testo 312-4 · Pressure measuring instrument

Instruction manual

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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.
1. ... 2. ...	Action: more steps, the sequence must be followed.
> ...	Action: a step or an optional step.
- ...	Result of an action.
Menu	Elements of the instrument, the instrument display or the program interface.
[OK]	Control keys of the instrument or buttons of the program interface.
... | ...	Functions/paths within a menu.
"..."	Example entries

2.2. Ensure safety

> Only operate the product properly, for its intended purpose and within the parameters specified in the technical data. Do not use any force.

> The objects to be measured or the measurement environment may also pose risks: Note the safety regulations valid in your area when performing the measurements.

> 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.

> Temperatures given on probes/sensors relate only to the measuring range of the sensors. Do not expose handles and feed lines to any temperatures in excess of 70 °C unless they are expressly permitted for higher temperatures.

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.

3 Specifications

3.1. Use

The testo 312-4 is a handy pressure measuring instrument that was developed specifically for use in heating system installations.

The main areas of use and measuring tasks are:

Gas pipes

- Performance of the pretest in acc. with DVGW-TRGI 2008
- Performance of the main test in acc. with DVGW-TRGI 2008
- Determining the usability by means of pressure drop method
- Pressure regulation testing incl. recording readings up to 24 h
- Monitoring of gas connection pressure at gas meter
- Monitoring of gas flow pressure at gas meter
- Setting the nozzle pressure for setting gas burners/heaters

Water pipes

- Leak test of wastewater disposal lines in acc. with DIN EN 1610
- Performance of load tests up to 25 bar at drinking water systems

Data transfer

- Printout via testo IR standard printer
- Data transfer to Easyheat PC software

The instrument offers the following characteristics:

- Measurement location management
- Data management via Easyheat software
- "On-site" printout of the measurement results via the testo protocol printer
- Temperature measurement
- Wide range of probes and sensors can be connected so that one instrument covers as many measuring tasks as possible

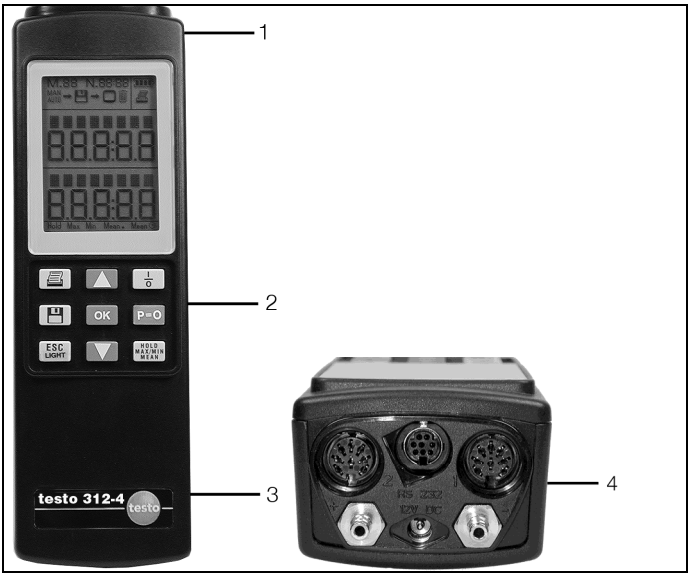
3.2. Technical data

Characteristic	Values
Measuring ranges and accuracies	0 to 3 hPa: ±0.03 hPa 3 to 40 hPa: ±1.5 % of m.v. 41 to 200 hPa: ±2 hPa
Intrinsic leakage	0.3 % pressure drop from test pressure over a period of 1 minute
Permissible media	Air, non-aggressive gases
Voltage supply	9 V monobloc (6LR61), alkaline manganese or 12 V DC mains unit
Sensor interface	Round 8-pin plug
PC interface	Serial, connection line 0409 0178
Printer interface	Infrared
Measurement data memory	approx. 25000 readings
Battery running time in continuous operation with internal pressure sensor	30 h with alkali manganese at 25 °C / 77 °F
Sensor	piezoresistive
Storage/transport temperature	-20 to 70 °C/-4 to 158 °F
Operating temperature	0 to 50 °C/32 to 122 °F
Weight (incl. TopSafe and battery)	approx. 600 g/1 lb 5 oz
Housing material	ABS
Dimensions (L x W x H)	219 x 68 x 50 mm/8.5" x 2.5" x 2"
Measuring rate	Auto: 1 sec to 24 h, quick: 0.04 sec
Adaption time	10 min
Refresh rate of display	2/sec, with rapid measurement: 4/sec
EC Directive	2014/30/EC

