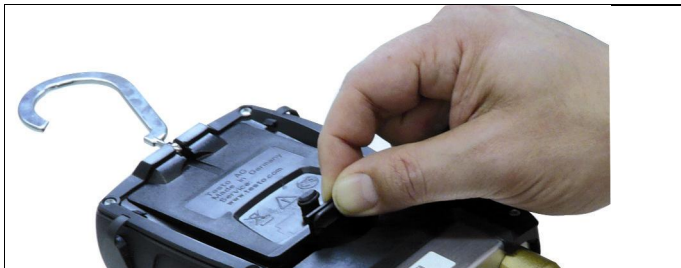
Ensuring the measuring accuracy

Testo Customer Service would be glad to further assist you if you so wish.

- > Check instrument regularly for leaks (recommended: annually). Keep to the permissible pressure range!
- > Calibrate instrument regularly (recommended: annually).

Changing batteries/rechargeable batteries

- ✓ Instrument is switched off.




1. Fold out the suspension device, loosen the clip and remove the cover of the battery compartment.
2. Remove empty batteries/rechargeable batteries and insert new batteries/rechargeable batteries (4x 1.5 V, type AA, Mignon, LR6) in the battery compartment. Observe the polarity!

3. Set on and close cover of the battery compartment (clip must engage).
4. Switch the instrument on.

8 Tips and assistance

8.1. Questions and answers

Question	Possible causes/solution
 flashes	Batteries are almost empty. > Change batteries.
The instrument switches off automatically.	Residual capacity of the batteries is too low. > Change batteries.
uuuu lights up instead of the parameter display	The permissible measuring range has been undershot. > Keep to the permitted measuring range.
oooo lights up instead of the parameter display	The permissible measuring range has been exceeded. > Keep to the permitted measuring range.

8.2. Measurement parameters

Name		Description
bar, °C	psi, °F	
Δ toh	SH	Superheating, evaporation pressure
Δ tcu	SC	Subcooling, condensation pressure
to	Ev	Refrigerant evaporation temperature
tc	Co	Refrigerant condensation temperature
toh	T1	Measured temperature, evaporation
tcu	T2	Measured temperature, condensation

8.3. Error reports

Question	Possible causes/solution
---- is lit up instead of measurement parameter display	Sensor or cable defective > Please contact your dealer or Testo Customer Service
Display EEP FAIL	Electronics defective > Please contact your dealer or Testo Customer Service

8.4. Accessories and spare parts

Description	Article no.
Clamp probe for temperature measurement at pipes (1,5m cable length)	0613 5505
Clamp probe for temperature measurement at pipes (5m cable length)	0613 5506
Pipe wrap probe with Velcro tape for pipe diameters of up to max. 75 mm, Tmax. +75 °C, NTC	0613 4611
Watertight NTC surface probe	0613 1912
Precise, robust NTC air probe	0613 1712
Transport case for measuring instrument, probe and hoses	0516 0012

For a complete list of all accessories and spare parts, please refer to the product catalogues and brochures or look up our website at: www.testo.com

If you have any questions, please contact your dealer or Testo Customer Service. The contact details can be found on the back of this document or on the Internet at www.testo.com/service-contact.

9 EC declaration of Conformity



Wir messen es.



EG-Konformitätserklärung

EC declaration of conformity

Für die nachfolgend bezeichneten Produkte:

We confirm that the following products:

testo 549

Best. Nr.: / Order No.: 0560 0550

wird bestätigt, daß sie den wesentlichen Schutzanforderungen entsprechen, die in der Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die **elektromagnetische Verträglichkeit** (2014/30/EU) festgelegt sind entspricht.

corresponds with the main protection requirements which are fixed in the EEC "Council Directive 2014/30 EU on the approximation of the laws of the member states relating to electromagnetic compatibility". The declaration applies to all samples of the above mentioned product.

