

## Instruction Manual Dräger P7-TDX



Dräger MSI GmbH  
Rohrstraße 32  
58093 Hagen

Tel.: +49 (0) 2331 95 84 0  
Fax: +49 (0) 2331 95 84 29  
email: [msi.info@draeger.com](mailto:msi.info@draeger.com)

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## 1. Tips

### 1.1 Approvals

The pressure and leak rate measuring device Dräger P7-TDX is tested and approved by the “Deutscher Verein des Gas- und Wasserfaches” (DVGW - German Association for Gas and Water) and approved under the registration number DG-4805BS0029.

### 1.2 Tips for use

The Dräger P7-TDX is suitable for measuring leak rates in gas installations and measuring pressure values.

Any use of this measuring device requires the full understanding of and compliance with this instruction manual, the relevant standards and DVGW process sheets as well as the applicable statutory regulations.

The device is only intended for the applications described in this manual.

The flawless condition of the measuring device and the accessories used must be checked prior to every measurement.

**The displays shown in this manual are examples!**

### 1.3 Tips regarding servicing

To ensure proper functioning and accurate measurements, the device must be inspected and recalibrated once a year by a service center authorized by the Dräger MSI GmbH.

### 1.4 Tip on disposal according to WEEE



EC regulations pertaining to the disposal of electrical and electronic equipment have been effective since 2005. In essence, these regulations govern the establishment of collection and recycling facilities for private users. Given that the MSI P7-TDX is not registered for use in private households, it is also not permitted to be disposed of using these channels.

The devices can be returned to your national retailer or to your national Dräger Safety Organization for disposal. Please contact the Dräger MSI GmbH if you have any questions regarding disposal.

### 1.5 Instruction manual and measurement data management software

The instruction manual can be found on our website [www.draeger-msi.de/en](http://www.draeger-msi.de/en) in the menu item **Services >Downloads>P7 >Operating Instructions**.

You can find the measurement data management software PC200P, which you can download after a brief registration using your device number and your address data, in the menu item **Services >Downloads >P7>Software**.

## 2. The measuring device

The P7-TDX is an electronic multi-channel measuring device. It enables various inspections of pipelines and containers filled with gases, air or water.

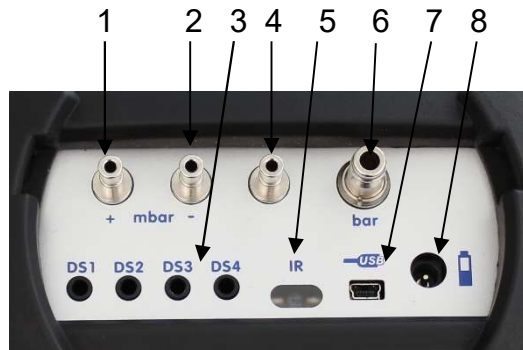
All inspections and measurements can be documented by means of printouts or storage.

Illuminated color display with touch screen

Function keys “F, ▲, ▼, H”



- 1 = pressure inlet (+) for mbar sensor
- 2 = pressure inlet (-) for mbar sensor
- 3 = connections for digital sensors
- 4 = gas inlet / gas outlet during pumping
- 5 = LED and infrared transmitter
- 6 = pressure inlet 0.1 MPa / 0.35 MPa (1 / 3.5 bar sensor)(Pneumatic quick coupling NW 5)
- 7 = USB - port
- 8 = socket for charger



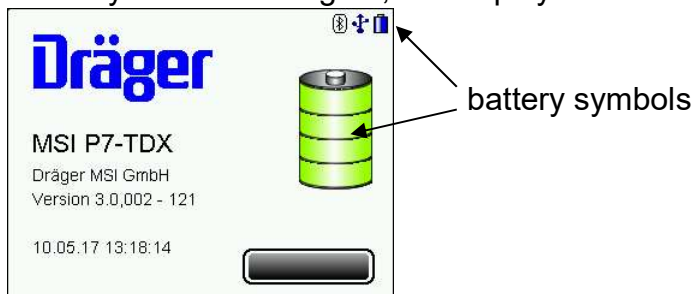
## 3. Operation

### 3.1 Function keys

#### 3.1.1 Switching on / off

**Switching on:** simultaneous pressing of keys “F” and “H” for approx. 1 second. If scheduled servicing is pending, the device issues a reminder one month prior to the date scheduled for servicing.

After pressing “F” (CONTINUE) or directly after switching on, the display reads:



The battery symbols show the charge level of the battery; in this case, full capacity. The bar indicates the progress of the inspection and stabilization phase. Furthermore, the software version of the device, a selected tester, date and time are shown.

The system check takes 5 seconds.

If errors are detected, warning messages are shown; otherwise the “selection of functions” menu is opened.

**Switching off:** press “F” key for a longer period (> 3 sec.) or using the “switch off” function in the “selection of functions” menu.

#### 3.1.2 Functions of the function keys

**The assignment of the functions keys is shown in the last line on the display respectively.**

The P7-TDX has a touch screen. Touching the display in the relevant spot replaces the command executed with the key. You can scroll the displayed content by dragging your finger in a specific direction on the screen. When entering numeric values (e.g. test pressure), the numeric value can be changed by dragging across the screen diagonally.

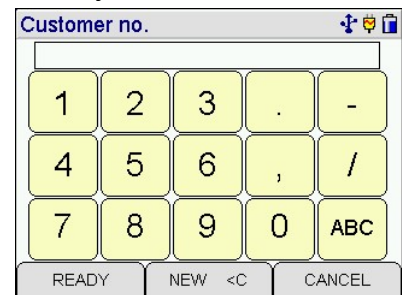
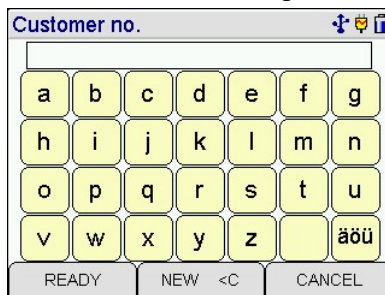
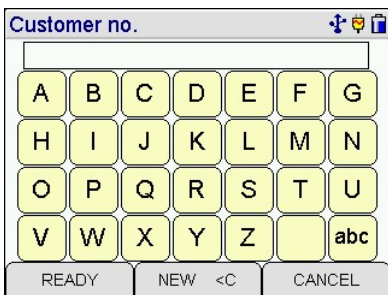
If the middle screen key is occupied by two functions, e.g. (▲▼), one of the functions is located on the right side of the key displayed and the other function on the left side.

A context menu is opened with (III). Depending on the menu item, the context menu offers various editing options and commands.



A previously selected customer number is shown in the result display with (REF). The customer number can be changed before storing.

Customer data and comments can be entered using an on-screen keyboard.



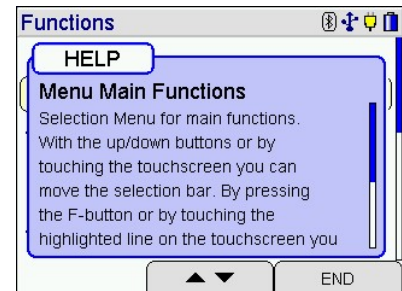
Touching the display with sharp or pointy objects can lead to the destruction of the display.

### 3.2 Info window and help functions

Pressing the right key for a longer period of time will open an info window. The info window provides information regarding the selected customer number, customer name, Inspector, clock, battery state and remaining life of the battery in the current operating state.



If the info window is open, a help function can be called up with (HELP), which provides information on and assistance with the respectively selected menu item.





### 3.3 Results display

A result display appears after completing a measurement. You can scroll through the result display using (▲▼).

A reference dataset is shown using (REF). It consists of a customer dataset selected prior to the measurement and the selected tester.

Pressure	
Time	13.05.18 12:13
Press.(AV)	37,01 mbar
Start	40,17 mbar
Stop	36,63 mbar
Diff.	3,54 mbar
Meas.time	1,5 min
CONTINUE	▲▼ REF

### 3.4 Documentation menu

The following functions can be selected:

- Back = switches to the result display
- New measurement = start a new measurement
- End, release = end of the measurement, the measurements are released
- Print = start printing out the recorded values (IR printer)
- Store = selection of the data storage

Documentation	
Back	
New Measurement	
End, release	
Print	
Store	
SELECT	▲▼ ESC

## 4. Selection of the functions

The following functions can be selected:

- Switch off = switch off the measuring device
- Customer administration = selection and entering of customer data
- Checklists/Visual examination = processing of checklists / documentation of visual examination
- Pressure measurements = selection of pressure measurement
- Tightness manual = freely configurable tightness test
- Gas Pipe Checks = selection of the gas pipeline test (stress, tightness and serviceability test)
- Liquid Gas Pipe Checks = selection of the LPG pipeline test
- Water Pipe Checks = selection of the drinking water installation test
- Sewage lines = selection of the sewer pipe test
- Regulator Check = selection of the regulator test
- Data management = selection of the data storage functions
- Info = information function
- Configuration = device configuration

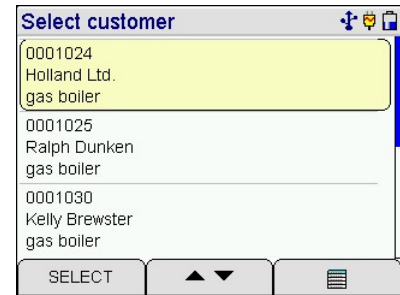
Functions	
Switch off	
Customer administration	
Checklists/Visual examination	
Pressure Measurements	
Tightness manual	
Gas Pipe Checks	
SELECT	▲▼ ESC

## 5. Selecting and entering customer data

Using the PC software, there is the option of creating a customer number, customer name and customer data and transmitting this information to the measuring device.

If customer data is stored in the device, this function can be used to select a customer and store data measurements under this customer's name.

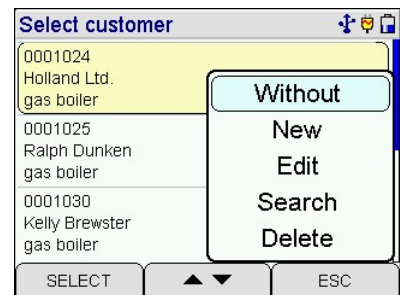
If there is no customer data stored for the customer, it can be entered using this function.



The context menu is opened with (III).

No customer is selected using (Without).

New customer data can be created using (New).



The highlighted customer number and, if available, corresponding data are shown using (Edit).

This data can be edited using (SELECT) and accepted using (END).



The following can be stored: Customer number, name, system type, installation location, system number, street, post code, city, customer name, customer's street, customer's post code, customer's city, customer's phone number.

A customer name can be searched for in the data stored using (Search).

The customer number shown can be accepted using (SELECT).

The accepted customer number applies to all subsequent measurements until the device is switched off or another number is selected.

The entire customer dataset can be deleted using (Delete). Individual customer datasets can only be deleted if this function is activated and there are no measurements stored on the device.