4 Product description

4.1. Overview

4.1.1. Control elements and connections



1 IR interface for protocol printer

2 Keyboard

Key	Function
	Print
	Select reading 1 (top line), select menu item
	Switching on/off
	Saving data
OK	Open menu level, confirm selection, execute function
P = 0	Zero pressure probes
ESC LIGHT	Cancel process, menu level back
	Select reading 2 (bottom line), select menu item

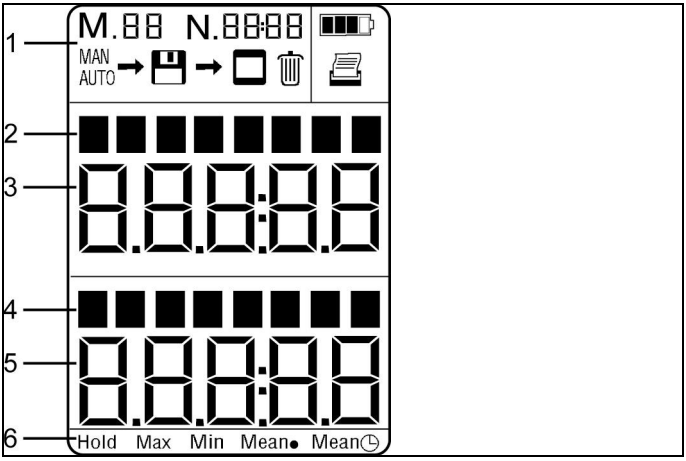
Key	Function
HOLD MAX/MIN MEAN	Keep reading, display maximum/minimum/mean value

3 Battery compartment (on rear)

4 Connections

Connection	Function
1	Socket 1: Thermocouple probe (type K), NTC probe, pressure probe
2	Socket 2: Thermocouple probe (type K), NTC probe, pressure probe
RS 232	PC connection
12 V DC	12 V DC mains unit (0554 0088)
+	Pressure nipple with quick-release connection
-	Pressure nipple with quick-release connection

4.1.2. Display



1 Status information

Icon	Function
M.	Counter for identifying the stored protocols in the case of manual, automatic and fast storage of the measurement series.
N 0000	Counter for identifying the measurement data in a measurement series in the case of automatic and fast storage.
MAN	Lights up: manual saving set. Flashes: current readings saved.
AUTO	Lights up: automatic saving set. Flashes: automatic saving running.
	The memory content will be cleared.
	Lights up: printing possible. Flashes: print function activated.
	Rechargeable battery/battery charge level. The black segments go out with a decreasing residual capacity
	Flashes: Battery/rechargeable battery empty. Instrument switches itself off within 1 min.

2 Description of internal sensor (**i**), external pressure probe / input socket (**P1**), external temperature probe / input socket (**T1**), differential value **Δp** (**P2 - P1**) or **Δt** (**T2 - T1**) and measurement parameter unit.

3 Reading 1

4 Description of external pressure probe / input socket (**P1** or **P2**), external temperature probe / input socket (**T1 oder T2**) and measurement parameter unit.

5 Reading 2

6 Measuring functions

4.1.3. Menu overview

The menu is organized into up to 3 levels, depending on the function.

Level 1	Level 2	Level 3
1 Measurements	11 Pretest	-
	12 LeakRate	-
	13 Maintest	-
2 Location	-	-
3 Memory	31 Man/Auto	-
	32 Config.	-
	33 Print	-
	34 Status	-
	35 Delete	-
4 Instrument	41 Time	-
	42 Auto Off	-
	43 Units	431 P Low
		432 P High
		433 ISO/US
		434 °C/°F
5 Service	51 Data	-
	52 Language	-
	53 Bat.type	-
	54 F-Reset	-

Level 1	Level 2	Level 3
6 Input	61 Pretest	611 Stabtime
		612 Meastime
		613 Finish
	62 LeakRate	621 Stabtime
		622 Meastime
		623 Finish
	63 Maintest	631 Stabtime
		632 Meastime
		633 Finish
	64 Pref	-
	65 Volume	651 Circle 1
		652 Length1
		653 Circle 2
		654 Length2
		655 Circle 3
		656 Length3
		657 Finish
	66 Pabs	-
7 Gas type	-	-

4.2. Basic properties

Voltage supply

The power can be selectively supplied to the testo 312-4 via:

- 9 V monobloc battery, type: IEC 6LR61 (included in delivery)
- 9 V monobloc rechargeable battery, type: NiMH IEC 6F22 (0515 0025)
- Mains unit (0554 1143)

With an attached mains unit the power is supplied automatically via the mains unit and the instrument's rechargeable battery is charged (only at ambient temperature: 0 to 45 °C).

