

Instruction Manual Dräger MSI P7 and MSI P7 plus



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1. General Hints

Any use of the MSI P7 requires a full understanding and strict adherence to these instructions and to national and international standards. The instrument is only to be used for the purposes specified in here.

To maintain accuracy and correct function the MSI P7 should be checked and be calibrated by authorized service people once a year.

As from 2005 EC specifications for disposal of electric and electronic equipment are valid. These are regulated in the 2002/96/EC directive and respective national law. Essential content is the establishment of special collection and recycling facilities for private users.

Since this device is not registered for private users, it is not allowed to dispose it in this way. For disposal you can send it back to your local Dräger Safety organisation and if requested, get further information concerning this matter from Dräger MSI GmbH.

2. The Instrument

The MSI P7 is a very helpful tool for the inspection of installations filled with gas or air. The system performs pressure measurements, direct tightness test (the integrated electronic pump applies test pressures fully automatically) and a leak rate test without the necessity to fill external containers with gas or to know the installations volume.

All tests and measurements may be printed and stored.

2.1 Front

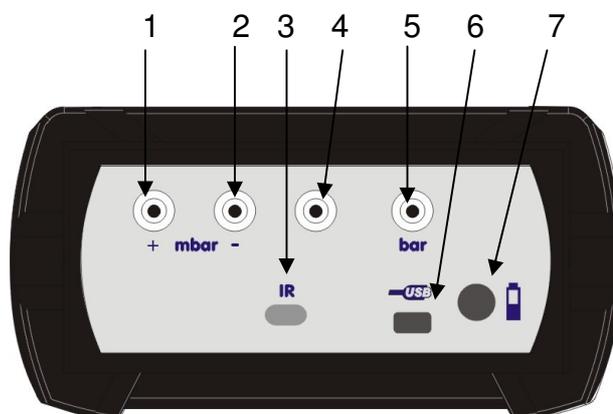
Illuminated graphic display

Function Keys "F, ▲, ▼, H"



2.2 Top

- 1 = Pressure inlet (+) for mbar sensor
- 2 = Pressure inlet (-) for mbar sensor
- 3 = LED and infrared transmitter
- 4 = Gas inlet / Gas outlet during pumping
- 5 = Pressure inlet for bar sensor
- 6 = USB - interface
- 7 = Socket for charger



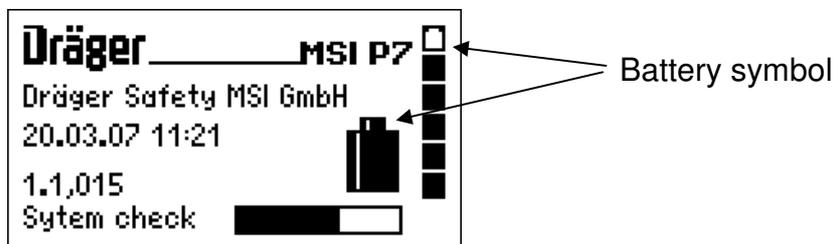
3. Switching On the MSI P7

Switch on the instrument by pushing for a second the buttons "F" and "H" together.

If the annual service has do be done the MSI P7 starts a month earlier to remind you with the following display screen:



After pushing "F" (Continue), or direct after switching on the display will read:



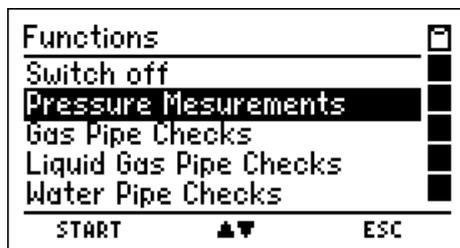
The battery symbols show the batteries capacity, here maximum capacity. After "System check" the bar represents the progress of the check and stabilizing mode. The system check incl. zero point adjustment lasts abbr. 5 seconds.

If an error occurs, a list of warning hints or error messages (See 14.) is shown after the system check, if not the menu "Selection of Functions" (See 4.) is called.

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4. Selection of Functions

If "Selection of Functions" has been called the display reads:



In every display screen the first line shows the actual function or menu name and the last line informs about the functions of the keys.

With pushing "▲" or "▼" (▲▼) you may mark the wanted function or menu.

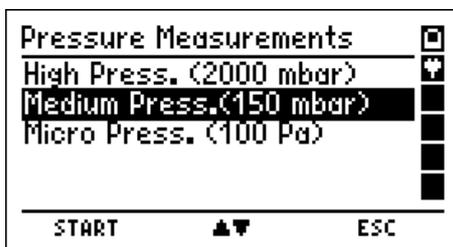
With "F" (START) you may call the marked menu or function.

Selectable functions are:

- | | |
|--|---|
| Switch off | = Switches off the MSI P7 |
| Pressure Measurements | = Calls menu "Pressure Measurements" (See 5.) |
| Gas Pipe Checks | = Calls menu to select type of Gas Pipe Check (See 6.)
(Leak Measurement, Tightness Test, Stress Test) |
| Liquid Gas Pipe Checks
(only MSI P7 plus) | = Calls menu to select type of Liquid Gas Pipe Check
(Stress and Tightness Tests see 7.) |
| Water Pipe Checks
(only MSI P7 plus) | = Calls menu to select type of Water Pipe Check
(Stress and Tightness Tests see 8.) |
| Regulator Check
(only MSI P7 plus) | = Realization of Regulator Checks (see 10) |
| Memory | = Calls "Data Menu" (See 11.2.) |
| Info | = Calls "Information Function" (See 12.) |
| Configuration | = Calls menu "Configuration" (See 13.) |

5. Pressure Measurements

If "Pressure Measurements" has been called the display will read:

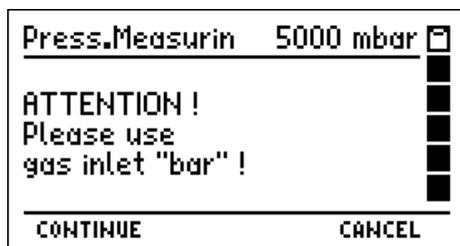


If you push "H" (ESC) the MSI P7 skips back to "Selection of Functions" (See 4.).
 With pushing "▲ or ▼" (▲▼) you may mark the wanted function.
 With "F" (START) you may call the marked function.

Selectable Pressure Measurements are:

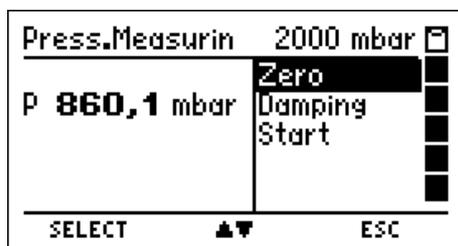
- High Pressure = Pressure Measurement range up to 2 bar (MSI P7plus up to 5 bar)
- Medium Press. = Pressure Measurement in the range up to 150 mbar
- Micro Press. = Pressure Measurement in the range up to 100 Pascal

After calling "High Pressure" e.g. the display reads:



The display screen asks you to connect the test nipple of the pressure reservoir or pipe via a pressure tube with the corresponding pressure inlet of the MSI P7.

After pushing "F" (CONTINUE) the display will read:



In the top line the actual type of pressure measurement is shown.

On the left of the display screen you find the pressure value together with its dimension unit and on the right you see the selectable functions.

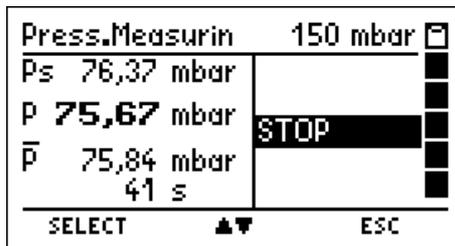
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If you push "H" (ESC) the MSI P7 skips back to "Pressure Measurements" (See 5.).
With pushing "▲" or "▼" (▲▼) you may mark the wanted function.
With "F" (START) you may call the marked function.

Selectable functions are:

- Zero = the shown value is set to zero
- Damping = Calls adjusting the damping value (See 13.2)
- Start = Start of pressure measurement

After selecting Start the display shows e.g.:



In the top line the actual type of pressure measurement is shown.

On the left of the display screen the first value is the pressure at the beginning of this measurement, the second value is the actual pressure value, the third is the mean value of the running measurement. The fourth value informs how long the pressure measurement is running.

If you push "H" (ESC) the MSI P7 skips back to the Selection of Pressure Measurements.

With "F" (SELECT) the measurement may be finished and the display reads:



The Start-, the Stop- and 10 until 20 measurement values between them have been stored in a buffer. These buffered values may be stored and transferred to a PC. With help of the MSI PC-program "P7 Tools" you may print a measurement report including a diagram of the time depending pressure measurement.

With "H" (ESC) you may skip back to "Pressure Measurements".
With pushing "▲" or "▼" (▲▼) you may mark the wanted function.
With "F" (SELECT) you may start the marked function.

Selectable functions are:

- Zero = the shown value is set to zero
- Damping = Calls function for adjusting the damping value (See 13.2)
- Start = Start of a new pressure measurement
- Print = Transfer of mean value, time of measurement, date and time to IR printer
- Store = Calls the function "Storing of Pressure Measurements" (See 11.1)

6. Gas Pipe Checks

6.1 General Information

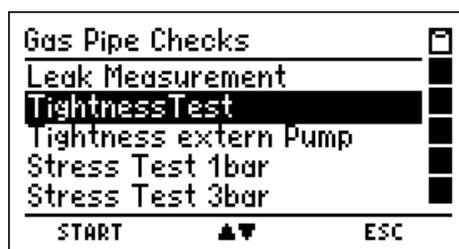
After a new installation or during maintenance of gas pipes the following tests have to be done: load test (stress test), tightness test and leak rate measurement.

Normally with new installation of gas pipes a load test and a tightness test have to be done before the tubes will be covered.

During maintenance of gas pipes a leak rate measurement is recommended.

6.2 Selection of Gas Pipe Check

Has "Pipe Check" been selected the display will show:



If you push "H" (ESC) the MSI P7 skips back to "Selection of Functions" (See 4.).

With pushing "▲" or "▼" (▲▼) you may mark the wanted type of gas pipe test.

With "F" (START) you may call the wanted type of gas pipe check.