## 6. Checklists / Visual inspection

A comment can be added to the results of the visual inspection and be documented.

Checklists can be configured using the professional software PC200P. Up to 4 different checklists each with up to 20 items can be stored, edited and documented on the device.

## 7. Pressure measurements

### 7.1 Selection of pressure measurements

The following functions can be selected:

- High Pressure = pressure measurements up to 3500 hPa (mbar)
- Medium Pressure = pressure measurements up to 150 hPa (mbar)
- Micro Pressure = pressure measurements up to 100 Pascal
- Pump (150 hPa (mbar)) = medium pressure measurement with pump function
- High pressure ext. (MPa)(bar) = high pressure measurement with external sensor up to 2.5 MPa (25 bar)
- Pressure monitor = recording of pressure fluctuations
- Diff. Pressure ( $\pm 2$  MPa (20 bar)) = differential pressure measurement with 2 external pressure sensors

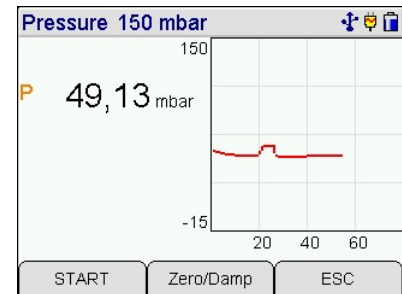
Differential pressure measurements with the integrated pressure sensor (150 hPa (mbar)) are conducted in the “medium pressure” function. Select the “differential pressure ( $\pm 2.0$  MPa (20 bar))” function for differential pressure measurements with external high pressure sensors.

## 7.2 Conducting pressure measurements

Connect the test nipple on the pressure tank or pressure line to be measured to the corresponding pressure inlet of the measuring device using a pressure hose. For high pressure measurements, connect the pressure tank or line to be measured to the external high pressure sensor using an adapter.



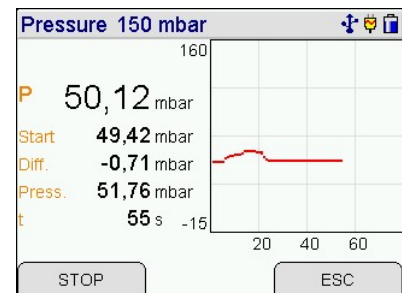
The left side of the display shows the current measurement with its measurement unit, the right side shows a diagram with the current pressure curve.



The following functions can be selected:

- Zero = the measured value shown is set to zero (not ext. sensor)
- Damp = selection of the damping value (not ext. sensor)
- START = start the pressure measurement
- ESC = ends the pressure measurement

After the pressure measurement is started, the current pressure, the starting pressure, the difference to the starting pressure, the mean value of the measurement and the duration of the current measurement are shown.

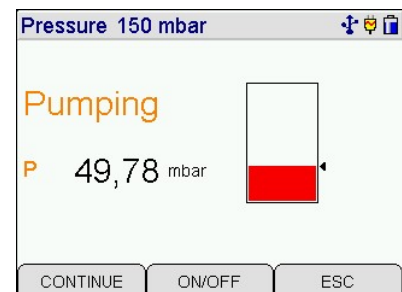


After completion of the measurement, the result display and documentation menu open.

## 7.3 Medium pressure measurement with pump function

Prior to the medium pressure measurement, a pressure of up to 150 hPa (mbar) can be built up using the installed pump.

Then, a medium pressure measurement can be made.



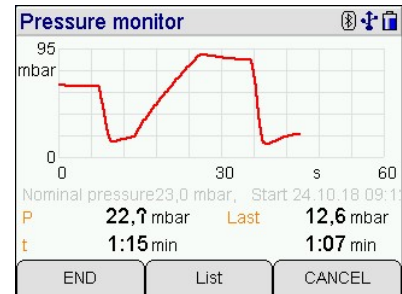
### 7.4 Pressure monitor

Pressure fluctuations can be recorded with the pressure monitor. The measuring channel, nominal pressure, upper threshold, lower threshold and the measurement time can be set for this purpose.



The current pressure, elapsed measurement period, pressure and time of the last pressure fluctuation are shown during the measurement.

The diagram always shows the last 30 – 60 seconds, so that brief pressure fluctuations can also be detected.



The pressure fluctuations of the ongoing measurement can be shown.

Events			
1	0	15,2mbar	19 s
2	0	90,5mbar	90 s
3	1	12,6mbar	21 s

Pressure monitor	
Time	24.10.18 09:12
Nominal press	23,0 mbar
Min. pressure	20,0 mbar
Max. pressure	26,0 mbar
Meas.time	00:05 h
Events	3

Pressure monitor			
Meas.time	00:05 h		
Events	3		
No	Time	Pressure	Duratio
1	09:12	15,2mbar	19 s
2	09:12	90,5mbar	90 s
3	09:13	12,6mbar	21 s

The result lists the number, time, pressure and duration of the pressure fluctuation.

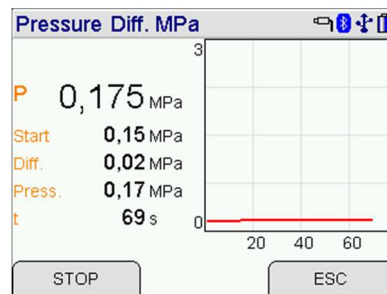
### 7.5 Differential pressure ( $\pm 2$ MPa (20 bar))

You use 2 external high pressure sensors for the differential pressure measurement ( $\pm 2$  MPa (20 bar)) and connect them to 2 of the connections for digital sensors. The external high pressure sensors must have the same measuring range.

The “zero” function sets the indicated differential pressure to zero; this means that the signals of both the high pressure sensors are equalized.

After the differential pressure measurement is started, the differential pressure, the starting differential pressure, the difference to the starting pressure, the mean value of the differential measurement and the duration of the measurement are shown.

The displayed differential pressure is the difference between the external pressure sensor is plugged in first and the external sensor that is plugged in second, e. g. DS1 minus DS2.



## 8. Manual tightness test

Manual tightness tests up to 48 h with compensation for changes of the absolute pressure (air pressure) and temperature can be conducted with the Dräger P7-TDX.

### 8.1 Settings

Test pressure, Stable time and measurement period can be set during the manual tightness test.

Select measuring channel: 150, 3,500 or 25,000 hPa (mbar).

Select test pressure: 10 - 150 hPa (mbar), 100 - 3,400 hPa (mbar) or 1,000 - 24,900 hPa (mbar).

If a tightness test was selected in the 150 hPa (mbar) measuring channel, the internal or an external pump can be used, to build up the test pressure. Tests with the 25,000 hPa (mbar) channel can only be conducted using an external pump.

Select stabilization time: 1 min - 48 h.

Select measurement time: 1 min - 48 h.

Select temperature correction: 0 - 100%. The percentage of the exposed pipeline can be entered for partially underground pipelines (constant temperature). Only the temperature change in the exposed pipeline is then corrected.

Tightness Test	
Channel	150 mbar
Test press	60 mbar
Intern.pump	YES
Stable time	00:05 h
Meas.time	00:10 h
Temp.corr.	100 %
<div style="display: flex; justify-content: space-between; width: 100%;"> <span>CONTINUE</span> <span>+/-</span> <span>ESC</span> </div>	

The selected measurement time is divided into 100 equal time units. A complete dataset is stored after each time unit.

When printing on the MSI printer IR3, each 5th dataset stored is printed out.

The measuring device switches to energy-saving mode, when measurements are set for 6 h or longer:

- as of 6 h measurement period: device switches “off”
- 10 s before the next storing of data: device switches “on”
- storing of a complete dataset
- directly after storing: device switches “off”
- manual switch on using “F” key
- device stays on until the next storing of data

### 8.2 Pressure build-up

While pressure is being built up, the following current information is shown:

- pressure in the “P” line
- temperature (if temperature sensor is connected) “T”
- absolute pressure “Pa”
- time elapsed for the pressure build-up “t”

You can switch to the stabilization phase using (CONTINUE).

Tightness Test	
80	P-Start - mbar
	T - °C
	Pa 1001 hPa
	t 00:09 min
	dP - mbar
	Pcorr - mbar
	dPcorr - mbar
<div style="display: flex; justify-content: space-between; width: 100%;"> <span>P 60,6 mbar</span> </div>	
<b>Pressure generation</b>	
<div style="display: flex; justify-content: space-between; width: 100%;"> <span>CONTINUE</span> <span>INFO</span> <span>ESC</span> </div>	

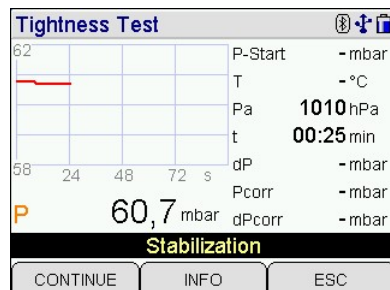


### 8.3 Stabilization

Every tightness or stress test includes a stabilization phase for temperature equalization and subsequent measurement. The duration of the stabilization phase and measurement as well as the test pressure can depend on specifications.

During stabilization, the following current information is shown:

- pressure in the "P" line
- temperature (if temperature sensor is connected) "T"
- absolute pressure "Pa"
- elapsed time of stabilization period "t"

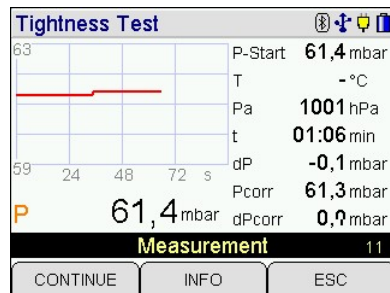


If the stabilization period is over or if it was prematurely ended using (CONTINUE), the measurement starts.

### 8.4 Measurement

During the measurement, the following current information is shown:

- pressure in the "P" line
- starting pressure "P-Start"
- temperature (if temperature sensor is connected) "T"
- absolute pressure "Pa"
- elapsed time of measurement period "t"
- difference to the starting pressure "dP"
- temperature corrected pressure in the "Pcorr" line
- temperature corrected difference to the starting pressure "dPcorr"

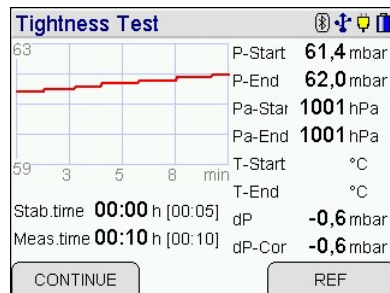


After completion of the measurement (measurement period elapsed or ended using (CONTINUE)), the result of the measurement is shown.

### 8.5 Result

The following is shown as the result:

- starting pressure "P-Start"
- final pressure "P-End"
- absolute starting pressure "Pa-Start"
- absolute final pressure "Pa-End"
- starting temperature "T-Start"
- final temperature "T-End"
- difference to the starting pressure "dP"
- temperature corrected difference to the starting pressure "dPcorr"
- stabilization period (selected stabilization period) "Stab. time"
- measurement period (selected measurement period) "Meas. time"



The documentation menu is opened using (CONTINUE).



