Operating Instructions
SU 501 Ex
Signal conditioning instrument
Contents

1 About this document
  1.1 Function ........................................................................................................................... 3
  1.2 Target group .................................................................................................................. 3
  1.3 Symbolism used ............................................................................................................. 3

2 For your safety
  2.1 Authorised personnel ....................................................................................................... 4
  2.2 Appropriate use ................................................................................................................ 4
  2.3 Warning about incorrect use ............................................................................................. 4
  2.4 General safety instructions ............................................................................................... 4
  2.5 Safety label on the instrument .......................................................................................... 4
  2.6 CE conformity ................................................................................................................... 5
  2.7 Safety instructions for Ex areas ........................................................................................ 5

3 Product description
  3.1 Configuration .................................................................................................................... 6
  3.2 Principle of operation ........................................................................................................ 6
  3.3 Adjustment ....................................................................................................................... 7
  3.4 Packaging, transport and storage ...................................................................................... 7

4 Mounting
  4.1 General instructions ......................................................................................................... 8
  4.2 Mounting instructions ....................................................................................................... 8

5 Connecting to power supply
  5.1 Preparing the connection ................................................................................................. 11
  5.2 Connection procedure .................................................................................................... 11
  5.3 Wiring plan ..................................................................................................................... 12

6 Setup
  6.1 Adjustment system .......................................................................................................... 13
  6.2 Adjustment elements ...................................................................................................... 14
  6.3 Function chart ................................................................................................................ 17

7 Maintenance and fault rectification
  7.1 Maintenance .................................................................................................................... 19
  7.2 Rectify faults .................................................................................................................. 19
  7.3 Instrument repair ............................................................................................................ 21

8 Dismounting
  8.1 Dismounting steps .......................................................................................................... 23
  8.2 Disposal .......................................................................................................................... 23

9 Supplement
  9.1 Technical data ................................................................................................................. 24
  9.2 Dimensions ..................................................................................................................... 26

Editing status: 2012-05-10
1 About this document

1.1 Function
This operating instructions manual provides all the information you need for mounting, connection and setup as well as important instructions for maintenance and fault rectification. Please read this information before putting the instrument into operation and keep this manual accessible in the immediate vicinity of the device.

1.2 Target group
This operating instructions manual is directed to trained specialist personnel. The contents of this manual should be made available to these personnel and put into practice by them.

1.3 Symbolism used

- **Information, tip, note**
  This symbol indicates helpful additional information.

- **Caution**: If this warning is ignored, faults or malfunctions can result.

- **Warning**: If this warning is ignored, injury to persons and/or serious damage to the instrument can result.

- **Danger**: If this warning is ignored, serious injury to persons and/or destruction of the instrument can result.

- **Ex applications**
  This symbol indicates special instructions for Ex applications.

- **List**
  The dot set in front indicates a list with no implied sequence.

- **Action**
  This arrow indicates a single action.

- **Sequence of actions**
  Numbers set in front indicate successive steps in a procedure.

- **Battery disposal**
  This symbol indicates special information about the disposal of batteries and accumulators.
2 For your safety

2.1 Authorised personnel
All operations described in this operating instructions manual must be carried out only by trained specialist personnel authorised by the plant operator.
During work on and with the device the required personal protective equipment must always be worn.

2.2 Appropriate use
SU 501 Ex is a universal signal conditioning instrument for connection of a level switch.
You can find detailed information on the application range in chapter "Product description".
Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.
For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden.

2.3 Warning about incorrect use
Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or adjustment.

2.4 General safety instructions
This is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards as well as all prevailing safety regulations and accident prevention rules.
The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for trouble-free operation of the instrument.
During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

2.5 Safety label on the instrument
The safety approval markings and safety tips on the device must be observed.
2.6 CE conformity
This device fulfills the legal requirements of the applicable EC guidelines. By attaching the CE mark, we provide confirmation of successful testing.

