

Operating Manual



Display and Switching Unit ASM 400



Important notes:

-  Please read this operating manual carefully before installing and starting up the device.
-  This operating manual must be kept at an accessible location for further use.
-  This operating manual describes the installation and operation of ASM 400. Further information about BD SENSORS pressure transmitters are given in the product-specific operating manuals.
-  The device may only be installed, used and serviced by persons who are familiar with this operating manual as well as with the applicable regulations on occupational safety and accident prevention.

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1. General

1.1 Information on the intended use

- The display and switching unit ASM 400 can be integrated in any transmitter or transducer with 4 ... 20 mA / 2-wire or 0 ... 10 V / 3-wire analogue output. With the ASM 400 a digital display and up to 2 contacts are available.
- Mounting the unit into different devices is very simple. A hole and up to 2 grooves have to be machined in a designated housing.
- The display can be programmed via two push-buttons. The following parameters can be adjusted: scaling, decimal point, damping, and limit contact (optional). Those parameters are being stored in an EEPROM and, thus, kept also in case of a power breakdown.
- The device shall be used according to the area of application specified above!
- No liability is assumed and warranty claims are excluded in case of improper application, modification of or damage to the device.

1.2 Target group

This operating manual is intended for qualified technical personnel.

The display and switching unit ASM 400 has been exclusively designed for qualified companies that have a large know how in the final assembly of fine mechanical and electrical devices as well as bonding, joining and soldering technologies.

1.3 Symbols used



: Caution



: Note

1.4 Safety information

The following notes must be observed to avoid hazards for the operator and his environment:



The device may only be installed, used and serviced by persons who are familiar with this operating manual!



Applicable regulations regarding occupational safety, accident prevention and national installation standards must be complied with!



The product must only be used within the specifications! (Compare the technical data under "12. Technical Data".)



The electrical assembly group in the ASM 400 is equipped with EMC components. The manufacturer of the total appliance must ensure CE conformity.



Mount the device in the currentless condition!

ASM 400

1.5 Package contents

Please verify that all listed parts are included in the delivery:

- Display and Switching Unit ASM 400
- O-ring 24x1.6 NBR
- Retaining ring (Seegerring AV20)
- Sheet of labels
- Operating Manual "ASM 400"

2. Product identification

The device can be identified by its type plate. It provides the most important data. By the ordering code the product can be clearly identified.

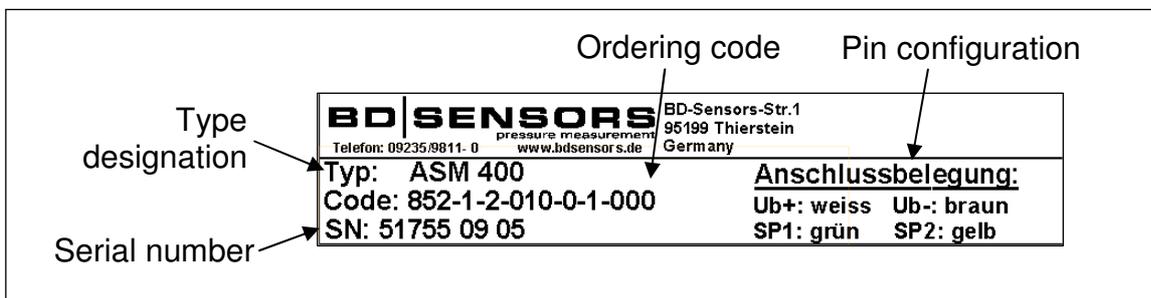


Fig. 1 Type plate

For identification of the firmware, the program version (e. g. P07) will appear for about 1 second in the display after starting up the device. Please hold it ready for inquiry calls.

3. Installation

3.1 General notes

- Please note that this device is a precision electronic instrument. Handle the device carefully to avoid damages to the plastic surface and housing parts.
- The display and the plastic housing are equipped with a rotational limiter. Please do only rotate the display or the housing within the limit.
- The ingress protection by factory is IP 00 (front side: IP 65). The ingress protection of the total appliance depends on the housing mounted by the customer.

3.2 Necessary utilities

- O-ring 24x1.6 NBR - is included in the scope of delivery -
- retaining ring (Seegerring AV20) - is included in the scope of delivery -
- grease for seals of NBR
- soldering iron, soldering grease and tin-solder (if the electrical connection should be made by soldering)
- crimping tool and a compatible plug connection (if the electrical connection should be pluggable)
- seeger circlip pliers
- devices for simulation of the measuring range (e. g. pressure calibrator) and for measuring the output signal (digital multimeter)
- device for checking the contact functions

3.3 Installation steps

- For the ASM 400, a hole and two grooves have to be machined into the designated housing (see fig. 2).
 - ☞ The groove of $\varnothing 38$ must be established in such a way that a web will remain top left (rotational limiter). It serves as a protection against over-winding, and the ASM 400 will be rotatable in the range between -35° and $+215^\circ$.
- Guide the O-ring 24 x 1.6 (position 2) over the cords emerging from the ASM 400 (position 1) and place it into the designated groove $\varnothing 27$ of the housing (position 3).
- Then you should slightly grease the O-ring with a lubricant for NBR seals.
- Put the ASM 400 onto the housing's side so that the rotational limiter of the circuit board carrier will be placed in the external groove ($\varnothing 38$).
- Secure the ASM 400 with the spring retainer on the side in such a way that both parts are firmly connected.
- Check whether the ASM 400 may be turned on the housing cover.
- Establish the electrical contact according to the description below.
- Check the output signal of the transmitter and compare it with the indicated value.

