testo 523
Refrigeration System Analyzer

Instruction manual

en (international)

Safety and environment

On this document

› Read this document through carefully, and familiarize yourself with the product before you put it to use. Keep this documentation close to hand in order to be able to consult it if required. Pass this documentation on to later users of the product.

› Pay particular attention to information which is marked with the following symbols:

- With the signal word **Warning!**:
  Warns of dangers which can lead to serious injury if the prescribed safety measures are not taken.
- With the signal word **Caution!**:
  Warns of dangers which can lead to injury or material damage if the prescribed safety measures are not taken.
- Important information

Avoiding personal injury/material damage

› Use the measuring instrument only for the purpose for which it is intended, and within the parameters stated in the technical data. Do not use force.

› Do not carry out measurements on or near live parts with the measuring instrument or the probes, if the instrument is not expressly approved for this!

› Never store the instrument together with solvents, do not use dessicants.

› Carry out only repair and maintenance work described in the instruction manual. Observe the prescribed handling steps. Use only original spare parts from Testo.

Warning!

Danger of injury exists if highly pressurized hot, cold and/or toxic refrigerants escape. For this reason, always wear protective glasses and protective gloves when carrying out measurements and other work on the refrigeration system.

If the measuring instrument falls down or is exposed to any other comparable mechanical strain, the end connections of the refrigerant hoses can break off. The valve knobs can also be damaged, which can lead to further damage in the interior of the instrument, which is not visible externally. For this reason, replace the refrigerant hoses after any fall or comparable mechanical strain with new, undamaged refrigerant hoses. For your own safety, send the instrument to Testo customer service for technical testing.

Protecting the environment

› Refrigerant gases can damage the environment. Observe the relevant environmental protection regulations.

› Dispose of faulty rechargeable batteries/empty batteries at the proper collection points.

› Send the product back to Testo at the end of its life. We will ensure that it is disposed of in an environmentally friendly manner.

Specifications

Functions and application

The testo 523 is a refrigeration system analysis instrument for maintenace and service work on refrigeration systems and heat pumps. It may only be used by qualified staff.

The functions of the testo 523 enable it to replace mechanical manifolds, thermometers and pressure/temperature tables. Pressures and temperatures can be increased, adjusted, checked and monitored.

The testo 523 is compatible with most non-corrosive refrigerants, water and glycol. The testo 523 is not compatible with refrigerants containing ammonia.

The product may not be used in areas where there is danger of explosion!

Technical data

Measurement parameters

· Pressure: kPa / Mpa / bar / psi, temperature: °C / °F

Measurement sensor

· Pressure: 2x pressure sensor, temperature: Pt100

Measurement channels

· Number: 3

Interfaces

· Pressure connections: 3x 7/16" (1/4 SAE)
· Probes: 1x mini DIN socket for Pt100 temperature probes
· Printer: IR for compatible Testo printer

Measurement ranges

· Meas. range pressure High Side: 0 to 50bar (rel) / 0 to 725psi (rel) / 0 to 5000kPa (rel) / 0 to 5MPa (rel)
· Meas. range pressure Low Side: 0 to 25bar (rel) / 0 to 362.5psi (rel) / 0 to 2500kPa (rel) / 0 to 2.5MPa (rel), Overload limit 50bar / 725psi / 5000kPa / 5MPa
· Meas. range temp: -50 to +200°C / -58 to 392°F

Resolution

· Resolution pressure 0.1bar/1.45 psi/10 kPa/0.01MPa
· Resolution temperature: 0.1°C / 0.1°F

Accuracy (Nominal temperature 22°C / 71.6°F, ±1 digit)

· Accuracy pressure: ±0.5% of full scale

Refrigerants

· Number: 30
· Measurable media: All refrigerants, nitrogen, water, glycol. Not measurable: Ammonia (R717) and other refrigerants containing ammonia

Ambient conditions

· Application temperature: -20 to 60°C / -4 to 140°F
· Storage temperature: -20 to 60°C / -4 to 140°F

Housing

· Material: ABS/PA/TPU
· Dimensions: 265 x 135 x75 mm (10.4 x 5.3 x 3.0“)
· Weight: approx 1200 g (2.7 lbs.)
· Protection class: IP54 / NEMA 3/3S

Current supply

· Current source: rechargeable or standard batteries 4x 1.5V, Type AA/Mignon/LR6
· Battery life: approx. 40h (display illumination off)

