

Contents

1. General Information
2. Safety Information
3. Description, Application
4. Technical Data
5. Installation
 - Storage and Transport
 - Mounting
6. Electrical Connection
 - Pin Assignment
 - Mounting of the Miniature Circular Plug Connection M16x0.75; 2...6-pin
7. Operation
 - Installation of the Software USSCOM
 - Operation of the Software
8. Maintenance, Repair
 - Zero, Span and Offset
9. Decommissioning
10. Accessory
11. Declaration of Conformity
12. Malfunctions

1. General Information

Please read these operating instructions carefully before putting the pressure transmitter DIGPTMvSF6 into operation.

You have purchased an instrument that was manufactured in a high quality standard in our company, which is certified according to DIN ISO 9001. Should a reason for complaint however arise, please return the pressure transmitter with a precise description of faults to our factory.

The DIGPTMvSF6 is a density control instrument for hermetically dense SF6-gas systems.

Pressure transmitters of the type DIGPTMvSF6 are manufactured in accordance with the corresponding valid standards. The instruments are CE-certified and accordingly EMC- tested.

If you have any questions regarding a special application of the instrument or storage, installation, operation or difficulties, please contact us as manufacturer or the distributor.

Please support us in improving this operating instruction. We will gladly accept your advice.



Applications that are not explicitly listed as according to regulations, are improper to intended purpose!

The company MANOTHERM Beierfeld GmbH does not assume liability for damages that arise from incorrect use of the instrument resp. from disregard of the information contained in these operating instructions.



Do not manipulate the instrument. Otherwise you will lose your warranty.



2. Safety Information



Please regard the valid instructions regarding safety at work and prevention of accidents, as well as the country-specific installation standards at installation, starting up and operation.

The installation may only be performed by qualified personnel*. Disregard of the respective regulations can cause severe bodily injuries and / or damage of equipment.

*Qualified personnel

are persons that are acquainted with installation, mounting, putting into operation and operation of the product and possess the corresponding knowledge resp. qualifications.

In order to ensure measurement accuracy and durability of the instrument and to avoid damages, the indicated limit values und *technical data* have to be observed.

In case of visible damages or malfunctions the instrument must be put out of operation immediately.

All parts have to be protected against direct contact during mounting of instrument and connections.

Avoid contamination and damage at the process connection and especially at the sealing face!

Do not insert any objects into the process connection!

At process connections with wrench flats only use the matching torque wrench for installation at the measuring point. The wrench must be applied at the designated wrench flat only. The right tightening torque depends on material and shape of the used sealing.

Tightening torque 50 Nm max.!

- For pressure connections according to DIN EN 837 use profile seals according to DIN 16258 (see section 10.).
- Avoid a direct pressure blast on the sensor diaphragm! In case of doubt use damping elements (damper without orifice, etc.), as far as this is possible!



The matching sealings for each connection must be used under all circumstances. Depending on the type of application, even the smallest leak can cause unpredictable damages of equipment and bodily injuries!



3. Description, Application

Digital gas density control instruments, model DIGPTMvSF6, are digital characteristic diagram controlled and temperature-compensated pressure sensors on microprocessor basis that were especially conceived for monitoring gas density in SF6-isolated switch gears. Absolute pressure is measured in order to eliminate errors caused through deviating ambient air pressure or varying geographical installation altitudes.

The transmitter models DIGPTMvSF6 additionally have 2 separate, freely programmable pnp-switching outputs that can trigger actions in case of alarm.

The extremely temperature-dependent gas pressure of the SF6-gas is (compensated mathematically and) converted to a gas condition at reference temperature of +20°C. The measuring signal, thus standardised, always corresponds to the gas pressure resp. the gas density, which the SF6-gas would have at a temperature of +20°C, even if another system pressure is adapted at a deviating system temperature.

As long as the system has no distribution loss, the output signal remains constant on the whole temperature range of the gaseous phase.

If partial liquefaction of SF6-gas occurs at low temperatures, the pressure of the system, and therefore also the output signal, drops due to physical reasons. Alarm can be triggered via the switching outputs.

Pressure transmitters, model DIGPTMvSF6, are for use under vacuum and allow at filling of the plant with SF6-gas during evacuation of the system for reliable measurement. As the transmitter is designed as two-wire, its signal can be constituted as analogue value 4...20 mA. The current is measured in the minus-branch (see section 7.).

For signalling of possible malfunctions such as a defective measuring cell or exceeding of the measurement range, the internal current source of the transmitter emits a NAMUR status-current of <3.6 mA.

Due to the additional RS-485 interface, the measurement result can also be transferred digitally. The digital measurement value is emitted, according to the ordering information, as standardised gas density (in g/litre) or as standardised gas pressure (in bar abs.) at +20 °C.

Crosslinking of up to 254 transmitters is possible via a bus-system. The general rules for RS-485 bus-systems apply.

Switching functions, software low pass, output signal as well as instrument address can be administered by the user with the USSCOM-software via the RS-485 interface.

The software furthermore allows for display of the measuring result in some alternative units.