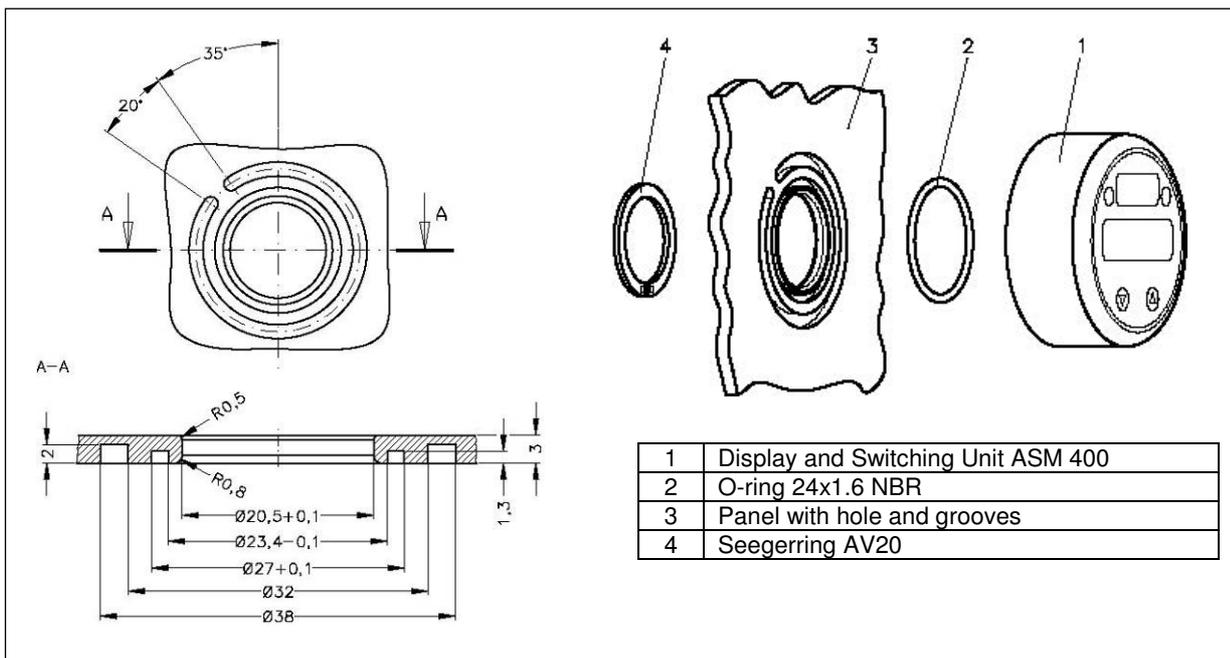


Fig. 2 ASM 400

ASM 400

3.4 Electrical installation

The following table describes how to install the ASM 400 on the transmitter. The connection has to be made by soldering or pluggable.

2-wire-system

Electrical Connection	cord colours	comment
Supply +	white	This cord must be connected with supply + of the power supply unit.
Supply -	brown	This cord must be connected with supply + of the transmitter.
Contact 1	green	This cord of contact 1 must be connected with the respective load resistor R_L .
Contact 2	yellow	This cord of contact 2 must be connected with the respective load resistor R_L .

In addition, a contact between supply - of the transmitter and supply - of the power supply unit must be established (see 3.7 Wiring diagrams - 2-wire-system).

3-wire-system

Electrical connection	cord colours	comment
Supply +	white	This cord must be connected with supply + of the power supply unit.
Supply -	brown ¹	This cord must be connected with supply - of the power supply unit.
Contact 1	green	This cord of contact 1 must be connected with the respective load resistor R_L .
Contact 2	yellow	This cord of contact 2 must be connected with the respective load resistor R_L .
Signal +	red	This line must be connected with the positive power supply (only for 3-wire-circuit 0 ... 10 V).
Signal -	brown ¹	This cord must be connected with signal + of the transmitter. Normally, it is the same as supply - of the transmitter (only for 3-wire-circuit 0 ... 10 V).

In addition, a contact between the transmitter and supply + of the power supply unit must be established.