Display

· Type:Illuminated LCD
· Refresh rate: 1s

Guidelines, norms and tests

· EC guideline: 2004/108/EEC

Warranty

· Duration: 2 years
· warranty conditions: See web page www.testo.com/warranty

Product description

At a glance

① IR interface for connection to Testo report printer

② Display: low pressure side (blue), high pressure side (red)

Display symbols

: Battery capacity (: full, : empty)

: Print function: data are being transmitted

③ Probe socket mini DIN for Pt100 temperature probes, with socket cover

④ Operating buttons

Button functions

: On/Off button: switches instrument on/off.

: Function buttons (4x, orange): respective function is shown in display.

: Up/Down buttons: change display view.

: Light button: switches display/sight glass illumination on/off.

: Printer button: transmits data to Testo report printer

⑤ Sight glass for refrigerant flow.

⑥ 2x valve knobs, with two valve positions (see ❷).

⑦ 3x connections 7/16“ UNF (1/4 SAE), brass. Left/right: low pressure/high pressure, for refrigerant hoses with fast screw connection, flow-through can be closed with valve.
Centre: for e.g. refrigerant bottles, with sealing cap.

⑧ 2x Unlocking buttons for valve knobs

⑨ Battery compartment. Rechargeable batteries cannot be charged in the instrument!

⑩ Fold-away suspension hook, with eye for a padlock (see ❶).

⑪ Plastic protector

Warning!

Do not remove fitting protector during measurement and transport. It protects the fittings at the base of the instrument from undue strain or potential breakage.

First steps

➢ Inserting batteries/rechargeable batteries:

1 Fold out the suspension hook and open battery compartment (clip fastening).

2 Insert batteries (included in delivery) or rechargeable batteries (4x 1.5V, Type AA/Mignon/LR6) into the battery compartment. Observe polarity!

3 Close battery compartment.

ℹ At longer periods of disuse: Remove batteries.

➢ Switching instrument on:

› Press ⏻ .

- Initialization phase:
  - · All display sements light up (duration: 2s).
  - · Instrument type, serial number and Firmware version are displayed (duration: 2s).
- The measurement view is opened

-or-

- When switched on for the first time after battery replacement: StAndArd bAtt flashes.

  The battery type used must be entered so that the battery capacity is correctly displayed. The instrument switches off after one minute, if no setting is made.

  1 Press ▲ or ▼ several times to set the battery type used: StAndArd bAtt = Standard batteries, rEchArGE bAtt = Rechargeable batteries.

  2 Press function button OK to confirm the setting.

  - The configuration menu is opened.

  3 Continue with Making settings, step 2.

➢ Making settings:

1 Press function button Set.

- The configuration menu is opened and the settable parameter flashes.

2 Setting parameters:

Button functions

- ▲▼ : Alter parameter.
- ◀▶ : Change to next parameter.
- **OK** : Store settings and leave configuration menu.
- **esc** : Leave configuration menu (without storing).

Settable parameters

- **P=0**: Set pressure sensors to zero
- **bar**, **kPa**, **MPa**, **psi**: Set pressure unit.
- **Pabs**, **Prel** or **psi$_a$**, **psi$_g$** (depending on pressure unit selected): Switch between display of absolute and relative pressure.
- **°C**, **°F** : Set temperature.
- **AutoOff off**, **on** : Automatic switch-off (20min after the last time a button was pressed) switch on/off.
- **24hr**, **am**/**pm** : Switch between 24h and 12h time display.
- **88:88** : Set time (hours, minutes).
- **day**, **month**, **year** : Set date (day, month, year).

Example "Set pressure unit"

1 Press function button ◀ or ▶ several times, until **bar**, **kPa**, **MPa** or **psi** flashes.
2 Press ▲ or ▼ several times, until the desired pressure unit appears.
3 Press function button ◀ or ▶ several times to switch to the next parameter

3 Press function button OK to store the settings and leave the configuration menu.

➢ Switching instrument off:

› Press ⏻.

➢ Operating valve knobs:

The function of the valve knobs is independent of the valve position. For easier operation, unlocking the knobs is recommended. For transport, stowing the valve knobs is recommended.

› Unlock valve knobs: Press unlocking button.

› Stow valve knobs: Press valve knobs into the housing.

