

# Operating instructions

for

SF<sub>6</sub> Multi Analyser (with and without  
gas return system)

Type no.: 3-038R- / 3-038-

Please read this operating instruction before putting the device into operation. Thus operating faults can be avoided. In case of nonobservance of the operating instruction the manufacturer cannot assume any liability or warranty.

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## 1. General information

### 1.1 Safety notes and symbols used

In the following operating instructions specific safety warnings are given in order to draw your attention to residual risks which cannot be avoided during the operation of the device.

These residual risks contain dangers for

- Persons
- Product and machine
- The environment

The symbols used in the operating instructions should draw your attention specially to the safety notes:



**Danger**

**This symbol refers to risks for persons (danger to life, danger of injury)**



**Warning**

**This symbol refers to risks for machines, material and the environment.**



**This symbol refers to electric shock**

The most important aim of the safety notes is to prevent personal injuries.

- If the warning sign „**Danger**“, appears, danger from machines, materials and the environment are not excluded.
- If the warning sign „**Warning**“, appears, there is no danger for persons.

The corresponding symbol which is used cannot replace the text of the safety note. Therefore the complete text must always be read.



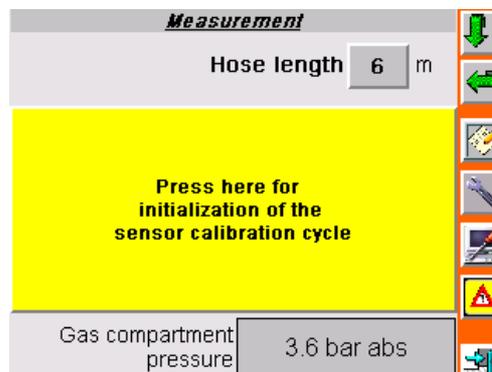
**Note**

This symbol is not for safety notes, but for information to understand the device better.

## **1.2 Initial setting into operation**

We recommend that all persons who are involved in the operation and repair of DILO devices are properly and specially trained.

For initial setting into operation of the SF<sub>6</sub> Multi Analyser the following measures are necessary: When turning on the device with the mains switch the control boots. After the first initialization process the following window appears on the touch panel.



III. 1.2 start screen initial setting into operation

For starting the sensor calibration cycle of 2 years confirm the yellow message on the window by pressing upon it. This must only be carried out in case of initial setting into operation or after having exchanged the sensor.

For measurement follow the instructions in chapter 4.7. "Measurement".

## **1.3 Correct use of the SF<sub>6</sub> Multi Analyser**

The SF<sub>6</sub> Multi Analyser is an important component in the reuse of SF<sub>6</sub>-gas to determine the gas quality used in medium and high voltage switchgear. The device can additionally be used for storing and reclaiming of SF<sub>6</sub> measuring gas.

The SF<sub>6</sub> Multi Analyser allows to determine the three most important parameters for reuse of SF<sub>6</sub>-gas with only one measurement:

- SF<sub>6</sub> concentration [%]
- Moisture concentration
- SO<sub>2</sub> concentration [ppm<sub>V</sub>]

After measurement the measuring values can be stored in the SF<sub>6</sub> Multi Analyser and transferred to a PC if required.

### **Devices with gas return system:**

The used measuring gas is stored in an internal vessel. After measurement the stored measuring gas is pumped back into the connected gas compartment by means of the compressor. After deactivation of automatic pumping (see 4.6) the measuring gas can alternatively be pumped in an external vessel.

### **Devices without gas return system:**

Are provided for connection to an external gas return system.

For this purpose the device is equipped with an open connection on the outlet which allows to operate the SF<sub>6</sub> Multi Analyser with and without external gas return system. The measuring gas is collected via the connecting hoses by means of the external gas return system.

For the operation without an external gas return system the outlet is open that means the measuring gas can be released easily into the atmosphere.

The device can only be used optionally for different gas mixtures (SF<sub>6</sub>-N<sub>2</sub>/air and SF<sub>6</sub>-CF<sub>4</sub>).

## **1.4 Obligation to exercise due care**

The device has been designed and constructed bearing in mind the standards to be observed as well as additional technical specifications.

Safe use of the machine can only be achieved if all the necessary measures are followed.

The operator has to ensure that

- the SF<sub>6</sub> Multi Analyser is only used for the purposes for which it is intended
- the SF<sub>6</sub> Multi Analyser is only operated in accordance with the instructions and in good condition and that the safety devices are regularly checked.
- complete and legible operating instructions are available on site.
- only qualified personnel operates or repairs the device.
- this personnel is regularly instructed in safety procedures and environmental protection and that this personnel is fully aware of the complete operating instructions and particularly in the safety notes.
- the safety and warning notes mounted on the SF<sub>6</sub> Multi Analyser are legible and not removed.



