

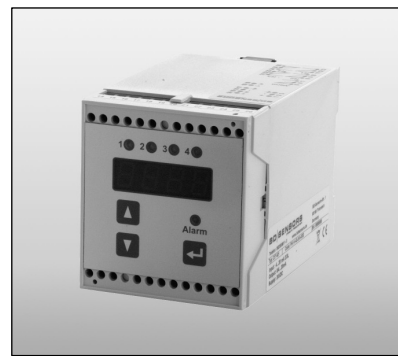
# Operating manual



## Multifunctional Process Transmitter CIT 400 / CIT 401






**CIT 400**  
*front panel housing*



**CIT 401**  
*top-hat rail housing*

### 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.
-  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.

## **Table of contents**

1. General .....	3
1.1 Information on the intended use .....	3
1.2 Target group .....	3
1.3 Symbols used .....	3
1.4 Safety notes .....	3
1.5 Security note for the Ex-version of CIT 400 .....	3
1.6 Contents of packaging .....	4
2. Product identification .....	4
3. Installation .....	5
3.1 General notes .....	5
3.2 Special notes .....	5
3.3 Top-hat rail mounting .....	5
3.4 Front panel mounting .....	5
3.5 Electrical installation .....	5
3.6 Installation example .....	7
4. Overvoltage protection .....	8
5. Operation .....	8
5.1 Operating and display elements .....	8
5.2 Menu operation .....	9
5.3 Description of the menu levels .....	9
5.4 Structure of the menu system .....	9
5.5 Menu list .....	11
6. Error handling .....	16
7. Programming examples .....	16
7.1 Level measurement .....	16
7.2 Interface level measurement .....	17
7.3 In bounds / out of bounds .....	18
7.4 Changing of pumps .....	19
8. Placing out of service .....	19
9. Service .....	19
10. Recalibration .....	20
11. Repair .....	20
12. Disposal .....	20
13. Warranty conditions .....	20
14. Appendix .....	21
14.1 Declaration of conformity .....	21
14.2. EC type-examination for CIT 400 with Ex-protection .....	22

## 1. General

### 1.1 Information on the intended use

- The multifunctional process transmitters CIT 400 and CIT 401 have been especially developed for the supply and data acquisition of 2- and 3-wire-sensors with current signal.
- The micro-controlled devices collect the signal of the sensor and show the measured value in a 4-digit LED-display.
- For simple handling, the device features an extensive menu system with several menu levels. The display can be freely programmed via 3 push-buttons in the touchpad, which allow navigation through the menu system and feeding in values.
- The combination of independent limit value relays and freely scaleable analogue output allows the solution of nearly every measurement task. The device is equipped with a password access protection to permit operation of the complete menu system only to authorized persons.
- The available versions of housing allow mounting on top-hat rails and in front panels of control cabinets.
- The CIT 400 with Ex-protection is designed for supplying intrinsically safe sensors in explosive atmosphere of areas 0/1.
- The device shall be used according to the area of application specified above!
- No liability is assumed and warranty claims are not guaranteed 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.

### 1.3 Symbols used



: Caution



: Note

### 1.4 Safety notes

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 in the current data sheet.)










Install the device in the currentless condition!

### 1.5 Security note for the Ex-version of CIT 400

When using the CIT 400 in intrinsic areas, the following additional demands must be fulfilled:



For the installation, maintenance and cleaning of the device, you must absolutely observe the relevant regulations and stipulations on explosion protection (VDE 0160, VDE 0165 and EN 60,079-14, EN 50,014-50,020) as well as the occupational safety provisions.

-  Have the installation, maintenance and cleaning of the devices only performed by persons who are specifically trained and authorized for this purpose and who are familiar with the devices!
-  Working on live parts, except for intrinsically safe circuits, is principally prohibited while an explosion hazard is present.
-  Modifications on devices and connections void the explosion protection approval and the warranty!
-  It is the responsibility of the user to verify whether the chosen device is suitable for the intended application and the existing environmental conditions. BD SENSORS does not assume liability for an incorrect selection and its consequences!
-  The technical data listed for the explosion sector correspond to the values certified in the EC type-examination certificate.
-  The technical data of the EC type-examination certificate are listed in the appendix. They are engaging and must absolutely be complied with.
-  For operation and maintenance work, the operator is obligated to observe the information on the warning signs possibly affixed to the device.

## 1.6 Contents of packaging

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

- Multifunctional Process Transmitter CIT 400 or CIT 401
- Operating Manual "CIT 400 / CIT 401"
- for front panel housing: additionally 2 screw-in clamps

## 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.

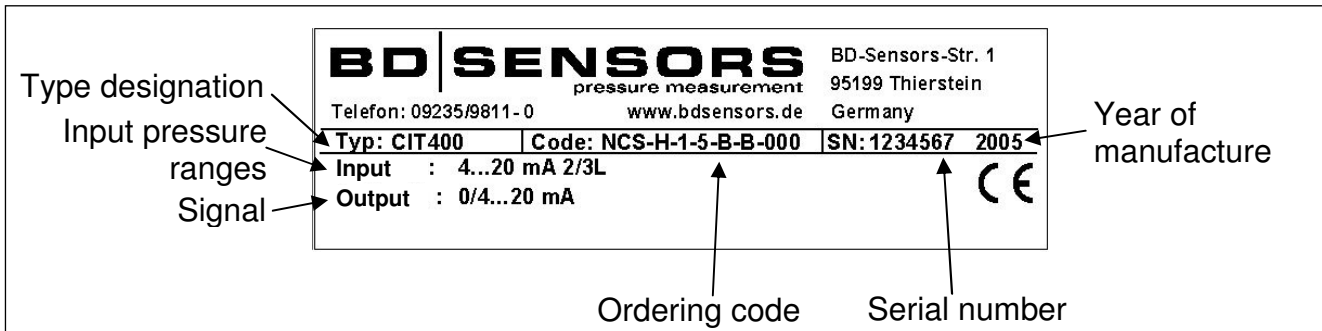


Fig. 1 Type plate for devices without Ex-protection

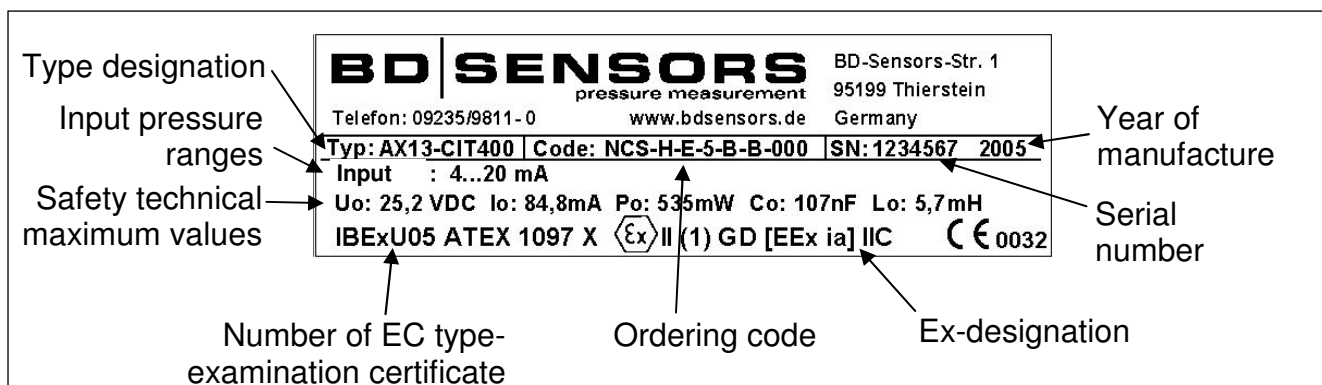


Fig. 2 Type plate CIT 400 with Ex-protection

For identification of the firmware, the program version (e. g. P071) 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**

- Do not use any force when installing the devices!
- Keep in mind that this device is an electronic precision measuring device. Handle the device carefully and properly to avoid damages.