2.7 Safety instructions for Ex areas
Please note the Ex-specific safety information for installation and operation in Ex areas. These safety instructions are part of the operating instructions manual and come with the Ex-approved instruments.
3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- SU 501 Ex signal conditioning instrument
- Terminal socket
- Bridges (4 pieces)
- Coded pins (2 pieces)
- Ex label
- Ex separating chamber
- Documentation
  - this operating instructions manual
  - Ex-specific "Safety instructions" (with Ex versions)
  - if necessary, further certificates

Constituent parts

The SU 501 Ex consists of:

- SU 501 Ex signal conditioning instrument

Fig. 1: SU 501 Ex

1 Ex separating chamber with Ex version
2 Terminal socket
3 Transparent cover

Type plate

The nameplate contains the most important data for identification and use of the instrument:

- Article number
- Serial number
- Technical data
- Article numbers, documentation

3.2 Principle of operation

Application area

SU 501 Ex is a single signal conditioning instrument for processing of vibrating level switches.
3 Product description

**Functional principle**

The SU 501 Ex signal conditioning instrument powers connected sensors and simultaneously processes their measuring signals.

When the medium reaches the switching point of the sensor, the voltage on the sensor drops. The output relays then switch according to the set mode.

**Voltage supply**

Wide-range power supply unit with 20 ... 253 V AC/DC for world-wide use.

Detailed information about the power supply can be found in chapter "Technical data".

**3.3 Adjustment**

The switching delay and the mode (A/B) can be preset on the signal conditioning instrument via a DIL switch block.

A test key is lowered on the front plate of SU 501 Ex. When pushing the key, the measuring system is checked on correct function.

**3.4 Packaging, transport and storage**

**Packaging**

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test based on ISO 4180.

The packaging of standard instruments consists of environment-friendly, recyclable cardboard. For special versions, PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.

**Transport**

Transport must be carried out under consideration of the notes on the transport packaging. Nonobservance of these instructions can cause damage to the device.

**Transport inspection**

The delivery must be checked for completeness and possible transit damage immediately at receipt. Ascertained transit damage or concealed defects must be appropriately dealt with.

**Storage**

Up to the time of installation, the packages must be left closed and stored according to the orientation and storage markings on the outside.

Unless otherwise indicated, the packages must be stored only under the following conditions:

- Not in the open
- Dry and dust free
- Not exposed to corrosive media
- Protected against solar radiation
- Avoiding mechanical shock and vibration

**Storage and transport temperature**

- Storage and transport temperature see chapter "Supplement - Technical data - Ambient conditions"
- Relative humidity 20 ... 85 %
4 Mounting

4.1 General instructions

Installation place
SU 501 Ex signal conditioning instrument with plug-in socket for mounting on carrier rail according to EN 50022.

Transparent cover
The front plate of SU 501 Ex can be provided with a lead-sealable transparent cover to protect the instrument against unauthorised or inadvertent adjustment. See the following figure on how to remove the transparent cover.

![Fig. 2: Removing the transparent cover](image)

Housing IP 65
For moisture-protected mounting outside the switching cabinet, we offer an insulated protective housing with transparent cover (IP 65) for surface mounting.
In this housing you can mount a maximum of 3 instruments of 36 mm width.

4.2 Mounting instructions

Installation
The plug-in socket is constructed for carrier rail mounting according to EN 50022. Operating voltage is connected to terminals 9 and 10. For neighbouring signal conditioning instruments, it is possible to continue connection L1 and N directly via the supplied bridges.

Danger:
The bridges must never be used with single instruments or at the end of a row of instruments. If this rule is not heeded, there is a danger of coming into contact with the operating voltage or causing a short circuit.

A SU 501 Ex in Ex version is an auxiliary, intrinsically safe instrument and may not be installed in explosion-endangered areas.
Before setup, the Ex separating chamber must be attached (as shown below) with Ex versions. Safe operation can be only ensured if the operating instructions manual and the EG type approval certificate are observed. SU 501 Ex must not be opened.

Close the upper terminals according to the following illustration.

![Mounting the separating chamber](image)

**Fig. 3: Mounting the separating chamber**

All signal conditioning instruments are provided with different gaps dependent on type and version (mechanical coding).

The plug-in socket is provided with coded pins that can be inserted to prevent accidental interchanging of the various instrument types.