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Selectable pipe checks are:

- Leak Measurement = Leak Rate Measurement (See. 6.3)
- Tightness Test = Automatic Tightness Test (See. 6.4)
- Tightness extern Pump = Tightness Test with external Pump (See 6.4)
- Stress Test 1 bar = Stress Test at 1 bar with external Pump (See 6.5)
- Stress Test 3 bar (only P7plus) = Stress Test at 3 bar with external Pump (See 6.5)

6.3 Leak Rate Measurement

6.3.1 General Statements

From the users' point of view, the MSI Comparison Leak Method is fast and easy. The MSI P7 is simply connected to a gas pipe with a single flexible tube.

After a stabilisation period for temperature equalisation, the measuring instrument instructs the user to close the main supply valve (e.g. just behind the gas meter).

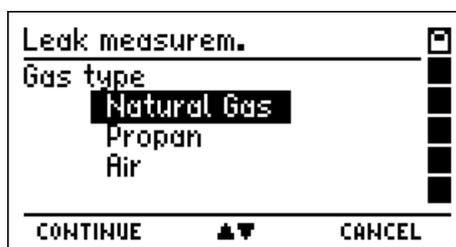
The measuring instrument measures the pressure in the gas pipe for a while (the period is calculated automatically by the MSI P7) and opens then an internal comparison leak.

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

The results are displayed in clear text and may be printed or stored with date and time. Stored values can be converted to a printed measurement report with help of a PC.

6.3.2 Preparing for Leak Rate Measurement

Has "Leak Measurement" been selected, the display reads:

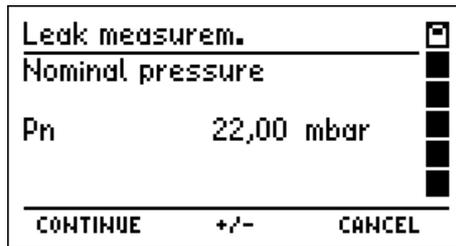


With "H" (CANCEL) the measurement may be cancelled (See 9.3).

With pushing "▲" or "▼" (▲▼) you mark the gas type with which the gas pipe is filled.

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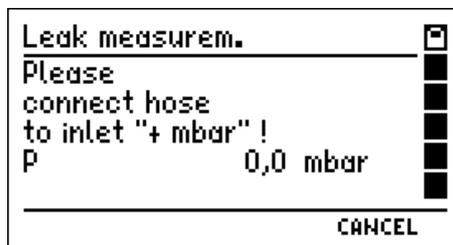
After pushing "F" (CONTINUE) the marked gas type is selected and the display reads:



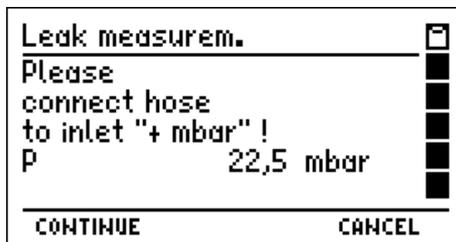
With "H" (CANCEL) the measurement may be cancelled (See 9.3).

With pushing "▲" or "▼" (+/-) you may select the used nominal operating pressure.

With pushing "F" (CONTINUE) the displayed operating pressure is accepted and the display reads e.g.:

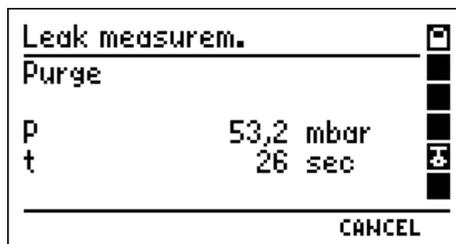


The actual pressure is displayed. Connect the pressure inlet labelled +mbar via a pressure probe with the nipple of the gas pipes plug. Open the plug. If a pressure is detected the display will read:



With "H" (CANCEL) the measurement may be cancelled (See 9.3).

After pushing "F" (CONTINUE) the display reads e.g.:



The valve of the MSI P7 is now opened and the gas flows out of the gas pipe through the pressure tubes and the comparison leak of the MSI P7.

The gas escapes out of the gas inlet / gas outlet (See 2.2) between the inlets of mbar and bar pressure sensors. The gas flow rate is about 5 l/h.

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After purging the tubes and the comparison leak are filled with the same gas as the gas pipe which has to be tested.

This purging is done because different gases have different viscosities. Without purging first air would have flown through the comparison leak and then gas, so the comparison measurement would be wrong.

! Observe national and international regulations concerning handling of explosive gases !

After 40 seconds of purging the stabilization is started automatically (See 6.3.3).

6.3.3 Stabilization

The measuring system waits for stabilization of the gas pressure to get temperature balance. The display now reads e.g.:

Leak measurem.		<input type="checkbox"/>
Stabilize		<input type="checkbox"/>
P	38,4 mbar	<input type="checkbox"/>
dP	0,09 mbar	<input type="checkbox"/>
t	35 sec	<input type="checkbox"/>
CANCEL		

The display informs you about the current pressure in the gas pipe, how much time has passed since the stabilization period started and the decrease of pressure (negative values mean the pressure in the gas pipe has risen).

With "H" (CANCEL) you may cancel the "Leak Rate Measurement" (See 9.3).

If a sufficient stabilization is achieved ($dP < 1\%$ of the gas pressure) or if 6 minutes have passed, the stabilization period will be finished automatically.

The end of the stabilization period will be announced acoustically, the display reads now:

Leak measurem.		<input type="checkbox"/>
Close pipe valve		<input type="checkbox"/>
P	30,1 mbar	<input type="checkbox"/>
dP	0,01 mbar	<input type="checkbox"/>
CONTINUE CANCEL		

The measuring system asks to close the gas supply (e. g. main valve direct behind the gas meter), and informs about the current pressure and the pressure decrease.

If the gas supply has been closed and the gas pipe has a leak, the MSI P7 will recognize a pressure decrease. If the pressure decrease is > 0.4 mbar, the measurement will start immediately (See 6.3.4).

If the gas pipe is tight or the volume of the pipe is very large and the leak small (very small pressure decrease), you may push "F" (CONTINUE). After 60 seconds then the measurement will start automatically (See 6.3.4).

With "H" (CANCEL) you may cancel the "Leak Rate Measurement" (See 9.3).

6.3.4 Measurement

The start of the measurement will be announced acoustically and the display reads:

Leak Measurement		☐
Measurement		■
P	21,0 mbar	■
dP	0,18 mbar	■
t	9 sec	■
CANCEL		

With "H" (CANCEL) you may cancel the "Leak Rate Measurement" (See 9.3).

The display informs about the current pressure (P) in the gas pipe, the decrease of pressure (dP) and how much time has passed since the measurement has been started (t).

If the pressure decrease in the gas pipe is > 0.9 mbar or the measurement lasts longer than 5 minutes, then the internal valve in the MSI P7 is opened. Now gas from the gas pipe will exhaust through the comparison leak.

The gas escapes out of the gas inlet / gas outlet (See 2.2) between the inlets of mbar and bar pressure sensors. The gas flow rate is about 5 l/h.

The display of the MSI P7 reads during the comparison leak measurement:

Leak measurem.		☐
Relation measurement		■
P	20,3 mbar	■
dP	0,37 mbar	■
t	2 sec	■
CANCEL		

After the comparison leak measurement ($dP > 0.9$ mbar or $t > 5$ minutes) the internal valve is closed. The end of the comparison leak measurement is announced acoustically.

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The result becomes calculated and the display reads:

Leak measurem	RESULT	
P	29,1 mbar	■
L (t)	1,53 l/h	■
L (n)	1,16 l/h	■
Vol	8,20 l	■
CONTINUE		

You are informed about the mean pressure value "P" during the leak rate measurement, the measured leak rate "L(t)", the calculated leak rate for the nominal operating pressure "L(n)" and the measured volume "Vol" of the gas pipe.

Is the leak rate shown in negative values, this means the pressure is risen during the measuring.

After pushing "F" (Continue) the display will read:

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

With "H" (CANCEL) you may cancel the "Leak Rate Measurement" (See 9.3).

With pushing "▲" or "▼" (▲▼) you may mark the wanted function.

With "F" (START) you may call the wanted function.

Selectable functions are:

Back = Skips back to the result display.

New Measurement = Start of a new measurement. You are asked to open the line valve of the gas pipe again (Next see 6.3.3).

End, release = The leak rate measurement becomes finished. The measured values are released (See 9.3).

Print = The result is printed on a IR-Printer. For this there has to be an intervisibility between Printer and IR-transmitter of the MSI P7

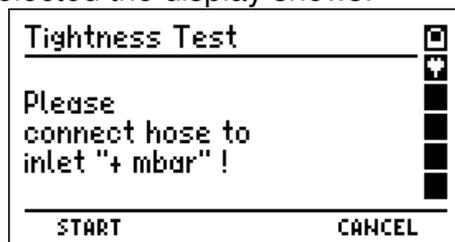
Store = Calls the function "Storing of Line Checks" (See 11.1)

6.4. Tightness Tests

To do a tightness test, you have to increase the pressure up to a little more than 110 mbar (150 mbar see 13.6). After a short time for stabilization of temperature the pressure has to be measured for a prescribed period.

6.4.1 Automatic Tightness Test

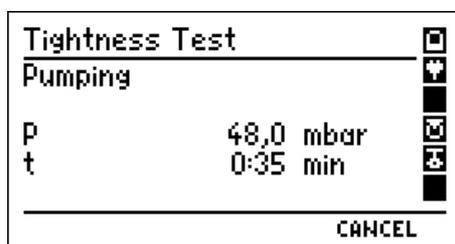
Has "Tightness Test" been selected the display shows:



Put the hose coupling of the supplied pressure probe on the "+ mbar" labelled pressure inlet of the MSI P7. Mount the hose of the pressure probe on the nipple of the gas pipe.

With "H" (CANCEL) you may cancel the "Tightness test" (See 9.3).
By pushing "F" (START) you may start the Tightness test.

After starting the Tightness test the display reads:



With "H" (CANCEL) you may cancel the "Tightness test" (See 9.3).