Technical data can also be found in our data sheets in our PDF-catalogue on www.armaturenbau.com resp. www.manotherm.com.

4. Technical Data

Measurement Range

0...16g/l to 0...80 g/l SF6@+20°C

(\pm 0...2.59 bar abs. to 0...11.33 bar abs. SF6@+20°C)

Output Signals

- 4...20 mA (measured in GND-branch)
- digital measurement value (indication via PC)
- 2 separate, freely programmable switching outputs

Medium Temperature

DIGPTMvSF6: typ. -40...+60 °C

Accuracy

DIGPTMvSF6: \pm 0.5% v. E. in the entire rated temperature range

Reference Temperature

+20 °C

Long-Term Stability

DIGPTMvSF6: < \pm 0.3 % / a

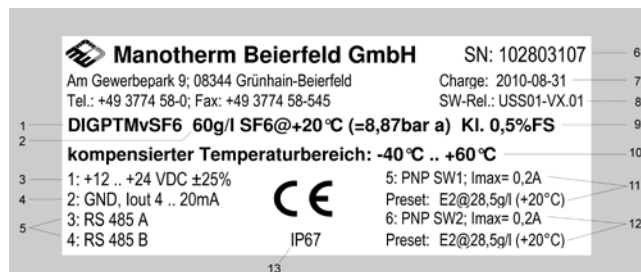
Wetted Parts (Connection/Diaphragm)

DIGPTMvSF6: 316L / 1.4435

Case

Stainless steel

Nameplate:



- | | |
|---------------------|-------------------------|
| 1 Basic model | 8 Firmware-version |
| 2 Measurement range | 9 Measurement accuracy |
| 3 Power supply | 10 Rated temperature |
| 4 Output signal | 11 Presetting switch 1 |
| 5 Pin assignment | 12 Presetting switch 2 |
| 6 Serial number | 13 Case protection type |
| 7 Production date | |

Electrical Connection

Miniature circular plug connector M16x0.75

Binder Series 723/423; 2...6-pin; EMC-constant version

Alternative: free cable head

Protection Type according to EN 60529

IP 67 (plug connector)

IP 68 (screwed cable gland)

Correction Possibilities

Offset (ZERO), span, low pass (USSCOM-software, RS-485 Interface)



5. Installation

Storage and Transport

Pressure transmitters are sensitive sensors. Leave the pressure transmitters in their original packaging until installation and store it protected against damages caused through external influences.

After a possible temporary removal of the measuring instrument (e.g. for examination), it has to be put back into its original packaging for further storage. Especially the protection cap of the process connection and plug connector must not be removed before installation of the instrument. During storage, the temperature indicated in the data sheets must not fall below or exceed the specified limits.

Mounting

Remove the packaging carefully! Please dispose of the packaging according to environmental considerations, resp. in accordance with the local waste disposal regulations! Keep the plastic protection caps for a later decommissioning.



Before installation, putting into operation and operation, ensure that you have the suitable measuring instrument regarding pressure range, version, case protection type and material (risk of corrosion!) for the specific case of application!

6. Electrical Connection

Electromagnetic compatibility (EMC) can only be ensured with the use of shielded cable and a properly connected ground connection. The shield must be connected to the ground terminal of the cable connection box (resp. the housing/case, for versions with screwed cable glands).

Cable

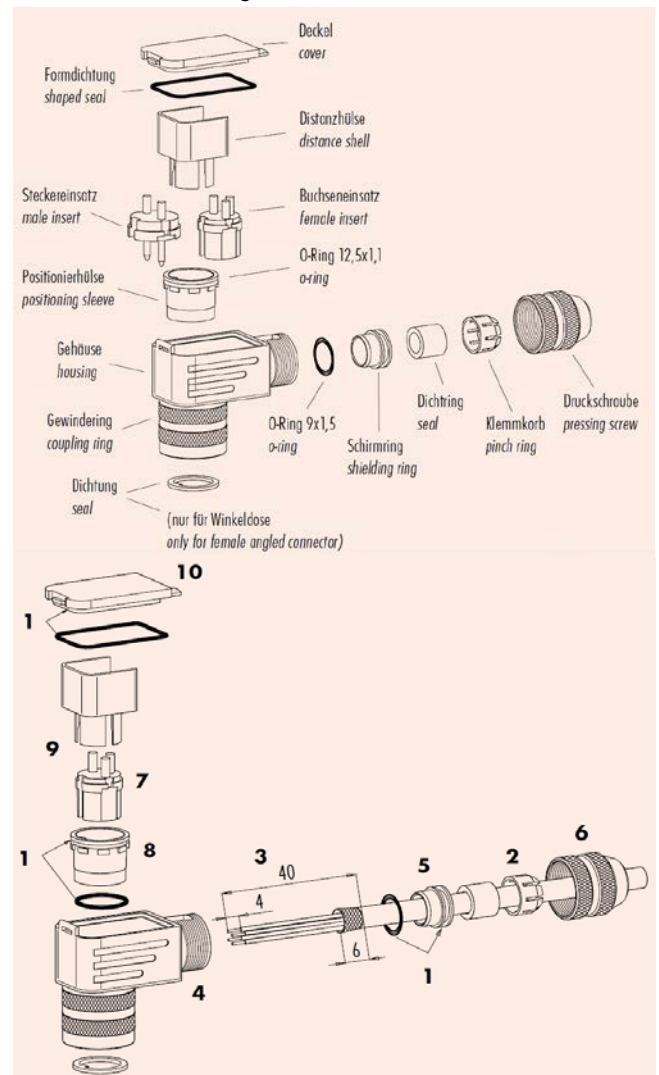
Model	screw fitting	cable cross-section	cable diameter
Circular plug connector Binder 423	M16x0.75	2 x 0.5 mm ² to 6 x 0.25 mm ² e.g. LiYCY	4...6 mm
Skintop EMC IP68	PG 9	2 x 0.5 mm ² to 6 x 0.32 mm ²	4...7.5 mm