**The parts inside the SF<sub>6</sub> Multi Analyser are under dangerous supply voltage in case of connected power connecting cable. Prior to opening the housing switch off and unplug the device.**

## 1.5. Transport

### European Transport Regulations:

SF<sub>6</sub> (Sulphur hexafluoride) service carts are exempt from “Hazardous Goods Transport Regulations” as long as the gas pressure in a tank or vessel at 15 deg C is not more than 2 bar above atmospheric pressure and it remains in a gaseous state during transport. This exemption covers all kinds of vessels and tanks as well as machinery (motors, pumps etc.) (see ADR annex A 1.1.3.2 c – exemptions with regard to the transport of gases).

For carriage of the device by air and sea the integrated pressure vessels must be emptied to atmospheric pressure in accordance with EC directive 859/2008. Contaminated SF<sub>6</sub> must not remain in the pressure vessels.

Otherwise observe the instructions valid in your country.

### Installation



Warning

Only operate the device indoors or in dry places outdoors.  
Operation in humid places may cause corrosion of couplings and valves.  
The ambient temperature during operation of the device should be in the range of -10°C to + 40 °C.

### Filling for transport

All devices are filled with gas to a slight overpressure (~ pe 0.2 bar) in our works. Labels giving the correct details for transport are provided.

Red label for devices filled with N<sub>2</sub> for transport



<p><b>Achtung/ Attention</b> N<sub>2</sub> - Transportfüllung N<sub>2</sub> - Filling for transport Remplissage N<sub>2</sub> pour le transport</p>
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Green label for devices filled with SF<sub>6</sub> for transport



<p><b>Achtung/ Attention</b> SF<sub>6</sub> - Transportfüllung SF<sub>6</sub> - Filling for transport Remplissage SF<sub>6</sub> pour le transport</p>
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Accessories which are filled with air (e. g. hoses) are not provided with a label.

Devices or accessories, which are filled with SF<sub>6</sub>-gas, can be put into operation without carrying out any additional preparatory operations.

Devices or accessories, which are filled with N<sub>2</sub>-gas or air must be evacuated before use with SF<sub>6</sub>-gas otherwise the SF<sub>6</sub>-gas will be contaminated.

## 1.6 Instructions for exchanging measuring gas modules



**Prior to opening the housing switch off and unplug the device.**

Tilt the front cover by loosening the six upper screws and unlock the connecting hoses of the corresponding measuring cell on the manifold block by pressing upon the blue fixing facility on the plug-in couplings (from left to right (SO<sub>2</sub>- humidity - percent)).

Opening of the plug-in couplings:

Press the blue fixing facility downwards with thumb and forefinger and pull out the hose with the other hand (see ill. 1.1).



Ill. 1.6 Opening of the plug-in couplings



**Warning**

**The connecting hoses cannot be mixed up due to their different hose diameter on the inlet (6 mm) or on the outlet (4 mm). When coupling again pay attention that the hoses are inserted completely into the plug-in coupling.**



**Note**

**The percentage module can be removed by pulling out the 96 pole connector strip and loosening the three fastening screws.**

**The moisture sensor can be removed after having unscrewed the M12 plug connector and loosening both fastening screws.**

**The SO<sub>2</sub> unit can be exchanged by pulling out the screw terminals and loosening both fastening screws.**

**Important:**

**When exchanging all measuring cells do not disconnect the connecting hoses from the cells.**



## **2. Overview of SF<sub>6</sub> Multi Analyser**

The SF<sub>6</sub> Multi Analyser allows the measurement of the following values:

- SF<sub>6</sub> volume percentage
- Moisture concentration
- SO<sub>2</sub> concentration

After each measurement the measuring values can be stored, indicating a name.

The following main components of the SF<sub>6</sub> Multi Analysers are installed dependant on the version: one measuring module with a SF<sub>6</sub> volume percentage sensor, a moisture sensor as well as a module with SO<sub>2</sub> sensor. Furthermore power supply units, a central unit with touch panel, pressure sensors and tubing with solenoid and control valves. All components of the SF<sub>6</sub> Multi Analyser are installed in a compact modular housing.

All values measured are indicated digitally.

The standard version of the SF<sub>6</sub> volume percentage sensor is calibrated to a SF<sub>6</sub>/N<sub>2</sub> or SF<sub>6</sub> air mixture and measures the SF<sub>6</sub> content in volume percent in such gas mixture. The SF<sub>6</sub> volume percentage sensor works independently of air pressure and installation position.

The moisture sensor measures the dew point temperature of SF<sub>6</sub> gas in °C dew point. The measuring value of the dew point in °C can automatically be indicated or converted into all established indicating units in case of modified setting. A conversion into dew point under pressure in the compartment is also possible. Furthermore, the SF<sub>6</sub> Multi Analyser can also include a SO<sub>2</sub> sensor (as option) which measures the decomposition products of SF<sub>6</sub> gas.

The modular construction of the SF<sub>6</sub> Multi Analyser enables to send each single measuring gas module for verification, calibration or exchange to the manufacturer. In principle, it is also possible to measure with only one measuring module.