3.5 Supply 2-wire-system

The supply created by the electronics of the ASM 400 is approx. 6 V_{DC}. Please take this into consideration when planning your power supply. The limits for the power supply can be calculated as follows:

$$\text{minimum supply: } V_{S\min} = V_{MU\min} + 6V$$

$$\text{maximum supply: } V_{S\max} = V_{MU\max} + 6V$$

$V_{MU\min}$ = Minimum supply of the used transmitter

$V_{MU\max}$ = Maximum supply of the used transmitter

¹ On the device, two brown cords have been installed. These are connected galvanically, so that you can freely choose the cord for installation.

 With Ex-protection the max. supply for a combination of transmitter and ASM 400 is 28 V_{DC}. Insure that no external power can flow into the contacts.

3.6 Supply 3-wire-system

minimum supply:

The minimum supply of the ASM 400 ($V_{S \min}$) is 8 V. The connected transmitter is supplied by the ASM 400, so the minimum supply of the transmitter must be used for the total appliance if it is higher than 8 V. The following formulas are valid:

$$\text{if } V_{MU \min} \geq 8 \text{ V} : \quad V_{S \min} = V_{MU \min}$$

$$\text{if } V_{MU \min} < 8 \text{ V} : \quad V_{S \min} = 8 \text{ V}$$

$V_{MU \min}$ = Minimum supply of the used 3-wire transmitter

maximum supply:

The maximum supply of the ASM 400 ($V_{S \max}$) is 36 V. As the connected transmitter is also supplied by the ASM 400, the maximum supply does not only depend on the supply of the ASM 400. If the maximum supply of the transmitter is lower than 36 V, the maximum supply of the total appliance may not exceed the transmitter's value. The following formulas are valid:

$$\text{if } V_{MU \max} \geq 36 \text{ V} : \quad V_{S \max} = 36 \text{ V}$$

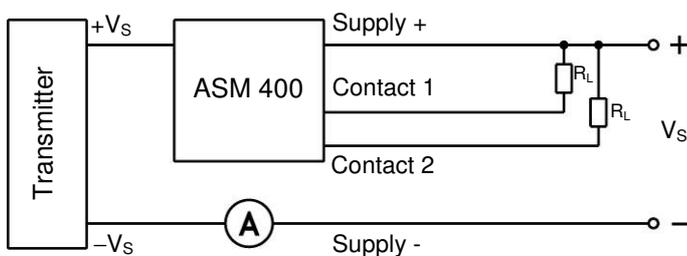
$$\text{if } V_{MU \max} < 36 \text{ V} : \quad V_{S \max} = V_{MU \max}$$

$V_{MU \max}$ = Maximum supply of the used 3-wire transmitter

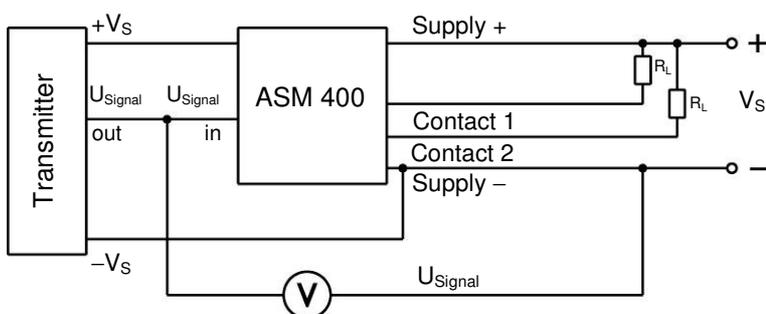
3.7 Wiring diagrams

For the usage with BD SENSORS pressure transmitters, the following wiring diagrams are given: For electrical connection a sheathed and twisted multicore cable is recommended.

2-wire-system (current)



3-wire-system (voltage)



3.8 Testing the signal and the displayed value

After assembling the transmitter, you should in any case perform a test of the displayed value and the switching functions. Therefore, the device must be connected according to the specifications. In the next step, you should carry out the settings at the zero point (menu 3) and end point (menu 4), as well as the decimal point (menu 2). The displayed value of the ASM 400 should correspond to the respective measuring value of the transmitter.

3.9 Final inspection of the device

For final inspection, it is essential to test the displayed value as well as the switching function again. The switching function may be externally tested by a variety of procedures. The use of two external LEDs, which are triggered through protective resistors, is the simplest and most suitable way.