Pin Assignment (see nameplate)

- 1: +12...+24 VDC ±25%
 - 2: GND, Signal lout 4...20mA
 - 3: RS 485 A
 - 4: RS 485 B
 - 5: Switching output 1 (PNP SW1); I_{max}= 0.2A
 - 6: Switching output 2 (PNP SW2); I_{max}= 0.2A
- Case: shield

Mounting of the Cable Box Binder Series 423 (EMC)

1. Assemble sealing rings
2. Bead cable parts
3. Dismantle cable and shielding braid
4. Push single wires through housing
5. Mount shielding ring and pinch ring
6. Slightly tighten pressing screw
7. Solder single wires to insert
8. Mount positioning sleeve in angled position
9. Put in insert and distance sleeve
10. Mount lid
11. Tighten pressing screw
12. Insert sealing



7. Operation

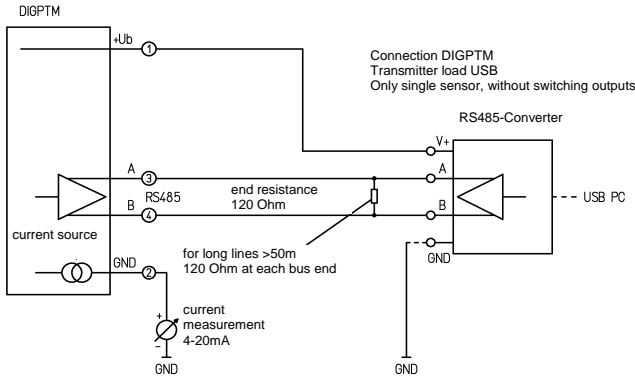
Analogue and Digital Connection

Please note that during the digital communication burst-peaks occur on the two-wire GND-line that affect the analogue measurement! As soon as the digital communication for the respective transmitter is stopped resp. interrupted, the analogue measuring signal is again unrestrictedly available.

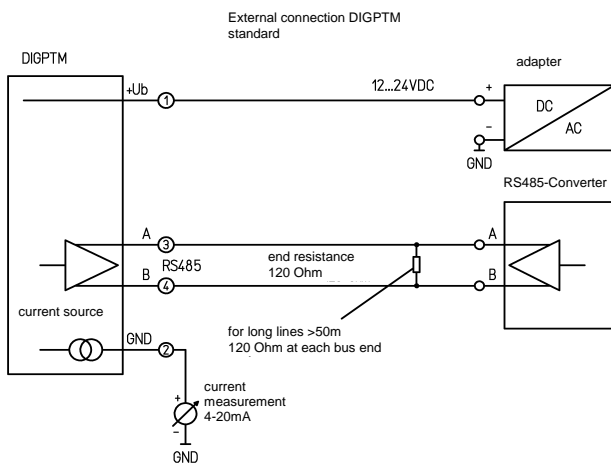


Operating Instruction Pressure Transmitter Model DIGPTMvSF6

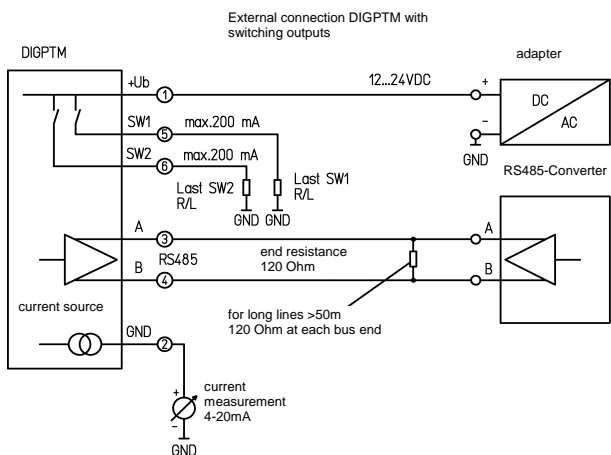
During operation of the transmitter without current-intensive use of the switching outputs it is possible, for the purpose of transmitter administration (address, switch, low pass, offset, spread), to load the transmitter directly through the USB-connection of the PC via the box, by using the USB/RS-485 connection box with internal 5V to 12V DC-DC-converter. An additional mains adapter is not necessary.