With a SU 501 Ex in Ex version, the supplied coded pins (type coded pin and Ex coded pin) must be inserted by the user according to the below chart.
Fig. 4: Plug-in socket SU 501 Ex

1 Bridges for looping the operating voltage
2 Type coding for SU 501 Ex
3 Ex coding with Ex version
4 Ex separating chamber
5 Connecting to power supply

5.1 Preparing the connection

Always keep in mind the following safety instructions:

- Connect only in the complete absence of line voltage
- If overvoltage surges are expected, overvoltage arresters should be installed.

In hazardous areas you must take note of the respective regulations, conformity and type approval certificates of the sensors and power supply units.

The power supply can be 20 … 250 V AC, 50/60 Hz or 20 … 72 V DC.

The operating voltage of SU 501 Ex is connected with standard cable according to the national installation standards.

The sensors are connected with standard two-wire cable without screen. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used.

Use cable with round cross-section. A cable outer diameter of 5 … 9 mm (0.2 … 0.35 in) ensures the seal effect of the cable gland.

If you are using cable with a different diameter or cross-section, exchange the seal or use a suitable cable gland.

Connect the cable screen on both ends to ground potential. In the sensor, the screen must be connected directly to the internal ground terminal. The ground terminal on the outside of the sensor housing must be connected to the potential equalisation (low impedance).

If potential equalisation currents are expected, the screen connection on SU 501 Ex must be made via a ceramic capacitor (e.g. 1 nF, 1500 V). The low frequency potential equalisation currents are thus suppressed, but the protective effect against high frequency interference signals remains.

Take note of the corresponding installation regulations for Ex applications. In particular, make sure that no potential equalisation currents flow over the cable screen. In case of grounding on both sides this can be achieved by the use of a capacitor or a separate potential equalisation.

5.2 Connection procedure

Move on to electrical connection and proceed as follows:

1. Snap the socket without SU 501 Ex onto the carrier rail
2. Connect sensor cable to terminal 1 and 2, and where applicable, connect the screen
3. Connect power supply (switched off) to terminal 9 and 10
4. Insert SU 501 Ex into the plug-in socket and screw it down tightly

The electrical connection is hence finished.
Before setting up Ex versions, make sure the Ex separating chamber is plugged (above the sensor terminals). The pins for type and Ex coding must also be inserted correctly.

5.3 Wiring plan

Fig. 5: Wiring plan SU 501 Ex
1 Sensor
2 Sensor input
3 Transistor output
4 Relay output
5 Operating voltage
6 Setup

6.1 Adjustment system

Fig. 6: Display and adjustment elements

1  Test key
2  Control lamp - level relay (LED yellow)
3  Control lamp - Fault signal (LED red)
4  Control lamp - Operating voltage (LED green)
5  Ex separating chamber
6  Terminal for probe
7  Sockets for bridges
8  Transistor output
9  Relay output
10  Voltage supply
6.2 Adjustment elements

Control lamps

Control lamps (LED) in the front plate indicate operation, switching status and fault signal.

- **Green**
  - Operating control lamp
  - Mains voltage on, instrument is operating

- **Red**
  - Failure lamp
  - Fault on the sensor circuit due to sensor failure or line break
  - The relay deenergises in case of failure

- **Yellow**
relay control lamp
- The yellow relay control lamp reacts depending on the set mode (A/B)
- The relay control lamp generally indicates the activated (energized) condition of the relay
- A dark relay control lamp means that the relay is deenergised (transistor blocks)

DIL switch block
Laterally on top (covered when mounted) there is a DIL switch block with six switches. The individual switches are assigned as follows:

- 1 - A/B mode
  - A - Max. detection or overflow protection
  - B - Min. detection or dry run detection
- 2 - Switch off delay (za)
- 3 - Switch on delay (ze)
- 4 - Switching delay 2 s
- 5 - Switching delay 6 s
- 6 - Switching delay 12 s

With switch 1 you can adjust the mode (A - overfill protection or B - dry run protection).

With switches 2 and 3 you can set switch off and/or switch on delays independent of each other.

The delay refers to the switching function of the relay.

In the example (see previous illustration), mode A (max. detection of overfill protection) is selected (switch 1). The switch off delay is activated (switch 2) and the switching delay is set to 8 seconds (switch 4, 5 and 6).

With switches 4, 5 and 6 you can adjust the switching delay. The times of the activated time switches accumulate. If the switch on (ze) and switch off delay (za) are switched on together, the set time applies to both delay modes.