Charging the instrument's rechargeable battery is also possible using a charging adapter (0554 0025) available as an accessory.

5 First steps

Insert battery/rechargeable battery.

To avoid the loss of data, it is imperative that you switch the instrument off when changing the battery/rechargeable battery and replace the battery within 10 min.

1. Open the battery compartment on the rear of the instrument.
2. Insert monobloc/rechargeable battery (observe the polarity!)
3. Close the battery compartment.

Connecting probes / sensors

Connect the probes/sensors before switching the instrument on. Sensor-specific characteristics are only read in when the instrument is switched on. Make sure the connections are secure, but do not use force!

> Connect thermocouple probe (type K), NTC probe, pressure probe at socket **1** and socket **2**.

> Connect pressure tubes to **+** and **-**.

Caution! Danger of injury caused by the pressure tube jumping away from the connection socket!

> Ensure correct connection.

External probes/sensors have priority over the internal sensors during recording of readings. A maximum of 2 measurement channels is shown.

> Only connect external probes/sensors if you require these for the respective measuring task.

Switching on

Connect the required probes/sensors before switching on.

1. Switch the instrument on using .

- A display test will follow: All segments of the display light up for around 1 sec.
- Automatic probe detection will be carried out. The supply voltage and the current time will be displayed.

For the initial commissioning or after a factory reset, the **Language** function is automatically opened. Set the required menu language:

> Select the language with ▲ or ▼ and confirm with OK.

- The current readings are displayed. The instrument is now operational.

The reading of the internal sensor is displayed in the upper line.

The reading of an externally connected probe appears in the lower line.

If two probes are connected externally, the measurement of the internal sensor is deactivated.

- Left probe socket: upper line
- Right probe socket: lower line
- Δp: With ▲ or ▼ , calculated differential pressure (pressure/temperature) is displayed.

Switching off

Unsaved readings are lost when the instrument is switched off.

> Switch the instrument off with ⏻.

6 Using the product

6.1. Performing settings

Menu navigation

1. Press OK to open the main menu.
2. Select the menu with ▲ or ▼ and confirm the selection with OK.
3. Repeat operating step 2 until you reach the function level.

> You can make entries with ▲ or ▼ depending on the menu item. Confirm the entry with OK.

> Go back one menu level with ESC LIGHT.

6.1.1. Location

1. Use ▲ or ▼ in main menu to select **Location**.
2. Use OK to activate setting mode.

- The location that is currently set will be displayed. If a location designation was assigned by the Easyheat software, this is also shown.
- If data is already stored for the chosen location, 💾 is shown.

3. Use ▲ or ▼ to select the desired location.

To enter a new location:

> Press the ▲ key until **NEW** appears in the lower line.

ℹ A location is created when the unit is first commissioned. Up to 98 additional locations can be added.

4. Confirm the selection with OK.

6.1.2. Memory

1. Use ▲ or ▼ in main menu to select **Memory** and confirm selection with OK.
2. Use ▲ or ▼ to select the desired save mode.
3. Use OK to activate setting mode.

Man/Auto

1. Use ▲ or ▼ to select manual, automatic or fast and confirm the selection with OK.
   - **Manual**: The current reading is saved by pressing 💾 in the measurement view.
   - **Automatic**: A measurement program is started by pressing 💾 in the measurement view. Readings can be recorded over max. 24 hours with the automatic measurement program (measuring rate: 1 second).

- **Fast**: 25 measurements are automatically recorded per second by pressing [💾] in the measurement view. A fast measurement is only possible with pressure probes or an internal pressure sensor. Only 1 channel can be evaluated and the following sequence applies: external pressure sensor before internal pressure sensor, channel 2 before channel 1.

Configuration

Set **Auto** measurement program (if the function **Manual** or **Automatic** was selected under **Man/Auto**):

1. Set measuring rate using [▲] or [▼]. Hold the key down to go forward/back quickly.
2. Confirm the selection with [OK].
3. Set number of measurements using [▲] or [▼]. Hold the key down to go forward/back quickly.

- The duration of the measurement series is displayed in the upper line for your information.

4. Confirm the selection with [OK].

Set **Fast** measurement program (if the function **Fast** was selected under **Man/Auto**):

1. Select number of measurements using [▲] or [▼]. Hold the key down to go forward/back quickly.
2. Confirm the selection with [OK].

Print

The protocols recorded for a location such as reading or other available parameters (density, temperature, humidity, pressure, section, offset factor, Pitot tube factor) can be printed.