#### **3.2 Special notes**

The transmitter mounting place has to be selected according to certain criteria.

Please avoid strictly:

- direct sunlight (use weatherproof cover if necessary)
- heat emitting objects (max. ambient temperature: +40 °C)
- objects with strong electromagnetic fields (e. g. frequency converters)
- corrosive chemicals or gas
- mechanical shocks
- vibrations
- radioactive radiation
- installation close to footpaths or travel ways

Please observe the following points when selecting the measurement place:

- The installation surface must be free of vibrations.
- The ambient temperature must be between -20° C and +60 °C, for Ex units between -20 °C and +40 °C
- Keep away from power lines or frequency converters (approx. 100 m).

#### **3.3 Top-hat rail mounting**

The unit will be fastened by snapping it onto an installed DIN top-hat rail with a minimum length of 70 mm.

#### **3.4 Front panel mounting**

The front panel housing has to be fastened by using 2 screw-in clamps.

- Push the panel housing front sided into the panel cut-out as far as possible.
- Hang the 2 screw-in clamps into 2 opposed undercuts in the housing.
- After that tighten the two set screws while holding the screw-in clamps firmly with the other hand.

#### **3.5 Electrical installation**

For installation the lawful regulations of the respective country have to be observed.



The power supply must be separately protected by a 6 A slow-blow fuse and has to be isolated from other facility parts (separate turn-off, e. g. by using an automatic cut-out with >B< characteristics).

Please note during installation that electronic components may be destroyed by electrostatic bursts. Therefore, avoid high electrostatic charge by providing proper ground connection.

Before impressing the rated voltage, the transmitter and sensor installation must be correctly completed and checked.


All outer circuits, wires and lines connected to the device must have a minimum isolation resistance of 250 V. If the voltage exceeds 42 V DC, a minimum isolation resistance of 500 kΩ is necessary.

The section dimension of the power supply wires must be 0.75 mm<sup>2</sup> in accordance to IEC 227 or IEC 245. To observe the degree of ingress protection, please refer to the technical data in the appendix. The maximum switching voltage on the relay contacts must not exceed 250 V. According to Ex-protection, you must check if the devices' power supplies have to be integrated into the emergency shutdown conception of the facility.

When installing the device, the different types of housing (top-hat rail and front panel) have no effect on the denomination of the terminal clamps, only their locations will vary.

For the electrical connection, please note the device's configuration.

One copper wire with a maximum cross section of 2.5 mm<sup>2</sup> can be connected per clamp. Connection is made by using terminal clamps and a screwdriver with a 2.5 mm blade. The terminal clamps are normally unscrewed on delivery. Nevertheless, this must be checked before connecting the power supply or the signal wires.

 Before first connection, it is necessary to have a slight pressure on the screw of the clamping connection to ensure a safe opening and a correct connection.