4. Operation

4.1 Operating and display elements

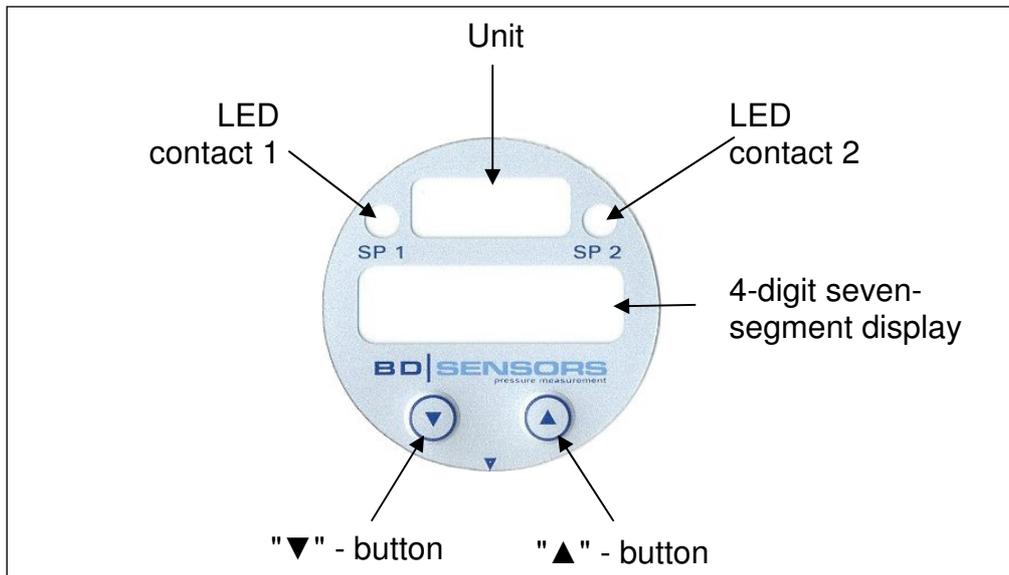


Fig. 3 Touchpad

The device has a green LED for displaying the active contact of set point 1 and a yellow LED for displaying the active contact of set point 2. The LEDs will light up when the respective set point has been reached and the contact is active.

The display of the measured value as well as the configuration of the individual parameters occur through a menu via a 4-digit seven-segment display. The individual functions can be set with the help of two miniature push buttons located in the front.

- **"▲" button: with this button you move forward in the menu system or increase the displayed value**
- **"▼" button: with this button you move backward in the menu system or decrease the displayed value**
- both buttons simultaneously: if both buttons are pushed simultaneously, the device changes between display and configuration mode; you can also confirm the menu items and set values

👉 When setting the values, you can increase the counting speed by pushing the respective button ("▲" or "▼") for more than 5 seconds.

4.2 Menu operation

The menu system is a closed system allowing you to scroll both forward and backward through the individual set-up menus to navigate to the desired setting item. All settings are permanently stored in an EEPROM and therefore available again even after disconnecting from the supply voltage. The menu system and the menu items have been designed as simply as possible. Below, each individual menu item is described in detail allowing a straightforward and quick configuration of your device. The structure of the menu system is identical for devices with or without contacts. The device with contacts deviates from the one without contacts by ten or five additional menus. These additional menus are marked by a gray background for clear identification.

-  Please follow the manual meticulously and remember that changes of the adjustable parameters (switch-on point, switch-off point, etc.) become only effective after pushing both buttons simultaneously and leaving the menu item.

4.3 Password system

The device is equipped with an access protection to allow access to the complete menu system only to authorized persons.

- Activating the access protection with the password will lock the complete menu.
- Deactivating the access protection with the password will unlock the complete menu.
-  The password can be activated and deactivated through menu "PAon" resp. "PAof".
-  It can be changed according to special menu 4.
-  In case the password has been lost, there is a possibility to reset the password. You can do this by loading the defaults via the special menu 3.

4.4 Unit

The unit of the values to be measured is determined on ordering. But it is also possible to change the unit later by using one of the enclosed unit labels.