You are informed that the internal pump is working (Pumping). Further the current pressure in the gas pipe (P) and the passed time for pumping (t) is displayed.

Ambient air is now pumped from the gas inlet / gas outlet (See 2.2) through the "+ mbar" pressure inlet into the gas pipe. So the pressure in the gas pipe will increase.

If the pressure in the tested gas pipe exceeds 110 mbar, the pump of the MSI P7 is stopped and the stabilization period is started automatically.

The period of stabilisation is between 2 and 10 min. and is calculated by the MSI P7, if the variation of pressure is lower 0.1 mbar per minute the stabilisation period is finished. The period of measurement itself lasts 10 minutes.

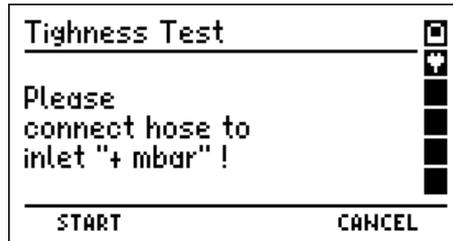
The further procedure becomes described in chapter 9.1

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6.4.2 Tightness Test with External Pump

Because the flow rate of the MSI P7 is ca. 1 l /min, it may last 15 min o increase the pressure up to 110 mbar in a gas pipe of 100 l volume. For even bigger gas pipes, it may be helpful to use a stronger (external) pump, to shorten the pump time.

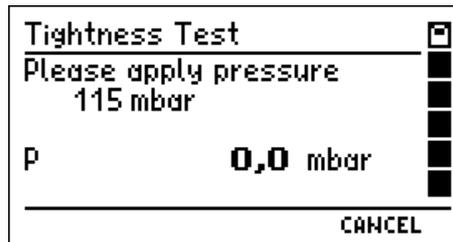
Has been "Tightness Test with External Pump" selected the display:



Put the hose coupling of the supplied pressure probe on the "+ mbar" labelled pressure inlet of the MSI P7. Mount the hose of the pressure probe on the nipple of the gas pipe.

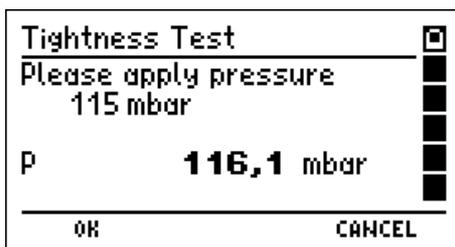
With "H" (CANCEL) you may cancel the "Tightness test" (See 9.3).

After pushing "F" (START) the display reads:



Connect the external pump by a valve with the gas pipe and increase the pressure to a little bit higher than 115 mbar.

Is the test pressure reached, the display of the MSI P7 will show:



With "H" (CANCEL) you may cancel the "Tightness test" (See 9.3).
After pushing "F" (OK) the MSI P7 will start the stabilization period.

The period of stabilisation is between 2 and 10 minutes and is calculated by the MSI P7, regarding if the variation of pressure is lower than 0.1 mbar per minute.

The period of measurement itself lasts 10 minutes.

The further procedure becomes described in chapter 9.1

6.5 Stress Tests according to common Safety Regulations

6.5.1 Low Operating Pressure

For new gas installations with operating pressure (< 100 mbar) German standards demand to do a load test (stress test) before a tightness test is done.

The pressure in the gas tube has to be increased to 1 bar. After a period for temperature stabilization the pressure must be measured for 10 minutes.

6.5.2 Medium Operating Pressure

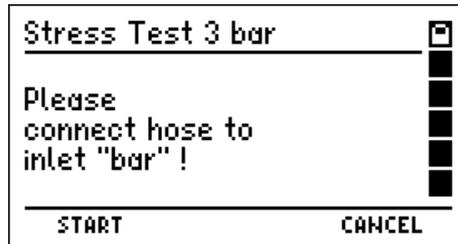
For new gas installations with medium operating pressure (100 mbar up to 1 bar) German standards demand to do a combined load and tightness test.

The pressure in the gas tube has to be increased to 3 bar. After a period for temperature stabilization of 3 hours the pressure must be measured for 2 hours. At a pipe volume of more than 2000 litres, the period has to be extended for 15 minutes, every 100 litres.

Has this stress test (3 bar) been selected the MSI P7plus shows you the pipe volume and the calculated duration of measurement. With "▲ or ▼" (▲▼) you may alter the Volume. With "F" the displayed volume is accepted and the stress test is started.

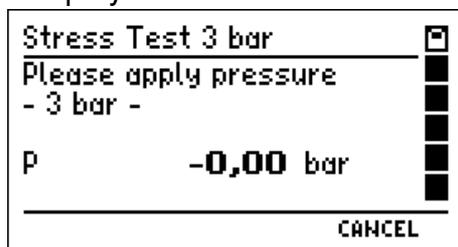
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Has "Stress Test" been started, the display will read e.g.:



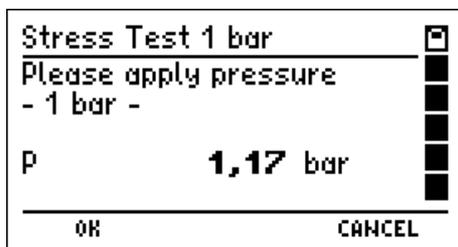
The first line shows which type of stress test has been started. Connect the "bar" labelled pressure inlet of the MSI P7 with the nipple of the gas pipe via a pressure hose with a pneumatic quick coupling (nominal diameter 5 mm).

After pushing "F" (START), the display reads:



Connect the external pump by a valve with the gas pipe and increase the pressure to a little bit higher than 1 bar or 3 bar (only possible with MSI P7plus).

Becomes the pressure in the pipe higher than the needed test pressure, the MSI P7 recognises this and the display reads e.g.:



With "H" (CANCEL) you may cancel the "Stress Test" (See 9.3).

After pushing "F" (OK) the MSI P7 will start the stabilisation period.

Low pressure installations: The period of stabilisation lasts between 2 and 10 minutes and is calculated by the MSI P7, regarding if the variation of pressure is lower than 0.1 mbar per minute. The period of measurement itself lasts 10 minutes.

Medium pressure installations (only MSI P7plus): The period of stabilisation is 3 hours. The period of measurement (min. 2 hours) is calculated by the MSI P7, regarding the inputted pipe volume, according to the regulation of the German standard.

The further procedure is described in chapter 9.2.

7. Liquid Gas Pipe Checks (Only MSI P7 plus)

7.1 Regulations for Liquid Gas Pipe Checks

7.1.1 General

There exist different national standards for tests regarding new installation or maintenance of liquid gas installations.

In Germany e.g. liquid gas installations must be checked by authorized experts, technical expert and /or gas installation handicraft enterprises:

- before first start-up,
- after modifications,
- after interruption for more than one year,
- periodic.

The German standards e.g. demand two tests: Pressure test (load test) and tightness test.

7.1.2 Pressure Test

Use air or nitrogen in the liquid gas pipes for creating a pressure which is 1.1 times as high as the maximum of the operating pressure.

Wait at least 10 minutes for temperature balance.

Measure pressure (accuracy better 1 % of 5 bar).

Measure pressure again after at least 10 min. (partial with earth covered tubes 30 min.), to check if there is no decrease.

7.1.3 Tightness Test

Immediate before first start-up all pipes have to been checked with air with an overpressure of 100 mbar for tightness. The pipes are tight if, after a temperature balance, the measured pressure for 10 minutes does not decrease.

On installations which are in use the tightness test should be done at operating pressure. For this you may use the "Leak Rate Measurement" (see 6.3). The only difference is, the standard "TRF" demands tightness (leak rate = 0 l/h).

Instruction Manual Dräger MSI P7 and MSI P7 plus

7.2 Selection of the Type of Liquid Gas Pipe Check

Has "Liquid Gas Pipe Checks" been selected, the display reads:



If you push "H" (ESC) the MSI P7 skips back to "Selection of Functions" (See 4.).

With pushing "▲ or ▼" (▲▼) you may mark the wanted type of liquid gas pipe test.

With "F" (START) you may call the wanted type of liquid gas pipe check.

Selectable liquid gas pipe checks are:

Tightness Test 100 mbar = Automatic Tightness Test (See. 7.3)

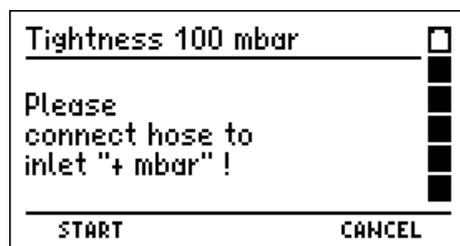
Tightness extern pump = Tightness Test with external Pump (See 7.4)

Pressure Test 1 bar 10 min. = Stress Test at 1 bar for 10 minutes (See 7.5)

Pressure Test 1 bar 30 min. = Stress Test at 1 bar for 30 minutes (See 7.5)

7.3 Automatic Tightness Test of Liquid Gas Installations

Has "Tightness Test" been selected the display shows:

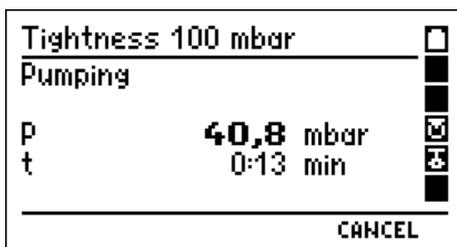


Put the hose coupling of the supplied pressure probe on the "+ mbar" labelled pressure inlet of the MSI P7. Mount the hose of the probe on the nipple of the liquid gas pipe.

With "H" (CANCEL) you may cancel the "Tightness test" (See 9.3).

By pushing "F" (START) you may start the tightness test.

After starting the tightness test the display reads:



With "H" (CANCEL) you may cancel the "Tightness test" (See 9.3).

You are informed that the internal pump is working (Pumping). Further the current pressure in the liquid gas pipe (P) and the passed time for pumping (t) is displayed.

Ambient air is now pumped from the gas inlet / gas outlet (See 2.2) through the "+ mbar" pressure inlet into the liquid gas pipe. So the pressure in the liquid gas pipe will increase.

If the pressure in the tested liquid gas pipe exceeds 100 mbar, the pump of the MSI P7 is stopped and the stabilization period is started automatically.