The SF<sub>6</sub> Multi Analyser is very easy to operate on the front side.

Devices with gas return system are equipped with:

- a "Gas inlet" coupling
- power socket with "ON/OFF" switch
- 5.7" coloured touch panel
- USB connection
- two fixing facilities for couplings for hose connections DN8/DN20

Devices without gas return system additionally include:

- a "Gas outlet" coupling

**2.1 Technical data**



III. 2.1. SF<sub>6</sub> Multi Analyser with standard accessories

Dimensions of the device **with** gas return system (transport case included)

Length (L):	500 mm
Width (B):	625 mm
Height (H):	297 mm

Weight:	33 kg
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Dimensions of the device **without** gas return system (transport case included)

Length (L):	500 mm
Width (B):	625 mm
Height (H):	218 mm

Weight:	20 kg
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General data:

Input pressure:	$p_e$ 0.3 – 9 bar
Operating temperature:	-10° - +40 °C
Operating voltage:	90 – 264V /50 – 60Hz (L, N, PE)
Interface:	USB
Mains fuse:	2 x 1.6 A/T (time delay)
Measuring time (individual measurement):	< 15 min. (automatically calculated)
Limit value vol.-%:	0.0 – 99.9 vol.-%
Limit value dew point:	-60 °C – +20 °C
Limit value SO <sub>2</sub> :	0.0 – 500.0 ppm <sub>v</sub>
Flow rate (all sensors):	18.3 – 20.5 l <sub>N</sub> SF <sub>6</sub> /h = 111 – 125 g SF <sub>6</sub> /h
Number of measured values to be stored:	100

SF<sub>6</sub> volume percentage sensor:

Measuring media:	SF <sub>6</sub> /N <sub>2</sub> or SF <sub>6</sub> /air gas mixtures and SF <sub>6</sub> /CF <sub>4</sub> gas mixtures
Measuring range:	0.0 to 100.0 vol.-% SF <sub>6</sub>
Measuring accuracy:	± 1 vol.-% for gas mixtures SF <sub>6</sub> /N <sub>2</sub> or SF <sub>6</sub> /air ± 2 vol.-% for gas mixtures SF <sub>6</sub> /CF <sub>4</sub>
Measuring condition:	measurement is carried out at atmospheric pressure
Flow rate:	0.3 – 0.5 l <sub>N</sub> SF <sub>6</sub> /h = 1.8 – 3.1 g SF <sub>6</sub> /h
Operating temperature:	-10 °C – +40 °C

Moisture sensor:

Measuring range:	-60 °C – +20 °C dew point temperature
Measuring accuracy:	± 2 – ± 3°C dew point temperature
Measuring condition:	measurement is carried out at atmospheric pressure, dew points and ppm values are converted by the device
Flow rate:	18 – 20 l <sub>N</sub> SF <sub>6</sub> /h = 109 – 122 g SF <sub>6</sub> /h
Operating temperature:	0 °C – +60 °C



## SO<sub>2</sub>-Sensor:

Measuring range:	0 – 20ppm <sub>v</sub> 0 – 100ppm <sub>v</sub> 0 – 500 ppm <sub>v</sub>
Measuring accuracy:	< ± 2% of measuring range
Measuring condition:	measurement is carried out under atmospheric pressure
Flow rate:	1 – 3 l <sub>N</sub> SF <sub>6</sub> /h = 6,2 – 18,6 g SF <sub>6</sub> /h
Operating temperature:	-20 °C – +40 °C

<u>Exchange measuring cells:</u>	Order no.
SF <sub>6</sub> volume percentage module	3-027-201
Moisture sensor	3-945-201
SO <sub>2</sub> sensor	3-1032-201

## **2.2 Standard accessories**

- 1 6 m long PTFE connecting hose with metal braiding and self-closing stainless steel couplings on both ends
- 1 DILO connecting coupling DN 20
- 1 DILO connecting coupling DN 8
- 1 2 m long power cable
- 1 USB stick with data file for evaluation
- 1 CD-ROM with data file for evaluation and reading out of measured data
- 1 Operating instruction



## **3. Functional description**

### **3.1 Function of the SF<sub>6</sub> volume percentage sensor**

The measuring principle is based on the evaluation of the different velocities of sound of gases. The velocity of sound in air is normally about 330 m/s, while in pure SF<sub>6</sub>-gas it is only about 130 m/s. The velocity of sound measured in the measuring cell is temperature compensated and converted into SF<sub>6</sub> volume percent by means of a microprocessor.

The measuring results are transmitted to the host computer.

### **3.2 Function of the moisture sensor**

The moisture sensor is based on the absorption of water molecules in a special ceramic substrate. Therefore the electric capacity of the sensor element changes which is registered by the evaluation electronics and is converted into a standard signal.

This signal is transmitted to the host computer.