4.5 Structure of the menu system

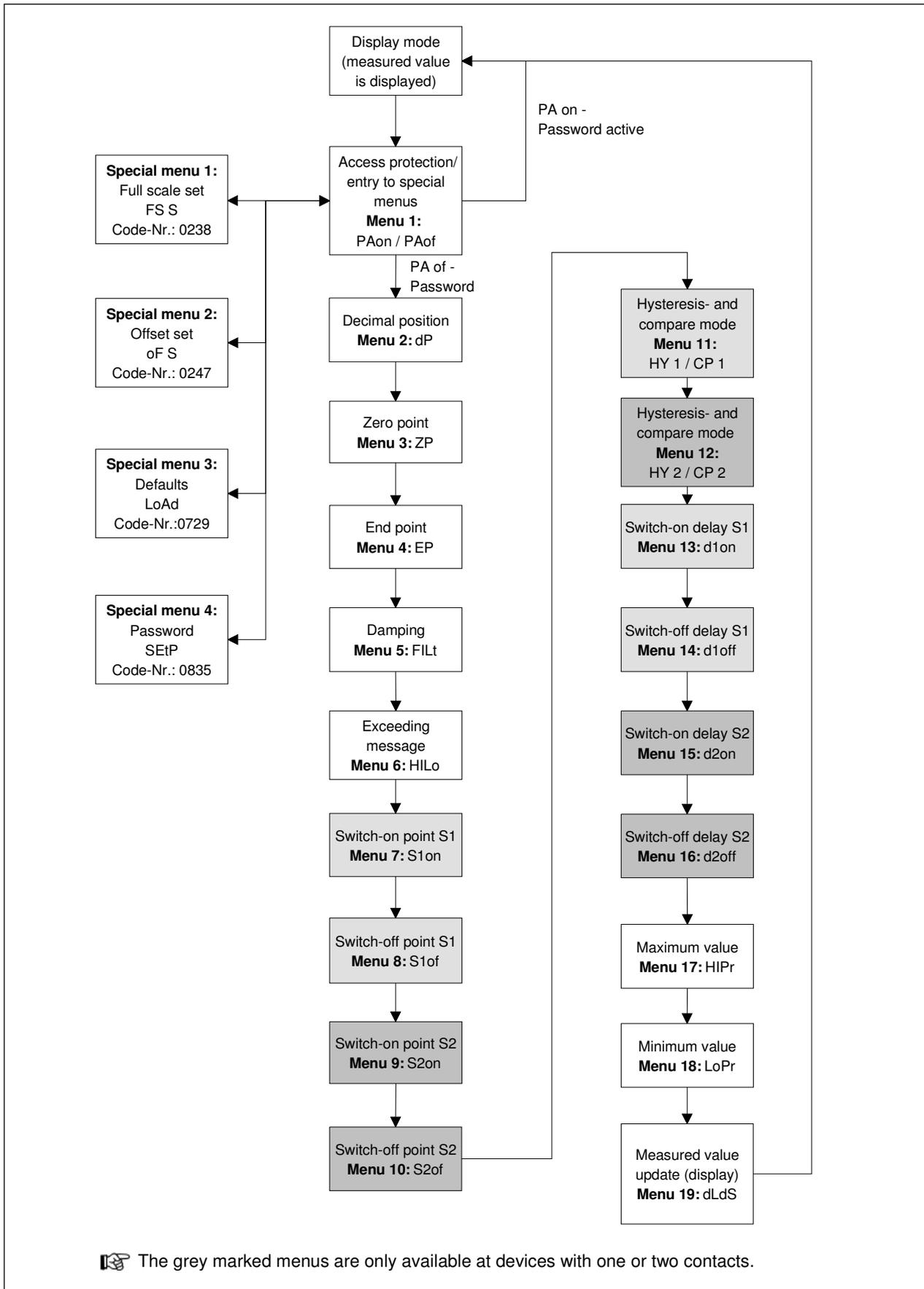


Fig. 4 Menu system Rev. P07

4.6 Menu list

Menu 1 – Access protection



If the **password is active**, the menu "PAon" will appear. Before being able to perform settings in the menu system, you must first enter the password. Proceed as follows for deactivation: Press both buttons simultaneously to confirm the menu item "PAon". Then set a password using the "▲" or "▼" buttons and confirm it by pushing both buttons together. The menu system is now unlocked and "PAof" will appear in the display. You can now proceed as desired.



If the **password is inactive**, the menu "PAof" will appear. To activate the access protection, press both buttons simultaneously. Then set your password using the "▲" or "▼" buttons to activate the access protection. Confirm the password with both buttons. The menu system is now locked and "PAon" will appear in the display.

The default setting for the password is "0005".

 A modification of the password is described in the special menu 4.

Menu 2 - Setting the decimal point position



After confirming "dP" by pushing both buttons, the position of the decimal point can be selected. Set the desired position by using the "▲" or "▼" button. To complete the setting, push both buttons simultaneously.

Menu 3 - Setting the zero point



After confirming "ZP" by pushing both buttons, the zero point can be set. The value set is shown when the output signal of the transmitter is 4 mA (zero point). To complete the setting, push both buttons simultaneously.

Menu 4 - Setting the end point



After confirming "EP" by pushing both buttons, the end point can be set. The value programmed will be shown when the electrical output signal of the transmitter is 20 mA (End point). To complete the setting, push both buttons simultaneously.

Menu 5 – Setting the damping



After confirming "FILt" by pushing both buttons, the time constant for a simulated low-pass filter can be set. This function allows getting a constant display value although the measuring values may vary considerably. The permissible range reaches from 0.3 till 30 seconds. To complete the setting, push both buttons simultaneously.

Menu 6 – Activation of the exceeding message



After confirming "HILO" by pushing both buttons, the alarm for exceeding the range of the display can be activated. Conditions "on" or "off" can be selected. To complete the setting, push both buttons simultaneously.

Menu 7 - Setting the switch-on point for contact 1

5 1on

After confirming "S1on" by pushing both buttons, the value to activate contact 1 can be set. To complete the setting, push both buttons simultaneously.

Please take further information from the figures in menu 11.

Menu 8 - Setting the switch-off point for contact 1

5 1of

After confirming "S1of" by pushing both buttons, the value to deactivate contact 1 can be set. To complete the setting, push both buttons simultaneously.

Please take further information from the figures in menu 11.

Menu 9 - Setting the switch-on point for contact 2

5 2on

After confirming "S2on" by pushing both buttons, the value to activate contact 2 can be set. To complete the setting, push both buttons simultaneously.

Please take further information from the figures in menu 11.

Menu 10 - Setting the switch-off point for contact 2

5 2of

After confirming "S2of" by pushing both buttons, the value to deactivate contact 2 can be set. To complete the setting, push both buttons simultaneously.