## 9. Testing gas pipelines

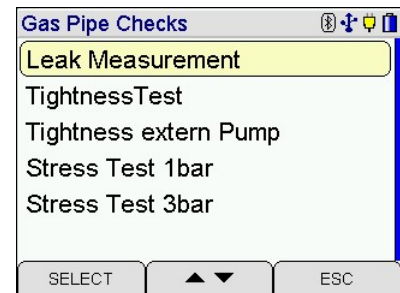
### 9.1 General information

The following tests must be conducted for the installation and maintenance of gas pipelines according to DVGW process sheet G600. Stress test, tightness test and serviceability test.

In the case of new installed pipeline systems, the stress and tightness test must be conducted before the pipelines are plastered or covered.

Gas can only be let into new pipeline systems or into existing pipeline systems on which work is to be conducted if the compulsory tests have been conducted successfully.

### 9.2 Selection of the gas pipeline test



The following functions can be selected:

- Leak Measurement = selection of the leak rate measurement
- Tightness Test = selection of the automatic tightness test
- Tightness extern Pump = Selection of the tightness test with external pump
- Stress Test 0.1 MPa (1 bar) = selection of a stress test at 0.1 MPa (1 bar)
- Stress Test 0.3 MPa (3 bar) = selection of a stress test at 0.3 MPa (3 bar)

### 9.3 Assessment of serviceability according to TRGI G 600 and G 5952

Operating gas pipeline systems must be treated according to the degree of usability. The basis for the assessment of usability is the measurement of the existing leak rate in liters per hour (leak rate measurement). Serviceability is divided into the following criteria:

- Unrestricted = gas leak rate < 1 l/h
- Reduced serviceability = gas leak rate 1 l/h to < 5 l/h
- No serviceability = gas leak rate > 5 l/h

If there is no serviceability, the system must be shut down immediately; if there is reduced serviceability, the system must be repaired within 4 weeks.

### 9.3.1 General information regarding leak rate measurement using the MSI P7-TDX

The MSI P7-TDX enables determining the serviceability of gas pipelines according to TRGI G 600 and test basis G 5952 at operating pressure. This method (comparison leak method) is patented. The measuring device is approved by the DVGW for the serviceability test under the registrations number DG-4805BS0029.

If all the consumers associated with the gas pipeline to be measured are closed by means of valves, the user only needs to connect the gas pipeline to be tested to the measuring device using a pressure measurement hose.

After the stabilization period for temperature equalization, the user is instructed to close the gas supply (e.g. main shut-off valve directly behind the gas meter). Then, the pressure in the gas pipeline is measured and after a time calculated by the measuring device, a comparison leak is opened.

The leak rate and the volume of the tested gas pipeline are calculated and shown from the measured pressure changes, with and without comparison leak.

The applied comparison leak method works independent of volume, temperature and absolute pressure.

A possible effect on the measurement accuracy through pressure regulators, which remain in the measuring section after closing the valve, can be prevented by selecting “leak measurement with regulator”. For this, the pipeline pressure is automatically reduced under the nominal operating pressure set after closing the gas supply and measurement has started, so that the pressure regulator fully opens and no gas can continue to flow during the measurement. This does not affect the result of leak rate measurement.

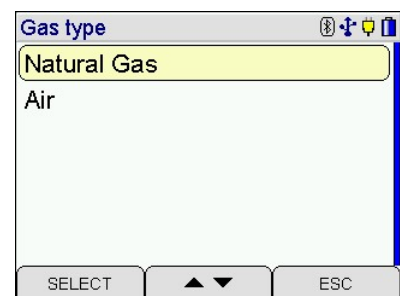
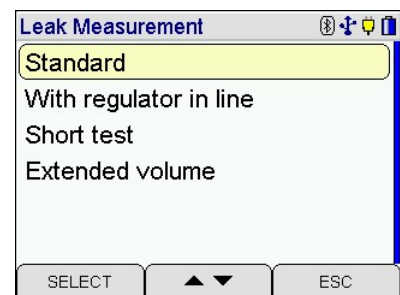
**!Observe the general requirements for handling combustible gases!**

### 9.3.2 Preparing the leak rate measurement

Select standard leak measurement or leak measurement with regulator in line.

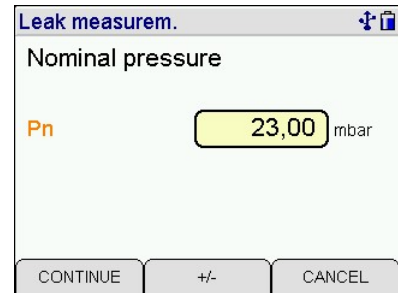
The quick test and the measurement for expanded volume are not DVGW (German competence network for all questions related to gas and water supply) tested and cannot be stored. Depending on the stability in the gas pipeline, a quick test can be conducted in approx. 7 minutes. The measurement for expanded volume enables measuring pipelines with up to 800 liters of volume.

Select type of gas.

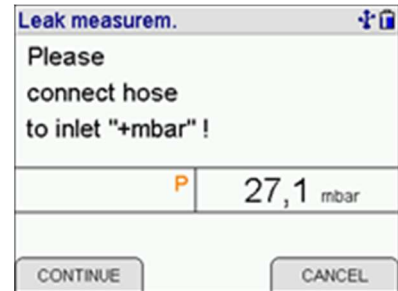


The actual operating pressure must be set as the nominal operating pressure for operating pressures > 30 hPa (mbar); otherwise the operating pressure must be set to 23.00 hPa (mbar).

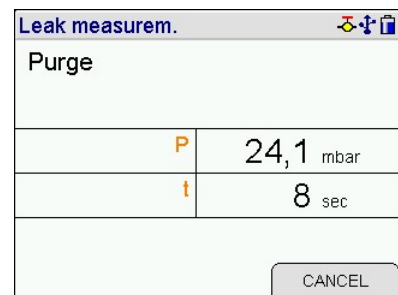
Accept operating pressure and establish connection to the system.



The current pressure is shown.  
Start measurement.

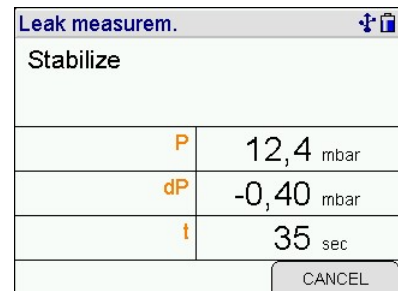


Now, purging is conducted for the connecting line and the measurement system for 40 seconds, to prevent falsifications of the measurement result. The gas is released from the gas connection between the pressure inlets for the mbar and bar sensors. At the same time, the flow rate is < 5 l/h. The stabilization phase automatically begins after purging.

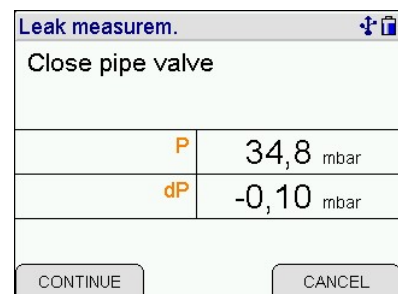


### 9.3.3 Stabilization

The stabilization of the gas pressure takes approx. 2 to 10 min. The current pressure in the gas pipeline to be tested, the already elapsed time of the stabilization period and the pressure drop up to this point (negative values mean that the pressure in the gas pipeline has increased, e.g. due to temperature influence) are shown. If stabilization has been reached or if 10 minutes have passed, the stabilization phase is automatically terminated and indicated acoustically.



The measuring system gives the instruction to close the gas supply for the gas pipeline to be tested (e.g. main valve directly behind the gas meter) and provides information about the current pressure in the gas pipeline to be tested and the pressure drop up to this point. If the gas supply is closed and the gas pipeline to be tested has a leak, the measuring device will detect a pressure drop. If the pressure drop is greater than 0.4 hPa (mbar), the leak measurement is started automatically, provided that automatic start is activated.



If the gas pipeline is airtight (does not have a leak) or if the pipeline volume is large and the leak small (> low pressure drop), (CONTINUE) can be pressed. After an additional 60 seconds, the leak rate measurement is started. In the case of “leak measurement with regulator in line”, the pipeline pressure is automatically reduced to 1 hPa (mbar) under the nominal operating pressure set, so that the pressure regulator fully opens and no gas can continue to flow during the measurement.

### 9.3.4 Leak rate measurement

After the measurement has started, the current pressure (P) in the gas pipeline, the pressure drop (dP) calculated up to this point and the elapsed time of the measurement period (t) are shown.

Leak measurement.	
Measurement	
P	22,5 mbar
dP	0,00 mbar
t	9 sec
CANCEL	

If the pressure in the gas pipeline to be tested has dropped by more than 0.9 hPa (mbar) or if the measurement takes longer than 5 minutes, the internal magnetic valve is opened and gas from the gas pipeline can flow through the comparison leak.

Leak measurement.	
Relation measurement	
P	26,4 mbar
dP	0,86 mbar
t	17 sec
CANCEL	

The magnetic valve is closed after the comparison measurement (dP > 0.9 hPa (mbar) or t > 5 minutes) is completed. The end of the comparison measurement is indicated acoustically. The result of the leak rate measurement is now analyzed and shown:

The display shows the mean pressure “P”, the measured leak rate “L(t)”, the leak rate with regard to the nominal operating pressure “L(n)” and the volume “Vol” of the gas pipeline. The volume is not shown for the “leak measurement with regulator in line”. If the leak rate is indicated with negative values, the pressure increased in the pipeline during the measurement. If the leak rate is smaller than -0.2 l/h or larger than 20 l/h, the leak rates are marked with ERR and in doing so, give a warning regarding measurement errors. If the pressure dropped below 10 hPa (mbar) or 8 hPa (mbar) during the measurement or the comparison leak measurement, “P” is marked with ERR and the measurement is inapplicable. If the measured volume is smaller than 1 l or larger than 300 l, the volume reading is marked with ERR because the leak rate measurement can be incorrect.

Leak measurement.	
Time	13.05.18 14:46
P	27,8 mbar
L (t)	0,86 l/h
L (n)	0,71 l/h
Vol	35,4 l
CONTINUE REF	

The documentation menu is opened using (CONTINUE).

## 9.4 Tightness tests according to DVGW TRGI 2018 process sheet G 600

A tightness test must be conducted and documented for every new or significantly modified gas installation.

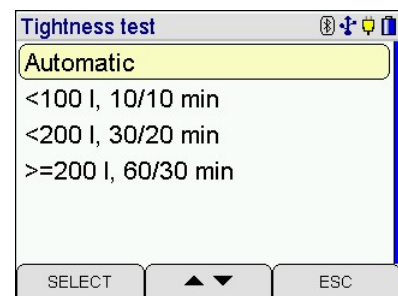
For this tightness test, the pressure in the gas pipeline to be tested must be increased to somewhat more than 150 hPa (mbar) according to DVGW TRGI 2018.