### **3.3 Function of the SO<sub>2</sub> sensor**

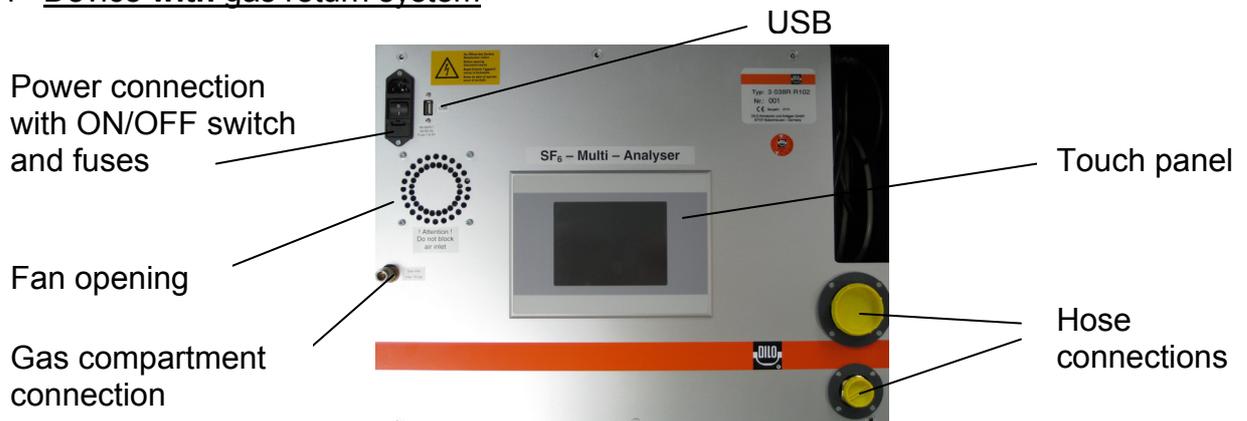
This sensor is based on the electro-chemical measuring principle.

The change in current is registered by the evaluation electronics and converted into a standard signal. This signal is transmitted to the host computer.

**4. Description of the device and measuring process**

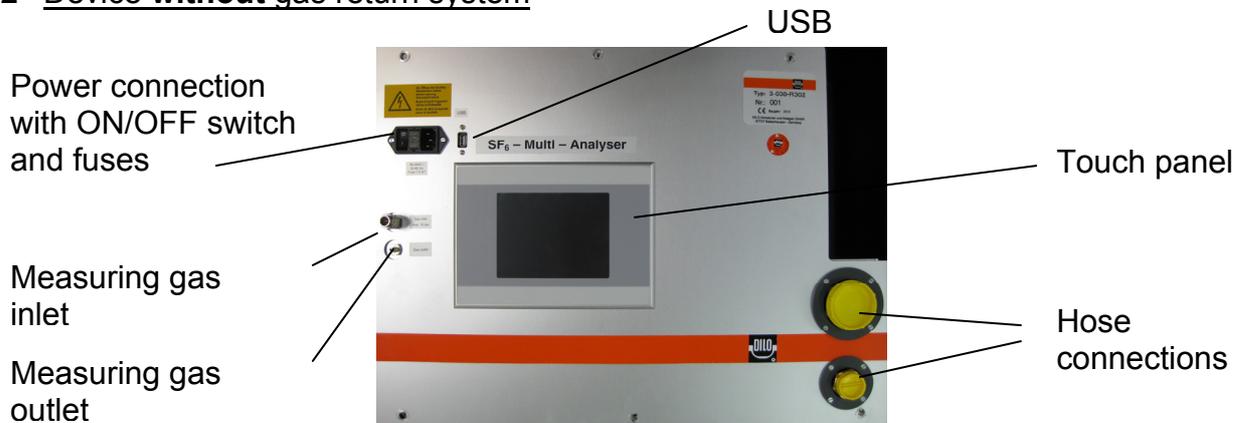
**4.1 Components of the device**

4.1.1 Device with gas return system



III. 4.1.1 top view of the 3-038R

4.1.2 Device without gas return system

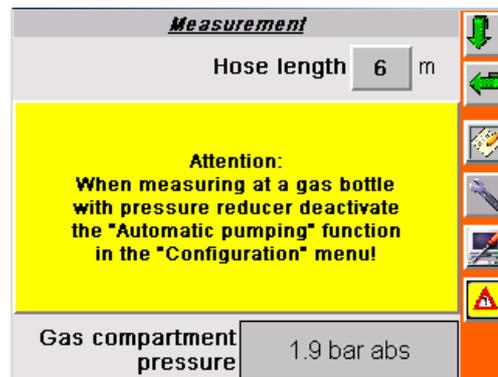


III. 4.1.2 top view of the -038

The SF<sub>6</sub> Multi Analyser is switched on and off with the I / 0 rocker switch on the front side.