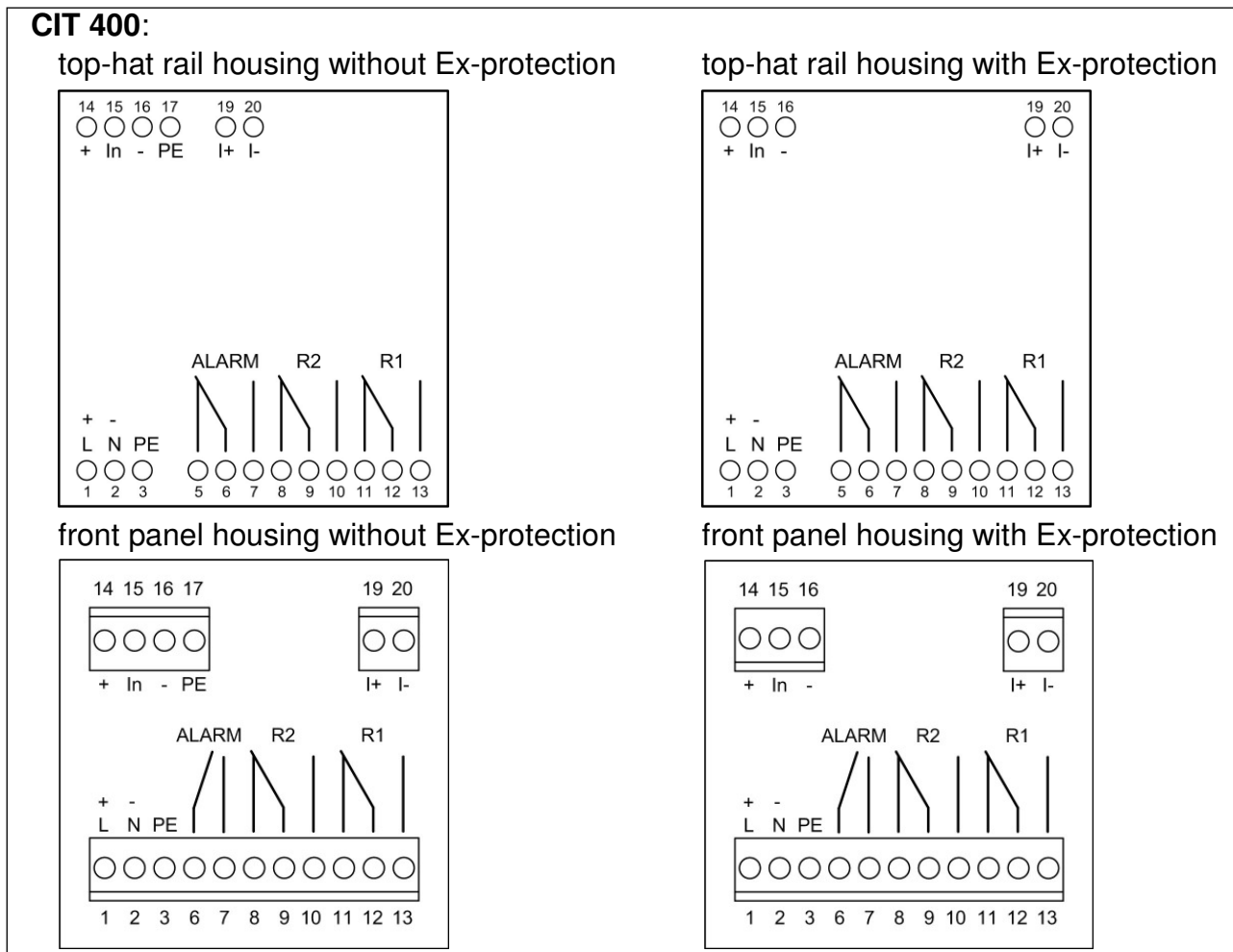


Fig. 3.1 Terminal clamps CIT 400

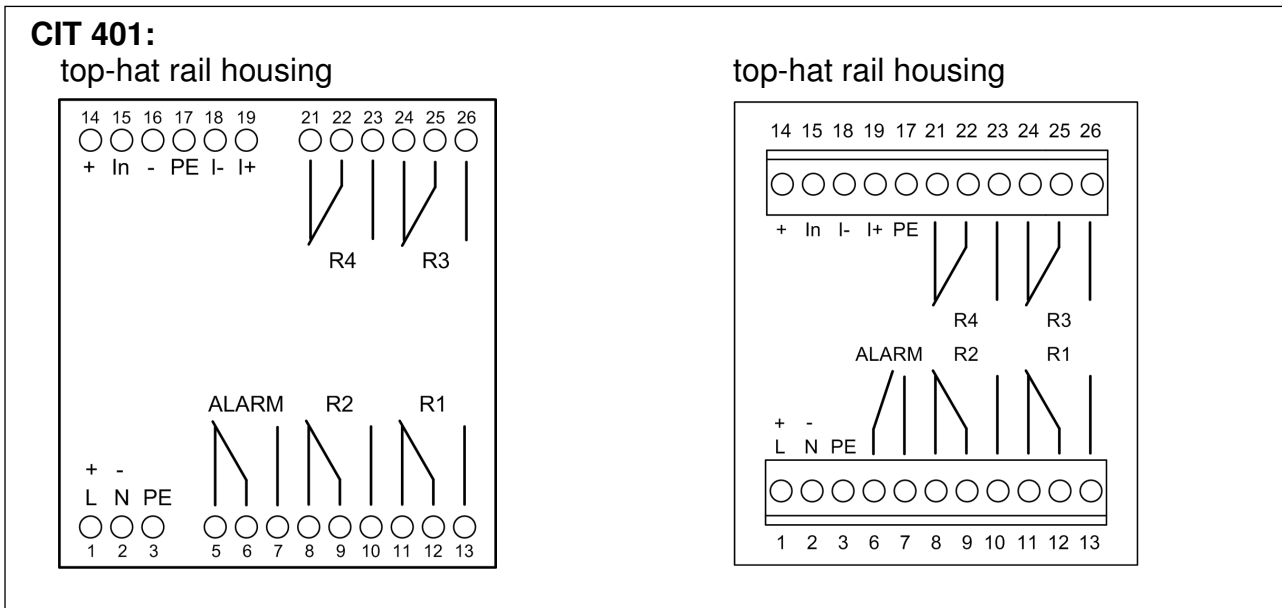


Fig. 3.2 Terminal clamps CIT 401

### 3.6 Installation example

The power supply of the transmitter has principally not been drawn, but is mandatory. The examples listed below represent only a selection of possible combinations between sensors and CIT 400 or CIT 401.

**Example 1:** CIT 400 with analogue output, supplied by a 2-wire-sensor; with alarm relay

**Example 2:** CIT 400 with analogue output, supplied by a 3-wire-sensor; with alarm relay

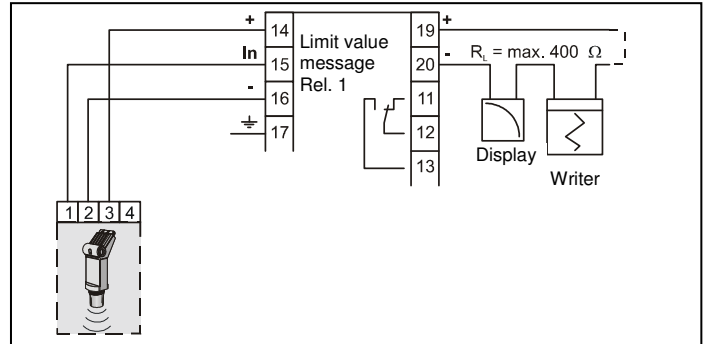
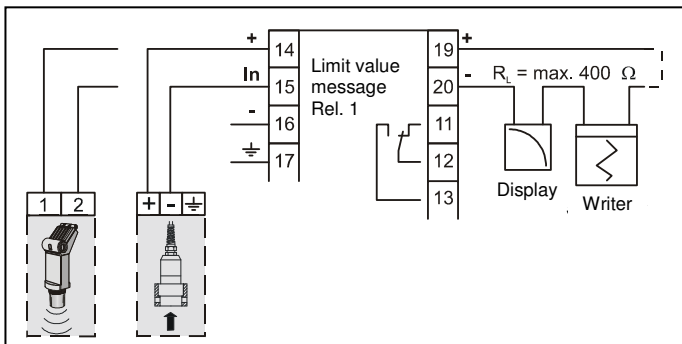


Fig. 4 CIT400 with 2-wire-sensor

Fig. 5 CIT 400 with 3-wire-ultrasonic-sensor

**Example 3:** CIT 400 as transmitter, when supplied with voltage signals from a pickup or to simulate an external sensor with voltage output at the CIT 400.

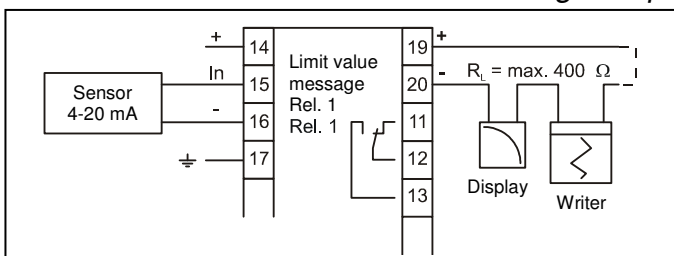


Fig. 6 CIT 400 with pickup feeding a mA-signal

The examples are based on the CIT 400; CIT 401 has a pin configuration different from the analogue output.

### 4. Overvoltage protection

For effective protection of the process transmitters, it is necessary to protect power supply and mA outputs by using overvoltage protection devices. We recommend:

- **Data Pro 2x1 24 V/24 V** for potential-free (galvanically isolated) data lines, 25 A leakage current as well as automatic self-control by failsafe diodes, which interrupt the current signal in case of error and cause an error message, given out by the process transmitter.
- **Ener Pro 220 Tr** for 230 V power supply of the process transmitter. Leakage current 20.000 A and high capacity (up to 16 A) for safe and durable protection of several devices simultaneously.