The period of stabilisation is between 2 and 10 minutes and is calculated by the MSI P7, regarding if the variation of pressure is lower than 0.1 mbar per minute.

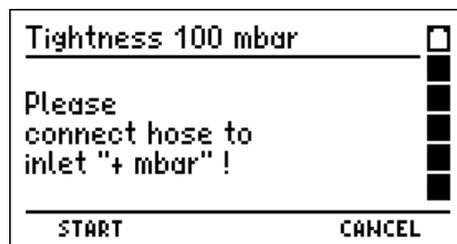
The period of measurement itself lasts 10 minutes.

The further procedure becomes described in chapter 9.1

7.4 Tightness Test with External Pump of Liquid Gas Installations

Because the flow rate of the MSI P7 is ca. 1 l/min, it may last 15 min to increase the pressure up to 100 mbar in a liquid gas pipe of 100 l volume. For even bigger liquid gas pipes, it may be helpful to use a stronger (external) pump, to shorten the pump time.

Has "Tightness Test with External Pump" been selected the display reads:

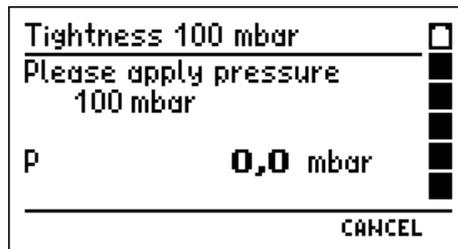


Put the hose coupling of the supplied pressure probe on the "+ mbar" labelled pressure inlet of the MSI P7. Mount the hose of the probe on the nipple of the liquid gas pipe.

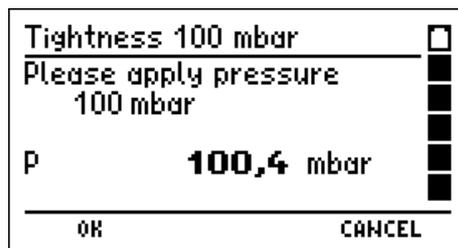
With "H" (CANCEL) you may cancel the "Tightness test" (See 9.3).

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After pushing "F" (START) the display reads:



Connect the external pump by a valve with the liquid gas pipe and increase the pressure to a little bit higher than 100 mbar. Is this done, the display of the MSI P7 will show:



With "H" (CANCEL) you may cancel the "Tightness test" (See 9.3).

After pushing "F" (OK) the MSI P7 will start the stabilization period.

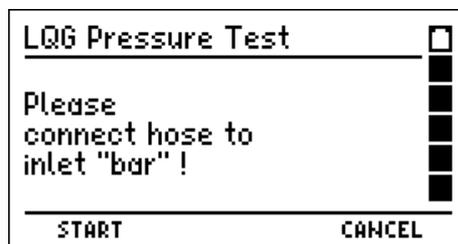
The period of stabilisation is between 2 and 10 minutes and is calculated by the MSI P7, regarding if the variation of pressure is lower than 0.1 mbar per minute.

The period of measurement itself lasts 10 minutes.

The further procedure becomes described in chapter 9.1

7.5 Pressure Tests of Liquid Gas Installations

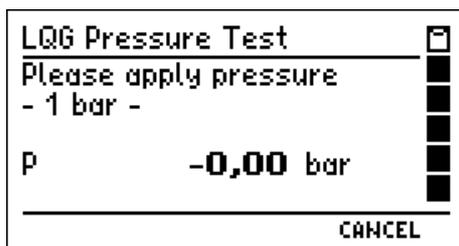
The Pressure Tests are done with an external pump. Has "Pressure Tests" been selected the display reads:



Connect the "bar" labelled pressure inlet of the MSI P7 and the nipple of the gas pipe via a pressure hose with a pneumatic quick coupling (nominal diameter 5 mm) and connect the external pump over a valve with the liquid gas pipe.

With "H" (CANCEL) you may cancel the "Stress Test" (See 9.3).

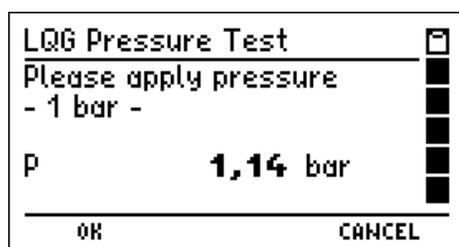
After pushing "F" (START) the display reads:



With "H" (CANCEL) you may cancel the "Stress Test" (See 9.3).

Connect the external pump by a valve with the gas pipe and increase the pressure to a little bit higher than 1 bar.

Becomes the pressure in the pipe a little higher than the needed test pressure, the MSI P7 recognises this and the display reads:



With "H" (CANCEL) you may cancel the "Stress Test" (See 9.3).

After pushing "F" (OK) the MSI P7 will start the stabilization period.

The period of stabilisation will take 10 minutes.

The period of measurement lasts 10 min. If you have called "Pressure Test 1 bar 30 min" (for partial with earth covered tubes) it will take 30 min.

The further procedure of Pressure Test (Load or Stress Test) is described in chapter 9.2.

8. Water Pipe Checks (Only MSI P7 plus)

There exist different national standards for tests regarding new installation or maintenance of drinking water installations.

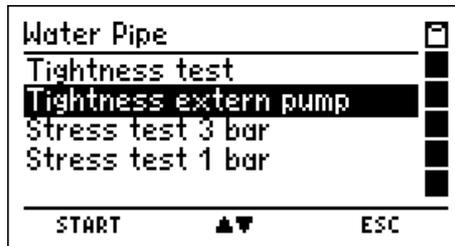
In Germany e.g. drinking water installations must be checked before covering, the German standards demand two tests, load test and tightness test. These tests may be done with water or nowadays with air or nitrogen.

Test with water create some problems, because of germ formation (Legionella etc.), therefore the tests should be done with air or nitrogen.

Instruction Manual Dräger MSI P7 and MSI P7 plus

8.1 Selection of the Type of Water Pipe Checks

If you have called "Water Pipe Checks" in the menu "Functions" the display will read:



If you push "H" (ESC) the MSI P7 skips back to "Selection of Functions" (See 4.).

With pushing "▲ or ▼" (▲▼) you may mark the wanted type of water pipe check.

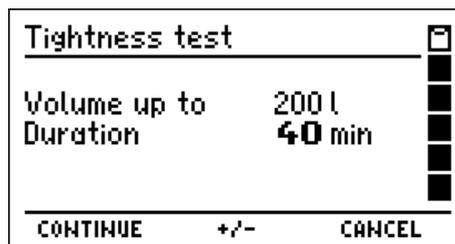
With "F" (START) you may call the wanted type of water pipe check.

Selectable water pipe checks are:

- Tightness Test = Automatic Tightness Test (See. 8.2)
- Tightness extern pump = Tightness Test with external Pump (See 8.3)
- Stress Test 3 bar = Stress Test at pipes until diameter 50 mm (See 8.4)
- Stress Test 1 bar = Stress Test at pipes until diameter 100 mm (See 8.4)

8.2 Automatic Tightness Test of Water Installations

Has "Tightness Test" been selected the display shows:

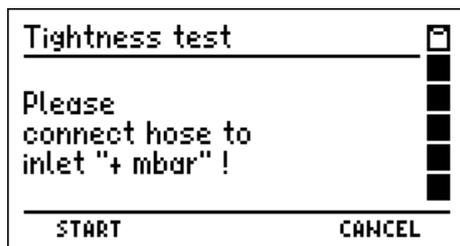


The display shows the volume of the water pipe and the period for measurement. The period is calculated by the MSI P7 plus according to the regulation of the German standard (DVGW TRWI).

With pushing "▲ or ▼" (+/-) the volume may be varied.

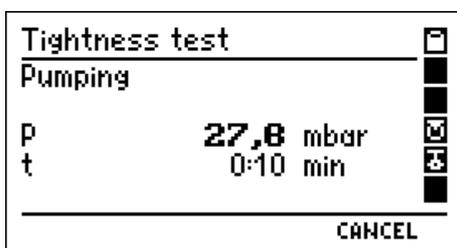
With "H" (CANCEL) you may cancel the "Tightness test" (See 9.3).

With "F" (START) the displayed period for measurement is accepted and the display reads:



Put the hose coupling of the supplied pressure probe on the "+ mbar" labelled pressure inlet of the MSI P7. Mount the hose of the probe on the nipple of the water pipe.

After starting the Tightness test the display reads:



With "H" (CANCEL) you may cancel the "Tightness test" (See 9.3).

You are informed that the internal pump is working (Pumping). Further the current pressure in the water pipe (P) and the passed time for pumping (t) is displayed.

Ambient air is now pumped from the gas inlet / gas outlet (See 2.2) through the "+ mbar" pressure inlet into the water pipe. So the pressure in the water pipe will increase.

If the pressure in the tested water pipe exceeds 110 mbar, the pump of the MSI P7 is stopped and the stabilization period is started automatically.

The period of stabilisation is between 2 and 10 minutes and is calculated by the MSI P7, regarding if the variation of pressure is lower than 0.1 mbar per minute.

For measurements of installations with a volume up to 100 l the period for measurement is 30 minutes. For every further volume of 100 l the period of measurement is extended for additional 10 minutes.

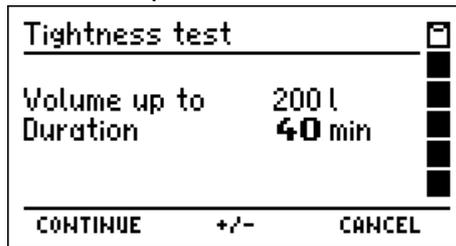
The further procedure becomes described in chapter 9.1.

8.3 Tightness Test with External Pump

Because the flow rate of the MSI P7 is ca. 1 l /min, it may last 15 min to increase the pressure up to 100 mbar in a water pipe of 100 l volume. For even bigger water pipes, it may be helpful to use a stronger (external) pump, to shorten the pump time.