Please take further information from the figures in menu 11.

Menu 11 – Hysteresis and compare mode of set point 1

HY 1
CP 1

After confirming "HY 1" resp. "CP 1" by pushing both buttons, you can choose between hysteresis and compare mode for contact 1. To complete the setting, push both buttons simultaneously.

The following figures show the difference between hysteresis and compare mode as well as their inversion. To invert the respective modes, you must exchange the values for switch-on point and switch-off point.

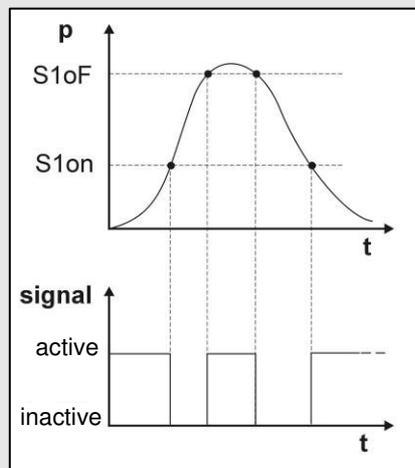


Fig. 5 compare mode

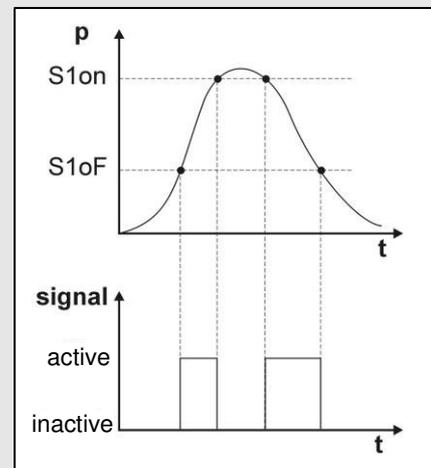


Fig. 6 compare mode inverted

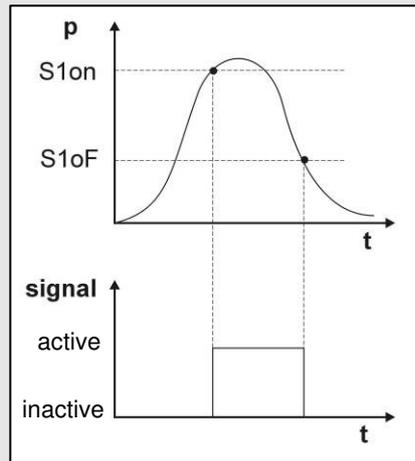


Fig. 7 Hysteresis mode

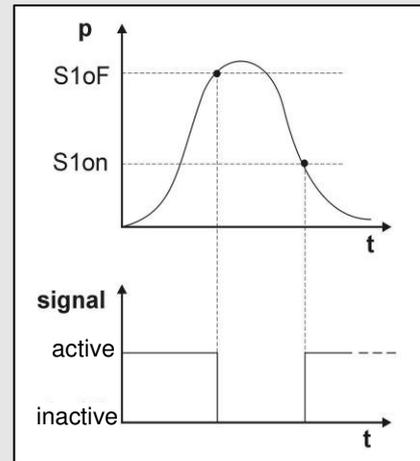


Fig. 8 Hysteresis mode inverted

Menu 12 – Hysteresis and compare mode of set point 2

HY 2
CP 2

After confirming "HY 2" resp. "CP 2" by pushing both buttons, you can choose between hysteresis and compare mode for contact 2. To complete the setting, push both buttons simultaneously.



Please take further information from the figures in menu 11.

Menu 13 – Setting the switch-on delay for set point 1

d1on

After confirming "d1on" by pushing both buttons, the switch-on delay after reaching contact 1 can be set. The time can be set from 0 to 100 seconds. To complete the setting, push both buttons simultaneously.

Menu 14 – Setting the switch-off delay for set point 1

d1of

After confirming "d1of" by pushing both buttons, the switch-off delay after reaching contact 1 can be set. The time can be set from 0 to 100 seconds. To complete the setting, push both buttons simultaneously.

Menu 15 – Setting the switch-on delay for set point 2

d2on

After confirming "d2on" by pushing both buttons, the switch-on delay after reaching contact 2 can be set. The time can be set from 0 to 100 seconds. To complete the setting, push both buttons simultaneously.

Menu 16 – Setting the switch-off delay for set point 2

d2of

After confirming "d2of" by pushing both buttons, the switch-off delay after reaching contact 2 can be set. The time can be set from 0 to 100 seconds. To complete the setting, push both buttons simultaneously.

Menu 17 – Maximum value display

After confirming "HiPr" by pushing both buttons, the maximum signal value during the measuring process will be shown. If both buttons are activated again within one second, the stored value will be erased. Please note that the value will not remain stored if the power supply is interrupted.

Menu 18 – Minimum value display

After confirming "LoPr" by pushing both buttons, the minimum signal value during the measurement process will be shown in the display. If both buttons are activated again within one second, the stored value will be erased. Please note that the value will not remain stored if the power supply is interrupted..