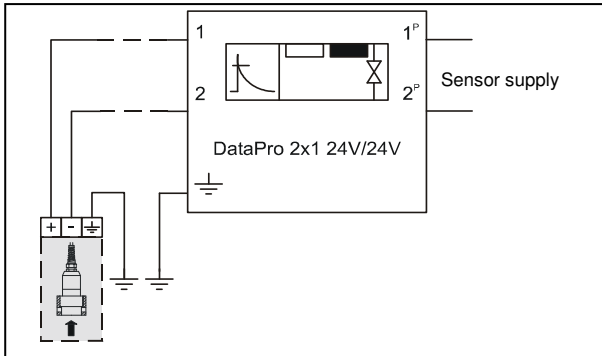


Fig. 7 Overvoltage protection of analogue inputs

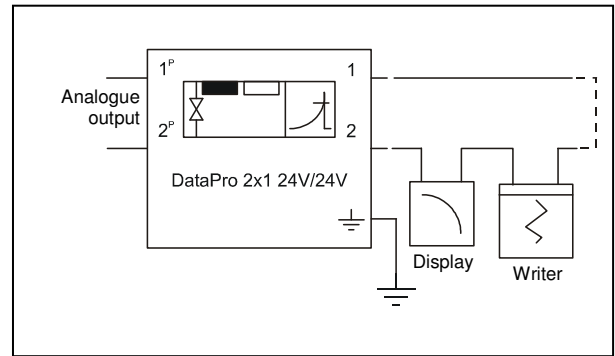


Fig. 8 Overvoltage protection of analogue outputs

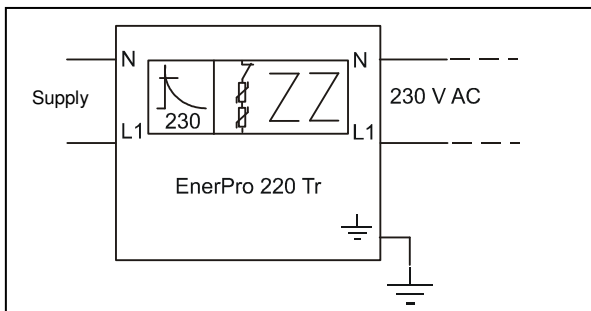


Fig. 9 Overvoltage protection of power supply

Please pay attention to the non-reversed connection of the Data Pro (p-side to transmitter) as well as to a correct, straight wiring supply. The grounding (earth) must lead to the unprotected side. The cross section of the ground wire should be 6 mm<sup>2</sup> at least!

### 5. Operation

#### 5.1 Operating and display elements

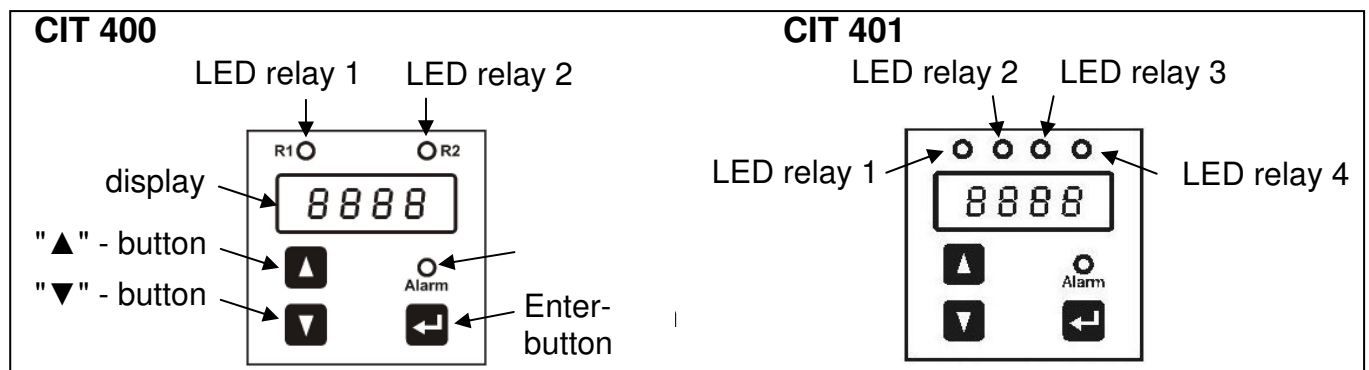


Fig. 10 Touchpad

The touchpad of the process transmitter was designed to be user-friendly. So even an untrained user will be able to carry out easily all fundamental tasks which ensure a correct operation of the unit. The indication of the measured value as well as the configuration of the individual parameters occur through a menu via the display. The individual functions can be set with the help of three miniature push buttons located in the front.

## 5.2 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. To leave a menu item, push the Enter-button. To leave the menu system completely, the last menu item has to be scrolled over or you will have to wait until the device changes automatically to display mode (about 1 minute after pushing a button). All settings are permanently stored in an EEPROM and therefore available again even after disconnecting the device from the supply voltage.

- **"▲" button:** with this button you move forward in the menu system or increase the displayed value; it will also lead you to operating mode
- **"▼" button:** with this button you move back in the menu system or decrease the displayed value; it will also lead you to operating mode
- **Enter-button:** with this button the menu levels can be entered to reach the menus items; use this button also to confirm the menu items and the set values

## 5.3 Description of the menu levels

There are 8 menu levels, which can be chosen separately.

Paof = password protection

diSP = display

SinP = signal input (analogue input)

Lin = linearization

rELn = contacts (relays)

Aout = analogue output

tESt = simulation- / testing mode

ALLG = unit parameters

CAL = calibration

## 5.4 Structure of the menu system

The menu system and the menu items have been designed as simply as possible. Each individual menu item is described below in detail allowing a straightforward and quick configuration of your device. The structure of the menu systems for the process transmitters CIT 400 and CIT 401 is identical. The CIT 401 deviates from the other by the gray marked menus, which are not available with CIT 400.

- ☞ Please follow the manual meticulously and remember that changes of the adjustable parameters become only effective after pushing the "OK" button and after leaving the menu item. If an error message appears in the display after pushing the enter-button, the set value will not be stored.