After the stabilization period for temperature equalization, the pressure in the gas pipeline to be tested is measured for the required time period. The stabilization periods and test times are each defined according to the volume of the line (line sections) to be tested.

### 9.4.1 Automatic tightness test

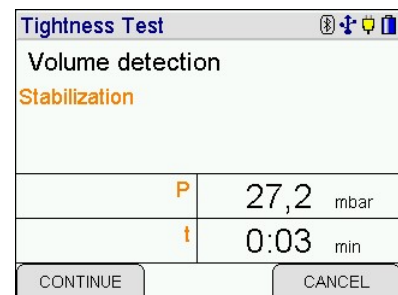
The P7-TDX enables a direct selection and an automatic identification of the gas pipeline volume.

The automatic identification of the gas pipeline volume can be helpful for significantly changed operating lines because these lines can, for the most part, be flush-mounted and therefore, concealed.

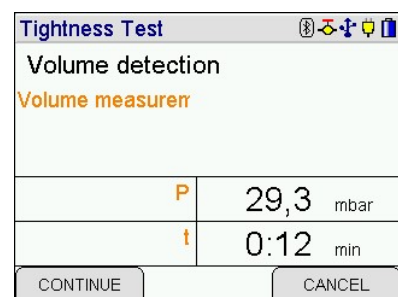


In the case of automatic measurement, the pipeline volume is determined after connecting the gas pipeline to the measuring device.

To do so, the pressure in the pipeline to be tested is increased to approximately 30 hPa (mbar) using the pump of the measuring device.

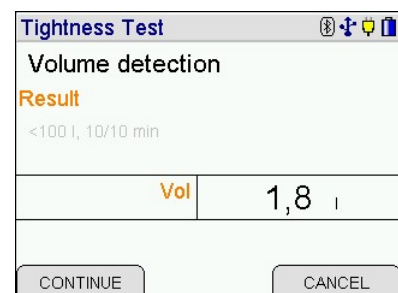


If the stabilization period is over or (CONTINUE) was pressed, the volume measurement starts.



The result with the corresponding stabilization and measurement period is shown.

Using (CONTINUE), the stabilization period and test time (e.g. 10/10min.) resulting from the volume range is accepted.



After selecting the pipeline volume, the gas pipeline is pumped up and the current pressure in the pipeline (P) and the already elapsed pump time (t) are shown.



The pump process can be terminated using (CONTINUE) even if the required test pressure has not yet been reached.

If the pressure reached the test pressure, the internal pump is automatically stopped.

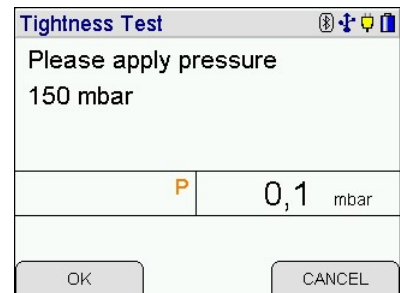
The duration of the stabilization phase and the test time is defined according to the selected pipeline volume.

The remaining sequence of a tightness test is described in Chapter 13.1. on page 33.

### 9.4.2 Tightness test with external pump acc. to DVGW TRGI process sheet G 600

The flow rate of the P7-TDX pump is approx. 1 l/min. The pressure increase to 100 hPa (mbar) for a gas pipeline volume of 100 l takes approx. 15 min. Therefore, it makes sense to work with an external pump, to shorten the time for pressure increase.

After starting the tightness test and connecting the gas pipeline to the P7-TDX, the measuring device gives the instruction to establish the pressure in the line.



Connect the external pump to the gas pipeline using a valve and increase the pressure.

The P7-TDX starts the stabilization phase using (CONTINUE).

The duration of the stabilization phase and the test time is defined according to the selected pipeline volume.

The remaining sequence of a tightness test is described in Chapter 13.1. on page 33.

## 9.5 Stress test acc. to DVGW TRGI process sheet G 600

### 9.5.1 Regulations for low pressure systems

A stress test must be conducted prior to the tightness test for gas installations for new low pressure systems (operating pressure < 100 hPa (mbar)).

To do so, the pressure in the gas pipeline must be increased to 0.1 MPa (1 bar).

After temperature equalization (there is no time specified), the pressure in the gas pipeline is measured for 10 minutes.

### 9.5.2 Regulations for medium pressure systems

A combined stress and tightness test must be conducted for gas installations in new medium pressure systems (operating pressure 100 hPa (mbar) to 0.1 MPa (1 bar)).

To do so, the pressure in the gas pipeline must be increased to 0.3 MPa (3 bar).

After temperature equalization (3 hours), the pressure in the gas pipeline is measured for 2 hours. The test duration must be prolonged by 15 minutes per additional 100 l volume for pipeline volumes exceeding 2,000 l.

### 9.5.3 Starting a stress test

If the 0.3 MPa (3 bar) test was selected, the pipeline volume must be indicated first. Set the pipeline volume and the measurement period determined based on it and start the measurement using (CONTINUE).

The screenshot shows a digital interface titled "Stress Test 3 bar". It features two input fields: "Volume up to" with a value of "2000 l" and "Duration" with a value of "120 min". At the bottom, there are three buttons: "CONTINUE", "+/-", and "CANCEL".

If the 0.1 MPa (1 bar) test was selected, the stress test is started immediately.

Connect the pipeline to be tested with the pressure inlet of the measuring device marked with "bar" using a pressure hose with a pneumatic quick coupling NW 5 and connect the external pump to the line via a valve.

Increase the pressure to 0.1 MPa (1 bar) or for medium pressure systems, to 0.3 MPa (3 bar).

**Low pressure systems:** The measuring device defines the duration of the stabilization phase depending on the pressure stability in the gas pipeline (2 to 10 min). A test time of 10 minutes is required for the measurement.

**Medium pressure systems:** A 3-hour waiting period is required for the stabilization phase. The measuring device defines the duration of the measurement (at least 2 hours) depending on the pipeline volume entered, according to the regulations of the TRGI G 600.

The remaining sequence of a stress test is described in Chapter 13.1. on page 33.



## 10. Testing LPG pipelines

### 10.1 Tech. Regulations Liquid Gas (German Technische Regeln Flüssiggas - TRF)

#### 10.1.1 General information

The flawless condition of liquid gas systems must be checked by authorized experts, technical experts and/or specialized service centers:

- before initial commissioning,
- after modifications,
- after an interruption of operations of more than one year,
- periodically.

Filling a stationary liquid gas tank with liquid gas is presumed to be commissioning. The following are required tests: Strength test and tightness test.

#### 10.1.2 Strength test

Apply 1.1 times the value of the permissible positive operating pressure however, at least 0.1 MPa (1 bar) to the pipeline by means of air or nitrogen.

Wait at least 10 minutes; in the case of partially underground pipelines, 30 minutes.

Read the pressure on the test pressure gauge (measurement accuracy 1 % from measuring range end value).

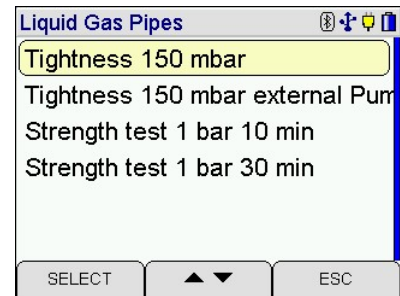
At the earliest, check pressure on the test pressure gauge for pressure drop after an additional 10 minutes.

#### 10.1.3 Tightness test

Immediately before commissioning, all pipelines up to the adjustment elements of the devices must be checked for tightness with a positive pressure of 150 hPa (mbar) using air. The pipelines are considered tight if the test pressure does not drop during the subsequent test time of 10 minutes after temperature equalization.



## 10.2 Selection of the LPG pipeline test



The following tests can be selected:

- Tightness 150 hPa (mbar) = start of the automatic tightness test
- Tightness 150 hPa (mbar) ext. pump = start of the tightness test with external pump
- Strength test 0.1 MPa (1 bar) 10 min = start of a strength test on LPG pipelines
- Strength test 0.1 MPa (1 bar) 30 min = start of a strength test on partially underground LPG pipelines

## 10.3 Fully automatic tightness test according to TRF

Connect measuring device and LPG pipeline and start measurement. The current pressure (P) and the elapsed pump time (t) are shown.

After reaching the test pressure, the stabilization for temperature equalization is automatically started.

The duration of the stabilization phase is 10 minutes.

A test time of 10 minutes is required for the subsequent automatic measurement.



The remaining sequence of a tightness test is described in Chapter 13.1. on page 33.

## 10.4 Tightness test with external pump according to TRF

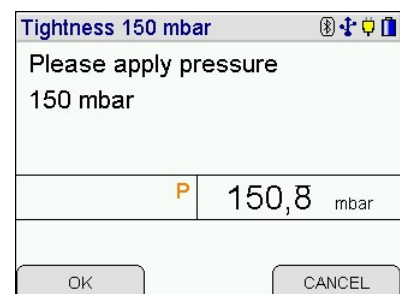
The flow rate of the P7-TDX pump is approx. 1 l/min. The pressure increase to 100 hPa (mbar) for a gas pipeline volume of 150 l takes longer than 15 min. Therefore, it makes sense to work with an external pump, to shorten the time for pressure increase.

After starting the tightness test and connecting the LPG pipeline to the measuring device, the pressure in the line must be increased.

Connect the external pump to the LPG pipeline using a valve and increase the pressure.

The 10-minute stabilization phase begins using (OK).

A test time of 10 minutes is required for the measurement.



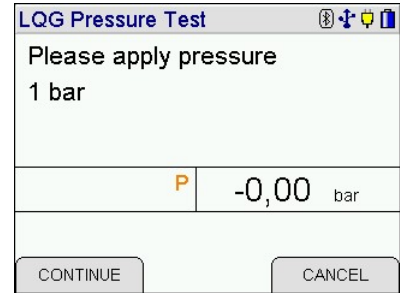
The remaining sequence of a tightness test is described in Chapter 13.1. on page 33.

### 10.5 Strength tests for LPG systems according to TRF

Connect the pipeline to be tested with the pressure inlet of the measuring device marked with “bar” using a pressure hose with a pneumatic quick coupling NW 5 and connect the external pump to the line via a valve.

Increase the pressure to somewhat more than 0.1 MPa (1 bar) and switch to the stabilization phase using (CONTINUE). At least 10 minutes or for partially underground pipelines, 30 minutes, are required for the duration of the stabilization phase for temperature equalization.

A measurement period of 10 minutes is required for the measurement.