During bus-operation of several transmitters, the provided current of the PC-USB-port is not sufficient. An external current supply is necessary.



The complete wiring with loaded switching outputs also requires an external power supply. Note that the loads and the current measurement must be assigned separately to GND according to the wiring diagram.



With the help of the USSCOM-software (accessory) the user has the possibility to adjust the transmitter according to his requirements, to display the measured value in different units and to examine instrument information.

In the basic menu the instrument address is indicated and can eventually be changed, the switches S1 and S2 are activated or deactivated and the current switching condition is displayed.

With the help of the functions download and upload the current transmitter function can be stored and restored on a data storage medium.

8. USSCOM Software for Administration and Visualisation

Compatibility: WinXP, Vista, Win7 and Win8

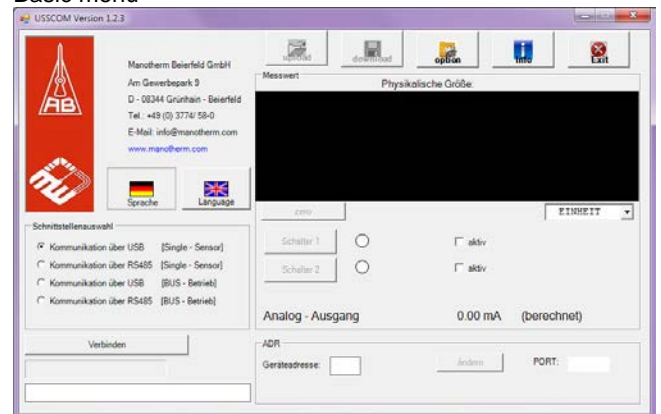
8.1. Installation

1. Insert CD
2. Install components with the installer
3. Connect USB cable
4. Connect the RS485 converter box to the USB cable
5. Automatic driver installation
6. Connect the transmitter to USB/RS485 converter resp. the COM-RS485 interface
7. Start software (via programmes or desktop icon)

The menus are self-explanatory and are partly equipped with a quick info. If the cursor is positioned on a button, guidelines appear.

8.2. Connection with Transmitter/Bus

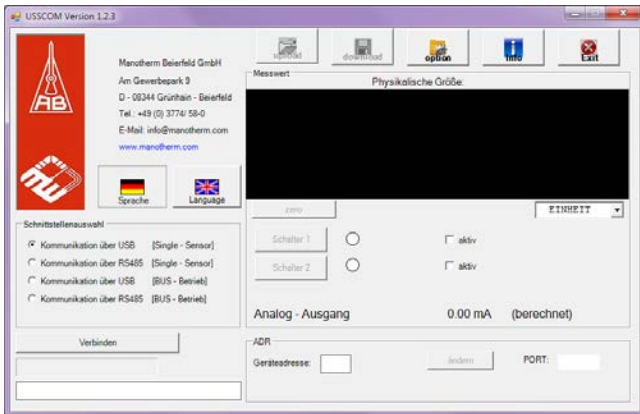
Basic menu



- Language selection GERMAN / ENGLISH
- Communication "single sensor" or bus-operation, if several sensors are present at RS485 bus
- Bus-connection via USB/RS485 converter box or RS485 interface as COM interface



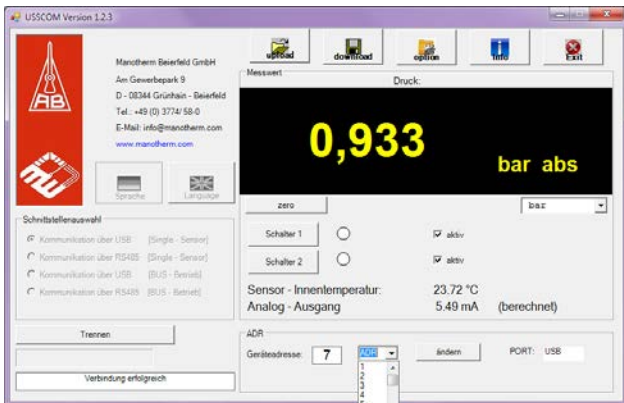
Operating Instruction Pressure Transmitter Model DIGPTMvSF6



- Select language
- Select connection port (RS-485-COM or RS-485-USB) and connection type (single sensor or Bus-operation)
- At single sensor operation communication automatically runs over backdoor address
- At Bus-operation: select address area to be scanned (1...8 or 1...32 or 1...99 or 1...254)

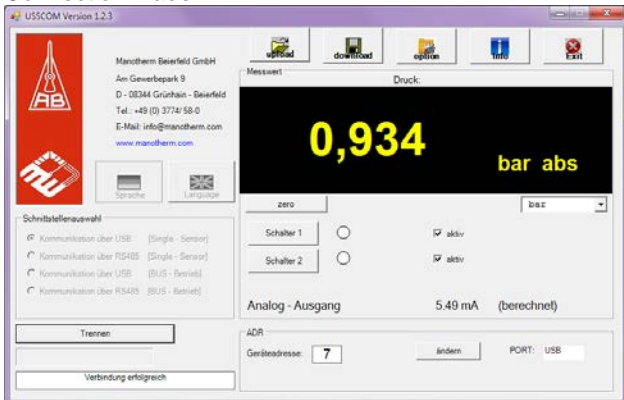


Addresses serve as specific assignment to measuring points – therefore, each address may only exist 1x at bus!