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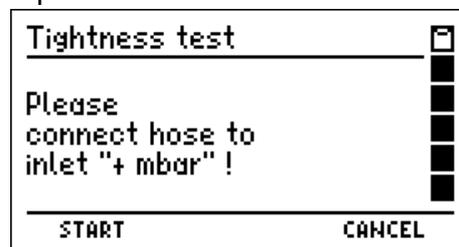
Has "Tightness Test with External Pump" been selected the display reads:



The display shows the volume of the water pipe and the period for measurement. The period is calculated by the MSI P7 plus, according to the regulation of the German standard (DVGW TRWI).

With pushing "▲ or ▼" (+/-) the volume may be varied.

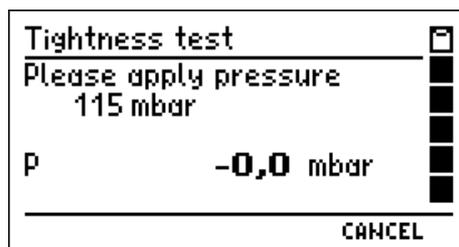
With "F" (START) the displayed period for measurement is accepted and the display reads:



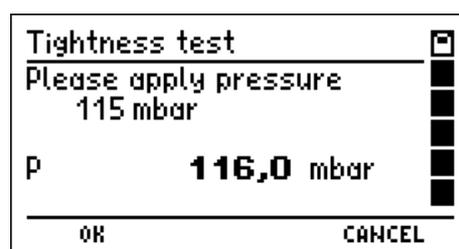
Put the hose coupling of the supplied pressure probe on the "+ mbar" labelled pressure inlet of the MSI P7. Mount the hose of the probe on the nipple of the water pipe.

With "H" (CANCEL) you may cancel the "Tightness test" (See 9.3).

After pushing "F" (START) the display reads:



Connect the external pump by a valve with the liquid gas pipe and increase the pressure to a little bit higher than 115 mbar. Is this done, the display of the MSI P7 will show:



With "H" (CANCEL) you may cancel the "Tightness test" (See 9.3).

After pushing "F" (OK) the MSI P7 will start the stabilization period.

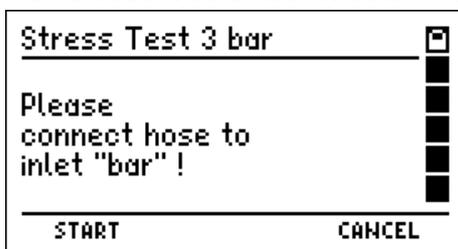
The period of stabilisation is between 2 and 10 minutes and is calculated by the MSI P7, regarding if the variation of pressure is lower than 0.1 mbar per minute.

For measurements of installations with a volume up to 100 l the period for measurement is 30 minutes. For every further volume of 100 l the period of measurement is extended for additional 10 minutes.

The further procedure becomes described in chapter 9.1.

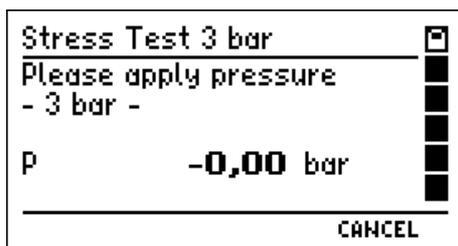
8.4 Stress tests

The Stress Tests are done with an external pump. The pressure in the gas tube has to be increased to 1 bar or 3 bar. Has "Stress Tests" been selected the display reads:



The first line shows, which type of stress test may be started. Connect the "bar" labelled pressure inlet of the MSI P7 and the nipple of the gas pipe via a pressure hose with a pneumatic quick coupling (nominal diameter 5 mm) and connect the external pump over a valve with the gas pipe.

After pushing "F" (START) the display will read e.g.:

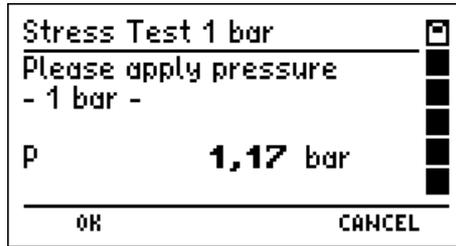


With "H" (CANCEL) you may cancel the "Stress Test" (See 9.3).

Connect the external pump by a valve with the gas pipe and increase the pressure to a little bit higher than 1 bar or little bit less than 3 bar (3 bar at pipes until diameter 50 mm and only with MSI P7plus, 1 bar at pipes between 50mm and 100 mm diameter).

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Becomes the pressure in the pipe a little higher than the pressure which is defined in the standards (1 bar or 2.9 bar), the MSI P7 recognises this and the display reads e.g.:



With "H" (CANCEL) you may cancel the "Stress Test" (See 9.3).

After pushing "F" (OK) the MSI P7 will start the stabilization period.

The period of stabilisation is between 2 and 10 minutes and is calculated by the MSI P7, regarding if the variation of pressure is lower than 0.1 mbar per minute.

The period of measurement itself lasts 10 minutes.

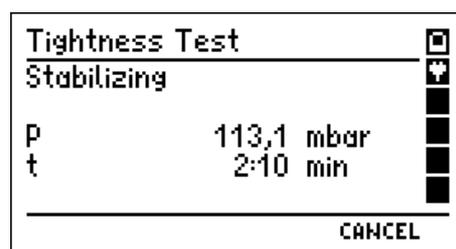
The further procedure is described in chapter 9.2.

9. Realization of Pipe Tests

9.1 Realization of Tightness Tests

Every "Tightness Test" contents a period for temperature balance and a period for pressure measurement. How long these periods are and with which pressure the test has to be done, depends on the standards (e.g. for Germany TRGI, TRF, TRWI, etc.).

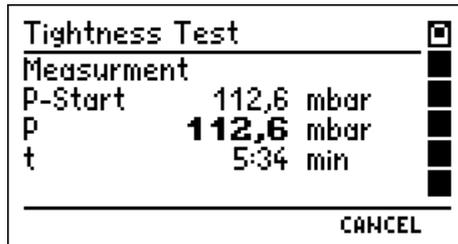
During stabilization period the display reads:



The display shows that the stabilisation time is running and it informs you about the actual pressure in the tested gas pipe and for how many seconds stabilisation is running.

Is the stabilization period finished, the MSI P7 starts measurement mode automatically.

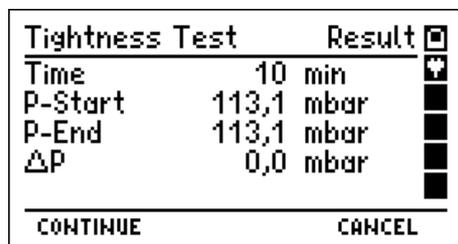
During the measurement the display reads:



The display shows that the measurement is running and it informs you about pressure at the beginning (P-Start), actual pressure (P) and how long the measuring is running (t).

With "H" (CANCEL) you may cancel the "Tightness Test" (See 9.3).

After the measuring period the MSI P7 will stop and show the result:

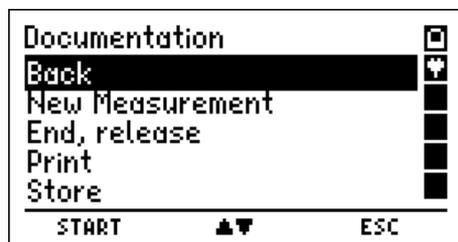


The display informs you how long the measuring has been done (Test time), about the pressure at the beginning (P-Start), the pressure at the end of the measurement (P-End) and the pressure difference (ΔP).

The Start-, Stop- and 20 measured values between have been stored in a buffer. These buffered values may be stored and transferred to a PC. With help of the MSI PC-program "P7 Tools" you may print a measurement report including a diagram of the time depending pressure measurement.

With "H" (CANCEL) you may cancel the "Tightness Test" (see 9.3).

After pushing "F" (Continue) the display reads:



With "H" (CANCEL) you may cancel the "Tightness Test" (see 9.3).

With pushing "▲" or "▼" (▲▼) you may mark the wanted function.

With "F" (START) you may call the wanted function.

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Selectable functions are:

Back = Skips back to the result display.

New Measurement = Start of a new measurement.

End, release = The leak rate measurement becomes finished. The measured values are released (Next see 9.3).

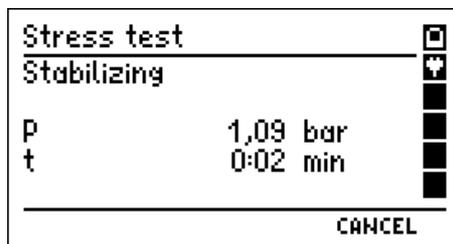
Print = The result is printed on a IR-Printer. For this there has to be an intervisibility between Printer and IR-transmitter of the MSI P7

Store = Calls the function "Store Data" (see 11.1)

9.2 Realization of Stress Tests

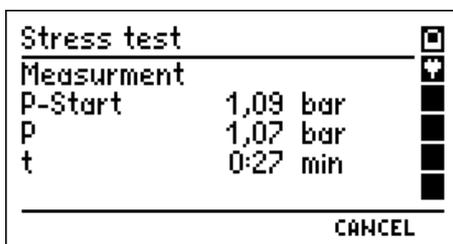
Every "Stress Test" contents a period for temperature balance and a period for pressure measurement. How long these periods are and with which pressure the test has to be done, depends on the standards (e.g. for Germany TRGI, TRF, TRWI, etc.).

Has "Realization of Stress test" been started the display reads:



The display shows that the stabilisation time is running and it informs you about the current pressure in the tested gas pipe and for how many seconds stabilisation is running. Is the stabilizing period finished, the MSI P7 starts measurement mode automatically.

During the measurement the display reads:



The display shows that the measurement is running and it informs you about pressure at the beginning (P-Start), actual pressure (P) and how long the measuring is running (t).

With "H" (CANCEL) you may cancel the "Stress Test" (see 9.3).

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Has the measuring period been finished, the MSI P7 stops and shows the result:

Stress test	Result	
Duration	10 min	■
P-Start	1,09 bar	■
P-End	1,07 bar	■
ΔP	0,02 bar	■
CONTINUE		CANCEL

The display informs you how long the measuring has been done (Duration), about the pressure at the beginning (P-Start), the pressure at the end of the measurement (P-End) and the pressure difference (ΔP).

With "H" (CANCEL) you may cancel the "Stress Test" (See 9.3).