Hence the relay deenergises with 8 seconds delay time when the switching point is reached.

Information:
Keep in mind that the switching delay of the sensor and signal conditioning instrument accumulate.

<table>
<thead>
<tr>
<th>Switch</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>za</td>
<td>ze</td>
<td>2 s</td>
<td>6 s</td>
<td>12 s</td>
<td></td>
</tr>
<tr>
<td>0.2 s</td>
<td>A/B</td>
<td>off</td>
<td>off</td>
<td>off</td>
<td>off</td>
<td></td>
</tr>
<tr>
<td>0.5 s</td>
<td>A/B</td>
<td>off</td>
<td>off</td>
<td>off</td>
<td>off</td>
<td></td>
</tr>
<tr>
<td>2 s</td>
<td>A/B</td>
<td>on</td>
<td>off</td>
<td>off</td>
<td>off</td>
<td></td>
</tr>
<tr>
<td>6 s</td>
<td>A/B</td>
<td>off</td>
<td>on</td>
<td>off</td>
<td>off</td>
<td></td>
</tr>
<tr>
<td>8 s</td>
<td>A/B</td>
<td>on</td>
<td>on</td>
<td>off</td>
<td>off</td>
<td></td>
</tr>
<tr>
<td>12 s</td>
<td>A/B</td>
<td>off</td>
<td>off</td>
<td>on</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Set alternately switch 2 and/or 3 to "on". The times apply to the adjusted delay mode.
**Function monitoring**

The measuring system is continuously monitored. The following criteria are checked:

- Two-wire cable on line break and shortcircuit
- Interruption of the connection cable to the piezo elements
- Corrosion or damage of the tuning fork (vibrating rod)
- Break of the tuning fork (vibrating rod)
- Loss of vibration
- Too low vibrating frequency
- Medium penetrating from the vessel side into the sensor

**Test key**

In systems with OPTISWITCH level switches in conjunction with a two-wire electronics module, a function test can be carried out. SU 501 Ex has an integrated test key. The test key is lowered in the front plate of the signal conditioning instrument. Push the test key with a suitable object (e.g. screwdriver, pen etc.).

By pushing the key, the system is checked on the following criteria:

- Switching function of the switching outputs
- Potential separation of the outputs
- The signal processing of the signal conditioning instrument

After pushing the test key, the complete measuring system is checked on correct function. The following operating conditions are simulated during the test:

- Fault message
- Empty signal
- Full signal

Check if all three switching conditions occur in the correct sequence and the stated duration. If not, there is a fault in the measuring system (see chapter “Fault rectification”).

**Note:**

Keep in mind that the connected instruments are activated during the function test. By doing this, you can check the correct function of the measuring system.

**Test procedure**

After releasing the key.

The specified times apply with a tolerance of ±20 %.

<table>
<thead>
<tr>
<th>Switch</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 s</td>
<td>A/B</td>
<td></td>
<td>on</td>
<td>off</td>
<td>on</td>
<td></td>
</tr>
<tr>
<td>18 s</td>
<td>A/B</td>
<td></td>
<td>off</td>
<td>on</td>
<td>on</td>
<td></td>
</tr>
<tr>
<td>20 s</td>
<td>A/B</td>
<td></td>
<td>on</td>
<td>on</td>
<td>on</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A-mode</th>
<th>B-mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relay control lamp off</td>
<td>Relay control lamp off</td>
</tr>
</tbody>
</table>

1 Simulation of a fault signal (approx. 3 s)
Level relay deenergised
6 Setup

<table>
<thead>
<tr>
<th>1</th>
<th>Simulation of a fault signal</th>
<th>A-mode</th>
<th>B-mode</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Failure lamp</td>
<td>Failure lamp lights</td>
<td>Failure lamp lights</td>
</tr>
<tr>
<td>2</td>
<td>Simulation an empty signal (approx. 1.5 s)</td>
<td>Relay control lamp lights</td>
<td>Relay control lamp off</td>
</tr>
<tr>
<td></td>
<td>Level relay energised</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Simulation of an empty signal</td>
<td>Failure lamp off</td>
<td>Failure lamp off</td>
</tr>
<tr>
<td></td>
<td>Failure lamp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Simulation of a full signal (approx. 1.5 s)</td>
<td>Relay control lamp off</td>
<td>Relay control lamp lights</td>
</tr>
<tr>
<td></td>
<td>Level relay deenergised</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Simulation of a full signal</td>
<td>Failure lamp off</td>
<td>Failure lamp off</td>
</tr>
<tr>
<td></td>
<td>Failure lamp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Return to the current operating condition (covered/uncovered)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Evaluation