- Select bus station (address)

Connection made

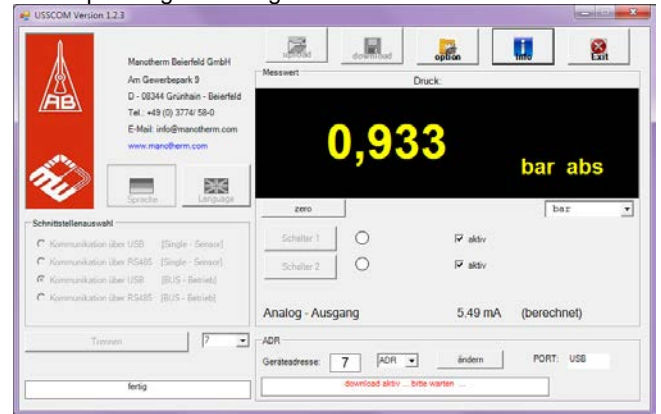


- Select unit where required



It is strongly recommended to back up the condition at delivery BEFORE changing parameters, to be able to restore the original condition anytime!

Back up of original configuration

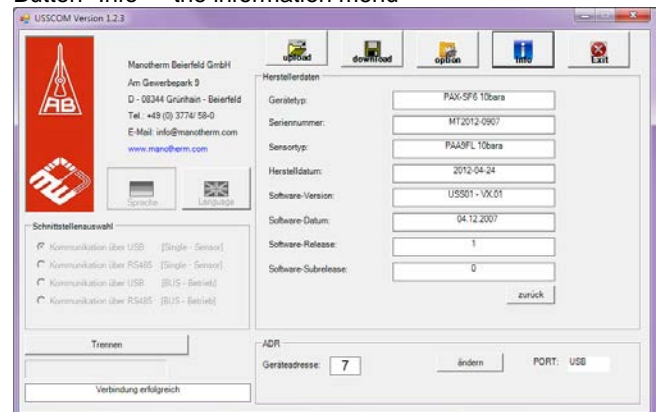


- Button "download" backs up the current transmitter configuration on the PC
- Button "upload" writes a selected *.dat-file back into the transmitter



Each transmitter has its individual calibration data. In each case the whole transmitter parameterisation is backed up resp. loaded via "download" resp. "upload". A change of configuration files will inevitably lead to wrong measurements!

Button "Info" – the information menu



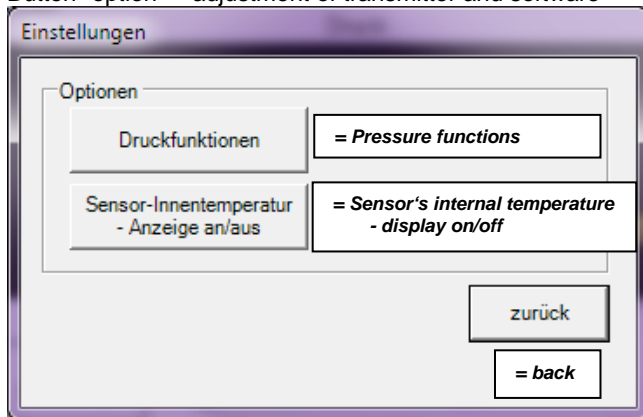
- The button "Info" opens a window in which instrument type, sensor type, serial number, date of construction and firmware-release etc. are indicated
- This indication can be exited via the button "back" ("zurück")

Button "Exit" – exits the programme "USSCOM"



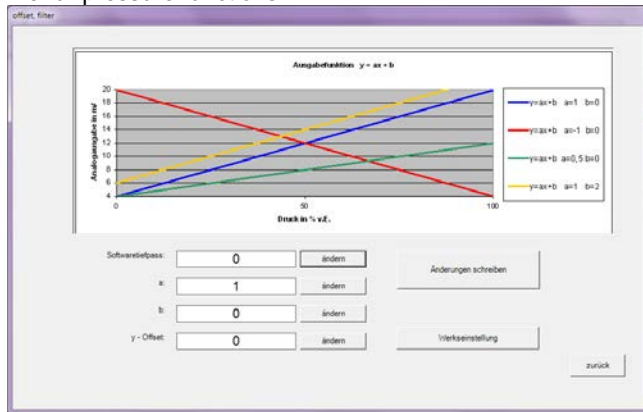
Operating Instruction Pressure Transmitter Model DIGPTMvSF6

Button "option" – adjustment of transmitter and software



- Activation of the sensor's internal temperature display indicates the temperature in the basic menu until reboot

Menu "pressure functions"