After pushing "F" (Continue) the display reads:

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

With "H" (CANCEL) you may cancel the "Leak Rate Measurement" (see 9.3).

With pushing "▲ or ▼" (▲▼) you may mark the wanted function.

With "F" (START) you may call the marked function.

Selectable functions are:

Back = Skips back to the result display.

New Measurement = Start of a new measurement.

End, release = The leak rate measurement becomes finished. The measured values are released (Next see 9.3).

Print = The result is printed on a IR-Printer. For this there has to be an intervisibility between Printer and IR-transmitter of the MSI P7

Store = Calls the function "Store Data" (see 11.1)

Instruction Manual Dräger MSI P7 and MSI P7 plus

9.3 Terminating and Cancelling of Pipe Tests

Has a pipe test been finished or cancelled the display reads:

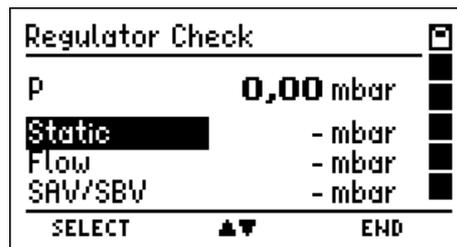


Close the plug of the nipple of the pipe and remove the hose.

With pushing "F" (CONTINUE) the selection of the pipe check is called again.

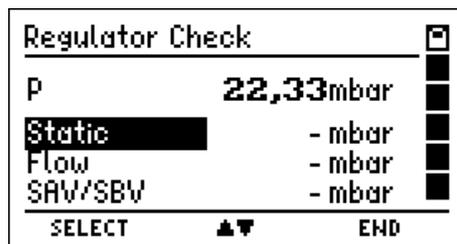
10. Regulator Checks (Only MSI P7 plus)

If in "Selection of Functions" you have called "Regulator Check" the display reads:



Put the hose coupling of the supplied pressure probe on the "+ mbar" labelled pressure inlet of the MSI P7. Mount the hose of the pressure probe on the nipple of the gas pipe.

The display may read now e.g.:

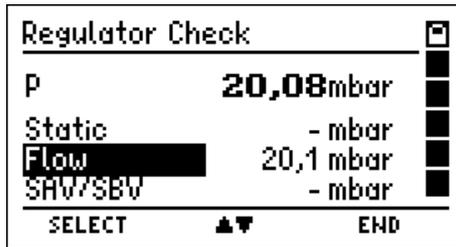


With pushing "▲ or ▼" (▲▼) you may mark the regulator check you are carrying out. By pushing "F" (SELECT) you take the shown pressure for the marked regulator check.

Selectable regulator checks are:

- Static = measuring of static pressure (see 10.1)
- Flow = measuring of flow pressure (see 10.2)
- SAV / SBV = measuring of SAV (see 10.3) or SBV pressure (see 10.4)

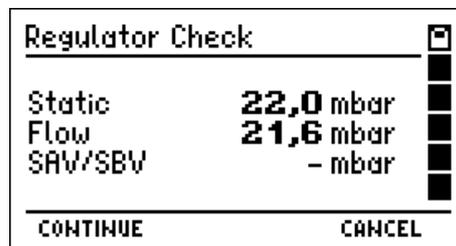
The display reads now e.g.:



With "▲ or ▼" (▲▼) you may mark the next regulator check you are carrying out.

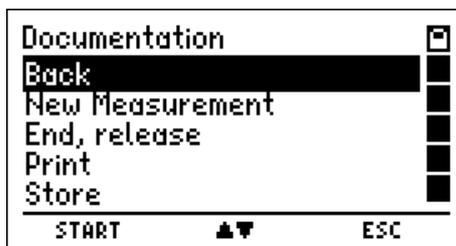
By pushing "F" (SELECT) you take the shown pressure for the ongoing regulator check.

Has e.g. the static pressure and the flow pressure been taken and you press "H" (END) the display will read:



After pushing "H" (CANCEL) the "Regulator Check" is cancelled and "Selection of Functions" (see. 4.) is called again.

After pushing "F" (CONTINUE) the display will read:



With "▲ or ▼" (▲▼) you may mark the wanted function.

By pushing "F" (START) you start the marked function.

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Selectable functions are:

- Back = Skips back to the result display.
- New Measurement = Start of a new measurement. The measurement values are maintained and may be overwritten.
- End, release = The measurement becomes finished. The measured values are released and "Selection of Functions" (see. 4.) is called again.
- Print = The result is printed on a IR-Printer. For this there has to be an intervisibility between Printer and IR-transmitter of the MSI P7
- Store = Calls the function "Store Data" (see 11.1)

10.1 Static Pressure

The measurement of static pressure allows finding malfunctions of regulator or valve.

The valve in front of the regulator has to be open, the valve behind the regulator (in front of the load) must have been closed.

Expected is an unchanging pressure in the pipe, its value proves, that the regulator is adjusted to the required pressure (e.g. 22 mbar).

Observation of time dependence of the pressure allows to evaluate the functions of regulator or valve (see following table).

Observation	Evaluation
Pressure raises	Regulator not tight
Pressure falls and raises thereafter	Valve behind Regulator not tight
Unchanging pressure	Valve and Regulator OK

10.2 Flow Pressure

The measurement of flow pressure allows finding malfunctions of the regulator. The valve in front of the regulator and in front of the load have to be open, the load has to work.

Expected is a nearly unchanging pressure in the pipe, its value should be near to the one of the static pressure. Is the flow pressure a lot lower than the static pressure, the flow resistance of the regulator is too high, may be the regulator is too small.

Observation of time dependence of the pressure allows evaluating the functions of the regulator (see following table).

Observation	Evaluation
Pressure falls and raises considerably	Regulator faulty, membrane adheres
Nearly unchanging pressure	Regulator OK

10.3 SAV Regulator Release Pressure

In gas installations used equipments (gas meter, burner etc.) normally are resistant against a specified pressure. A higher pressure may destroy these equipments. A SAV - regulator avoids that the pressure behind the regulator becomes this high.

The valve in front of the SAV - regulator has to be open, the valve behind the regulator (in front of the load) has to be closed.

Increase the pressure in the pipe behind the SAV - regulator. If the pressure in the pipe becomes higher than the adjusted release pressure the SAV regulator locks the gas supply and you hear a click.

The pressure at the time you recognise the click is the SAV release pressure.

The lock of the gas supply has to be released manually.

10.4 SBV Regulator Release Pressure

In gas installations used equipments (gas meter, burner etc.) normally are resistant against a specified pressure. A higher pressure may destroy these equipments. A SBV - regulator avoids that the pressure behind the regulator becomes this high.

The valve in front of the SBV - regulator has to be open, the valve behind the regulator (in front of the load) has to be closed.

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Increase the pressure in the pipe behind the SBV - regulator. If the pressure in the pipe becomes higher than the adjusted release pressure the SBV regulator opens a valve, gas escapes to the open air and you hear a fizzling.

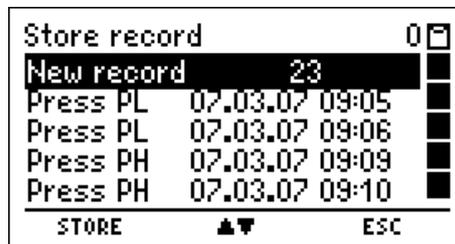
The pressure at the time you recognise the fizzling is the SBV release pressure.

The valve locks automatically, if the pressure in the pipe is low enough.

11. Data Processing

11.1 Store Data

Has "Store" been selected the display reads:

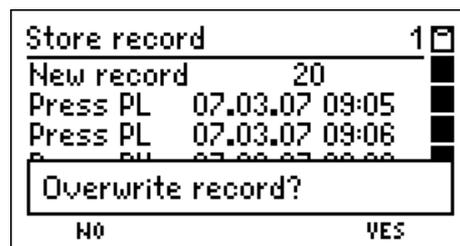


With pushing "H" (ESC) the display screen is shown again from where this function has been called.

With pushing "▲" or "▼" (▲▼) you may mark the wanted data record.

With "F" (STORE) it is possible to store all measured values, together with date and time.

Is an existing data record selected the display reads:



With pushing "H" (YES), the existing data record will be overwritten.

Pushing "F" (NO) calls the former display screen again.

Is the storing completed, that display screen will be shown, from where this function has been called.

11.2 Data Menu

Has "Memory" been selected in "Selection of Functions" (see 4.) the display reads:



With pushing "H" (ESC) you may cancel the "Data Menu" and skip back to "Selection of Functions" (see 4.).

With pushing "▲" or "▼" (▲▼) you may mark the wanted function.

With "F" (START) you may call the marked function.

Selectable functions are:

Info = Calls Info function of the data menu (See 11.3)

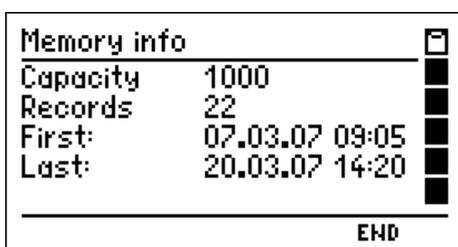
Show, pos at last = Show last stored data record (See 11.4)

Show, pos at first = Show first stored data record (See 11.4)

Clear data file = Delete all stored data records (See 11.5)

11.3 Info Function of Data Menu

If "Info" has been selected, the display reads:



The display informs you about the number of free data records, the number of stored data records and the date and time of the first and the last storing.

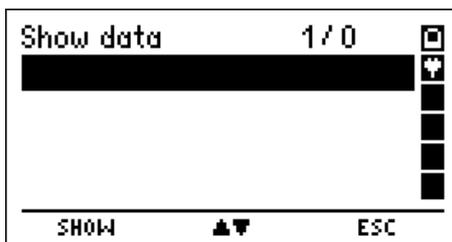
With "H" (END) you finish the "Info Function" and skip back to "Data Menu" (see 11.2).

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11.4 Show Stored Data Records

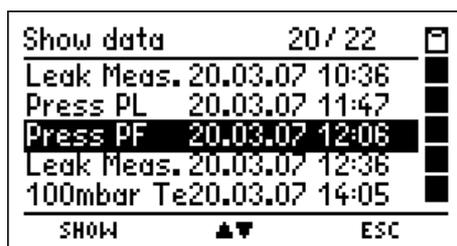
If "Show, pos at first" or "Show, pos at last" has been called, the stored data records are displayed. In the first case the first data record is marked, in other case the last one is marked.