Check the procedure of the function test. Note the following criteria for assessment of the result:

**Test passed**
If all three switching conditions occur in the correct sequence and the specified duration (±20 %), then the test is passed and the instrument functions correctly.

**Test not passed**
- The specified times deviate considerably from the table (>3 s)
- One of the switching conditions remains unchanged
- No start-up of the test - no signal sequence

6.3 Function chart

The following chart provides an overview of the switching conditions depending on the set mode and the level.

The mode switch on the sensor (if available) must be set to max. operation.

<table>
<thead>
<tr>
<th>Mode on the signal conditioning instrument</th>
<th>Sensor (max. operation)</th>
<th>Signal conditioning instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Signal current - Sensor</td>
<td>Signal lamp - Switching output (yellow)</td>
</tr>
<tr>
<td>Mode A Overflow protection</td>
<td>approx. 8 mA</td>
<td>Sun</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode on the signal conditioning instrument</td>
<td>Level</td>
<td>Signal current - Sensor</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Mode A Overflow protection</td>
<td></td>
<td>approx. 16 mA</td>
</tr>
<tr>
<td>Mode B Dry run protection</td>
<td></td>
<td>approx. 16 mA</td>
</tr>
<tr>
<td>Mode B Dry run protection</td>
<td></td>
<td>approx. 8 mA</td>
</tr>
<tr>
<td>Fault message (mode A/B)</td>
<td>any</td>
<td>approx. 1.8 mA</td>
</tr>
</tbody>
</table>
7 Maintenance and fault rectification

7.1 Maintenance
If the instrument is used properly, no special maintenance is required in normal operation.

7.2 Rectify faults
The operator of the system is responsible for taking suitable measures to rectify faults.

Reaction when malfunctions occur

Failure reasons
A maximum of reliability is ensured. Nevertheless, faults can occur during operation. These may be caused by the following, e.g.:
- Measured value from sensor not correct
- Voltage supply
- Interference on the cables

Fault rectification
The first measure to be taken is to check the input and output signals. The procedure is described as follows. In many cases the causes can be determined this way and faults can be easily rectified.

<table>
<thead>
<tr>
<th>Error code</th>
<th>Cause</th>
<th>Rectification</th>
</tr>
</thead>
</table>
| The red failure control lamp (LED) of the signal conditioning instrument lights | Sensor not connected correctly | – Measure the current value on the signal cable to the sensor  
– In Ex systems, make sure that the Ex protection is not influenced by the measuring instruments used.  
– Faults on the sensor causing a current change below 2.3 mA or above 23.2 mA, cause a fault signal on measuring instruments. |

Fig. 22: Connection of a multimeter
1 SU 501 Ex signal conditioning instrument
2 Sensor

Sensor not connected correctly
- Measure the voltage on the connection cable
- In Ex systems, make sure that the Ex protection is not influenced by the measuring instruments used.
- The terminal voltage of the sensor is at least 12 V in normal condition
<table>
<thead>
<tr>
<th>Error code</th>
<th>Cause</th>
<th>Rectification</th>
</tr>
</thead>
<tbody>
<tr>
<td>The red failure control lamp (LED) of the signal conditioning instrument lights</td>
<td>Current value $&lt; 2.3 \text{ mA}$</td>
<td>Measure the current value on the signal cable to the sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Check all connections and connection cables to the sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The voltage should be approx. $17 \ldots 20 \text{ V}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If the value is below $17 \text{ V}$, probably the signal conditioning instrument is defective.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exchange the signal conditioning instrument or send it for repair</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. If the red failure lamp continues to light, separate the sensor from the connection cable and connect a resistor of $1 \text{ k} \Omega$ instead on the signal conditioning instrument</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If the failure lamp continues to light, the signal conditioning instrument is defective</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exchange the signal conditioning instrument or send it for repair</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Should the failure lamp extinguish, you can connect the sensor again. Separate the signal conditioning instrument from the connection cable and connect a resistor of $1 \text{ k} \Omega$ to the sensor input</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. If the failure lamp continues to light, the connection cable is probably interrupted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check the connection cable to the sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Should the failure lamp extinguish, the sensor will be defective</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exchange the sensor or send it in for repair</td>
</tr>
</tbody>
</table>
### Error code