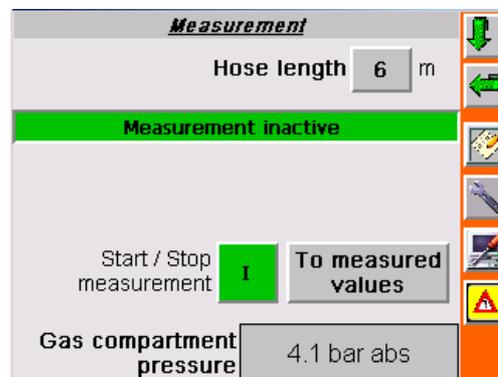
## 4.2 Setting into operation

Turning on the power switch the control is booting. After the initialization process the following window appears on the touch panel (only at devices with gas return system)



III. 4.2.1 Instruction window

The message box can be confirmed by pressing upon the yellow field. Then the following start screen appears (only at devices with gas return system immediately after the initialization process)



III. 4.2.2 start screen

The SF<sub>6</sub> Multi Analyser is ready for operation now.

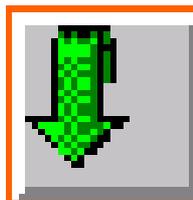
In the "Hose length" field the 6 m or 12 m long measuring hose can be selected by pressing upon 6 or 12. The rinsing time (at the beginning of the measurement) depends on the length of the measuring hose.

### 4.3 Basic functions

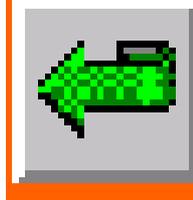
After switching on the device the start screen appears (ill. 4.2).

All functions of the SF<sub>6</sub> Multi Analyser can be selected here. There is a status bar on the upper side of the screen to indicate which window has been selected.

It is possible to select between different windows on the right side of the screen via keys.



Back to the start screen



Back to the previous window



To the stored measuring values



To settings



To service



To error indication

Ill 4.3 selection of windows

#### 4.4 Setting possibilities

After pressing the



key the following window appears:



III. 4.4 Settings

1. Language selection
2. Selection of the pressure unit [bar abs., bar rel., psi, kPa, MPa]
3. Selection of the carrying gas [N<sub>2</sub>, CF<sub>4</sub>]
4. Selection of the moisture unit [°C abs., °C (p), °F abs., °F (p), ppm<sub>v</sub>, ppm<sub>w</sub>]

The units of the measuring values are indicated behind the measuring values.

When selecting the carrying gas the volume percentage is distinguished referred to the carrying gas N<sub>2</sub> or the carrying gas CF<sub>4</sub> (as option).

#### 4.5 Service

After pressing the



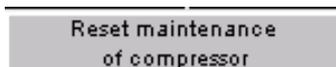
key the following window appears:

<i>Service</i>				
<b>Compressor</b>	Operating hours	Operating hours last maintenance	Maintenance interval [h]	
	0.00 h	0.00 h	500 h	
(Double-click to reset)		Reset maintenance of compressor		
<b>No maintenance required</b>				
<b>Configuration</b>				
<i>Status</i>				
<b>Pressures:</b>	Input	Measuring cells	Compressor input	Internal storage
	4.0 bar abs	1.0 bar abs	0.9 bar abs	1.2 bar abs
<b>Valves:</b>				

III. 4.5 Service

1. Setting of operating hours and reset maintenance of compressor
2. Possibility to switch over to the "Configuration" window.
3. Status indications (operating pressures and valves)

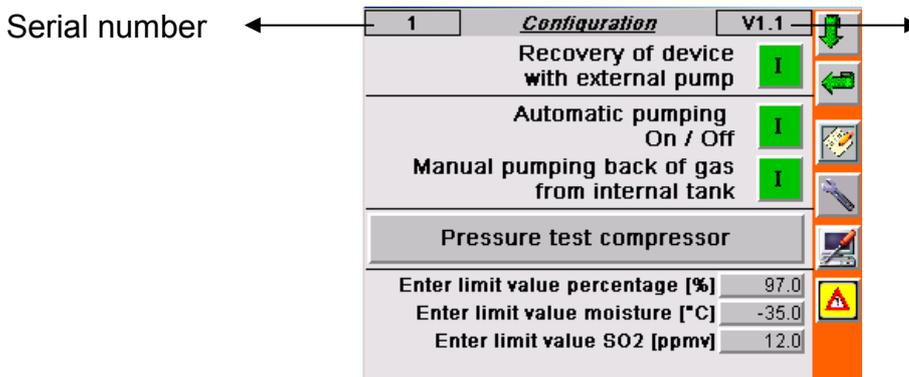
With the



key the maintenance counter must be reset after having carried out the maintenance works on the compressor.

## 4.6 Configuration

After pressing the **Configuration** key the following window appears:



Ill. 4.6, configuration

1. Recover the device with an external pump
2. Automatic pumping On /Off (only at devices with gas return system)
3. Pump back the gas from the internal tank manually (only at devices with gas return system)
4. Compressor pressure test (only at devices with gas return system)
5. Input limit value (percentage): 0.0 to 100.0 Vol.-%
6. Input limit value (moisture): -60.0 to +20.0 °C dew point
7. Input limit value SO<sub>2</sub>: 0.0 to 500.0 ppm<sub>v</sub>



Note

In case of negative limit values the numerical values must first be input. Then press the „ - “ key.