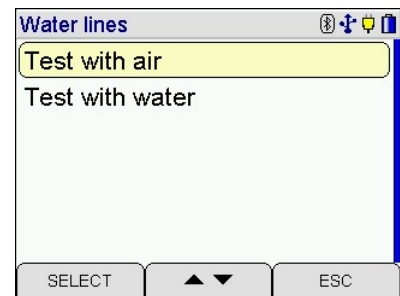


The remaining sequence of the strength test (stress test) is described in Chapter 13.1. on page 33.

## 11. Testing drinking water installations

According to DIN EN 806-4, the tests required for drinking water installations can either be conducted using water or with air or inert gas.

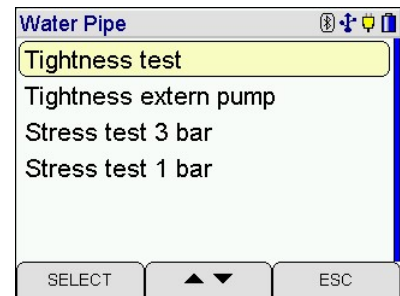
**Tests for drinking water installations with water can only be conducted with an optional external high pressure sensor. If tests are conducted using the internal pressure sensor, the device can be damaged!**



For hygienic reasons, a test using water should not be conducted until immediately after commissioning the drinking water installation.

For this, please also refer to the VDI (Association of German Engineers) Guideline VDI 6023 “Hygiene in Drinking Water Installations” and the ZVSHK (The German Sanitation, Heating and Air Conditioning Association) data sheet “Tightness Testing of Drinking Water Installations”.

## 11.1 Testing of drinking water installations using air

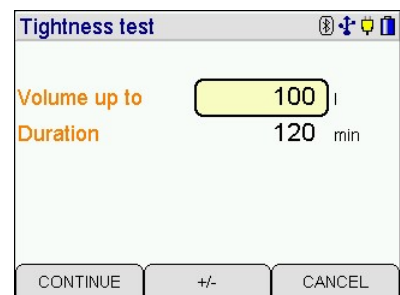


The following tests can be selected:

- Tightness test = start of the automatic tightness test
- Tightness external pump = start of the tightness test with extern pump
- Stress test up to DN50 0.3 MPa (3 bar) = start of a stress test at 0.3 MPa (3 bar)
- Stress test up to DN100 0.1 MPa (1 bar) = start of a stress test at 0.1 MPa (1 bar)

### 11.1.1 Fully automatic tightness test

Up to a pipeline volume of 100 l a test time of 120 minutes is required for the measurement. The test time must be prolonged by 20 minutes per additional 100 liters of pipeline volume. The duration of the stabilization phase is not specified and is defined depending on the pressure stability in the drinking water installation pipeline (2 to 10 min).



The measurement period is automatically calculated depending on the volume.

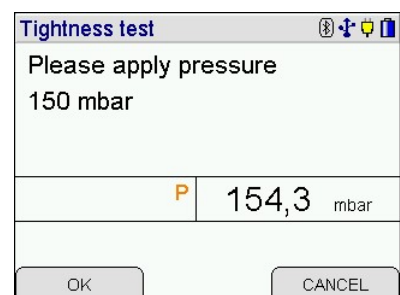
Connect measuring device and drinking water installation and start measurement. The current pressure (P) and the elapsed pump time (t) are shown. After reaching the test pressure, the stabilization for temperature equalization is automatically started.

The remaining sequence of a tightness test is described in Chapter 13.1. on page 33

### 11.1.2 Tightness test with external pump

Until the tightness test is started, the function equals the fully automated tightness test (Chapter 11.1.1 on page 26).

After starting the tightness test and connecting the drinking water installation pipeline to the measuring device, the pressure in the line must be increased. Connect the external pump to the drinking water installation pipeline using a valve and increase the pressure to 155 hPa (mbar). The stabilization phase begins using (OK). The duration of the stabilization phase is not specified and is defined depending on the pressure stability in the drinking water installation pipeline (2 to 10 min).



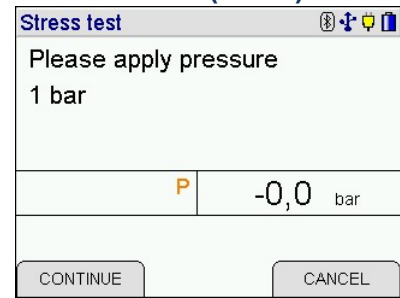
The remaining sequence of a tightness test is described in Chapter 13.1. on page 33

### 11.1.3 Stress test up to DN 50 0.3 MPa (3 bar) and up to DN 100 0.1 MPa (1 bar)

The stress test is conducted with an external pump for pressure increase.

Connect the water pipeline to be tested with the pressure inlet of the measuring device marked with “bar” using a pressure hose with a pneumatic quick coupling NW 5 and start the measurement.

Connect the external pump to the pipeline using a valve and increase the pressure.



**Up to DN 50: Increase the pressure to 0.3 MPa (3.0 bar).**

**Up to DN 100: Increase the pressure to 0.1 MPa (1.0 bar).**

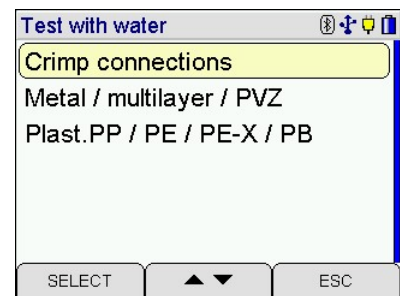
Switch to the stabilization phase using (CONTINUE).

The duration of the stabilization phase for temperature equalization is not specified; the P7-TDX defines the duration depending on the pressure stability in the pipeline (2 to 10 min). A measurement period of 10 minutes is required for the measurement.

The stabilization phase can be terminated manually and you can switch to testing using (CONTINUE); the remaining sequence is described in Chapter 13.1. on page 33.

## 11.2 Tightness tests for drinking water installations using water

**Tests for drinking water installations with water can only be conducted with an optional external high pressure sensor. If tests are conducted using the internal pressure sensor, the device can be damaged!**



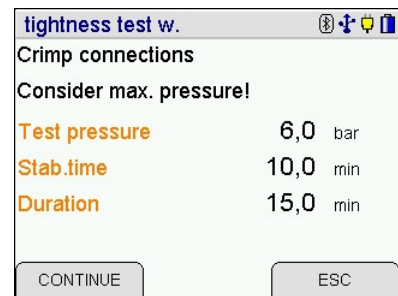
The following tests can be selected:

- |                            |   |
|----------------------------|---|
| Crimp connections          | = press connections (unpressed untight)   |
| Metal / multi-layer/PVC    | = metal, multi-layer composite and PVC pipes  |
| Plast. PP / PE / PE-X / PB | = PP, PE, PE-X and PB pipes and therefore, combined installations consisting of metal and multi-layer composite pipes |

### 11.2.1 Crimp connections (unpressed untight)

Unpressed untight connections must be checked with a test pressure of 0.6 MPa (6 bar) or according to manufacturer's specifications prior to the actual tightness test. The test time is 15 minutes.

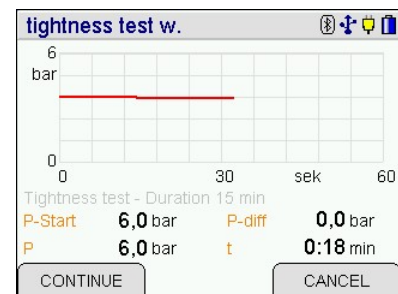
Connect the pressure sensor to the pipeline to be tested and start measurement using (CONTINUE).



Connect the external pump to the pipeline using a valve and increase the pressure. If the test pressure is reached, start the stabilization phase using (CONTINUE).

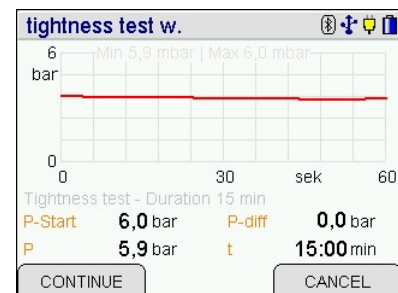
The stabilization phase can be terminated manually and you can switch to the measurement manually. The measurement starts automatically at the end of the stabilization period.

The measurement can be terminated prematurely using (CONTINUE).



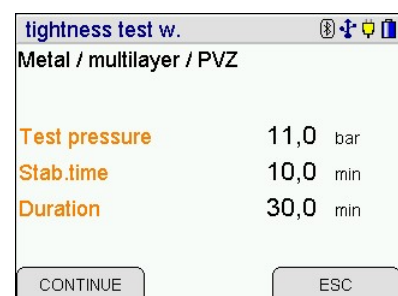
The pressure at the beginning of the measurement, the current pressure in the pipeline and the already elapsed time of the measurement period are shown during the measurement.

At the end of the measurement or after premature termination, a switch to the result display occurs and the documentation menu can be accessed.



### 11.2.2 Metal, multi-layer composite and PVC pipes

A stabilization period for temperature equalization amounting to 10 min and a test time of 30 min must be complied with for the tightness testing of drinking water installations using water, which consist of metal, multi-layer composites and PVC pipes. The test pressure is 1.1 MPa (11 bar). There can be no drop in pressure during the test time and there can be no recognizable leaks.

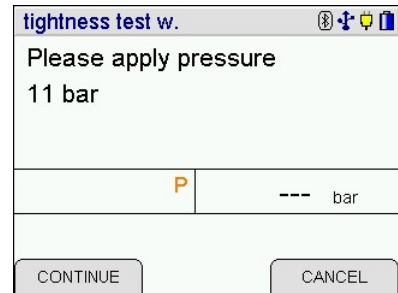


Connect the pressure sensor to the pipeline to be tested and start the measurement.

Connect the external pump to the pipeline using a valve and increase the pressure.

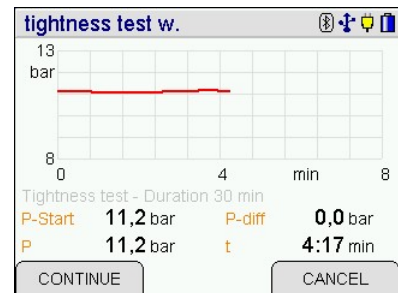
Start the stabilization phase.

The stabilization phase can be terminated manually and you can switch to the measurement using (CONTINUE).



The measuring device automatically switches to the measurement at the end of the stabilization period.

The measurement can be terminated manually using (CONTINUE).



The pressure at the beginning of the measurement, the current pressure in the pipeline, the pressure difference and the already elapsed time of the measurement period are shown during the measurement.

At the end of the measurement or after manual termination, a switch to the result display occurs and the documentation menu can be accessed.

### 11.2.3 PP, PE, PE-X and PB pipes and therefore, combined installations

The tightness test with water for PP, PE, PE-X and PB pipes and therefore, combined installations consisting of metal and multi-layer composite pipes includes a stabilization part and a measurement part.

