SIEMENS

SITRANS

Process monitoring SITRANS DA400 for material flow monitoring

Operating Instructions

7MJ2400-1AA02 device
7MJ2000-1A*00 sensor

07/2008
A5E00841134-02

Safety Guidelines

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠CAUTION

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

CAUTION

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

NOTICE

indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:

⚠WARNING

This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

Trademarks

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Siemens AG
Industry Sector
Postfach 48 48
90327 NÜRNBERG
GERMANY

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Introduction

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1.1 Purpose of this documentation

These instructions contain all the information you need for commissioning and using the device.

It is aimed both at persons mechanically installing the device, connecting it electronically, configuring the parameters and commissioning it as well as service and maintenance engineers.

1.2 History

This history establishes the correlation between the current documentation and the valid firmware of the device.

The documentation of this edition is applicable for the following firmware:

Edition	Firmware ID
02 07/2008	FW: V3.01.**

The most important changes in the documentation when compared with the respective previous edition are given in the following table.

Edition	Remark
01 08/2007	First edition
02 07/2008	Chapter "11.3 Meaning of 8 byte binary status signals" added.

1.3 Further information

Information

The contents of these instructions shall not become part of or modify any prior or existing agreement, commitment or legal relationship. All obligations on the part of Siemens AG are contained in the respective sales contract which also contains the complete and solely

applicable warranty conditions. Any statements contained herein do not create new warranties or modify the existing warranty.

The content reflects the technical status at the time of printing. We reserve the right to make technical changes in the course of further development.

Worldwide contact person

If you need more information or have particular problems which are not covered sufficiently by the operating instructions, get in touch with your contact person. You can find contact information for your local contact person in the Internet.

Product information on the Internet

The Programming Manual is an integral part of the companion CD, which may be ordered separately. In addition, the Programming Manual is available on the Internet on the Siemens homepage.

On the CD you will also find the technical data sheet containing the ordering data, the Device Install software for SIMATIC PDM for subsequent installation and the required software.

See also

Contacts (http://www.siemens.com/processinstrumentation/contacts)

Product information on SITRANS DA in the Internet (http://www.siemens.com/sitransda)

Instructions and Manuals (http://www.siemens.com/processinstrumentation/documentation)

1.4 CE label

This device meets the requirement of EU guidelines:

- 89/336/EEC Guideline of the Council on Aligning Legal Regulations of Member States on Electromagnetic Compatibility (EMV). Revised by
  - 91/263/EEC
  - 92/31/EEC
  - 93/68/EEC
- 94/9/EC Guideline of the European Parliament and the Council on Aligning Legal Regulations of the Member States on Devices and Protective Systems for defined use in areas subject to explosion.

This is communicated by the CE label.

CE 0032

D-76181 Karlsruhe

General safety notes

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2.1 General information

This device left the factory free from safety problems. In order to maintain this status and to ensure safe operation of the device, please observe the safety information and warnings contained in these instructions.

2.2 Correct usage

The device may only be used for the purposes specified in these instructions.

Insofar as they are not expressly stated in these instructions, all changes to the device are the sole responsibility of the user.

2.3 Laws and directives

The regulations of the test certification valid in your country are to be observed.

Electrical connection in hazardous zones with explosive atmospheres

The national directives and laws for hazardous areas valid in your country must be observed for electrical connection. For example, in Germany these are:

- Operational safety regulations
- Directive for the installation of electrical systems in hazardous areas DIN EN 60079-14 (previously VDE 0165, T1)

2.4 Measures to be taken

For the sake of safety, the following precautions must be observed:

⚠ WARNING

"Intrinsically safe" protection type

"Intrinsically-safe" devices lose their certification as soon as they are operated on circuits which do not correspond with the test certification valid in their country. The device's protection level "ia" is reduced to "ib" when intrinsically safe electrical circuits with protection level "ib" are connected.

Protection type "limited energy" nL (zone 2)

Devices with "limited energy" may be connected and disconnected while in operation.

Protection type "non-sparking" nA (zone 2)

Devices with "non-sparking" protection may only be connected and disconnected when off circuit.

⚠ CAUTION

Electrostatic Sensitive Devices (ESD)

This device contains electrostatic sensitive devices. Electrostatic sensitive devices may be destroyed by voltages that are undetectable to a human. Voltages of this kind occur as soon as a component or an assembly is touched by a person who is not grounded against static electricity. The damage to a module as a result of overvoltage cannot usually be detected immediately. It may only become apparent after a long period of operation.

2.5 Qualified Personnel

Qualified personnel are people who are familiar with the installation, mounting, commissioning, and operation of the product. These people have the following qualifications:

- They are authorized, trained or instructed in operating and maintaining devices and systems according to the safety regulations for electrical circuits, high pressures and aggressive as well as hazardous media.
- For explosion-proof devices: They are authorized, trained, or instructed in carrying out work on electrical circuits for hazardous systems.
- They are trained or instructed in maintenance and use of appropriate safety equipment according to the safety regulations.
- They should be trained in first aid.

Description

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3.1 Application range

SITRANS DA400 is a four-channel acoustic diagnostics unit for monitoring material flow.