If the input limit values are exceeded or if they fall below the input value the “Limit value fallen below” or “Limit value exceeded” message appears (see chapter 4.7).



Note

The “Manual pumping back of gas from internal tank” function can only be started if the “Automatic pumping ON / OFF” key has been pressed beforehand.

#### 4.7 Measurement

##### **Devices with integrated gas return system:**

Connect the measuring gas hose to the coupling (DN 8 or DN 20) by means of the self-closing miniature coupling and couple to the "Gas inlet". Connect the coupling (DN 8 or DN 20) to the gas compartment

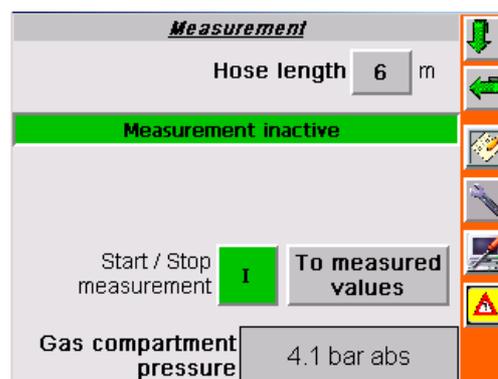
##### **Device without gas return system:**

Connect the measuring gas hose to the coupling (DN 8 or DN 20) by means of the self-closing miniature coupling and couple to the "Gas compartment" connection of the external gas return system. Connect the coupling (DN 8 or DN 20) to the gas compartment.

The connection between the measuring device and external gas return system is established via two hoses which are included in the scope of supply of the gas return system.

In case moisture is visible on the couplings it must be wiped with a dry and lint-free cloth beforehand. Then dry the couplings with a commercial hairdryer for several minutes, however the temperature of the couplings must not exceed 70°C. If moisture penetrated in the measuring gas hose disconnect it from the device and rinse it with dry gas for about 5 minutes (e. g. nitrogen). The connecting coupling on the compartment to be tested must also be dry and clean.

After having carried out all necessary settings start the measurement on the start screen with the "Measurement Start / Stop" key.

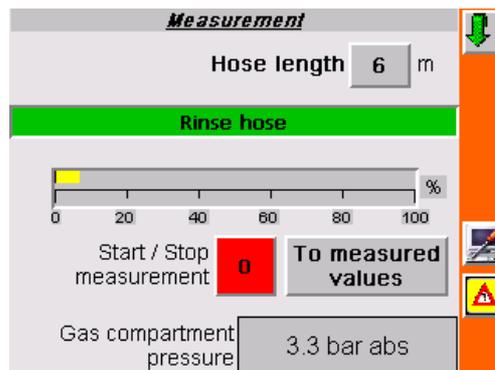


III 4.7.1, start screen

The current function is indicated on the green bar. The current measuring status is shown on the bar diagram in yellow colour.

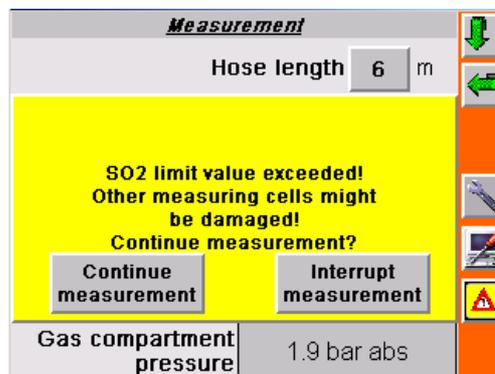
The following functions are running one after another:

1. Rinsing the hose



III. 4.7.2, measurement

2. SO<sub>2</sub>-measurement in operation (in case SO<sub>2</sub> sensor is available).  
In this case the SO<sub>2</sub> content in the gas to be measured is determined beforehand. If the value is higher than 12 ppmv the following message appears:



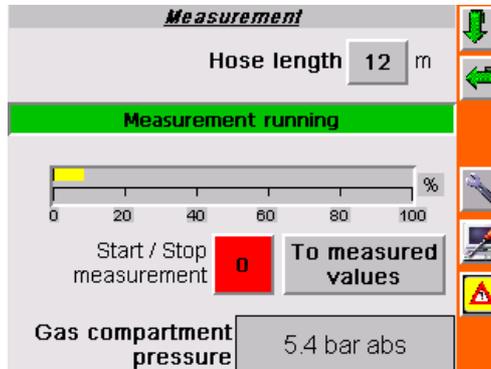
III. 4.7.3, SO<sub>2</sub> measurement

The operator can select between:

- Continue measurement: measurement until the measuring result appears
- Interrupt measurement: measurement is interrupted and the start screen appears again.