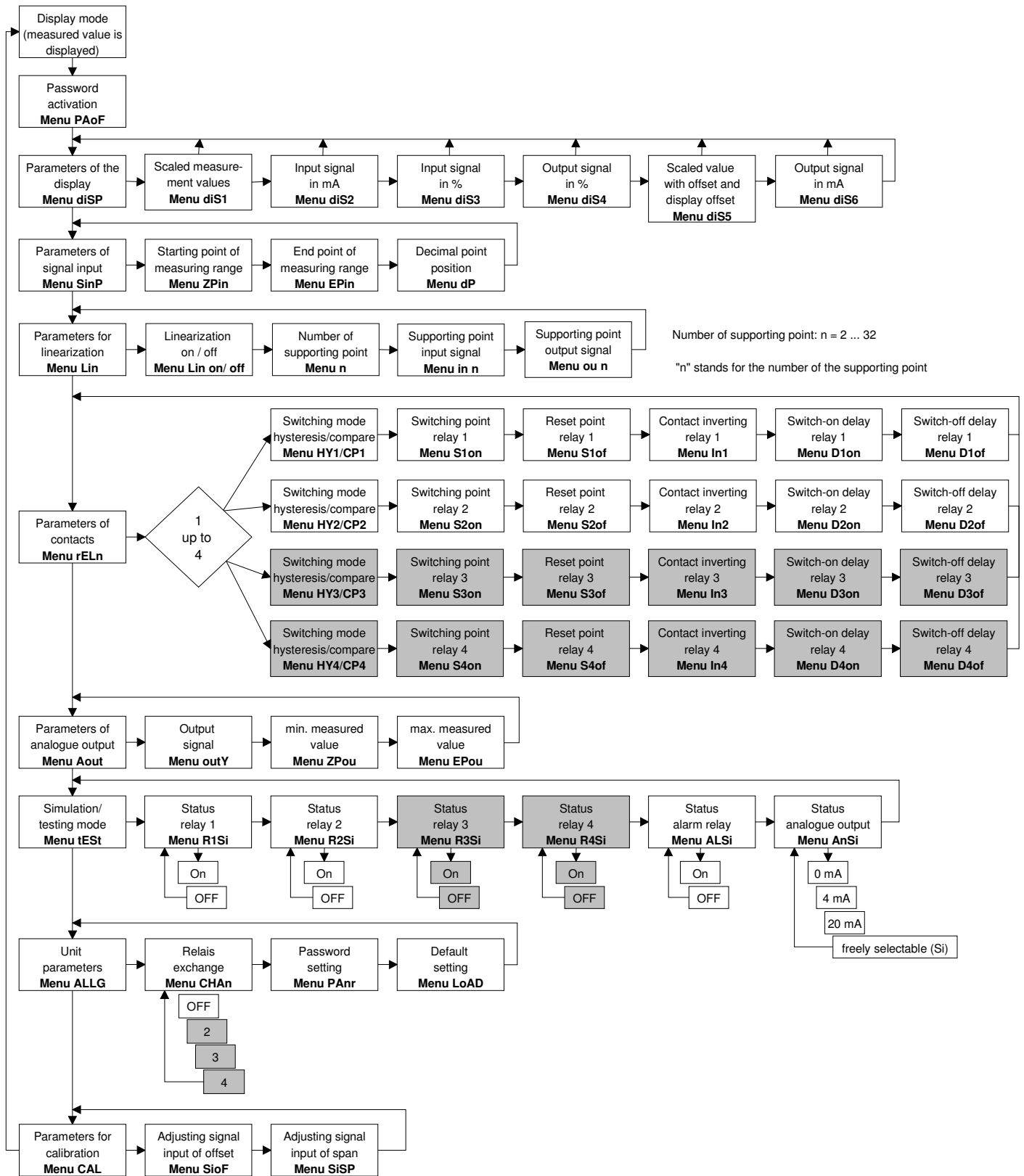


Fig. 11 Menu system P074

## 5.5 Menu list

### Menu level diSP - parameter of the display (mode)

The menus "diS1" to "diS6" determine the display mode.

#### Display - scaled measurement value

**diS1** Indicates the scaled measurement value on the display. The indicated value may vary between 0.000 and 9999. Confirm with Enter after selecting "diS1" in order to activate this mode.

#### Display - input in mA

**diS2** Indicates the input signal in mA on the display. In this mode, the unit virtually operates as a mA-meter which indicates the sensor current. Confirm with Enter after selecting "diS2" in order to activate this display mode.

#### Display - input in %

**diS3** Indicates the input signal as percentage on the display. The value ranges between 0 and 100 % and has a direct relation to the sensor signal which varies within a range of 4 to 20 mA. Confirm with Enter after selecting "diS3" in order to activate this display mode.

#### Display - analogue output in %

**diS4** Indicates the output signal as percentage on the display. The value ranges between 0 and 100 % and has a direct relation to the analogue output of the transmitter which varies within a range of 4 to 20 mA (depending on the value selected in menu "outY"). Confirm with Enter after selecting "diS4" in order to activate this display mode.

#### Display - scaled measurement value with offset and display offset

**diS5** Indicates the scaled measurement value with the added offset on the display. The indicated value may vary between 0.000 and 9999. The display offset must be entered in the menu "diS5". Confirm with Enter after selecting "diS5" in order to activate this display mode. The value set here will be used as display offset and will be added to the investigated measurement value. Use the arrow keys to enter the numeric value and confirm with Enter.

#### Display - output in mA

**diS6** Indicates the output signal in mA on the display. In this mode, the unit virtually operates as a mA-meter which represents the analogue output of the transmitter. This is essential for the user to check the signal circuit to operate correctly and if subsequent evaluation units indicate the same values. Confirm with Enter after selecting "diS6" in order to activate this display mode.

## Menu level SinP - parameter of signal input (analogue input)

The subordinate menu items are used to define the measurement span of the analogue input for 4 mA and 20 mA.

### Signal input - starting point of measuring range

#### **ZPIn**

The measurement value for the analogue input at 4 mA must be entered here. Normally this value is 0, which means 0 m at 4 mA in case of a pressure probe with a measurement range of 0 to 6 m water column height. Use the arrow keys to enter the numeric value and confirm with Enter.

### Signal input - end point of measuring range

#### **EPIn**

The measurement value for the analogue input at 20 mA must be entered here. Normally this is the maximum measurement span, resulting from the example above, i. e. a value of 6. Use the arrow keys to enter the numeric value and confirm with Enter.

### Signal input - decimal point position

#### **dP**

Here you can define the decimal point position. Use the arrow keys to move the decimal point and confirm with Enter.

## Menu level Lin - parameter of the linearization

Via this menu level, you can linearize the input signal (sensor) by a supporting point. This function is essential when the sensor signal is not linear to the output signal of the process transmitter. By this function, it is possible to get an output signal nearly linear to the filling volume in irregular shaped tanks.

### Linearization - activation / deactivation

#### **Lion/Liof**

With this menu, the linearization can be switched on or off. In the switch-off mode, the supporting points are not taken into account.

### Linearization - number of supporting points

#### **n**

In this menu, the number of supporting points has to be set. The permissible range is set from 2 to 32 supporting points.

### Linearization - input signal of supporting points

#### **in n**

In this menu, the first part of the supporting points has to be defined, whereas "n" in the menu designation is replaced by the number of the supporting point (in 1, in 2, ... in32). The sensor signal of the respective supporting point which lies on the input must be entered. In the following menu, the corresponding output signal must be set. The input value is based on the scaling limits defined in the menu level **SinP**.

### Linearization - output signal of the supporting points

#### **ou n**

In this menu, the second part of the supporting points has to be defined, whereas "n" in the menu designation is replaced by the value of the respective supporting point (ou 1, ou 2, ... ou32). The value has to be entered corresponding to the value for reaching a supporting point. Between two supporting points, the course is linear. Please note that the supporting points must be entered in ascending sequence, i. e. the value for n+1 has to be higher than the value for n. The output signal on the analogue output is developed by the indicated value, whereas the parameters from the menu level **Aout** are used.

## Menu level rELn - parameter of the contacts (relais)

The menu items of this level are responsible for the limit value settings and the switching behaviour of the relays. Since the menus for the relays have been conceived identically, the description is the same for all menus. This menu level can be called up by pressing Enter like any other menu. After that, the respective relay must be selected. This can be achieved by selecting the numbers of the relay with the arrow keys. Confirm your selection with Enter (CIT 400 features 2 relays; CIT 401 features 4 relays).

### Contacts - switching mode hysteresis/compare

**HY 1 / CP 1** With this menu, you can define the switching logic of the relays. It is possible to select between the so-called hysteresis mode HY X (limit level) and the compare mode CP X (in bounds/out of bounds). Select with arrow keys as usual – HYon indicates the selected hysteresis mode (limit level). CPon will indicate the window mode (in bounds/out of bounds). Confirm with Enter. (compare 7. Programming examples)

**HY 2 / CP 2**

**HY 3 / CP 3**

**HY 4 / CP 4**

### Contacts - switching point

**S1on** This menu defines the upper switching point of the respective relay. The programming example shows the function of this menu. In hysteresis mode (limit level), this value determines e. g. the turn-on point. In window mode (in bounds/out of bounds), this value determines e. g. the in bounds upper switching point. The value can be set using the arrow keys. Confirm with Enter.

**S2on**

**S3on**

**S4on**

### Contacts - reset point

**S1of** This menu defines the lower switching point of the respective relay. The programming example shows the function of this menu. In hysteresis mode (limit level), this value determines e. g. the reset point. In compare mode (in bounds/out of bounds), this value determines e. g. the in bounds lower switching point. The value can be set using the arrow keys. Confirm with Enter.