The SITRANS DA400 detects high frequency sound waves caused by movement through systems and material. The device reacts immediately to changes in the material flow. Therefore, be aware of expensive blockages, material absence, or system malfunction (e.g. due to burst hose filters). This allows an operator to take preventative action and avoid damage.

Common applications include:

- pellets
- powder
- practically every kind of solid in:
  - pipes
  - chutes or vibratory pans
  - pneumatic conveyors
  - aerated gravity flow systems

3.2 Operation

You can operate and configure the SITRANS DA400 using the keys. In parallel, you can also operate the SITRANS DA400 via a PROFIBUS connection.

3.3 Design

3.3.1 Device structure

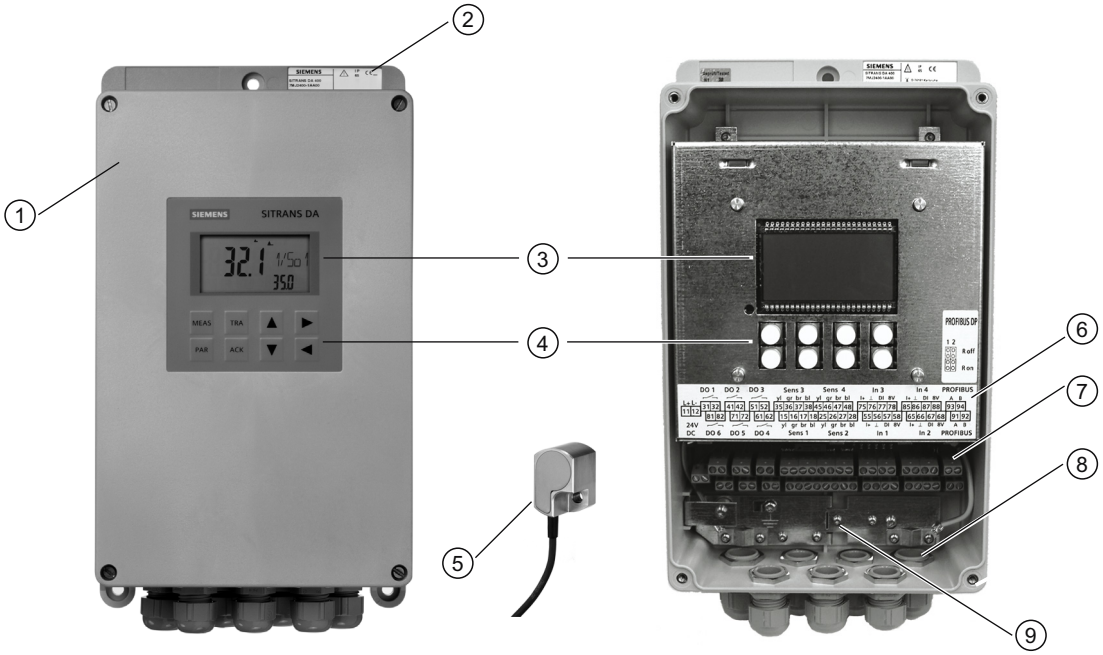

Figure 3-1 Front view (closed and open)

①	Screwable cover	⑥	Terminal connection diagram
②	Type plate	⑦	Terminal strip
③	Digital display	⑧	Cable gland
④	Keypad	⑨	Mounting plate
⑤	Sensor		

3.3.2 Structure of the nameplate

Device

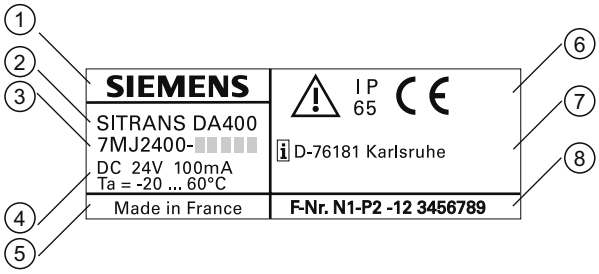

Figure 3-2 Device type plate

①	Manufacturer	⑤	Place of manufacture
②	Product name	⑥	Product information
③	Order no.	⑦	Information address
④	Technical data	⑧	Serial number

Sensor

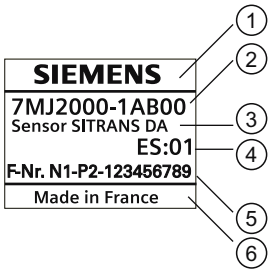

Figure 3-3 Sensor type plate

①	Manufacturer	④	Product version
②	Order no.	⑤	Serial number
③	Product name	⑥	Place of manufacture

3.4 Mode of operation

3.4.1 Principle of measurement

Mode of operation

The SITRANS DA400 uses acoustic emission sensors to detect high-frequency acoustic vibrations. These vibrations are caused by:

- friction and impact of solids in:
  - pipes
  - chutes
  - conveyors
- friction and contact between mechanical parts
- bubbles bursting
- cavitation
- turbulence formation in gas and liquid flows.