<table>
<thead>
<tr>
<th>Error code</th>
<th>Cause</th>
<th>Rectification</th>
</tr>
</thead>
</table>
| The red failure control lamp (LED) of the signal conditioning instrument lights | Current value > 23.2 mA | - Measure the current value on the signal cable to the sensor  
1. Check all connections and connection cables to the sensor  
2. If the red failure lamp continues to light, separate the sensor from the connection cable and connect a resistor of 1 kΩ instead on the signal conditioning instrument  
   If the failure lamp extinguishes, the sensor is defective. Check the connected sensor  
3. If the failure lamp continues to light, connect the sensor again. Separate signal conditioning instrument from the connection cable and connect a resistor of 1 kΩ to the sensor input  
4. If the failure lamp extinguishes, this is probably due to a shortcircuit in the connection cable  
   Check the connection cable to the sensor  
5. If the failure lamp continues to light, the signal conditioning instrument is defective  
   Exchange the signal conditioning instrument or send it for repair |

| Malfunction during function test | After pushing the test key, the switching conditions do not occur in the correct sequence or correct duration, e.g. no full signal is outputted | - Measure the line resistance  
- If the cable is highly resistive, bring it to a normal resistance, e.g. check terminals and cable connections on corrosion |

### Reaction after fault rectification

Depending on the reason for the fault and the measures taken, the steps described in chapter "Set up" may have to be carried out again.

### 7.3 Instrument repair

If a repair is necessary, please proceed as follows:  
You can download a return form from our website  
PDF-Download/Specimen_e.pdf.
By doing this you help us carry out the repair quickly and without having to call back for needed information.

- Print and fill out one form per instrument
- Clean the instrument and pack it damage-proof
- Attach the completed form and possibly also a safety data sheet to the instrument
8 Dismounting

8.1 Dismounting steps
Take note of chapters "Mounting" and "Connecting to power supply" and carry out the listed steps in reverse order.

8.2 Disposal
The instrument consists of materials which can be recycled by specialised recycling companies. We use recyclable materials and have designed the parts to be easily separable.

**WEEE directive 2002/96/EG**
This instrument is not subject to the WEEE directive 2002/96/EG and the respective national laws. Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points. These may be used only for privately used products according to the WEEE directive.

Correct disposal avoids negative effects on humans and the environment and ensures recycling of useful raw materials.

Materials: see chapter "Technical data"

If you have no way to dispose of the old instrument properly, please contact us concerning return and disposal.
## 9 Supplement

### 9.1 Technical data

#### General data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series</td>
<td>Module unit with plug-in socket for mounting on carrier rail 35 x 7.5 or 35 x 5 according to EN 50022</td>
</tr>
<tr>
<td>Weight</td>
<td>170 g (6 oz)</td>
</tr>
<tr>
<td>Housing material</td>
<td>Noryl SE100, Lexan 920A</td>
</tr>
<tr>
<td>Socket material</td>
<td>Noryl SE100, Noryl SE1 GFN3</td>
</tr>
</tbody>
</table>

#### Voltage supply

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage</td>
<td>20 … 250 V AC, 50/60 Hz, 20 … 72 V DC</td>
</tr>
<tr>
<td>Max. power consumption</td>
<td>3 W (3 … 18 VA)</td>
</tr>
</tbody>
</table>