- If no protocol is recorded, **Error** is shown in the display.

1. Use [▲] or [▼] to select the protocol. Hold the key down to go forward/back quickly.
2. Confirm the selection with [OK].

- The data is sent to the printer via the infrared interface. 🖷 flashes during the data transfer.

Status

Indicates the available memory space as a %.

Delete

The complete memory content can be erased. It is not possible to erase individual protocols or locations.

> Select **Yes** or **No** using ▲ or ▼ and confirm selection with OK.

- If you select **Yes**: The memory content will be erased.
- If you select **No** or ESC LIGHT: the process will be cancelled.

6.1.3. Instrument

1. Use ▲ or ▼ in main menu to select **Device** and confirm selection with OK.
2. Select the required function/menu with ▲ or ▼ and confirm with OK.
3. Use OK to activate setting mode.

Time

Time and date can be set.

1. Set hour with ▲ or ▼ (**hh**). Hold the key down to go forward/back quickly.
2. Confirm the setting with OK.
3. Repeat steps 1 and 2 for the other values.

Auto off

An automatic switch-off function can be activated/deactivated.

1. Select **On** or **Off** with ▲ or ▼ and confirm selection with OK.

- **On**: The instrument switches off automatically if no key is pressed for 10 minutes.
- **Off**: The instrument does not switch off automatically.

Unit

The units of the parameters can be set. Which units are available depends on the selected setting under **ISO/US**:

- **ISO**: Pa, hPa, mbar, kPa, bar, psi, mmWS, Torr
- **US**: Pa, hPa, mbar, kPa, bar, psi, InW, InHg

The following parameter assignments are possible:

- **P Low** (low pressure): Unit for measurements with the internal pressure sensor (up to 200 hPa) and external differential and absolute pressure probes (up to 25 bar).
- **P High** (high pressure): Unit for measurements with external relative pressure probes with measuring range (1 to 25 bar).
- **°C/°F** (temperature).

1. Select **ISO/US** with ▲ or ▼ and confirm the selection with OK.
2. Select **ISO** or **US** with ▲ or ▼ and confirm selection with OK.
3. Select **P Low**, **P High** or **°C/°F** with ▲ or ▼ and confirm selection with OK.
4. Select the units with ▲ or ▼ and confirm the selection with OK.

> If needed, repeat steps 3 and 4 for other parameter assignments.

6.1.4. Service

1. Use ▲ or ▼ in main menu to select **Service** and confirm selection with OK.
2. Select the required function/menu with ▲ or ▼.
3. Confirm the selection with OK and selected the desired function with ▲ or ▼.
4. Use OK to activate setting mode.

Data

Battery voltage and firmware version are shown.

> Press 🖶 to print all instrument data.

Language

The instrument menu language can be set.

The following languages are available:

> Select the desired language with ▲ or ▼ and confirm the selection with OK.

Bat. type

The battery type that is used can be set.

The battery can only be recharged in the instrument if a rechargeable battery is inserted and the battery type is set to **RechBatt**. Only set the battery type to **RechBatt** if a rechargeable battery is actually fitted in the instrument.

> Select **Battery** or **RechBatt** using ▲ or ▼ and confirm selection with OK.

Factory reset

The instrument settings can be reset to the condition on delivery (factory settings).

Caution: The entire memory is erased when a factory reset is performed.

The following functions are reset:

Function	Setting after factory reset
Auto off	On
Stabilization time	5’
Measuring time	10’
Reference pressure	22hPa
Volume	0.00 l
circle 1	0 mm
length 1	0.00 m
circle 2	0 mm
length 2	0.00 m
circle 3	0 mm
length 3	0.00 m
Absolute pressure	1013 hPa
Units	ISO

Function	Setting after factory reset
Pressure unit	hPa
Temperature unit	°C
Battery type	Battery
Language	English
Save	Manual
Gas type	Natural gas

> Select **Yes** or **No** using ▲ or ▼ and confirm selection with OK.

- If you select **Yes**: the factory reset will be performed.
- If you select **No** or ESC LIGHT: the process will be cancelled.

6.1.5. Input

1. Use ▲ or ▼ in main menu to select **Input** and confirm selection with OK.
2. Select the required function with ▲ or ▼.
3. Use OK to activate setting mode.

Pretest, LeakRate, Maintest

The stabilization time (slowdown time before the test time) and the measurement period (test time) can be set for the pretest, leak rate and main test measurement procedures.