Menu 19 – Measured value update (Display)

After confirming "dLdS" by pushing both buttons, the measured value update in the display as well as the cycle for updating the display can be set. The permissible range is between 0.0 and 10 seconds. To complete the setting, push both buttons simultaneously.

4.7 Special menus

To access the special menus, you must be in menu 1 "PAof".

Select the menu item "PAof" with the "▲" or "▼" button and confirm by pushing both buttons simultaneously. "1" will appear in the display. To navigate to the special menus, proceed as described below.

Special menu 1 – Correction of the display on deviation of full scale

For correction of the display on deviation of the full scale, select "0238" by using the "▲" and "▼" buttons. Confirm by pushing both buttons simultaneously. "FS S" will appear in the display. Now it is necessary to place the transmitter under pressure using a known pressure reference. This pressure must correspond to the end point of the pressure measuring range. If you then activate both buttons, the signal being emitted from the transmitter will be stored as offset. The display will show the end point, although the sensor signal in the offset is displaced.

Please note that the output signal is not affected by this change.

Special menu 2 – Resetting the display on deviation of offset

For resetting the display on deviation of the offset, set the number "0247" using the "▲" and "▼" buttons. Confirm by pushing both buttons simultaneously. "of S" will appear in the display. If the offset differs from the ambient pressure, it is necessary to place the device under pressure. This pressure must correspond to the zero point of the pressure measuring range. If you then confirm with both buttons, the signal being emitted from the transmitter will be stored as offset. The display will then show the zero point, although the sensor signal in the offset is displaced.

 Please note that the output signal is not affected by this change. When displacing the offset, the full scale will also be displaced.

Special menu 3 – Load Defaults

LoAd

To load the defaults, set the number "0729". Confirm by pushing both buttons simultaneously. "LoAd" will appear in the display. Pressing the two buttons again will load the defaults.

 Please note that also the password will be set on its default.

Special menu 4 – Set new password

SEtP

To change the password, set the number "0835" using the "▲" and "▼" buttons. When confirmed with both buttons, "SEtP" will appear in the display. Push both buttons again and set the password using the "▲" or "▼" button. It can be freely chosen (0 ... 9999). However, it must not be identical with the code numbers of the special functions (i. e. numbers 0238, 0247, 0729 and 0835). Finally confirm the password by pressing both buttons. The new password is now set. To activate the password, proceed as described in menu PAon.

5. Placing out of service



When dismantling the device, it must always be done in the depressurized and currentless condition!

6. Service

This device is maintenance-free.

If desired, the device can be cleaned using non-aggressive cleaning solutions.

7. Repair

If there are malfunctions which cannot be eliminated the device should be sent to us for repair. Before that the device has to be cleaned carefully and packed shatter-proofed. You have to enclose a notice of return with detailed defect description when sending the device. If your device came in contact with harmful substances, a declaration of decontamination is additionally required. Appropriate declaration can be downloaded from our homepage **www.bdsensors.com**. Should you dispatch a device without a declaration of decontamination and if there are any doubts in our service department regarding the used medium, repair will not be started until an acceptable declaration is sent.



If the device came in contact with hazardous substances, certain precautions have to be complied with for purification!

Our service address:

BD SENSORS GmbH, Serviceabteilung, BD-Sensors-Str. 1, 95199 Thierstein, Germany

8. Disposal

The device must be disposed according to the European Directives 2002/96/EC and 2003/108/EC (on waste electrical and electronic equipment). Electrical and electronic waste equipment may not be disposed by domestic refuse.



 Special consideration is required for the disposal if the device has been in contact with hazardous substances!

9. Warranty conditions

The warranty conditions are subject to the legal warranty period of 24 months from the date of delivery. In case of improper use, modifications of or damages to the device, we do not accept warranty claims. Furthermore, defects due to normal wear are not subject to warranty services.

10. CE-Note

The electrical assembly group in ASM 400 is equipped with EMC components. The manufacturer of the total appliance must ensure CE conformity.

11. Ex-Note

From the intrinsically safe version of the ASM 400, the type plate must not be removed. The manufacturer of the total appliance must ensure that all relevant safety precautions and tests for intrinsic safety have been performed during production. The responsibility for all documentation and operating instructions rests with the manufacturer of the total appliance.

It is the responsibility of the user to verify whether the chosen version of the device is suitable for the intended application and the existing environmental conditions. BD SENSORS does not assume any liability for an incorrect selection and the consequences!

The technical data listed in the EC type-examination certificate are engaging and must be absolutely complied with.