The refrigeration system analyzer acts like a conventional two-way manifold with respect to the refrigerant path: The passage is opened by opening the valves. The connected pressure is measured measured independently of whether the valves are open or closed.

› Open valve: Turn the valve knob anti-clockwise.

› Close valve: Turn the valve knob clockwise.

Warning!

Tighten valve positioner only hand-tight. Do not use tools to tighten the valve positioner, as the thread may be damaged thereby!

Using the product

Preparing measurement

➢ Connecting temperature probe:

For the measurement of the line temperature and the automatic calculation of super-heating and sub-cooling, a Pt100 temperature probe (accessory) must be connected.

Probes must be connected before switching the instrument on, in order for them to be recognized.

1 Open the socket cover on the left-hand side of the instrument.

2 Plug the connection plug of the temperature probe into the probe socket.

3 Depending on the measurement task, position the probe at the end of the evaporator (Superheat) or condenser (Sub-cooling).

➢ Switching instrument on:

› Press ⏻ .

➢ Zeroing pressure sensors:

Carry out a zeroing of the pressure sensors before each measurement.

ℹ The measurement values can be falsified by a change in the position of the measuring instrument. After zeroing, the position of the measuring instrument must not be changed. Carry out zeroing before every measurement in order to compensate faulty positioning or long-term zero-point drift. Zeroing is only possible in a range of ±1bar(rel)/±14.5psi (rel) and 0...2bar(abs)/±29psi (abs) resprectively.

✓ The connections on the low and high pressure sides must be depressurized (ambient pressure).

1 Press function button Set.

- p=0 flashes.

2 Press OK to carry out zeroing.

➢ Connecting refigerant hoses:

✓ The valve knobs are closed.

1 Connect refrigerant hoses for low pressure side (blue) and high pressure side (red) to the instrument.

2 Connect refrigerant hoses to the system.

Warning!

If the measuring instrument falls down or is exposed to any other comparable mechanical strain, the end connections of the refrigerant hoses can break off. The valve knobs can also be damaged, which can lead to further damage in the interior of the instrument, which is not visible externally. For this reason, replace the refrigerant hoses after any fall or comparable mechanical strain with new, undamaged refrigerant hoses. For your own safety, send the instrument to Testo customer service for technical testing.

➢ Setting refrigerant:

1 Press right-hand function button (R..., ...T or ---) .

- The refrigerant menu is opened and the selected refrigerant flashes.

2 Set refrigerant:

Button functions

- ▲ ▼ : Change refrigerant.
- **OK** : Confirm setting and leave refrigerant menu.
- **esc** : Leave refrigerant menu without applying setting.

Settable refrigerants

- **R...** : R-number of the refrigerant according to ISO 817.
- **...T** : Special Testo description of certain refrigerants: **1T** = R1270, **2T** = R407D, **3T** = R422D.
- **---** : No refrigerant selected.

Example "Setting refrigerant R401B"

1 Press ▲ or ▼ several times, until **R401B** flashes.
2 Press function button **OK** to confirm the setting.

Carrying out a measurement

Warning!

Danger of injury due to highly pressurized hot, cold or poisonous refrigerants!

- ❯ Always secure the measuring instrument with the carabiner suspension hook before pressurizing the instrument, in order to prevent falls (danger of breakage).
- ❯ Before each measurement, ensure that the refrigerant hoses are intact and correctly connected. Do not use tools to connect the hoses. Connect the hoses only hand-tight (max. torque 5.0Nm/ 3.7ft*lb).
- ❯ Wear protective glasses and protective gloves.
- ❯ Observe permitted pressure range!

➢ Measuring:

✓ The handling steps from the chapter “Preparing measurement” have been carried out.

1 Pressurize the instrument.

2 Read off measurement values:

For Zeotropic refrigerants (those with temperature glide), the temperatures t_o/t_c displayed are those at the end of the phase change (evaporation or condensation) of the last component.

The temperature measured must be allocated to the super-heating or sub-cooling side (function button t_{oh} <--> t_{cu}). Dependent on this allocation, t_{oh} or $\Delta t_{oh}/t_{sh}$, or t_{cu} or $\Delta t_{cu}/t_{sc}$ is displayed.