The displayed value is calculated on the basis of the following formula:

$$\text{Display} = a \cdot x + b - \text{Offset}$$

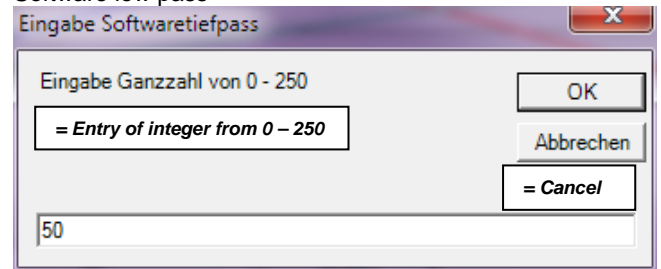
- "Display" = displayed value digital
- "x" = real pressure, measured value
- "a" = spread factor (factor span, slew rate)
- "b" = shift of the characteristic diagram
- "Offset" = also shift of the characteristic diagram (for alternative, non SF6 applications)
- ["Display", "b", "x" and "Offset" in bar !]



Changes of the values a, b and offset change the calculated digitally displayed measured value, which accordingly also affects the analogously measured value!

Changes of the values a, b and offset may only be executed by qualified personnel! An incorrectly calibrated measurement range can result in unpredictable bodily injuries and damage to equipment! A spread of the measurement range always results in an increase of the measuring error by the same factor.

Software low pass

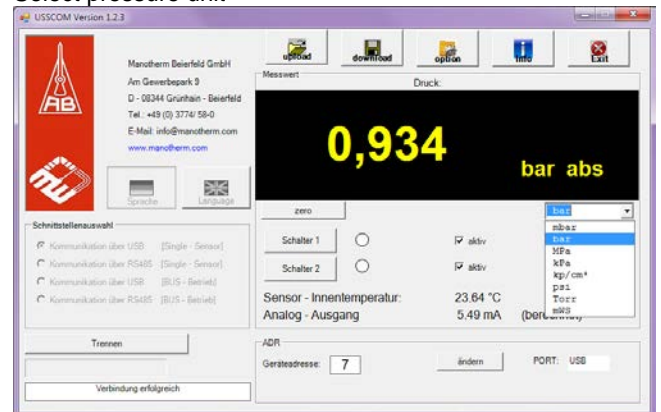


- The digital software low pass serves as averaging calculation of several measured values, in order to settle a signal calculatory, which varies through pulsation. Its adjustment range comprises 0 to 250. The low pass is ineffective at "0". The damping degree is calculated according to the following formula:

$$P = (P(n-1) * \text{SoftwareTP-1}) + P(n) / \text{SoftwareTP}$$

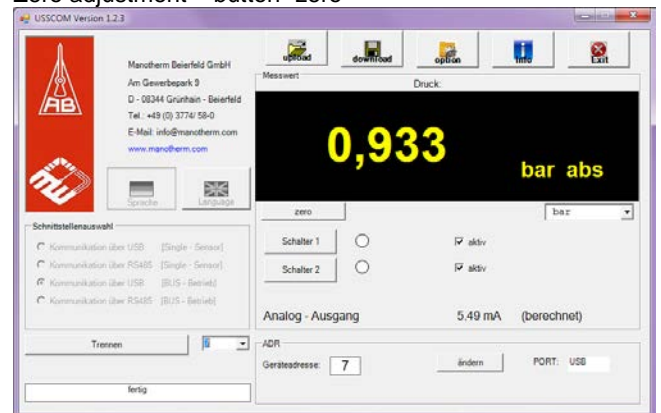
8.3. The Measuring Procedure in the Basic Menu

Select pressure unit



- Selection of a pressure unit according to proposal list

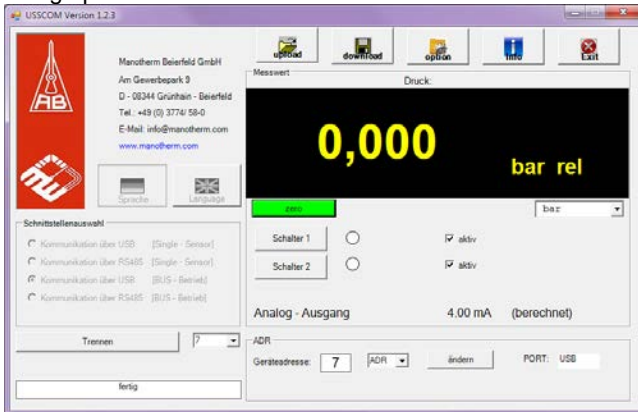
Zero adjustment – button "zero"



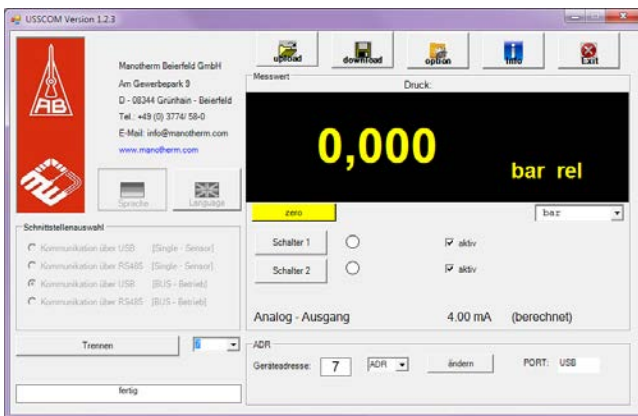
- The button "zero" serves the zero setting of the atmospherically bled transmitter before starting the gauge pressure measurement (the indication "abs." in the display goes out); the indication shows "0", the "zero"-button is shaded in green.