Are no records stored the display reads:



With pushing "H" (ESC) you may cancel the function and skip to "Data Menu" (See 7.).

Are records stored the display reads e.g.:



The head line informs you about the number of the marked record and the number of stored records. The table informs you about the type of measurement and date and time.

With "H" (ESC) you may cancel this function and skip back to "Data Menu" (See 11.2.).

With pushing "▲" or "▼" (▲▼) you may mark the wanted measurement.

With "F" (START) you may show this record.

Following types of measurement may be shown:

- Press PL = Pressure measurements in the range up to 100 Pa (See 11.4.1)
- Press PM = Pressure measurements in the range up to 100 mbar (See 11.4.1)
- Press PH = Pressure measurements in the range up to 1 bar (See 11.4.1)
- Leak Meas. = Leak rate measurement (see 11.4.2)
- Tightness = Gas pipe tightness test (see 11.4.3)
- Stress Test = Gas pipe stress test (see 11.4.4)
- Wat.Tight = Water pipe tightness test (see 11.4.3)
- Wat.Stress = Water pipe stress test (see 11.4.4)
- LqG Tight = Liquid gas pipe tightness test (see 11.4.3)
- LqG Press = Liquid gas pipe pressure (Stress) test (see 11.4.4)
- Pr.Contr. = Regulator tests (see. 11.4.5)

11.4.1 Show Pressure Measurements

Has "Show Pressure Measurement" been called, the display will read:

Press PM	30.11.07 16:28	☐
Press (AV)	39,39 mbar	■
Start	39,31 mbar	■
Stop	39,45 mbar	■
Diff	-0,14 mbar	■
Meas.time	30 s	■
PRINT ESC		

The display informs you about the type of pressure measurement (PL, PM or PH), date and time, the measured mean pressure value, the pressure at the beginning (Start) and the end (Stop), the difference of pressure between start and stop and the period of the measurement.

With "▲" (PRINT) the measurement result is printed on an IR printer.

With "H" (ESC) you cancel this function and skip to "Show Data Records" (See 11.4).

11.4.2 Show Leak Rate Measurement

Shall a leak rate measurement be shown, the display will read:

Leak Meas.	20.03.07 12:36	☐
P	29,7 mbar	■
L(p)	2,06 l/h	■
L(b)	1,52 l/h	■
Vol	26,0 l	■
PRINT ESC		

The head line informs you about the type of the measurement and its date and time.

The screen shows the mean pressure (P), the measured leak rate L(p), the leak rate at nominal pressure L(b) and the measured volume of the gas pipe (Vol).

With "▲" (PRINT) the measurement result is printed on an IR printer.

With "H" (ESC) you cancel this function and skip to "Show Data Records" (See 11.4).

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11.4.3 Show Tightness Tests

Shall a tightness test measurement be shown, the display will read:

Tightness	29.03.07 09:14	☐
Time	10 min	☒
P-Start	113,1 mbar	■
P-End	113,1 mbar	■
ΔP	0,0 mbar	■
PRINT		ESC

The head line informs you about the type of the measurement and its date and time.

The screen shows the period of the measurement, the pressure at the beginning (P-Start), the pressure at the end (P-End) of measurement, and pressure difference (ΔP).

With "▲" (PRINT) the measurement result is printed on an IR printer.

With "H" (ESC) you cancel this function and skip to "Show Data Records" (See 11.4).

11.4.4 Show Stress Test

After selection of a stress test the display will read:

Stress test	Result	☐
Duration	10 min	☒
P-Start	1,09 bar	■
P-End	1,07 bar	■
ΔP	0,02 bar	■
PRINT		ESC

The head line informs you about the type of the measurement and its date and time.

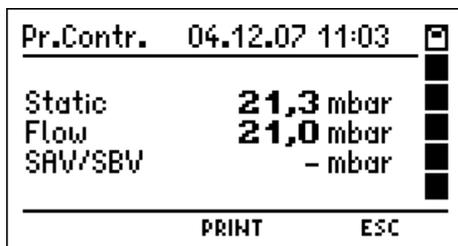
The screen shows information about the period of the measurement, the pressure at the beginning (P-Start) and at the end (P-End) and the measured pressure difference (ΔP).

With "▲" (PRINT) the measurement result is printed on an IR printer.

With "H" (ESC) you cancel this function and skip to "Show Data Records" (See 11.4).

11.4.5 Show Regulator Tests (Only MSI P7plus)

Has a Regulator Test been selected the display will read e.g.:

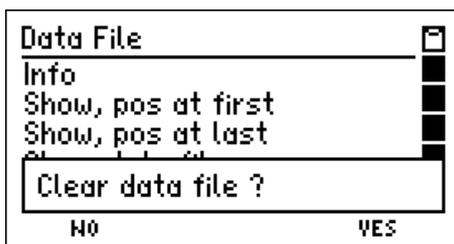


With "▲" (PRINT) the measurement result is printed on an IR printer.

With "H" (ESC) you cancel this function and skip to "Show Data Records" (See 11.4).

11.5 Clear Data Files

After selecting this function the display reads:



With "F" (NO) the MSI P7 calls "Data Menu" (See 11.2) without deleting data.

With "H" (YES) all stored data records are deleted and "Data Menu" (See 11.2) is shown.

12. Info Function

After selecting "Info" the display reads:



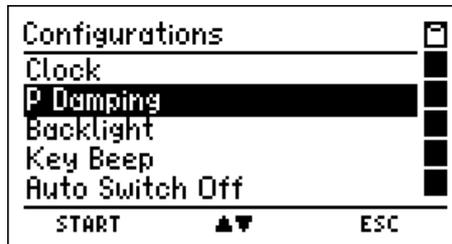
You are informed about the analyser (MSI P7), the manufacturer (Dräger MSI GmbH), date and time (Info Function was called), the version of the firmware (1.2,010) and the serial number of the analyser.

With "H" (ESC) you may cancel "Info Function" and call "Selection of Functions" (see 4.).

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13. Configurations

After selecting "Configurations" the display reads:



With pushing "H" (ESC) you may stop the "Configurations" and skip back to the menu "Selection of Functions" (see 4.).

With pushing "▲ or ▼" (▲▼) you may mark the wanted function.

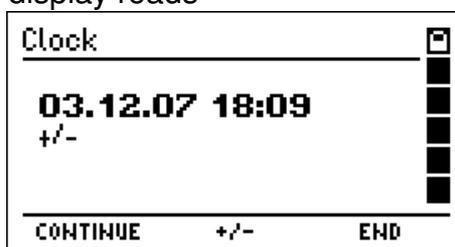
With "F" (START) you may call the marked function.

Selectable functions are:

- Clock = Adjust date and time (see 13.1)
- P-Damping = Select the damping (see 13.2)
- Backlight = Adjust backlight (see 13.3)
- Key Beep = Switch on / off the key beep (see 13.4)
- Auto Switch Off = Able / disable the automatic switch off (see 13.5)
- Tightness test = Tightness test with 110 mbar or 150 mbar (see 13.6)
- Printer = Select HP or MSI printer protocol (see 13.7)
- Contrast = Adjust display contrast (see 13.8)
- Language = Select language of display text (see 13.9)

13.1 Adjust Date and Time

After selection of "Clock" the display reads



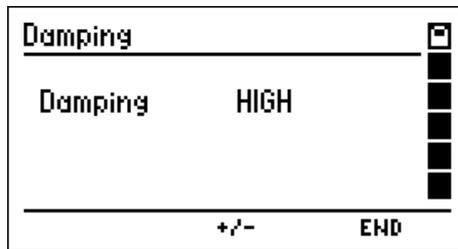
With pushing "▲ or ▼" (+/-) you may vary the value marked with "+/-".

With pushing "F" (CONTINUE) you mark the next value.

With pushing "H" (END) you may accept the displayed date and time and skip back to "Configuration" (see 13.).

13.2 Adjust the Damping Value

Has "Adjust the Damping Value" been called the display reads:



With pushing "▲" or "▼" (+/-) you may change the damping value.

Selectable damping values are:

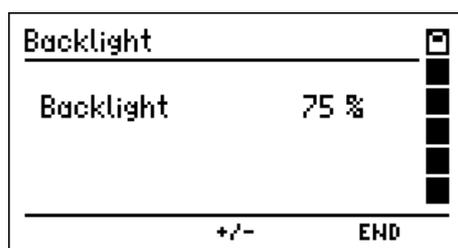
OFF	= no damping
MEDIUM	= medium damping
HIGH	= strong damping

With pushing "H" (END) the shown damping value is accepted and menu "Configurations" (See 13.) is shown again.

The selected damping value remains held even after switch off.

13.3 Adjust Backlight

Has "Adjust Backlight" been called the display reads:



With pushing "▲" or "▼" (+/-) you may change the intensity of the backlight.

Selectable intensity levels are: 0 %, 25 %, 50 %, 75 % and 100 %

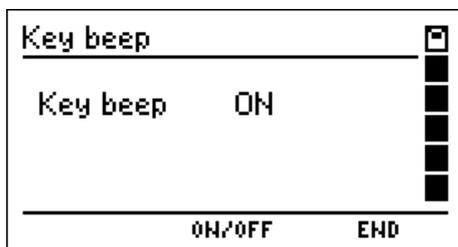
With pushing "H" (END) the shown intensity level is accepted and menu "Configurations" (See 13.) is shown again.

The selected intensity level remains held even after switch off.

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13.4 Switch on / off Key Beep

After selecting "Key Beep" the display reads:



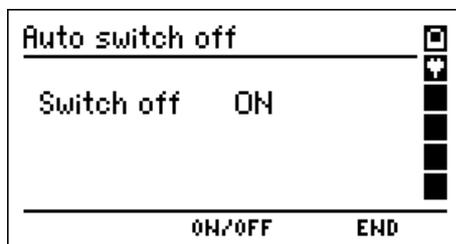
With pushing "▲" or "▼" (ON / OFF) you may select "Key beep ON" or "Key Beep OFF".