**S2of**

**S3of**

**S4of**

### Contacts - inverting

**In 1** This menu allows you to invert the relay position. In hysteresis mode (limit level), the upper and lower switching points will be changed. In window mode (in bounds/out of bounds), the switching behaviour will change from in bounds to out of bounds. Please note that this determination is valid only in case of activated auxiliary power, as the relay has to be powered with auxiliary power depending on the parameter setting. Relay inversion will be set by using the arrow keys. "St" in the display indicates the standard position, "In" the inverted relay position. Confirm the setting with Enter.

**In 2**

**In 3**

**In 4**

### Contacts - switch-on delay

**D1on D2on** This menu is used to define a switch-on delay within a range from 0 to 100 seconds for the selected relay. Set the delay with the arrow keys and confirm with Enter.

**D3on D4on**

### Contacts - switch-off delay

**D1of D2of** With this menu, you can define a switch-off delay within a range from 0 to 100 seconds for the selected relay. Set the delay with the arrow keys and confirm with Enter.

**D3of D4of**

## Menu level Aout - analogue output

The settings for the analogue signal output are determined in the menu items.

### Analogausgang - output signal

#### **outY**

This menu defines the output signal range. You can choose between the following settings: 4-20 mA, 0-20 mA, 20-4 mA and 20-0 mA. Select by using the arrow keys and confirm with Enter.

### Analogue output - minimum measurement value

#### **ZPou**

In this menu, you can enter the minimum measurement value which should correspond to the analogue output signal, e. g. 0 meters. If the sensor reaches this value, the output will be e. g. 4 mA if the signal range in menu "outY" was set to 4-20 mA.

### Analogue output - maximum measurement value

#### **EPou**

Enter the maximum measurement value which has to correspond to the analogue output signal here. If, for example, "ZPIn" and "EPIn" of a pressure sensor are given with 0 up to 6 meters, the menu "EPou" can be set on 5 meters. If the sensor reaches this value, the output will be e. g. 20 mA if the signal range in menu "outY" was set to 4-20 mA.

## Menu level tESt - simulation / testing mode

In this menu level, all test and simulation menus are located. The simulation options cover a manual relay control as well as an analogue output signal simulation.

### Simulation - status of the relays

#### **R1SI**

#### **R2SI**

#### **R3SI**

#### **R4SI**

#### **ALSI**

This menu is used to simulate the relay conditions. Menu "ALSI" is responsible for the alarm relay. By using the arrow keys, it is possible to simulate the "energized" (ON) and "de-energized" (OFF) condition. The relay will change its condition immediately after selection. Pressing Enter will exit the respective simulation menu.

### Simulation - status of the analogue output

#### **AnSI**

The signal value of the analogue output can be simulated using this menu. You can pre-set the fixed values 0 mA, 4 mA, 20 mA and variable values. In order to set a variable signal value, use the arrow keys to move to screen "SI" meaning output value simulation. Press Enter and "12.00" mA will appear as simulation value. Now you can set with the arrow keys the signal value to be rendered on the signal output after pressing the Enter key. Abort simulation by leaving this menu.

## Menu level ALLG - unit parameter

Menu level contains general unit parameters.

### Unit parameter - relay exchange

#### **CHAn**

With this menu, you can set the exchange of used relays if they reach a defined value. The background of this function is a pump exchange in order to achieve a regular pump load (capacity utilisation).

By changing the relays, both pumps will be activated on reaching the next turn-on point. With CIT 400, this function can be switched on and off. With CIT 401, values 2, 3, 4, and OFF can be set. The value gives the number of used relays for the changing.

### Unit parameter - password setting

#### **PAnr**

This menu defines the unit password (PIN). Set the number by using the arrow keys and confirm with Enter. To activate the password, use menu "PAoF".

The default setting for the password is "5".

### Unit parameter - default setting

#### **LoAd**

The unit's factory default settings can be loaded by using this menu. In order to execute this function, you should know the password (PIN). If this function is selected, the unit will wait for PIN entry. The function will not be executed until a correct entry of the password. The default setting for the password is "5".

 Please note that also the password is reset to default.

## Menu level CAL - calibration

This level is for self-calibration of the analogue input to the lower and upper sensor signal (4/20 mA). You can choose between single and double point calibration.

### Calibration - adjusting signal input of offset

#### **Slof**

With this menu, you can adjust the zero point of the transmitter (4 mA) to the applied sensor signal. To start the calibration, it is necessary to enter the password. For this, the minimum output signal (output of the min. measurement span of the sensor) must be applied to the transmitter input.

### Calibration - adjusting signal input of span

#### **SISP**

With this menu, you can adjust the final value of the measurement span (20 mA) to the applied sensor signal. To start the calibration, it is necessary to enter the password. For this, the maximum output signal (output of the max. measurement span of the sensor) must be applied to the transmitter input.

## 6. Error handling

Error messages	Possible cause	Error corrective
Err	<ul style="list-style-type: none"> <li>- cable break between sensor on analogue input</li> <li>- mechanical sensor damage and therefore interruption</li> <li>- sensor damage</li> <li>-&gt; current on analogue input below 3.3 mA</li> </ul>	<ul style="list-style-type: none"> <li>- check cable for damage</li> <li>- exchange cable or sensor if necessary</li> </ul>
Err	<ul style="list-style-type: none"> <li>- sensor electronics damaged</li> <li>- supplying too high current</li> <li>- cable short circuit or connection box causes current higher than 22 mA on analogue input due to humidity or damaged terminal clamps.</li> <li>-&gt; current on analogue input higher than 3.3 mA</li> </ul>	<ul style="list-style-type: none"> <li>- check cable for damage</li> <li>- exchange cable or sensor if necessary</li> </ul>
Heavy fluctuation of measurement values	<ul style="list-style-type: none"> <li>- cable damaged</li> <li>- contacting problems due to cable extension</li> <li>- connection box or similar</li> <li>- humidity in the cable</li> <li>- sensor damage</li> </ul>	<ul style="list-style-type: none"> <li>- check all contacts and connections</li> <li>- replace filter on cable end</li> <li>- check connection box for humidity ingress</li> </ul>

If you detect an error, please try to eliminate it by this table or send the device to our service address for repair.

**⚠ Repairs on the device may only be performed by the manufacturer!**

## 7. Programming examples

Please note that the display offset has to be set on "0" in the examples.

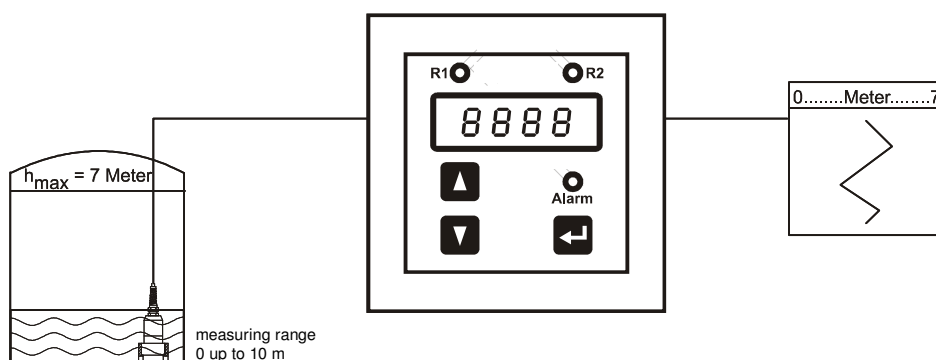
👉 Compare "dIS5" under "5.5 menu list".