In case the value is lower than 12ppm<sub>v</sub>, the measurement is continued under item 3 without interruption.

3. Measurement running

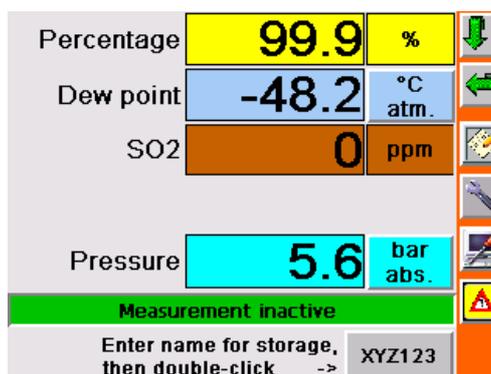


III. 4.7.3, measurement running

4. Measurement completed.
5. Pumping back measuring gas (only at devices with gas return system)
6. Rinsing the SO<sub>2</sub> sensor (if SO<sub>2</sub> sensor is available and the value is higher than 2ppm<sub>v</sub>)

The **To measured values** key enables to switch over to the current measuring values during measurement.

After the end of the measuring time it is automatically switched over to the “Measuring results” window.



III. 4.7.4 measuring result



Note

In case the values fall below or exceed the limit values entered on the “Configuration” window a “Limit value fallen below” or “Limit value exceeded” message appears on the “current measuring value” window”.

Limit value fallen below	30.9	%	
Limit value exceeded	-9.6	°C atm.	
SO <sub>2</sub>	0	ppmv	
Pressure	6.8	bar abs.	
Measurement inactive 			
Enter name for storage, then double-click ->		XYZ123	

## III. 4.7.5 limit values



Warning

Oil or condensated moisture must not penetrate the SF<sub>6</sub> Multi Analyser.

Make sure that the pressure in the gas compartment to be measured does not exceed  $p_e$  9 bar prior to connect the SF<sub>6</sub> Multi Analyser.



Note

The solenoid valves in the SF<sub>6</sub> Multi Analyser open automatically during the measurement. If there is back pressure e. g. because the “Gas outlet” is closed on the outlet or the SF<sub>6</sub>-gas cannot be transported the input solenoid valve is closed and the measurement is interrupted by a message. The back pressure cannot continue to increase.

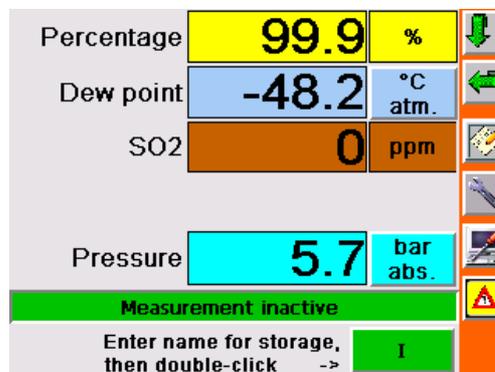
#### 4.8 Storage of measurements

After the automatic measuring process the measured values can be stored in the device. For this purpose press the “XYZ123” key on the “Measuring results” key. The following prompt appears:



##### III. 4.8.1 enter name of measuring value

Enter the desired name and confirm with the “RET” key.



##### III. 4.8.2 storage of measuring value

Confirm the inputs by double clicking the green “I” key.  
The current measuring value is stored in the device now.

The stored measuring value can be indicated by pressing the  key. The current memory capacity with a total of 100 is indicated on the top right. The arrow keys enable to browse up and down in single increment or increments of 10.

<i>Stored measured values</i>		No.
Name	1	0
Date	2010-09-27	
Time	09:04:48	
Percentage	99.9 %	
Dew point	-58.1 °C atm	
SO2 value	0 ppmv	
Pressure	5.8 bar abs	
Data storage (double-click):	all	
Delete data (double click):	current	all

### III. 4.8.3 measuring results

In the “Delete data (double click)” line either one or all measuring values can be deleted.

In the “Data storage (double click)” line the values can be transmitted to an USB stick (see chapter 5.1)

## **5. Transmission of the measuring data on PC**

The stored measuring data of the SF<sub>6</sub> Multi Analyser can be transmitted to an USB stick for filing.

For this purpose press the “All” key in the “Data storage (double click)” line.



### III. 5.1, data transmission

#### **5.1 Storing the data on USB stick**

Procedure:

- a) Plug in the USB stick on the front side of the SF<sub>6</sub> Multi Analyser.
- b) Storage is carried out by double clicking on the “all” key.  
The “Data transmission successful” message appears.
- c) Open the EXCEL program on the PC and open the “log\_file.txt” file.