1. Set the **Stab**(ilization)**time** with ▲ or ▼. Hold the key down to go forward/back quickly.
2. Confirm the selection with OK.
3. Use OK to activate setting mode.
4. Set the **Meastime** with ▲ or ▼. Hold the key down to go forward/back quickly.
5. Confirm the selection with OK.
6. Confirm **Finish** message with OK.

Pref (reference pressure)

The reference pressure with which the measurement is to be carried out can be set.

1. Set reference pressure value using ▲ or ▼. Hold the key down to go forward/back quickly.
2. Confirm the selection with OK.

- The instrument changes to the **Volume** function.

Volume

The performance volume is required for the measurement of leakage rate.

Three circular diameters (in mm) and three pipe lengths (in m) can be entered, from which three partial volumes can be calculated. The performance volume is calculated by adding the three partial volumes together.

1. Use ▲ or ▼ to select **Circle 1**.
2. Confirm the selection with OK.
3. Set value using ▲ or ▼. Hold the key down to go forward/back quickly.
4. Confirm the selection with OK.
5. To set other values (**Length 1** for first partial volume, **Circle 2** und **Length 2** for second partial volume, **Circle 3** and **Length 3** for third partial volume), perform steps 2. to 4. accordingly.
6. Confirm **Finish** message with OK.

Pabs (absolute pressure)

The absolute pressure that is used to calculate the density can be set.

1. Set absolute pressure using ▲ or ▼. Hold the key down to go forward/back quickly.
2. Confirm the selection with OK.

6.1.6. Gas type

1. Use ▲ or ▼ in main menu to select **Gas type**.
2. Confirm the selection with OK.
3. Select **Town gas**, **Nat gas** or **Air** with ▲ or ▼.
4. Confirm the selection with OK.

6.2. Measuring

6.2.1. Important information for pressure measurement

Temperature fluctuations and positional changes have an effect on the accuracy of pressure measurements:

- The entire measuring system must be adapted to the ambient temperature and to the temperature of the pipe system to be tested.
- The temperature of the measuring system and the pipe system must remain stable during measurement.
- The position of the measuring system must not change during measurement.

- Do not subject the housing to mechanical strains during measurement.

Warning! Risk of explosion due to gas escaping from a leaky measuring system!

> Check the complete measuring system for leaks before any measurements at pipes carrying gas, e.g. with pressure test set by plugging it into the single-valve stop.

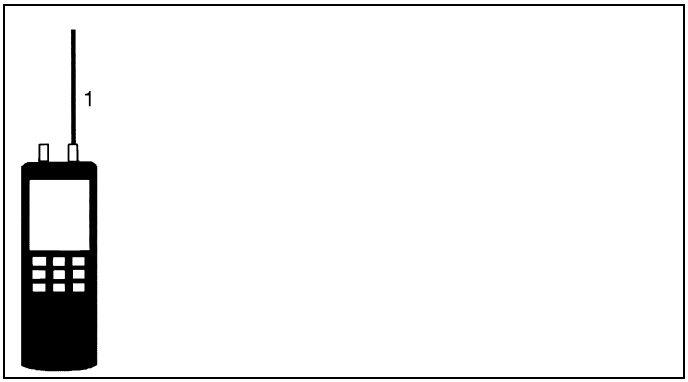
Caution! Damage to the sensoring technology in the event of exceeding the permissible pressure.

> Do not subject the measuring instrument to pressures > 200 hPa.

6.2.2. Connection variations

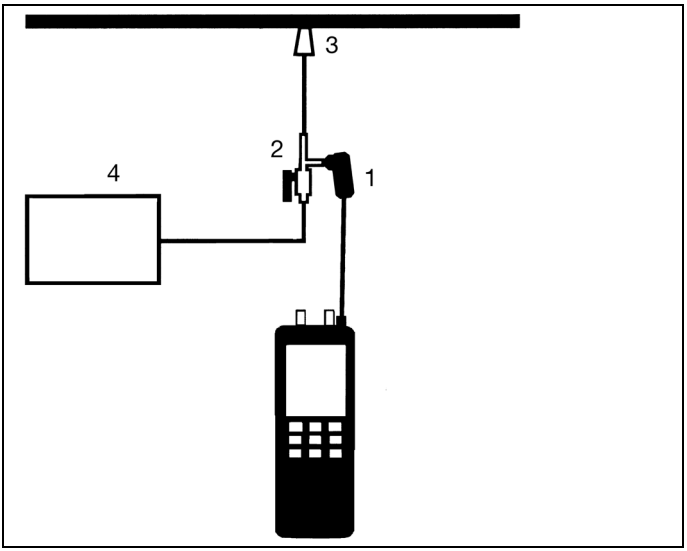
Typical connection variations for the measurement tasks that can be performed with the instrument are shown below.