### 7.1 Level measurement

given: tank (max. level 7 m); medium: water; probe 4-20 mA; measuring range 10 m

required: indication of measurement value, pen recorder on analogue output (4-20 mA), final peak of pen recorder 20 mA at 7 m

The process transmitter has to indicate the max. filling level of the tank (7 m).



## Programming:

Select the menu "dIS1" in the menu level "dISP".

Set the following values in the menu level "SInP":

ZPIn = 0 (starting point of measuring range)

EPIn = 10 (end point of pressure range)

dP = 2 (decimal point position)

Set the following values in the menu level "Aout":

outY = 4-20 (output signal in mA)


ZPou = 0 (min. measured value)

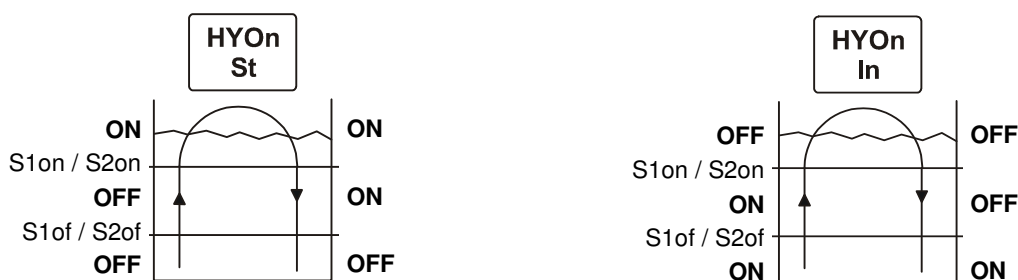
EPou = 7 (max. measured value)

## 7.2 Interface level measurement

given: tank (max. level 7 m); medium: water, probe 4-20 mA, measurement range 10 m

required: pen recorder on analogue output 4-20 mA, final peak of pen recorder 20 mA at 7 m; the process transmitter has to indicate the max. filling level of the tank; relay 1 should have the function of a limit value switch (on = 6 m; off = 5 m)

 Please note that the values in "S1on" and "S2on" usually have to be higher than the values in "S1of" and "S2of". To exchange the switching points, please use the menu contact inverting ("In 1" and "In 2")



*switch-on point > switch-off point*

*switch-on point < switch-off point*

### Programming

Select the menu "dIS1" in the menu level "dISP".

Set the following values in the menu level "SinP":

ZPIn = 0 (starting point of measuring range)

EPIn = 10 (end point of pressure range)

dP = 2 (decimal point position)

Select the menu "1" in the menu level "rELn" and set the following values:

HY 1/CP 1 = HYon (hysteresis mode)

S1on = 6 (switching point relay 1)

S1of = 5 (reset point relay 1)

In1 = St (Set point inverting relay 1)

Set the following values in the menu level "Aout":

outY = 4-20 (output signal in mA)

ZPou = 0 (min. measured value)

EPou = 7 (max. measured value)

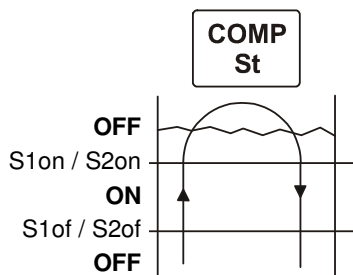
## 7.3 In bounds / out of bounds

given: tank (max. level 7 m); medium: water; probe 4-20 mA; measuring range 10 m

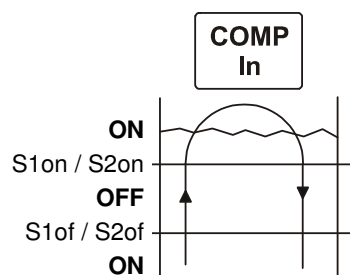
required: pen recorder on analogue output 4-20 mA, final peak of pen recorder 20 mA at 7 m;  
the process transmitter has to indicate the max. filling level of the tank, relay 1 should have the function of an out of bounds switch and relay 2 the function of an in bounds switch (bound between 3 m and 4 m)

☞ For using the out of bounds function, the menu "In 1" has to be set on "In".

☞ Please note that the values in "S1on" and "S2on" usually have to be higher than the values in "S1of" and "S2of". To exchange the switching points, please use the menu contact inverting ("In 1" and "In 2")



*in bounds function*



*out of bounds function*

### Programming

Select the menu "dIS1" in the menu level "dISP".

Set the following values in the menu level "SinP":

ZPIn = 0 (starting point of measuring range)

EPIn = 10 (end point of pressure range)

dP = 2 (decimal point position)

Select the menu "1" in the menu level "rELn" and set the following values:

HY 1/CP 1 = CPon (window mode)

S1on = 4 (switching point relay 1)

S1of = 3 (reset point relay 1)

In1 = In (set point inverting relay 1)

Select the menu "2" in the menu level "rELn" and set the following values:

HY 2/CP 2 = CPon (windows mode)

S2on = 4 (switching point relay 2)

S2of = 3 (reset point relay 2)

In2 = St (no inverting of relay 2)

Set the following values in the menu level "Aout":

outY = 4-20 (output signal in mA)


ZPou = 0 (min. measured value)

EPou = 7 (max. measured value)

## 7.4 Changing of pumps

given: tank (max. level 7 m); medium: water; probe 4-20 mA; measuring range 10 m

required: pen recorder on analog output 4-20 mA, final peak of pen recorder 20 mA at 7 m; the process transmitter has to indicate the max. filling level of the tank (7 m); relay 1 should have the function of a limit value switch (on = 6 m; off = 5 m) with a switch-on delay of 10 seconds; alternating with relay 2 (on = 6 m; off = 4.5 m)

 Please note that the values in "S1on" and "S2on" usually have to be higher than the values in "S1of" and "S2of". To exchange the switching points, please use the menu contact inverting ("In 1" and "In 2")

### Programming

Select the menu "dIS1" in the menu level "dISP".

Set the following values in the menu level "SinP":

ZPIn = 0 (starting point of measuring range)  
 EPIn = 10 (end point of pressure range)  
 dP = 2 (decimal point position)

Select the menu "1" in the menu level "rELn" and set the following values:

HY 1/CP 1 = HYon (hysteresis mode)  
 S1on = 6 (upper switching point 1)  
 S1of = 5 (lower switching point 1)  
 In1 = In (inverting of relay 1)  
 d1on = 10 (switch-on delay in seconds)

Select the menu "2" in the menu level "rELn" and set the following values:

HY 2/CP 2 = HYon (hysteresis mode)  
 S2on = 6 (upper switching point 2)  
 S2of = 4.5 (lower switching point 2)  
 In2 = In (inverting of relay 2)  
 d2on = 10 (switch-on delay in seconds)

Set the following values in the menu level "Aout":

outY = 4-20 (output signal in mA)  
 ZPou = 0 (min. measured value)  
 EPou = 7 (max. measured value)

Select the menu "ALLG" and set the following values:

CHAN = On (change relays)

## 8. Placing out of service



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

## 9. Service

This device is maintenance-free.

If desired, the device can be cleaned using non-aggressive cleaning solutions. Clean the housing with a dry lint-free cloth if necessary. When cleaning the enclosure surface with a wet cloth, first disconnect the device from mains.

## **10. Recalibration**

During the life-time of the device, the offset may shift. As a consequence, a deviating signal value in reference to the nominal pressure range starting point may be transmitted.

The full scale may also shift. This would cause a signal value of the pressure switch to be transmitted that deviates from the nominal pressure range end point.