Zur Beurteilung der Erzeugnisse hinsichtlich elektromagnetischer Verträglichkeit wurden folgende Normen herangezogen:

For assessment of the product following standards have been called upon:

Störaussendung/ Pertubing radiation:
Störfestigkeit: / Pertubing resistance:

DIN EN 61326-1:2013 class B
DIN EN 61326-1:2013 table 1

Sicherheits-Richtlinie:

EN 60950-1:2006 +A11:2009 +A1:2010 +A12:2011

Diese Erklärung wird für:

This declaration is given in responsibility for:

Testo AG
Postfach / P.O. Box 1140
79849 Lenzkirch / Germany
www.testo.com

abgegeben durch / by:

Dr. Jörk Hebenstreit
(Name / name)

Uwe Haury
(Name / name)

Managing Director
(Stellung im Betrieb des Herstellers)
(Position in the company of the manufacturer)

Head of Qualification & Test
(Stellung im Betrieb des Herstellers)
(Position in the company of the manufacturer)

Lenzkirch, 18.02.2015
(Ort, Datum / place, date)

J. Hebenstreit
(Rechtsgültige Unterschrift)
(Legally valid signature)

U. Haury
(Rechtsgültige Unterschrift)
(Legally valid signature)



Der Hersteller betreibt ein zertifiziertes Qualitätssicherungssystem nach DIN ISO 9001

The manufacturer operates a certified quality assurance system according to DIN ISO 9001



EG-Konformitätserklärung

EC declaration of conformity

Für die nachfolgend bezeichneten Produkte:

We confirm that the following products:

testo 550

Best. Nr.: / Order No.: 0560 1550

wird bestätigt, daß sie den wesentlichen Schutzanforderungen entsprechen, die in der Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die **elektromagnetische Verträglichkeit** (2014/30/EU) festgelegt sind und bei bestimmungsmäßiger Verwendung den grundlegenden Anforderungen gemäß Artikel 3 der R&TTE-Richtlinie 1999/5/EG entspricht.

corresponds with the main protection requirements which are fixed in the EEC "Council Directive 2014/30 EU on the approximation of the laws of the member states relating to electromagnetic compatibility" and comply with the essential requirements of Article 3 of the R&TTE 1999/5/EC Directive. The declaration applies to all samples of the above mentioned product.

Zur Beurteilung der Erzeugnisse hinsichtlich elektromagnetischer Verträglichkeit wurden folgende Normen herangezogen:

For assessment of the product following standards have been called upon:

Störrausendung/ Pertubing radiation:
Störfestigkeit/ Pertubing resistance:

DIN EN 61326-1:2013 class B
DIN EN 61326-1:2013 table 1

R&TTE Richtlinie:

EN 300 328 V1.8.1: 2012
EN 301 489-1 V1.9.2: 2011-09
EN 301 489-17 V2.2.1: 2012-09

Sicherheits-Richtlinie:

EN 60950-1:2006 +A11:2009 +A1:2010 +A12:2011

Diese Erklärung wird für:

This declaration is given in responsibility for:

Testo AG
Postfach / P.O. Box 1140
79849 Lenzkirch / Germany
www.testo.com



abgegeben durch / by:

Dr. Jörk Hebenstreit
(Name / name)

Uwe Haury
(Name / name)

Managing Director
(Stellung im Betrieb des Herstellers)
(Position in the company of the manufacturer)

Head of Qualification & Test
(Stellung im Betrieb des Herstellers)
(Position in the company of the manufacturer)

Lenzkirch, 18.02.2015
(Ort, Datum / place, date)

J. Hebenstreit
(Rechtsgültige Unterschrift)
(Legally valid signature)

U. Haury
(Rechtsgültige Unterschrift)
(Legally valid signature)

Der Hersteller betreibt ein zertifiziertes Qualitätssicherungssystem nach DIN ISO 9001

The manufacturer operates a certified quality assurance system according to DIN ISO 9001