Micro-pressure, flue draught, differential pressure in comparison to environment



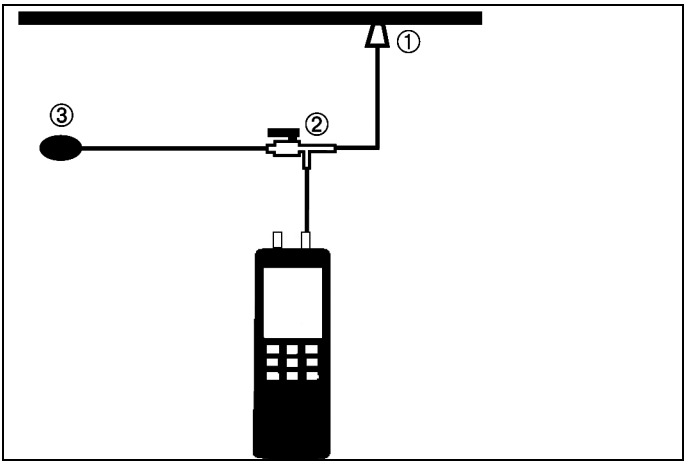
1 Silicone hose

Pretest and high pressure at water pipes



1 High-pressure probe
2 Pressure test set
3 High pressure stage stop
4 Compressor

Main test, leak rate, regulator testing



1 Conical test stop

2 Pressure test set

3 Balloon pump

6.2.3. Zeroing the display

To zero the display of the internal pressure sensor, the instrument must be in measurement view and there must be a differential pressure of < ±2.5h Pa.

Please refer to the instruction manual of the pressure probe for the zeroable range of the external pressure probes.

> Zero the display values of the internal pressure probe and all connected (zeroable) pressure probes with P = 0.

> Carry out the zeroing of the measurement system in operational position.

- The zero value is retained until another zeroing is performed or the device is switched off.

6.2.4. Save readings/implement measurement program

For the readings to be saved, the instrument must be in the measurement view. Depending on the set save mode, the save process is performed differently:

Save mode	Use
Manual	Retaining the current readings.
Automatic	Saving the readings for an extended period of time. A typical application is testing a regulator, for example. The saved readings can be transferred to the EasyHeat PC software and analyzed in graph form.
Fast	Saving 25 readings per second to record fast changes in pressure over a short period. A fast measurement is only possible with pressure probes or an internal pressure sensor. Only 1 channel can be evaluated and the following sequence applies: external pressure sensor before internal pressure sensor, channel 2 before channel 1. The saved readings can be transferred to the EasyHeat PC software and analyzed in graph form.

> Before you save the readings, you must select the location under which the data is to be saved.

Manual save mode is set:

> Press 💾 to save the current readings with the date, time, location and other available parameters.

- MAN→💾 flashes briefly.

Automatic save mode is set:

> Press 💾 to start the set measurement program.

- AUTO→💾 flashes for as long as the measurement program is running.

> The save program can be ended early by pressing 💾. Press again to save a new series of measurements.

Fast save mode is set:

1. Press [💾] to begin the measurement program.
- 25 measurements are automatically saved per second.
2. Press [💾] to end the measurement program.

6.2.5. Print readings

For individual readings to be printed, the instrument must be in the measurement view.

> Press [🖶] to print the current readings with the date, time, location and other available parameters.

- The data is sent to the printer via the infrared interface. 🖶 flashes during the data transfer.

6.2.6. Activate measuring functions

The instrument has the following measuring functions:

- Hold value (**Hold**): The last readings are held in the display.
- Display maximum value (**Max.**): The highest readings since the start of measurement are displayed.
- Display minimum value (**Min.**): The lowest readings since the start of measurement are displayed.
- Calculate multi-point mean (**Mean●**)

To call up the measuring functions, the instrument must be in the measurement menu.

Hold, Max., Min.:

> Select the measuring functions successively with [HOLD MAX/MIN MEAN].

Mean●:

1. Repeatedly press [HOLD MAX/MIN MEAN] until **Mean●** is shown in the display.
2. Activate multi-point mean calculation with [OK].
- **Mean●** flashes.
3. Record the reading for the calculation with [OK].
4. Repeat step 2 as required.
- The number of recorded readings is shown in the topmost line in the display.

5. Calculate the multi-point mean with HOLD MAX/MIN MEAN.

- The calculated mean is displayed and can be stored or printed out.

> Reactivate the mean calculation with OK.

> Cancel the process with ESC LIGHT.

6.3. Perform measurement procedures

Special measurement procedures are saved in the instrument that support you when performing special measuring tasks.