Button functions

· ▲▼ : Change measurement value display. Possible display combinations:

Evaporation pressure **Refrigerant evaporation temperature. t_o**	**Condensation temperature** **Refrigerant condensation temperature. t_c**

- or (only with connected temperature probe) -

Evaporation pressure **Measured line temperature. t_{oh}**	**Condensation pressure** **Measured line temperature. t_{cu}**

- or (only with connected temperature probe) -

Evaporation pressure **Super-heating Δt_{oh} / t_{sh}**	**Condensation pressure** **Sub-cooling Δt_{cu} / t_{sc}**

· Function button **Hold/Min/Max** : Freeze measurement values, display min./max. values (since switch-on, last reset or last switch-over t_{oh} <--> t_{cu}).

· Function button **RESET** : Reset min./max. values. Only available when min./max. values are displayed.

· Function button **t_{oh} <--> t_{cu}** : Allocation of the temperature probe measurement value to the low pressure side (blue) or high pressure side (red). Only available when a temperature probe is connected and the measured temperature or sub-cooling/super-heating is displayed.

- When the critical pressure of the refrigerant is reached: Measurement value and display illumination flash.

Maintaining the product

➢ Cleaning the housing:

› If dirty, clean the housing with a damp cloth (soap solution). Do not use aggressive cleaning products! Immediately remove oils, refrigerants and solvents from the housing.

➢ Keep connections clean:

› Keep screw connections clean and free of grease and other deposits, if necessary clean with a damp cloth.

➢ Regularly replace refrigerant hoses

Warning!

If the measuring instrument falls down or is exposed to any other comparable mechanical strain, the end connections of the refrigerant hoses can break off. The valve knobs can also be damaged, which can lead to further damage in the interior of the instrument, which is not visible externally. For this reason, replace the refrigerant hoses after any fall or comparable mechanical strain with new, undamaged refrigerant hoses. For your own safety, send the instrument to Testo customer service for technical testing.

➢ Removing oil traces:

› Carefully blow any oil traces out of the valve block with compressed air.

➢ Ensuring measurement accuracy:

If required, Testo customer service is happy to help you.

› Regularly check the instrument for leakage (recommended annually). Observe maximum pressure ratings!

› Calibrate the instrument regularly (recommended annually).

➢ Changing batteries/rechargeable batteries:

✓ Instrument is switched off.

1 Fold out the suspension hook and open battery compartment (clip fastening).

2 Remove empty batteries and insert new batteries or rechargeable batteries (4x 1.5V, Type AA/Mignon/LR6) into the battery compartment. Observe polarity!

3 Close battery compartment.

4 Set battery type and check/set date/time, see chapter First steps, handling objective Switching instrument on.

➢ Replacing the valve or the positioner knob:

Warning!

Replacing of the positioner knob and the valve by the customer is not allowed. Send the instrument to Testo customer service.

Tips and assistance

Questions and answers

Question	Possible causes	Possible solution
flashes	· Batteries are nearly empty.	· Change batteries.
The instrument switches off automatically.	· Function **Auto Off** is switched on. · Remaining battery capacity is too low.	· Switch function off. · Change batteries.
---- lights up 4x, all other displays are not lit.	· Instrument error.	· Please contact your dealer or Testo customer service.
uuuu lights up instead of meas. parameter display.	· Value under permitted measurement range.	· Observe permitted measurement range.
oooo lights up instead of meas. parameter display.	· Value over permitted measurement range.	· Observe permitted measurement range.
---- lights up instead of meas. parameter display.	· Probe not connected. · Probe breakage.	· Connect probe. · Exchange probe.
Refrigerant escaping from valve positioner	· Valve positioner not tight	· Please contact your dealer or Testo cutomer service.

If we were not able to answer your question, please contact your dealer or Testo customer service. For contact data, see back of this document or web page www.testo.com/service-contact

Accessories and spare parts

Description	Part no.
Probes	
Air probe, PT100	0609 1773
Surface probe, PT100	0609 1974
Immersion / penetration probe, PT100	0609 1273
Pipe wrap probe, PT100, with Velcro, 2.9m / 9.5ft wire	0609 5602
Pipe wrap probe, PT100, with spring clamp	0609 5605
Miscellaneous	
Report pinter, IrDA	0554 0547
Spare paper for report printer, 6 rolls, long life paper	0554 0568

A complete list of all accessories and spare parts can be found in the product catalogues and brochures or on the internet at: www.testo.com

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