The stabilization part takes 30 minutes, the test pressure during this time is 1.1 MPa (11.0 bar). The test pressure must be maintained during these 30 minutes. After that, the test pressure must be reduced to 0.55 MPa (5.5 bar). A test time of 120 minutes must be adhered to with the reduced pressure. Leaks cannot be identified at any location in the system being tested and the test pressure must remain constant during the test time.

The screenshot shows the 'tightness test w.' interface for plastic pipes. The title is 'Plast.PP / PE / PE-X / PB'. The parameters are listed in a table:

Stab.Press.	11,0 bar
Test pressure	5,5 bar
Stab.time	30,0 min
Duration	120,0 min

At the bottom, there are 'CONTINUE' and 'ESC' buttons.

Connect the pressure sensor to the pipeline to be tested and start the measurement.

Connect the external pump to the pipeline using a valve and increase the pressure.

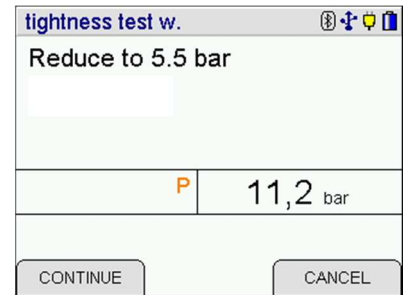
Start the stabilization phase.

Maintain the test pressure during the stabilization phase.

The screenshot shows the 'tightness test w.' interface during the 'Stabilizing' phase. The main text reads 'Stabilizing'. Below this, there is a pressure gauge icon with a 'P' and a value '11,0 bar'. Below that, there is a time icon with a 't' and a value '1:17 min'. At the bottom, there are 'CONTINUE' and 'CANCEL' buttons.

The stabilization phase can be terminated prematurely and you can switch to the measurement using (CONTINUE).

At the end of the stabilization period, the reduction of the test pressure is required.

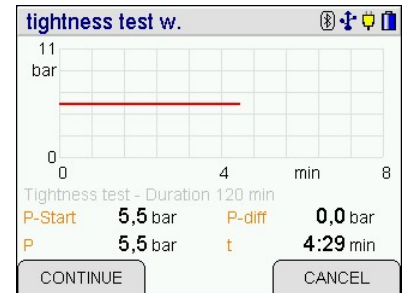


After reducing the test pressure, the measurement is started using (CONTINUE).

The pressure at the beginning of the measurement (P-Start), the current pressure or the pressure at the end of the measurement (P), the pressure difference (P-diff) and the already elapsed time of the measurement period (t) are shown during and at the end of the measurement.

A diagram shows the pressure curve.

The measurement can be terminated prematurely using (CONTINUE).



At the end of the measurement or after premature termination, a switch to the result display occurs.

A switch to the documentation menu can be made using (CONTINUE).

Tightness Test	
Time	15.10.18 11:41
Time	10 min
P-Start	5,5 mbar
P-End	5,5 mbar
dP	0,0 mbar
CONTINUE REF	



## 12. Testing sewage lines

The tightness test for sewage lines according to DIN EN 1610 applies to new and refurbished sewage lines and sewers.

For the test using air (method L), the initial pressure, which exceeds the required test pressure by approx. 10 %, must be initially maintained for approx. 5 minutes. After that, the test pressure must be set according to test method LC (100 hPa (mbar)) or LD (200 hPa (mbar)). In case the drop in pressure measured after the test time is lower than 15 hPa (mbar) for both these test methods, the pipeline complies with the requirements.

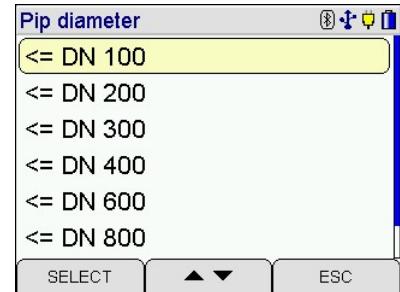
Select the material of the sewer pipe and the test method.



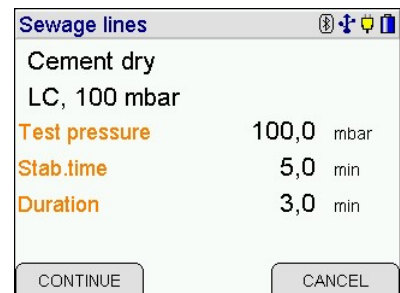
The following materials and test methods can be selected:

Cement dry LC 100 hPa (mbar) =	dry cast concrete pipes Test method LC (100 hPa (mbar))
Cement dry LD 200 hPa (mbar) =	dry cast concrete pipes Test method LD (200 hPa (mbar))
Cement wet LC 100 hPa (mbar)=	wet cast concrete pipes and all other materials Test method LC (100 hPa (mbar))
Cement wet LD 200 hPa (mbar)=	wet cast concrete pipes and all other materials Test method LD (200 hPa (mbar))

Select pipe diameter and start.

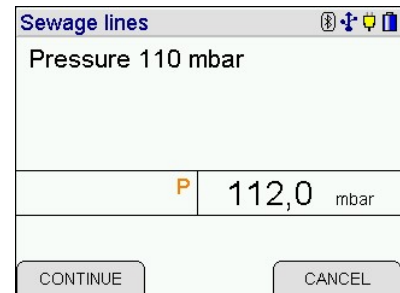


The selected material, the test method and the test pressure resulting from this data, the stabilization period and the test time are shown.

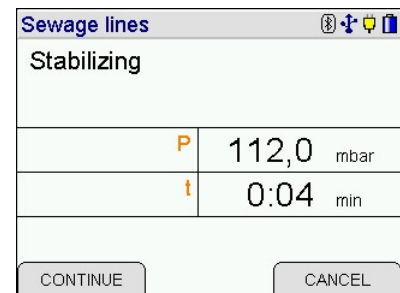




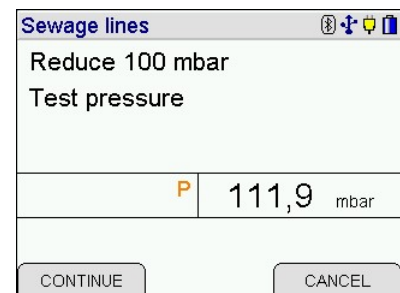
Connect the sewage line to be tested with the pressure inlet of the measuring device marked with “bar” using a pressure hose with a pneumatic quick coupling NW 5 and start the measurement. Using (CONTINUE), the instruction is given to establish the test pressure plus 10 %. The measuring procedure cannot be continued until the required pressure is established.



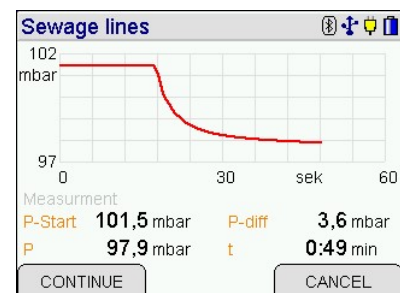
Start the stabilization phase. The stabilization phase can be terminated manually and you can switch to the measurement using (CONTINUE).



After the stabilization period has ended or using (CONTINUE), the instruction is given to reduce the pressure to the test pressure.



The test time begins after reducing the pressure to the test pressure and (CONTINUE). The pressure in the sewage line at the beginning of the measurement, the current pressure, the pressure difference and the already elapsed test time are shown.



After the test time has ended or (CONTINUE), the result is shown with test time, pressure in the sewage line at the beginning of the test time, pressure at the end of the test time and the pressure loss and you can switch to the documentation menu.

## 13. Conducting pipeline tests

### 13.1 Tightness and stress tests

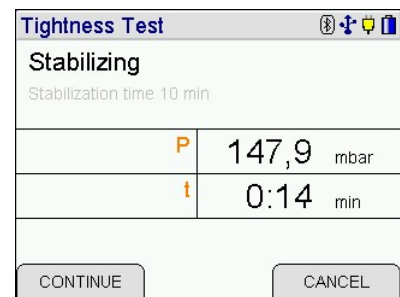
During pipeline tests, an informational text provides information pertaining to the current measurement process.

After pumping up to the respective test pressure (not for external pumps), the device checks the pressure for 1 minute. If the pressure drops below the required test pressure, the measuring device automatically starts pumping again. This can be repeated up to 2 times. The last minute of this period of checking belongs to the stabilization phase.

Every tightness or stress test includes a stabilization phase for temperature equalization and subsequent measurement. The duration of the stabilization phase, measurement and test pressure depends on the regulations (TRGI, TRF, TRWI, etc.).

The current pressure in the pipeline to be tested and the already elapsed stabilization period are shown during the stabilization phase.

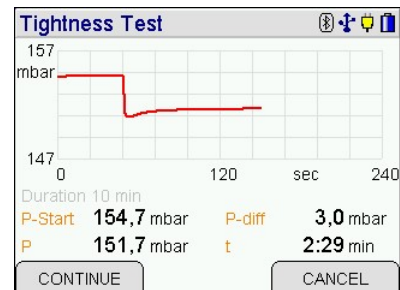
If stabilization was reached or prematurely terminated, the measurement starts.



The pressure at the beginning of the measurement (P-Start), the current pressure or the pressure at the end of the measurement (P), the pressure difference (P-diff) and the already elapsed measurement period (t) are shown during and at the end of the measurement.

A diagram shows the pressure curve.

The measurement can be terminated prematurely using (CONTINUE).



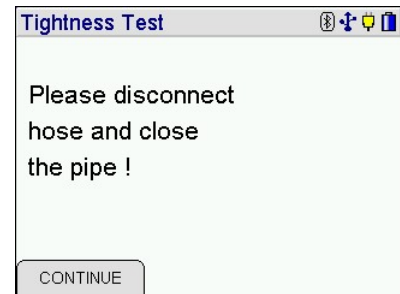
The start and stop values as well as the up to 20 intermediate measurements and the elapsed time were retained. These retained values can be stored and transferred to a PC at a later point in time. Measurement reports, which show the chronological sequence of the measurement in a diagram, can be printed using the PC200P software.

The documentation menu is opened using (CONTINUE).

### 13.2 Termination or cancellation of pipeline tests

If a pipeline test was terminated or cancelled, the measuring device gives the instruction to close the valve on the connecting nipple of the measuring point and remove the hose on the pressure probe from the pipeline being tested.

The requirements of the corresponding regulations must be observed.



### 14. Testing pressure regulators

To measure the functions of a regulator, connect the test nipple of the gas pipeline to the pressure inlet of the measuring device marked with "+ mbar" using a pressure hose.