## **6. Fault correction**

**It is not recommended to carry out repair works of the SF<sub>6</sub> Multi Analyser by yourself (except for disassembling the single modules, see chapter 1.5).**

**But do not carry out any works on the measuring cells. In case of malfunction return them to the manufacturer of the device.**

**If there is no indication after switching on the device check whether correct power supply is connected and the mains plug is fixed tightly.**

If this is correct check both mains fuses which are in the fuse carrier on the mains plug and can be opened by pulling out. In case an indication does not yet appear the SF<sub>6</sub> Multi Analyser must be sent to DILO.



**Prior to the removal of the mains fuse unplug the power plug.  
If the mains fuse is replaced only use the same type (see technical data 2.1.)**

In case the device cannot be started or if there are malfunctions during operation qualified personnel is to be consulted for repair and maintenance.

**To avoid danger to life by electrical shock:**



- **Only properly trained electricians should carry out maintenance and repair works on electrical equipment.**
- **The operator should only eliminate faults, which result from operating or maintenance errors.**



**List of failure on the touch panel:**

<b>Error message</b>	<b>Possible cause of error</b>	<b>Correction</b>
Defective pressure sensor	Defective pressure sensor	Check pressure sensor
	Cable not connected	Check sensor connection
Storage pressure too high	Pressure in the internal storage vessel too high	Reduce pressure by "manual pumping" (see chapter 4.6)
Suction pressure too high	Check the compressor	Carry out pressure test (see chapter 8.1)
	The solenoid valves downstream from the compressor do not open	Check the solenoid valves
Input pressure too high	The pressure of the connected gas compartment is $> p_e = 9$ bar	Reduce the input pressure
Output pressure too high	The pressure downstream from the measuring cells is too high	Check the valves between measuring cells or compressor
Input pressure too low	The pressure of the connected gas compartment is $< p_e = 0.3$ bar	Increase the input pressure
Lifetime of measuring cells expired	The lifetime of two years will expire in three months	Purchase an exchange sensor or send the device to DILO for verification

**List of other breakdowns:**

<b>Error message</b>	<b>Possible cause of error</b>	<b>Correction</b>
The compressor does not reach any high output pressure	The incorrect solenoid valves are opened	Check the position of the solenoid valves
	Defective piston rings, defective valve seats	Check the compressor in accordance with the operating instructions of the compressor



## **7. Gas return system**

Legal directives becoming more and more strict and the voluntary self-commitment of the SF<sub>6</sub>-users also require the collection of used gas even of smallest amounts of SF<sub>6</sub>, as being discharged during measurements. For this purpose, the gas return system has been developed.

### **Devices with integrated gas return system:**

At these devices the collected measuring gas is pumped back automatically in the connected gas compartment. (This function is preset in our works).  
However this function can be deactivated in the configuration menu (see chapter 4.6). Then the measuring gas can be pumped in other vessels manually (max. pressure  $p_e = 9\text{bar}$ ).

### **Devices without integrated gas return system:**

These devices are provided for connection to an external gas return system.  
The measuring gas inlet and outlet are connected to the external gas return system.  
The gas compartment is directly connected to the external gas return system.  
If the internal intake capacity of the external gas return system is reached the input valve of the external gas return system closes and the measuring device does no longer receive measuring gas on the inlet. The measurement is stopped and the measuring gas is automatically pumped back in the connected gas compartment. (This function is preset in our works).  
However this function can be deactivated in the configuration menu of the external gas return system. Then the measuring gas can be pumped manually in other vessels (max. pressure  $p_e = 9\text{bar}$ ).

### **External gas return system**

This single device is available for devices without gas return system.

## 8. Special functions

### 8.1 Pressure test of compressor

We recommend checking the compressor for faults once a year or not later than the maintenance interval indicated.

After pressing the  key in the configuration menu the following window appears:



III. 8.1 pressure test

1. Do not connect any gas compartment.
2. The function can be started by the "Start / Stop" key.
3. Indication of the current pressure on the pressure side of the compressor.
4. After the test time a window with the following message appears:
  - A) "Pressure test successful" if a final pressure of  $p_e = 9$  bar has been reached or
  - B) "Pressure test not successful" if a final pressure of  $p_e = 9$  bar is not reached.
5. In case the function is stopped prior to expiry of the test time the "Pressure test not successful" appears.
6. The function is completed by pressing the red "Start/Stop" key.

In case of successful pressure test it can be continue to operate without hesitation.  
If the pressure test is not successful the device should be sent to DILOR for verification.

## **9. Maintenance**



Only authorized personnel should carry out purification and maintenance works in accordance with maintenance instructions and regulations for the prevention of accidents.  
In case of non compliance this could result in injury or death and also considerable damage to the equipment.

Carry out maintenance works only if the device is switched off!

- Touch hot components (compressor) only after they have cooled down!
- Exchange filters which contain or are saturated with decomposition products!

## **Maintenance**

Preventive measures

<b>Object</b>	<b>Maintenance works</b>	<b>Recommended control interval</b>
Compressor	Valve seat, piston ring, O-rings	Check every 500 hours and exchange if necessary (exchange by DILO GmbH)
Particle filter	Purify or exchange	During each pressure revision