6.3.1. Pretest/main test, high pressure at water pipes

Pretest and main test at gas pipes in acc. with DVGW-TRGI 2008 worksheet G 600

The pretest (using air) is used for the load test (stability test) of newly laid gas pipes. The test is performed at the pipe without gas meter and fittings. The pipe is pressurized with 1 bar and the pressure may not drop within 10 minutes. The measurement is performed using a high-pressure probe (25 bar).

The main test (using air or inert gas, e.g. CO_2 or N_2) is used for the leak test (acceptance inspection) of newly laid or restructured pipes. The test is performed at the pipe, including the fittings, without gas installations and corresponding control and safety equipment. The line must be pressurized with 110 mbar which must remain constant for 10 minutes for this test.

High pressure at water pipes

The high pressure measurement at water pipes is performed in accordance with the same measurement procedure as a pretest at gas pipes. Use the **Pretest** measurement procedure for this.

Connecting the instrument

> Connect the instrument as suits the measurement task (pretest/high pressure or main test), see Connection variations, page 24.

Configure measurement procedure

1. Use ▲ or ▼ in main menu to select **Measure** and confirm selection with OK.
2. Select **Pretest** or **Maintest** with ▲ or ▼ and confirm selection with OK.

If you wish to use the preset values for the stabilization time and measurement period, continue directly to the begin of the measurement procedure as follows:

> Select **Finish** with ▲ or ▼ and confirm with OK.

---

3. Select **Stabtime** with ▲ or ▼ and confirm with OK.
4. Set the stabilization time with ▲ or ▼ and confirm with OK.
5. Select **Meastime** with ▲ or ▼ and confirm with OK.
6. Set **Meastime** with ▲ or ▼ and confirm with OK.
7. Confirm **Finish** message with OK.

Begin measurement procedure

1. Open the stop valve of the pressure test set, pressurize the system using the compressor (pretest/high pressure) or the balloon pump (main test) and close the stop valve again.
2. Begin measurement procedure with OK.

- The stabilization phase ends. Following this, the measuring phase begins automatically.

The stabilization phase can be ended early:

> Press OK.

- The measuring phase starts automatically.

- After the measuring phase ends the difference value is shown.

> Press OK to save the measurement result.

6.3.2. Leak rate/usability after pressure drop

Leak rate measurement in acc. with DVGW-TRGI 2008 worksheet G 624.

The measurement of leaks is used for the serviceability test of an existing gas pipe system. The pipe must be cleared of gas before the test.

Low-pressure pipes in operation are differentiated according to the degree of usability as follows:

1 Unlimited usability exists if the gas leakage rate is lower than 1 litre per hour at operating pressure.

2 Diminished usability exists if the gas leakage rate is between 1 and 5 litres per hour at operating pressure.

3 No usability exists if the gas leakage rate is higher than 5 litres per hour at operating pressure.

According to the degree of usability, the following measures must be carried out:

1 If there is unlimited usability, the pipes can still be used.

2 If there is diminished usability, the pipes must be sealed or replaced. The tightness must be restored within 4 weeks of determining the diminished usability.

3 If there is no usability, the pipes must be immediately put out of operation. The specifications for newly routed pipes are valid for repaired pipeline parts and their recommissioning.

Connecting the instrument

> Connect the instrument, see Connection variations, page 24.

Configure measurement procedure

1. Use ▲ or ▼ in main menu to select **Measure** and confirm selection with OK.
2. Select **LeakRate** with ▲ or ▼ and confirm selection with OK.
3. Set the gas type with ▲ or ▼ and confirm with OK.
4. Set the reference pressure with ▲ or ▼ and confirm with OK.

5. Set the absolute pressure with ▲ or ▼ and confirm with OK.

If you wish to use the preset values for the pipe volume, continue directly to the begin of the measurement procedure as follows:

> Confirm preset value with OK.

Three circular diameters (in mm) and three pipe lengths (in m) can be entered, from which three partial volumes can be calculated. The performance volume is calculated by adding the three partial volumes together.

6. Use ▲ or ▼ to select **Circle 1**.
7. Confirm the selection with OK.
8. Set value using ▲ or ▼. Hold the key down to go forward/back quickly.
9. Confirm the selection with OK.
10. To set other values (**Length 1** for first partial volume, **Circle 2** und **Length 2** for second partial volume, **Circle 3** and **Length 3** for third partial volume), perform steps 7. to 9. accordingly.
11. Confirm **Finish** message with OK.
12. Confirm set pipe volume with OK.