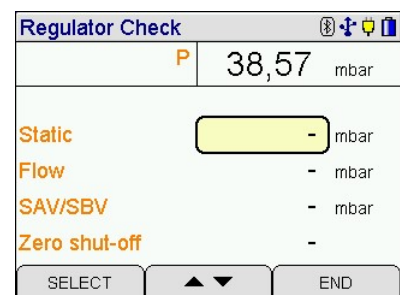
The following functions can be selected:

Static = measurement of static pressure

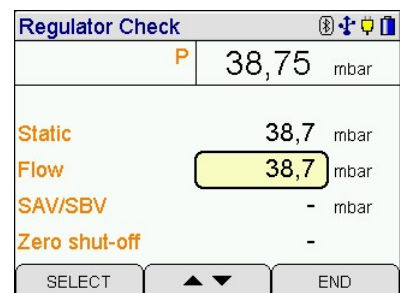
Flow = measurement of flow pressure

SAV / SBV = measurement of the SAV pressure or measurement of the SBV pressure (SAV = safety shut-off valve / SBV = safety bleed valve)

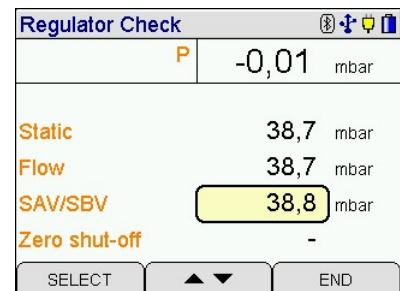
Zero-shut off = SAV zero-pressure check



Using (SELECT), the indicated pressure for the highlighted function is accepted.



Using (END), the result of the regulator test is shown and the documentation menu can be opened.



### 14.1 Static pressure

Measuring the static pressure enables detecting errors in the pressure reducer (regulator) and in the shut-off valve (ball valve) upstream of the consumer.

The valve upstream of the regulator must be open, the valve upstream of the consumer must be closed.

A constant pressure in the gas pipeline is expected, the amount of which provides information, on whether the pressure reducer is correctly adjusted for the pressure required (e.g. 23 hPa (mbar)).

Observing the chronological sequence of the pressure measured provides information on whether regulator and ball valve are OK.

Measurement result	Test result
Pressure increases	regulator untight
Pressure drops and then increases again	ball valve downstream of regulator untight
Pressure remains constant	ball valve and regulator OK

### 14.2 Flow pressure

Measuring the flow pressure enables detecting errors in the pressure reducer (regulator).

The valve upstream of the regulator must be open. The valve upstream of the consumer must be open and the consumer must be operating.

A fairly constant pressure in the gas pipeline is expected, the amount of which approximately complies with the static pressure. If the flow pressure is significantly lower, the pressure drop on the pressure reducer is too high.

Observing the chronological sequence of the pressure measured provides information on whether the regulator is working properly.

Measurement result	Test result
Pressure fluctuates strongly	regulator defective (sticky membrane)
Pressure remains nearly constant	regulator OK

### 14.3 SAV pressure

The measurement provides information on whether the SAV (safety shut-off valve) pressure is adjusted correctly. The valve upstream of the SAV must be open, the valve upstream of the consumer closed.

The pressure downstream of the regulator (secondary side) in the gas pipeline must be increased.

If the SAV pressure is exceeded, the SAV is triggered and the gas supply on the primary side is blocked (loud clicking). The existing pressure (secondary side) at the time of the clicking is the SAV pressure.

The SAV block must then be disengaged again manually.

## 14.4 SBV pressure

The measurement provides information on whether the SBV (safety bleed valve) pressure is adjusted correctly. The valve upstream of the SBV must be open, the valve upstream of the consumer closed.

The pressure downstream of the regulator (secondary side) in the gas pipeline must be increased.

If the SBV pressure is exceeded, the SBV opens and gas is released on the secondary side (hissing). The existing pressure (secondary side) at the time of opening is the SBV pressure.

The SBV closes automatically if the pressure is significantly undercut.

## 14.5 Zero-pressure

After the SAV is triggered, the tightness is checked, to determine whether there is a connection from the line side to the house installation, e.g. via a defective seal. To do so, depressurize the line downstream of the SAV with main shut-off valve open and then, check whether the pressure is at 0 hPa (mbar) or is slowing increasing. There can be no pressure increase measurable downstream of the SAV.

Measurement result	Test result
Pressure 0 hPa (mbar)	zero-pressure
Pressure increases slowly	no zero-pressure (seal defective)

## 15. Data storage

### 15.1 Storing measurements

If a customer number is not selected, the dataset is stored with the type of measurement as well as date and time.

Switch to customer number using (▲▼).

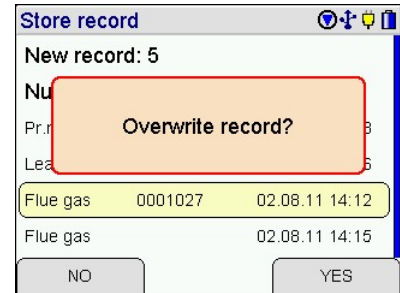
Open the “Selecting and entering customer data” function using (SELECT). This function enables editing the customer data shown, selecting another customer or creating a new customer.

Select the dataset, under which the measurement is to be stored using (▲▼). The datasets can be listed with date or customer number.



All measurements are stored together with date and time using (STORE) “New dataset”.

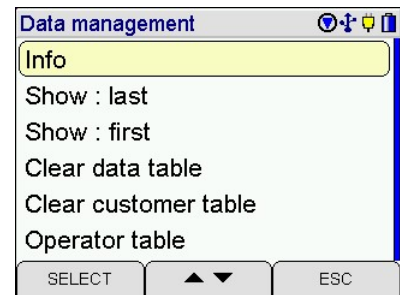
If an already existing dataset was selected, the dataset can be overwritten.



## 15.2 Data management functions

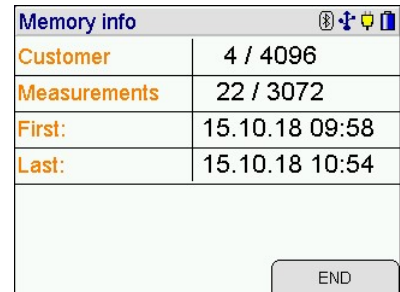
The following functions can be selected:

- Info = access the information function
- Show data: Last = show last dataset
- Show data: First = show first dataset
- Clear data table = delete data storage
- Clear customer table = delete customer data storage
- Operator table: = editing the testers' table



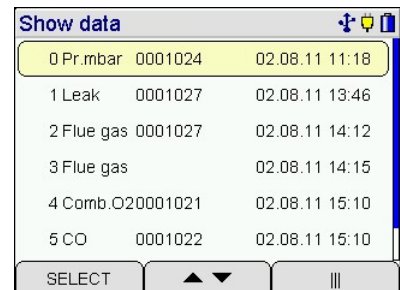
## 15.3 Memory info

The number of stored and possible customer and measurement datasets are shown and when the first and when the last dataset was stored.



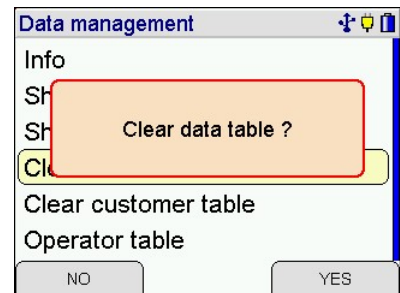
## 15.4 Show data and delete individual dataset

The dataset selection is shown under “Show data: first or last” and the first dataset or the last dataset is highlighted. The type of measurement, customer number (if entered) and date and time the storage was made are shown. The result display of the highlighted measurement is accessed using (SELECT).



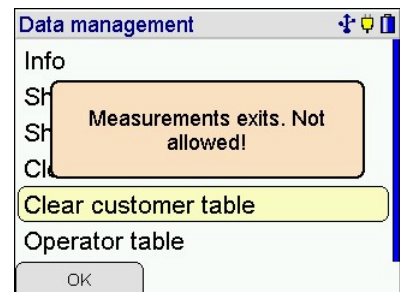
### 15.6 Deleting measurement data

Deleting measurement data: All stored measurement data is deleted.



### 15.7 Deleting customer data

Deleting customers: All customer data is deleted. The customer data storage can only be deleted if there is no measurement data stored in the device.



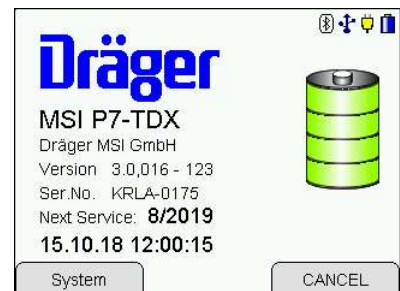
### 15.8 Inspector table

Different testers can be entered in the inspectors' table with number, name, street, postal code, city and telephone number. A tester can only be deleted if there is no measurement data stored in the device. The selected tester is linked to the stored measurement dataset.



## 16. Information function

The display provides information regarding the measuring device type (MSI P7-TDX), the manufacturer (Dräger MSI GmbH), the version of the measuring device software (here 3.0,016), the serial number of the measuring device, the next servicing date and date and time of accessing the information function.





## 17. Configuration

The measuring device can be configured according to the user's requirements.

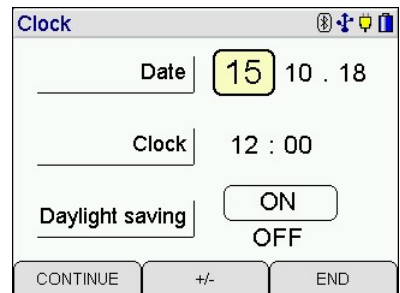


The following functions can be selected:

- Clock = set date and time
- Leak Auto Start = activation of the automatic start for leak rate measurement
- P Damping = selection of the damping value for the pressure measurement
- Backlight = adjust backlight
- Key beep = switch key tone on/off
- Auto Switch Off = selection of the time before the device goes into standby mode
- Printer = selection of printer protocol and printout of customer and tester
- Touch pad = calibration of the touchpad
- Info window = switching the swipe effects on and off in the info window
- Enable delete function = allow a single measurement dataset to be deleted
- Language = language selection for the display texts

### 17.1 Set clock

Setting the date, time and automatic acceptance of daylight-saving time.

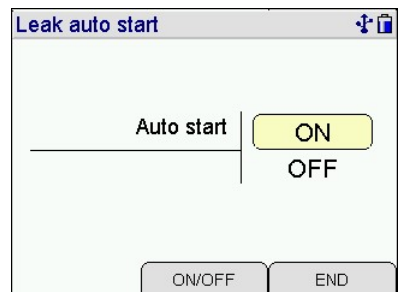


### 17.2 Activate automatic start for leak rate measurement

The automatic start enables the leak rate measurement in pipelines with low to medium volume, which have a leak. After closing the gas supply, the pressure in pipelines with low volume would drop significantly and starting the leak rate measurement manually would possibly take too long and the pressure in the pipeline would then be too low for a measurement.

The measuring device recognizes a drop in pressure and automatically starts the leak rate measurement.

However in rare cases, the pressure fluctuation in the gas pipeline is so high that the automatic operation causes an incorrect start of the leak rate measurement. In this case, the automatic start must be disabled.