Gauge pressure measurement on tarred transmitter



- At taring the current measured value is added to the register "Offset" and is prospectively subtracted from this (see article "pressure functions"). Thus it is possible to measure "gauge pressure" with absolute pressure transmitters and to dismiss variations in air pressure or in geographical installation altitudes.
- As long as the offset value in the menu "pressure functions" is not equal "0", the addition "abs." is not displayed – an absolute pressure measurement is not possible either. For this purpose, the "offset" in the menu "pressure functions" has to be set to "0", resp. the transmitter has to be set back to its factory setting.



- if, in bus operation switchings between different transmitters (measuring points) are effected, the "zero"-button is shaded in yellow, if the "offset"-register is not set to "0", which means that a previous zero setting is still set. This indicates that no new taring of the measuring chain was performed.

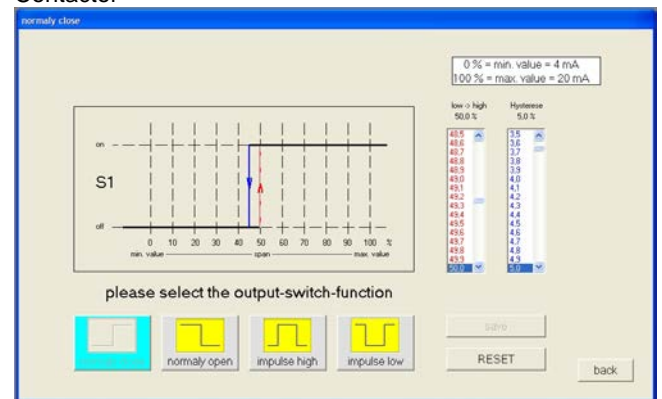
8.4 The Switching Functions of the Transmitter

- In the basic menu the switches of transmitter can be activated or deactivated
- The current switching states of the particular switches are displayed via the green indication.

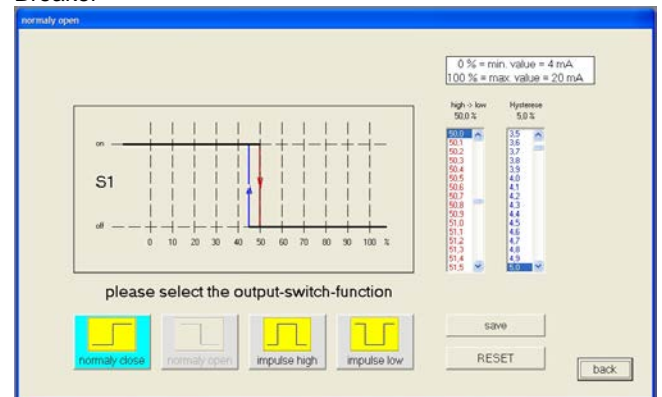
Adjustment of Switches

At activation of a switch (enabled) the required switching function is at first selected from the 4 different switching symbols. The varying parameters (switching point and switching hysteresis) can be selected via the sliders. The %-values always refer to the entire measuring range (which is the output current 4...20 mA). After adjustment of the switching parameters, the updated switch configuration is saved in accordance with the transmitter by clicking the button "save" (*speichern*). **The switch configuration thus saved, remains saved in the transmitter, even when there is no digital communication (2-wire operation) or the transmitter is temporarily disconnected from the power supply.**