With "H" (END) the shown function is accepted and menu "Configurations" (See 13.) is shown again.

The selected function remains held even after switch off.

13.5 Able / Disable the Automatic Switch Off

After selecting "Auto Switch Off" the display reads:



With pushing "▲" or "▼" (ON / OFF) you may able or disable the automatic switch off.

With "H" (END) the shown function is accepted and menu "Configurations" (See 13.) is shown again.

The selected function remains held even after switch off.

13.6 Tightness Test with 110 mbar or 150 mbar

13.6.1 Tightness Test according German Standard TRGI (old)

The old standard demands a period of stabilisation (without defined time) and a measurement period of 10 minutes with 110 mbar test pressure.

The tightness test is carried out regarding these demands, if "Test pressure 110 mbar" has been activated.

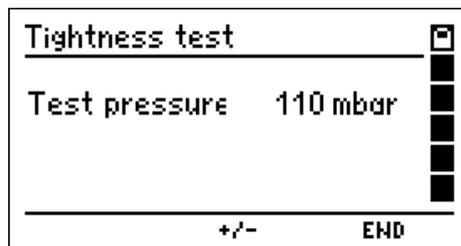
13.6.2 Tightness Test according German Standard TRGI (actual)

The actual standard demands a tightness test with a defined stabilization period (dependent from the pipe volume) and a measurement period of 10 minutes with 150 mbar test pressure.

The tightness test is carried out regarding these demands, if "Test pressure 150 mbar" has been activated.

13.6.3 Selecting Type of German Tightness Test Standard TRGI (actual or old)

After selecting "Tightness test" the display reads:



With pushing the keys "▲" or "▼" (+/-) you may select "Test pressure 150" actual TRGI or "Test pressure 110" old TRGI.

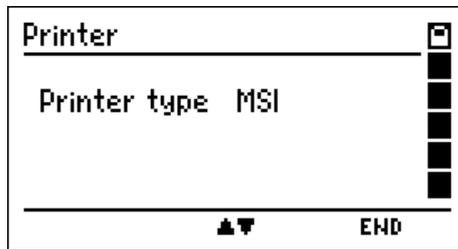
With "H" (END) the shown function is accepted and menu "Configurations" (See 13.) is shown again.

The selected function remains held even after switch off.

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13.7 Select HP or MSI Printer Protocol

After selecting "Printer" the display reads:



With pushing "▲" (▲▼) you may select the printer MSI IR3. Data transfer and printing is much quicker than with HP compatible printers.

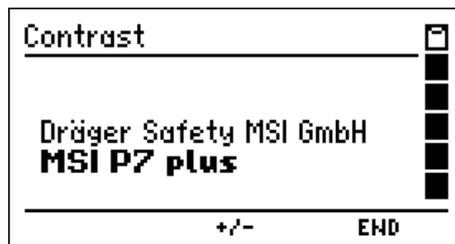
With pushing "▼" (▲▼) you may select the printer HP. The Data transfer is conform to the HP protocol and fits to all HP compatible printers, of course for MSI IR3 too.

With "H" (END) the shown function is accepted and menu "Configurations" (See 13.) is shown again.

The selected function remains held, even after switch off.

13.8 Adjust Display Contrast

After selecting "Contrast" the display reads:



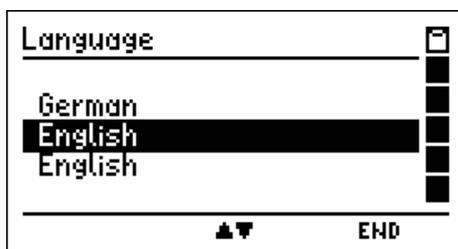
With pushing "▲ or ▼" (+/-) you may change the displays contrast.

With "H" (END) the selected contrast is accepted and the MSI P7 shows menu "Configurations" (See 13.) again.

The selected contrast remains held, even after switch off.

13.9 Selection of Language

After selecting "Language" the display reads:



With pushing "▲ or ▼" (▲/▼) you may select the wanted language.

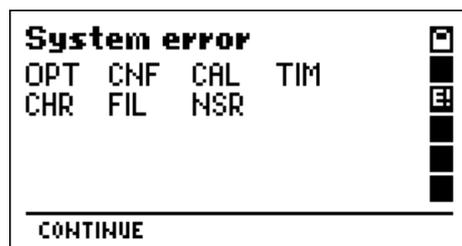
With "H" (END) the selected language is accepted and the MSI P7 shows the menu "Configurations" (See 13.). The selected language remains held after switch off.

14. Error Messages and Function Assistance

14.1 System Error Messages

After switching on the MSI P7 a system check is done. Have errors been detected, they will be displayed in plain text or in an system error list, depending of the error.

For errors in an error list the display may read:



Following errors may be displayed in the system error list:

Message	Meaning	Remedy
CAL	Calibration data error	Service
CHR	Charge controller data error	Charge
CNF	Configuration is wrong	Repeat configuration
FIL	File system error	Clear data file
NSR	Configuration memory error	Service
OPT	Configuration error	Service
TIM	Time administration error	Set time and date

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14.2 Function Assistance

14.2.1 Function Assistance Symbols

In all display screens in the last column following symbols may be shown:

Symbol 1		Capacity of the battery
Symbol 2		Battery becomes charged
Symbol 3		Error
Symbol 4		Internal pump is working
Symbol 5		Internal valve is activated
		NN

14.2.2 Charge Battery

The MSI P7 contains a Ni-MH Battery (4,8 V, 2100 mAh), which can be charged with the provided plug-in charger (Primary 100 - 240 V; secondary 12 V; 0,8 A; euro-type).

The capacity of the battery is controlled by the instrument and displayed as a symbol.

Becomes the voltage and the capacity of the battery too low, this is indicated red flashing of the LED. The battery has to be charged immediately.

The charging is indicated in the display by symbols 1 and 2 (even if the MSI P7 is switched off) and by red lighting of the LED. After ca. 3 hours the battery is completely recharged. Now the MSI P7 is switched to trickle charging and the LED lights green.

Has the charging been missed the MSI P7 is switched off automatically.

Is it impossible to switch on the MSI P7, caused by undervoltage, the charger must be connected and the switch-on must be repeated!!

Avoid deep discharge of the battery. If the battery is empty there is the risk for decreasing the lifetime of the battery. Charge the P7 after every use.

15. Technical Data

15.1 General Technical Data

Approvals:	Type approval by DVGW, Reg. number: DG-4805BS0029
Display:	Graphic display, manual controlled illumination
Interface:	USB, IR
Power supply:	NI-MH Battery, 4.8 V, 2000 mAh, battery monitoring, plug-in charger (primary 100 - 240 V; secondary 12 V; 0.8 A)
Dimensions:	145 x 195 x 75 mm (W x H x L)
Weight:	ca. 1000 g
Operating temperature:	+ 5 °C ... + 40 °C
Storage temperature:	-20 °C ... + 50 °C
Humidity:	10 - 90 % RF, not condensing
Ambient air pressure:	800 to 1100 hPa

15.2 Technical Data Pressure Measurements

Micro Pressure	Range	- 100 ... + 100 Pascal
	Resolution	0.1 Pascal
	Accuracy	< 5 % v MV or < 1 Pascal
Medium Pressure I	Range	10 ... + 100 mbar
	Resolution	0.01 mbar
	Accuracy	< 3 % v MV or < 0.5 mbar
Medium Pressure II	Range	- 15 ... + 150 mbar
	Resolution	0,1 mbar
	Accuracy	< 5 % v MV or < 0.5 mbar
High Pressure	Range	- 200 ... + 2,000 mbar (5,000 mbar MSI P7plus)
	Resolution	1 mbar
	Accuracy	< 5 % v MV or < 10 mbar

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15.3 Technical Data Pipe Checks

Leak rate measurement:

Leak rate	Range	0 to 10 Litre/h
	Resolution	0.01 Litre /h
Volume	Range	1 to 300 Litre
	Resolution	0.1 Litre
Pressure	Range	10 ... + 100 mbar
	Resolution	0.01 mbar
	Accuracy	< 3 % v MV or < 0.5 mbar
Gas types	Natural gas, propane, air	

Tightness tests:

Realization	according to German standards TRGI, TRWI, TRF
Pump flow	1.0 Litre/min to 0.5 Litre /min (pressure dependent)
Test pressure	100.1 to 150.9 mbar
Resolution	0.1 mbar
Stabilization	2 - 30 min, depends from standard
Measurement period	10 - 60 min, depends on standard

Stress tests:

Realization	according to German standards TRGI, TRWI, TRF
Test pressure	1.0 (and 3.0 with MSI P7plus)
Resolution	1 mbar
Stabilization	2 min - 3 hours, depends on standard
Measurement period	10 min - 3 hours depends on standard

16. Working Error Free

Pay attention, that the analyser is charged. Before measurement make sure, that the analyser and the probe are in proper condition. If necessary, please contact a Dräger MSI service partner.

16.1 General Information Regarding Error Messages

If the corresponding range of the MSI P7 during a leak rate measuring is exceeded or if other errors occur (e.g. unexpected rising pressure, connection to gas pipe disturbed) the measuring values will be indicated by **ERR!** (See 14.).

The shown measuring values may be used for error analysis. The print out contains possibly additional lines with error information.

After switch-on of the MSI P7 the pressure sensor is checked. If the check shows that the results do not meet the specifications, an error message is shown in clear text after the start up mode.

16.2 General Information Regarding Power Supply

The MSI P7 possesses a rechargeable Ni-MH Battery. The period of operation is normally longer than 8 hours, depending of the type of measurement.

The capacity of the battery is controlled by the instrument and displayed as a symbol.

Becomes the voltage and the capacity of the battery too low, this is indicated red flashing of the LED at the top of the MSI P7. The battery should be charged immediately.

Charge the instrument only with the supplied charger, if possible after every use.

If the instrument is not in use for a longer period, we recommend charging every month.

For safety reasons check the instruments condition regularly.

16.3 Maintenance

In order to assure accurate measurements and the reliability of the functions the MSI P7 should be checked and if requested be calibrated by an authorised service point once a year.