Begin measurement procedure

1. Pressurize the measuring instrument.
2. Begin measurement procedure with OK.

- The stabilization phase ends. Following this, the measuring phase begins automatically.

The stabilization phase can be ended early:

> Press OK.

- The measuring phase starts automatically.

- After the measuring phase ends the difference value and the leak rate are shown.

> Press OK to save the measurement result.

7 Maintaining the product

Changing the battery/rechargeable battery

To avoid the loss of data, it is imperative that you switch the instrument off when changing the battery/rechargeable battery and replace the battery in < 10 min.

1. Open the battery compartment on the rear of the instrument.
2. Remove the empty monobloc/rechargeable battery.
3. Insert new empty monobloc/rechargeable battery.

> Observe the polarity!

4. Close the battery compartment.

Charging rechargeable battery

Incorrect charging of batteries!

Danger of explosions.

Only start the charging process if a rechargeable battery is in the instrument and the battery type is set to **RechBatt**.

1. Check if a rechargeable battery is in the instrument.
2. Check if the battery type is set to **RechBatt**.
3. Connect the connector of the mains unit to the **12 V DC** socket of the instrument.
4. Connect the mains plug to the mains socket.

- A message box is displayed asking whether the rechargeable battery should be charged.

5. Select **Yes** with ▼ and confirm with OK.

The charging process begins automatically. flashes during the charging process and the current battery voltage is displayed.

Cleaning the instrument

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

Do not use any aggressive cleaning agents or solvents! Weak household cleaning agents and soap suds may be used.

8 Tips and assistance

8.1. Questions and answers

Question	Possible causes/solution
Instrument switches off after printing.	Battery voltage too low. > Replace battery.
Display cannot be zeroed.	There is a differential pressure outside of the range permissible for zeroing. > Reduce the differential pressure to a permissible value.
Saved settings and measurement values are no longer present in the instrument.	A factory reset was performed or the instrument was de-energized for a long period. > No remedy possible! Regularly save the readings (PC software, printout).

8.2. Accessories and spare parts

Description	Article no.
testo 316-1 gas leak detector	0632 0316
Differential pressure probe, 100 Pa	0638 1347
Differential pressure probe, 10 hPa	0638 1447
Differential pressure probe, 100 hPa	0638 1547
Differential pressure probe, 1000 hPa	0638 1647
Differential pressure probe, 2000 hPa	0638 1747
Absolute pressure probe, 2000 hPa	0638 1847
Relative pressure probe, 10 bar	0638 1741
Relative pressure probe, 30 bar	0638 1841
Relative pressure probe, 40 bar	0638 1941
Relative pressure probe, 100 bar	0638 2041
Relative pressure probe, 400 bar	0638 2141
Pipe wrap probe TC type K	0600 4593
Immersion/penetration probe type K	0604 0493
Temperature/air probe NTC	0610 9714

Description	Article no.
Temperature surface probe TC type K, can be attached to 0430 0143 and 0430 0145	0604 0194
Line plug-in head probe for probe 0604 0194, length 1.5 m	0430 0143
Line plug-in head probe for probe 0604 0194, length 5 m	0430 0145
Hose set for testo 312-4	0554 3172
Pressure connection hose set, coiled	0554 0441
Pressure set for gas pressure measurement on heating units	0554 0449
LW6 connection hose	0554 3158
Balloon pump with bleed screw	0554 3173
Single pipe counter cap, connects test set to pipe	0554 3156
Dual valve connector for the connection of two or more pipes	0554 3161
Single valve stop for blocking off the pipe	0554 3162
Conical test stop 1/2"	0554 3151
Conical test stop 3/4"	0554 3155
High-pressure stage stop 3/8" and 3/4"	0554 3163
High-pressure stage stop 1/2" and 1"	0554 3164
IR protocol printer	0554 0547
Spare thermal paper (6 rolls)	0554 0568
Connection line for high-pressure probes 0638 1741, 0638 1841, 0638 1941, 0638 2041, 0638 2141	0409 0202
Adapter for pressure probes	0699 3127
High-pressure probe to 25 bar	0638 1743
Leak detection spray to detect leaks in gas pipes	0554 3166
Table mains unit with international connection	0554 1143
Test pump for setting the test pressure	0554 3157
9 volt rechargeable battery for testo 312-4	0515 0025
Battery charger for 9 V rech. battery, for external charging of rech. battery	0554 0025

Description	Article no.
TopSafe for testo 312-4	0516 0446
Magnetic holder for TopSafe	0554 0225
Easyheat PC software	0554 3332
RS232 cable, connecting measuring instrument to PC	0409 0178
System case	0516 3121

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