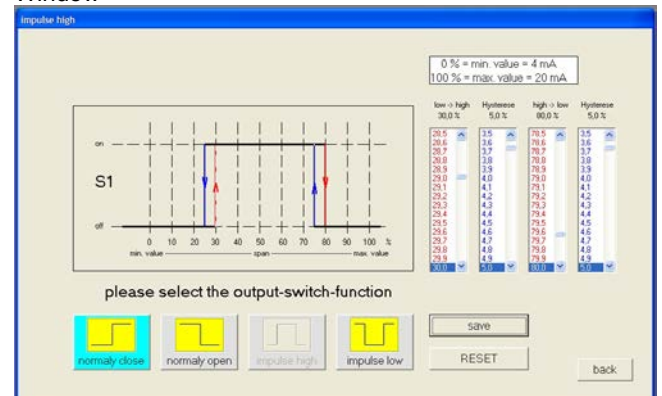
Contactor



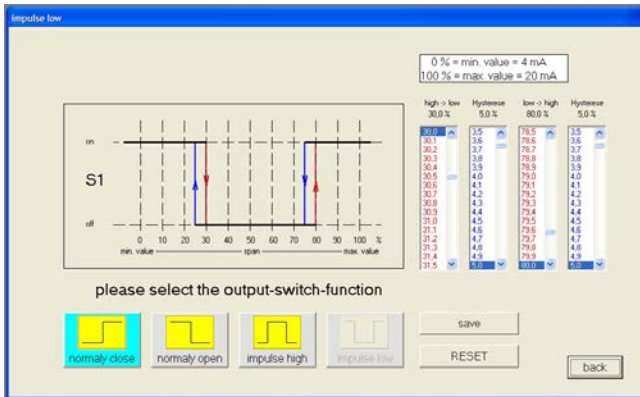
Breaker



Window



Window inverse



9. Maintenance, Repair

Our pressure transmitters are maintenance-free. Should malfunctions occur which cannot be corrected by controlling the digital parameterisation within the scope of the USSCOM-software (RESET, factory setting), please return the transmitter with a precise description of the malfunction to our factory. Repairs may only be performed by the manufacturer. **Never use ultrasonic baths, sharp or hard objects when cleaning the pressure connection, as these would destroy the sensor!**

10. Decommissioning

For decommissioning, the transmitter must at first be disconnected electrically from the peripherals. Put the protection cap, included in the delivery, on the electrical connection of the transmitter.



Only after having verified that the pressure connection is depressurised, the transmitter may be detached from the system. Please use the spanner flats and suitable tools!

Clean the process connection before putting on the protection cap. At contamination of the transmitter through physiologically, chemically or ecologically harmful substances, please mark this BEFORE return or storage and choose a suitable packaging!

Data sheets and operating instructions *online*

The latest versions of our data sheets can be found in the PDF-download area of our websites at all times www.armaturenba.com and www.manotherm.com. Under heading 9 you can find, among others, the data sheets of the pressure transmitters.

The latest issues of our operating instructions are also available for download as PDF under point 2 "Operating instructions".

You can reach our sales teams for further questions:
Monday – Thursday from 7.00 a.m. to 4.30 p.m.
Friday from 7.00 a.m. to 3.15 p.m.
ARMATURENBAU GmbH +49 (0) 2803 / 9130–0
MANOTHERM Beierfeld GmbH +49 (0) 3774 / 58–0

11. Accessory

USSCOM- Software



For digital display of the measuring value and adjustment of the switching outputs, of the software low pass, the offsets and the instrument address.

Item number: 1000 25 0002

USB/ RS-485- Connection Box



For PC communication of the transmitter(s) to a PC via USB port and for feeding with 12VDC to 0.165 A

Item number: 1000 25 0001

CU-Form Sealing



Item number: 1000 118 005
(G $\frac{1}{4}$ B, M12x1.5)

Item number: 1000 118 006
(G $\frac{1}{2}$ B, G3/8B, M20x1.5)

12. Declaration of Conformity

CE The CE-marking of the instruments indicates conformity with the applicable EU-directives for placing products on the market within the European Community. The following directives apply:
89/336/EWG (EMVRL) and 97/23/EG (DGRL)

13. Malfunctions

Description	Possible cause	Corrective action
No output signal	missing operating voltage	apply operating voltage
	cable broken	check cable and repair
	wiring fault	check wiring and correct
	missing input pressure	check pressure connection, apply pressure
	incorrect operating conditions	send in with description of faults and of application conditions
Output signal constant	orifice clogged	check measuring point, clean carefully and, if necessary, send in with description of faults
	NAMUR malfunction information (Iout <3.6 mA)	send in with description of faults
	pressure transmitter defective	send in with description of faults
Output signal too high	incorrect measurement range	replace pressure transmitter
	pressure transmitter scaled incorrectly	reset values a, b and Offset to factory setting (RESET) via USSCOM software
	pressure transmitter defective	send in with description of faults
Output signal too low	incorrect measurement range	replace pressure transmitter
	load impedance too high	reduce load impedance or operating voltage; calculation according to data sheet
	pressure transmitter scaled incorrectly	reset values a, b and Offset to factory setting (RESET) via USSCOM software
	NAMUR malfunction information (Iout <3.6 mA)	send in with description of faults
	operating voltage too low	increase operating voltage
	pressure transmitter defective	send in with description of faults
Incorrect zero signal	zero point misaligned due to incorrect operating conditions	send in with description of faults
	incorrect operating voltage	use correct operating voltage
	NAMUR malfunction information (Iout <3,6 mA)	send in with description of faults
	pressure transmitter scaled incorrectly	reset values a, b and Offset to factory setting (RESET) via USSCOM software
	pressure transmitter defective	send in with description of faults
No RS-485- communication	check wiring of the RS485-A and RS485-B	if applicable, change cable connection A and B
	check driver settings	check driver for RS485 converter, at PC interface card check settings: asynchronous, half-duplex, NRZ-format, 1 START-Bit, 8 data bits, 1 STOP-Bit, without priority; (Autogate, Half-Duplex, UART-Type BB950)
	incorrect instrument address or assigned repeatedly in the bus	correct address(es)
	pressure transmitter defective, NAMUR malfunction information (Iout <3.6 mA)	send in with description of faults