If one of these two phenomena occurs after prolonged use, a recalibration is recommended to ensure furthermore high accuracy.

You can send us the device for recalibration. It is also possible to perform this recalibration by yourself with the help of a pressure reference. The required information is given in the menu "CAL" in the menu list.

## **11. 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 note 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 forms can be downloaded from our homepage [www.bdsensors.com](http://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

## **12. Disposal**

The device must be disposed according to the European Directives 2002/96/EC and 2003/108/EC (on waste electrical and electronic equipment). Waste of electrical and electronic 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!**

## **13. 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.

## 14. Appendix

### 14.1 Declaration of conformity



## EG-Konformitätserklärung

*EC Declaration of Conformity*

BD SENSORS GmbH  
BD-Sensors-Str. 1

D-95199 Thierstein  
Germany.

erklärt in alleiniger Verantwortung, dass die nachfolgend aufgeführten Produkte mit untenstehenden Publikationen übereinstimmen.  
*declares on its own responsibility that the following listed products fulfil the below mentioned requirements.*

CIT 400, CIT 401

Europäische Richtlinien / *European Directives:*

- 89/336/EWG - EMV-Richtlinie / *EMC Directive*
- 94/9/EG - Richtlinie für Ex-Bereiche / *Directive for Ex-areas*<sup>1</sup>

Harmonisierte Normen oder Dokumente / *Harmonized standards or documents:*

- EN 61326 (1997)
- EN 61326/A1 (1998)
- EN 61326/A2 (2001)
- EN 61326/A3 (2003)

Thierstein, 2006-06-27

F. Widdig

Leiter Konstruktion  
*Mechanical Design Manager*

M. Martin

Leiter Elektronikentwicklung  
*Electronics Design Manager*

<sup>1</sup> Die Anwendung dieser Richtlinie bezieht sich nur auf Geräte mit ATEX-Zulassung.  
*This directive is only valid for devices with ATEX-approval.*



BD | SENSORS GmbH  
BD-Sensors-Straße 1  
D-95199 Thierstein

Telefon +49 (0) 92 35/98 11-0  
Telefax +49 (0) 92 35/98 11-11

www.bdsensors.de  
info@bdsensors.de

14.2. EC type-examination for CIT 400 with Ex-protection

**IBExU Institut für Sicherheitstechnik GmbH**  
An-Institut der TU Bergakademie Freiberg

[1] **EC-TYPE EXAMINATION CERTIFICATE**  
according to Directive 94/9/EC, Annex III (Translation)



[2] Equipment and Protective Systems intended for use in Potentially Explosive Atmospheres, Directive 94/9/EC

[3] EC-Type Examination Certificate Number: **IBExU05ATEX1097 X**

[4] Equipment: Process Transmitter type AX13-CIT400  
[5] Manufacturer: BD SENSORS GmbH

[6] Address: BD-Sensors-Str. 1, 95199 Thierstein  
Germany

[7] The design of this equipment mentioned under [4] and any acceptable variation thereto are specified in the schedule to this EC-Type Examination Certificate.

[8] IBExU Institut für Sicherheitstechnik GmbH, NOTIFIED BODY number 0637 in accordance with article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.  
The test results are recorded in the test report IB-05-3-144 of 18 July 2005.

[9] Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 50014:1997+A1+A2, EN 50020:2002, EN 50284:1999 and E DIN IEC 61241-11:2001.

[10] If the sign „X“ is placed after the Certificate number, it indicates that the equipment is subject to special conditions for safe use specified under [17] in the schedule to this EC-Type Examination Certificate.

[11] This EC-Type Examination Certificate relates only to the design and construction of the specified equipment. If applicable, further requirements of this directive apply to the manufacture and supply of this equipment.

[12] The marking of the equipment mentioned under [4] shall include the following

II (1) GD [Ex ia] IIC

IBExU Institut für Sicherheitstechnik GmbH  
Fuchsmühlenweg 7 - D-09599 Freiberg  
Phone: +49 3731 3805-0 - Fax: +49 3731 23650

Authorised for certifications  
-Explosion protection-

By order

(Dr. Lösch)

Freiberg, 19 July 2005



- Seal -  
(ID no. 0637 )

Certificates without signature and seal are not valid. Certificates may only be duplicated completely and unchanged. In case of dispute, the German text shall prevail.

Schedule

**IBExU Institut für Sicherheitstechnik GmbH**  
An-Institut der TU Bergakademie Freiberg

[13] **Schedule**

[14] **to the EC-TYPE EXAMINATION CERTIFICATE IBExU05ATEX1097 X**

[15] **Description of equipment**

The Process Transmitter type AX13-CIT400 is an associated apparatus. It has to install outside of hazard areas. It serves to the galvanic isolated supply and the signal transmission for 2- respectively 3-line sensors in potentially explosive atmospheres, which requires Category 1 Apparatus. The electronic components are placed on a circuit board inside of the enclosure. The electrical connection is carried out with terminals in the front for the top-head rail version and on the back-side for the built-in enclosure. The equipment is fitted out with LC-Display and foil keyboard.

Ambient temperature -20 °C up to +40 °C

**Electrical data**

Supply circuit:  
Terminals 1, 2 and 3

$U_N$	24 VDC res. 230 VAC
$P_V$	app.4 VA
$U_m$	250 VAC (maximum r.s.m)

Signal output:  
Terminals 25 and 26

$U_N$	10 V
$U_m$	250 VAC (maximum r.s.m)

Relais output:  
Terminals 5 up to 13

$U_N$	250 VAC, 6 A
-------	--------------

Sensor circuit:  
Terminals 14, 15 and 16

**type of protection EEx ia IIC, IIB res. IIA**

$U_O$	25.2 V
$I_O$	84.8 mA
$P_O$	535 mW

characteristic linear  
maximum values without lumped capacitance / inductance

	EEx ia	IIC	IIB	IIA
$C_o$		107 nF	820 nF	2900 nF
$L_o$		5.7 mH	20 mH	42 mH

[16] **Test report**

The proof of explosion protection is recorded in details in test report IB-05-3-144. The test documents are part of the test report and listed there.

**Summary of the test results:**

The Process Transmitter type AX13-CIT400 fulfils the requirements of explosion protection for an associated apparatus of Equipment group II and Category (1) GD in type of protection Intrinsic safety for explosive atmospheres of explosion group IIC.

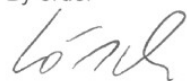
[17] **Special conditions for safe use**

The minimum distance of 50 mm between intrinsically safe terminals and other terminals must be fulfilled by the assembly. It is reachable with use of a partition or insulations and fixations of the single wires (res. shrinkdown plastic tubing).

[18] **Essential Health and Safety Requirements**

Confirmed by compliance of standards (see [9]).

By order



(Dr. Lösch)

Freiberg, 19 July 2005

**BD SENSORS GmbH**  
**BD-Sensors-Str. 1**

**95199 Thierstein**

**Germany**

**Phone +49 (0) 92 35 / 98 11- 0**

**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.

***further agencies in:***

**EUROPE**

- Belgium
- Denmark
- Germany
- England
- France
- Greece
- Italy
- Lithuania
- Luxembourg
- Netherlands
- Norway
- Poland
- Romania
- Russia
- Sweden
- Switzerland
- Slovakia
- Spain
- Czech Republic
- Turkey
- Ukraine

**ASIA**

- Iran
- Israel
- Kazakhstan
- Taiwan
- Thailand

**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 –