12. Technical Data

output signal

2-wire-system:	4 ... 20 mA
3-wire-system:	0 ... 10 V

contact

Number, type	0, 1, or 2 independent PNP outputs
Switching performance	standard: contact rating max. 125 mA, short-circuit resistant Ex-protection: max. switching current ² : 70 mA; max. permissible inductivity per contact: 4.7 mH

Repeatability:	$\leq \pm 0.1$ % FSO
Switching frequency:	max. 10 Hz
Switching cycles:	$> 100 \times 10^6$
Delay time:	0 ... 100 s

Electrical protection

Short-circuit protection	permanent
Reverse polarity protection:	no damage, but also no function
Option Ex protection AX11-ASM 400:	zone (0) 1: II (1) 2 G EEx ia IIC T4 (only with 4 ... 20 mA / 2-wire) safety technical maximum values: $V_i = 28$ V, $\Sigma I_i = 93$ mA, $\Sigma P_i = 660$ mW

Display

Type	4-digit, red LED display, digit height 7 mm, digit width 4.85 mm
Range:	-1999 ... +9999
Accuracy:	0.1 % \pm 1 digit
Digital damping:	0.3 ... 30 sec (programmable)
Update value:	0.0 ... 10 sec (programmable)

Mechanical stability

Vibration:	5 g RMS (20 ... 2000 Hz)
Shock:	100 g / 11 ms

Permissible temperatures

Electronics / environment:	-25 ... 85 °C
Storage:	-40 ... 85 °C

Materials

Display housing	PA 6.6, polycarbonate
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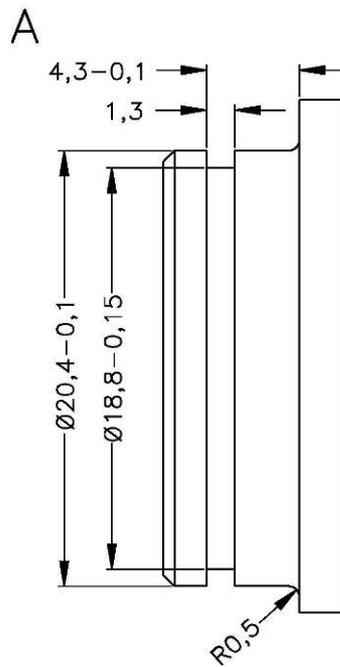
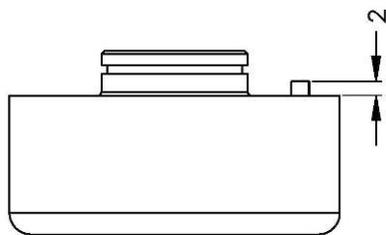
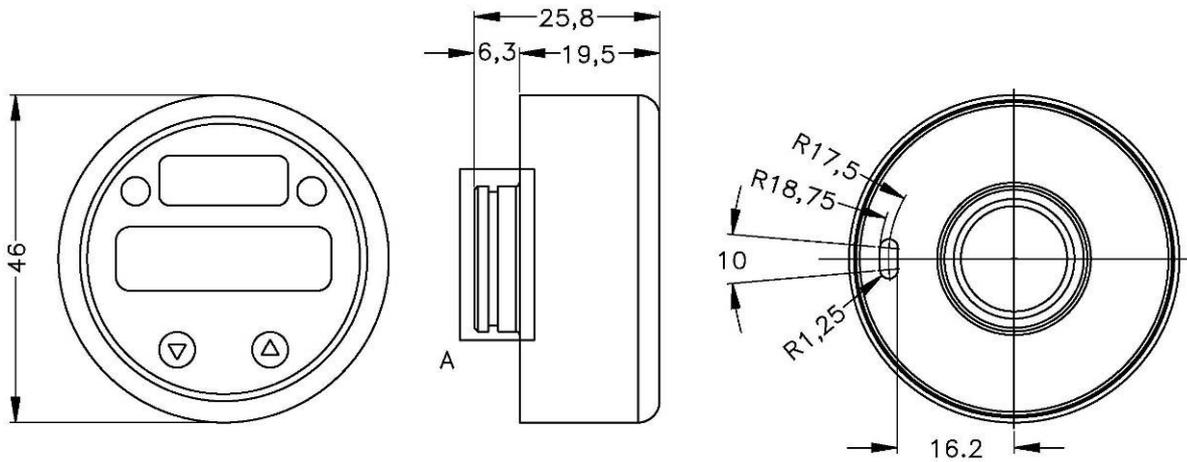
Miscellaneous

Cords length	150 mm
Weight	approx. 35 g
Data memory:	non-volatile EEPROM
ingress protection	IP 00 (front side: IP 65) The ingress protection of the manufactured device depends on the housing, mounted by the customer.

² the real switching current in the application depends on the power supply unit

ASM 400

Dimensions



ASM 400

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Germany

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Fax + 49 (0) 92 35 / 98 11- 11

The addresses of our 'Distribution Partners' are listed on our homepage www.bdsensors.com. It is possible to download data sheets, operating manuals, ordering codes and certificates, as well.

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AUSTRALIA

- Queensland



The contents of this operating manual reflect the version available at the time of printing. It has been issued to our best knowledge and belief. However, errors may still be included. For incorrect statements and their consequences, liability cannot be assumed by BD SENSORS.

– Technical modifications reserved –