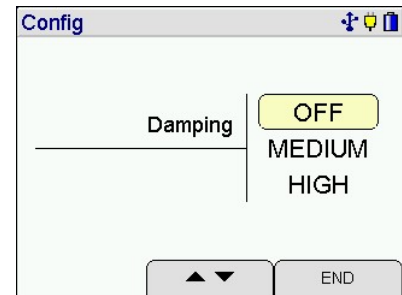


### 17.3 Selection of the damping value for the pressure sensor

The damping value for the pressure sensor can be changed for a normal pressure measurement.

The following damping values can be selected:

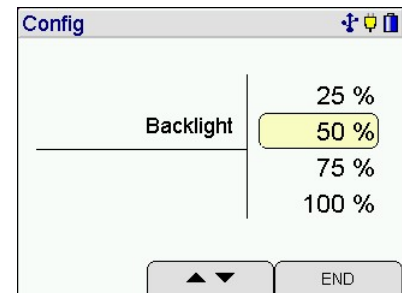
- OFF = no damping
- MEDIUM = medium damping
- HIGH = high damping



### 17.4 Adjust backlight

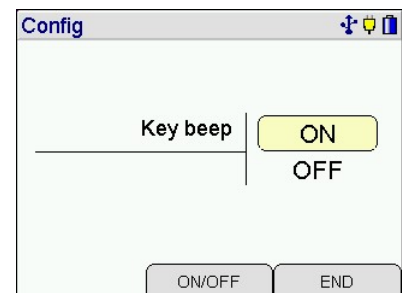
The following backlight intensity levels can be selected: 25 %, 50 %, 75 % and 100 %.

The selected intensity of the backlight is retained even after switching off the measuring device.



### 17.5 Switch key tone on / off

This function allows switching the key tone on and off.



### 17.6 Automatic switch off (standby)

Selection of the time before the device goes into standby mode.

- OFF = standby mode off
- SHORT = reduction of the backlight after 30 s, switch off after 30 min
- MIDDLE = reduction of the backlight after 60 s, switch off after 60 min
- LONG = reduction of the backlight after 10 min, switch off after 180 min



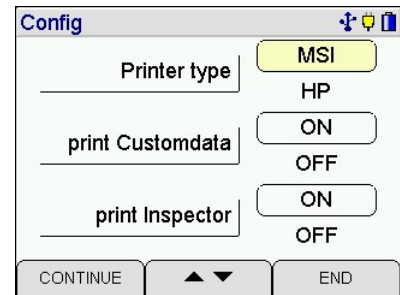
### 17.7 Printer

The MSI IR3 printer or the HP printer can be selected using (▲▼).

MSI IR3 printer: Data transmission and printing rates are now faster than with HP protocol compatible printers.

HP printer: Data transmission corresponds to the HP protocol and is suitable for all HP protocol compatible printers; of course for the MSI IR3 as well. There is the option of selecting whether the customer address and/or tester's name should also be printed.

This function remains active even after switching off the measuring device.



### 17.8 Calibrating the touchpad

Calibrating the touchpad may be required, to enable the recognition of touches on the display in the correct spots.



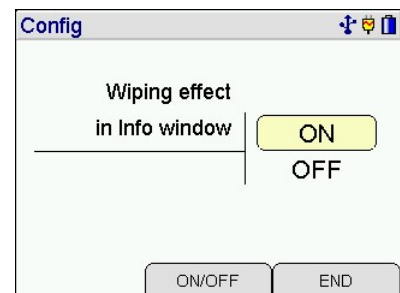
First, touch the middle of point 1 with a pointy pen or pencil and then, do the same in point 2.

The touchpad is now recalibrated and touches on the display are recognized in the correct spots.

Make sure the display does not suffer any damage.

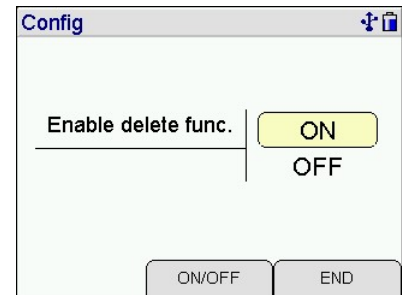
### 17.9 Wiping effect in Info window

Switching the touchpad functions on and off while the info window is shown.



### 17.11 Deleting an individual measurement

This function enables deleting an individual measurement dataset.



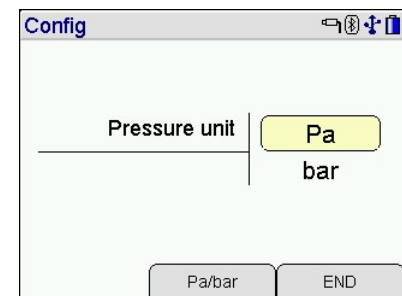
### 17.12 Language

Text on the display can be shown in German and English.



### 17.13 Switching pressure units








This function allows switching the pressure units. Changing the pressure unit is applied to all measurements.



## 18. Function assistance, warnings and error messages

### 18.1 Function assistance - symbols

A number of function symbols are shown on the right side of the display. The following symbols can be shown:

Battery charging	
Capacity of the battery	
Bluetooth	
Error	
The internal valve is activated	
Die internal pump is working	
USB	

## 18.2 Warnings and error messages

The measuring device checks the proper functioning of all measuring channels during the activation phase and during measurement operation. Warnings and error messages are shown after the start-up phase or during normal functioning.

### Next time for servicing

If scheduled servicing is pending, the measuring device issues a reminder one month prior to the date scheduled for servicing.

### Please set the clock

Date and time must be set, e.g. after total discharge of the battery.

### Zero point error

The pressure source is possibly connected to the mbar inlet. There can be no pressure on an inlet of the measuring device when it is being switched on.

### System temperature $-5 > x > 50$ °C

The temperature of the measuring device is not within the technical specification. Establish the operating temperature in the device.

### Battery temperature $-5 > x > 55$ °C

Battery temperature is not within the technical specification when charging. Establish the battery temperature in the device.

### Capacity of the battery is unknown

The measuring device does not recognize the capacity of the battery. Charge battery.

### Battery voltage low

The measuring device must be operated with the charger or be charged before the next measurement.

If the functional range of the measuring device is exceeded or undercut during leak measurement or other errors occur during the measurement (e.g. unexpected pressure increase, hose disconnected during the measurement, etc.), the respective measurements on the display are marked inaccurate with the code **ERR!** The indicated measurements can be used to localize the error. If applicable, an additional line is added to the printout with error information.

## 19. High performance rechargeable battery

### 19.1 General information regarding the power supply

A high performance rechargeable nickel metal hydride battery installed in the measuring device enables network-independent operation. The operating time with a fully charged battery is normally more than 8 hours; however, this can vary depending on the type of measurements.

Measurements can be continued during the charging process.

The plug-in charger is called the Dräger P7/EM200.

### 19.2 Charging the battery

The capacity of the battery is monitored by the measuring device and shown on the display. The battery symbol on the display indicates the charge state. The red LED on the top of the device blinks when the battery is empty. The device should be charged now. Only charge the measuring device using the corresponding plug-in charger. We recommend monthly recharging in the event of longer periods of non-use. The plug-in charger is designed to operate at 100 - 240 V AC. For safety reasons, the condition of the charger should be checked regularly for damage.

The charging process takes 1 - 4 hours, depending on the charge state. The red LED on the top of the device is on during the charging process. At the beginning of the charging process a green blinking indicates that the battery and the charging system are being checked. The blinking changes to a continuously lit green light at the end of the charging process. This means that the battery is now being powered with a trickle charge current.

If the charging connection detects an error, for instance battery temperature too high or too low, the LED blinks in a mixture of red/green. In this case, please wait for approx. ½ an hour and then, restart the charging process. The measuring device can only be charged at ambient temperatures between 5 °C and 35 °C. Charging or storage in direct sunlight must be avoided.

If the battery is not charged, it will shut off automatically. If the measuring device can no longer be switched on due to low voltage, the plug-in charger must be connected and the device must be switched on again!

Total discharge of the battery should be avoided, for this can shorten the life of the battery. The battery should be charged after each time the measuring device is used.

## 20. Technical specifications

### 20.1 General technical specifications

Approvals:	type test DVGW, registration number: DG-4805BS0029
Display:	colour display with touchscreen
Interfaces:	USB, IR
Power supply:	NI-MH Battery, 4.8 V, 2000 mAh, charge level indicator, Charger primary 230 V; secondary 12 V; 0.8 A
Dimensions:	145 x 195 x 75 mm (w x h x d)
Weight:	approx. 1000 g
Operating temperature:	+ 5 °C ... + 40 °C
Storage temperature:	-20 °C ... + 50 °C
Relative humidity:	10 - 90% RH, non-condensing
Air pressure:	800 to 1100 hPa

### 20.2 Technical specifications pressure measurements

Micro pressure	measuring range resolution tolerance	- 100 ... + 100 Pa 0.1 Pa < 5% v. MW or < 2 Pascal
Medium pressure I	measuring range resolution tolerance	- 10 ... + 100 hPa (mbar) 0.01 hPa (mbar) < 1% v. MW or < 0.5 hPa (mbar)
Medium pressure II	measuring range resolution tolerance	- 15 ... + 160 hPa (mbar) 0.1 hPa (mbar) < 5% v. MW or < 0.5 hPa (mbar)
Pressure	measuring range resolution tolerance	- 200 ... + 3,500 hPa (mbar) 1 hPa (mbar) < 1% v. MB
High pressure (Option)	measuring range resolution tolerance	0... + 2.5 MPa (25 bar) 0.001 MPa (0.01 bar) < 1% v. MB



## 20.3 Technical specifications pipeline tests

Serviceability test:

Leak rate	measuring range resolution	0 to 10 liter/h 0.01 liter/h
Volume	measuring range resolution	1 to 300 liters 0.1 liter
Medium pressure	measuring range resolution tolerance	10 ... + 100 hPa (mbar) 0.01 hPa (mbar) < 1% v. MW or < 0.5 hPa (mbar)
Gas types	natural gas, air	

## 21. Maintenance and care

To ensure accurate measurements and safe functioning, the measuring device should be checked once a year by an authorized service center and if necessary, be recalibrated. The device can be cleaned with a damp cloth.

## 22. Consumables and accessories

Single pipe cover DN 25	5600842
Single pipe cover DN 40	5600985
½" adapter	5600813
Gas pressure hose	5600365
High pressure hose	5600821
Low pressure hose	5610693
Pump hose	5610692
High pressure gas distributor	5610691
Pump adapter 10 bar	5600882
Pump adapter 150 mbar	5600876
Pressure sensor EP35 (3.5 bar)	5600875
Pressure sensor EP250 (25 bar)	5600877
Hand pump	5600880
Equipment case P7 series	5600968
Plug-in charger P7	5680106
Printer with infrared data transmission	5600401
Printer paper for printer	5690151