#### Sensor input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>1</td>
</tr>
<tr>
<td>Data transmission</td>
<td>Analogue</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>100 µA</td>
</tr>
<tr>
<td>Switching threshold</td>
<td>12 mA</td>
</tr>
<tr>
<td>Current limitation</td>
<td>24 mA (permanently short-circuit proof)</td>
</tr>
<tr>
<td>Sensor operating voltage</td>
<td>15 … 18 V DC</td>
</tr>
<tr>
<td>Detection line break</td>
<td>&lt; 2.3 mA</td>
</tr>
<tr>
<td>Detection shortcircuit</td>
<td>&gt; 23.2 mA</td>
</tr>
<tr>
<td>Configuration, connection cable</td>
<td>2-wire</td>
</tr>
<tr>
<td>Resistance per conductor</td>
<td>max. 35 Ω</td>
</tr>
</tbody>
</table>

#### Relay output

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number, function</td>
<td>1 x switching relay (spdt)</td>
</tr>
<tr>
<td>Switching delay</td>
<td>0.2 … 20 s, directional switching</td>
</tr>
<tr>
<td>Mode</td>
<td>A/B switch (A - max. detection or overfill protection, B - min. detection or dry run protection)</td>
</tr>
<tr>
<td>Contact</td>
<td>1 x spdt</td>
</tr>
<tr>
<td>Contact material</td>
<td>AgNi 0.15 hard gold-plated</td>
</tr>
<tr>
<td>Switching voltage</td>
<td>≥ 10 mV DC, ≤ 253 V AC/DC</td>
</tr>
<tr>
<td>Switching current</td>
<td>≥ 10 µA DC, ≤ 3 A AC, 1 A DC</td>
</tr>
<tr>
<td>Breaking capacity</td>
<td>≤ 500 VA, ≤ 54 W DC</td>
</tr>
</tbody>
</table>

#### Transistor output

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number, function</td>
<td>1 output, synchronously switching with the relay</td>
</tr>
<tr>
<td>Galvanic separation</td>
<td>Floating</td>
</tr>
<tr>
<td>Maximum values</td>
<td></td>
</tr>
<tr>
<td>$- U_B$</td>
<td>36 V DC</td>
</tr>
<tr>
<td>$- I_B$</td>
<td>≤ 60 mA, short-circuit proof</td>
</tr>
<tr>
<td>Transistor voltage loss ($U_{CE}$)</td>
<td>approx. 1.5 V at $I_B$ 60 mA</td>
</tr>
</tbody>
</table>
Inverse current ($I_0$) $< 10 \mu\text{A}$

**Adjustment elements**

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIL switch block</td>
<td>for preadjustment of the switching delay and mode</td>
</tr>
<tr>
<td>Test key</td>
<td>for function test</td>
</tr>
<tr>
<td>Control lamps in the front plate</td>
<td></td>
</tr>
<tr>
<td>- Status indication operating voltage</td>
<td>LED green</td>
</tr>
<tr>
<td>- Status indication fault signal</td>
<td>LED red</td>
</tr>
<tr>
<td>- Status indication switching point control</td>
<td>LED yellow</td>
</tr>
</tbody>
</table>

**Ambient conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>-20 ... +60 °C (-4 ... +140 °F), the permissible ambient temperature reduces linear from 60 °C (140 °F) auf 40 °C (104 °F) with an operating voltage of 60 ... 72 V DC</td>
</tr>
<tr>
<td>Storage and transport temperature</td>
<td>-40 ... +70 °C (-40 ... +158 °F)</td>
</tr>
</tbody>
</table>

**Electrical protective measures**

<table>
<thead>
<tr>
<th>Component</th>
<th>Protection rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal conditioning instrument</td>
<td>IP 30</td>
</tr>
<tr>
<td>Terminal socket</td>
<td>IP 20</td>
</tr>
<tr>
<td>Overvoltage category</td>
<td>II</td>
</tr>
<tr>
<td>Protection class</td>
<td>II</td>
</tr>
<tr>
<td>Electrical separating measures</td>
<td>reliable separation (VDE 0106, part 1) between power supply, sensor input, level relay and transistor output</td>
</tr>
</tbody>
</table>

**Approvals**

Depending on the version, instruments with approvals can have different technical data. For these instruments, please note the corresponding approval documents. They are included in the scope of delivery.
9.2 Dimensions

Fig. 23: Dimensions SU 501 Ex
1 Transparent cover
2 Carrier rail 35 x 7.5 or 35 x 15 according to EN 50022
3 Ex separating chamber