Acoustic vibrations conduct well in solids such as metals but are greatly diffused and attenuated in the air. Therefore, the sensor does not sense background noise and allows for non-invasive process and equipment monitoring.

The SITRANS DA400 provides a measuring value in the form of sound level L, which is dependent on the acoustic power. The sound level L produced by the material flow is dependent on the mechanical power. L is calculated with the following formula:

$$L = 10 \log (\eta * P_{mech} / P_0)$$

L	Sound level
η	Energy transfer coefficient, from mechanical to acoustic
P_{mech}	Mechanical output
P_0	Reference output

If a preset limit is exceeded, SITRANS DA400 issues a pre- or main alarm. Depending on the configuration, the alarm signals are output on the digital output. Additionally or alternatively, a PROFIBUS interface is available, which allows for connecting to control systems.

3.4.2 Sensor operation

The acoustic emission sensor works on the piezoelectric principle. The acoustic emission is injected into the sensor via the sensor base (mounting surface) and inside it is converted into an electrical voltage by a piezoceramic element. This is amplified in the sensor and transmitted via the cable.

The sensor frequency range lies in the ultrasonic range (>20 kHz). The sensor is non-directional, i.e. the angle at which the sound wave is incident on the sensor base is not important.

3.4.3 Operation of the electronics

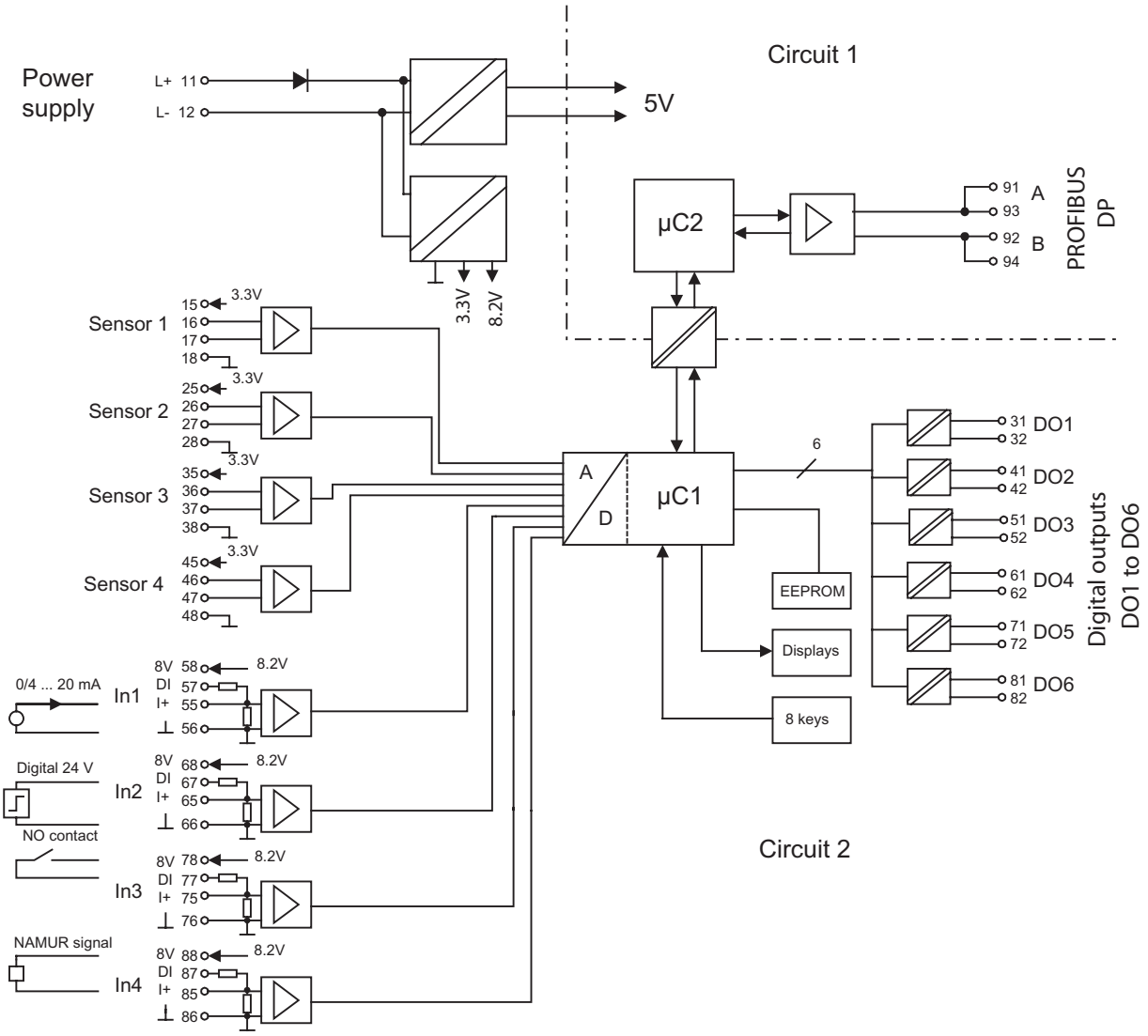

Figure 3-4 Block diagram

L+	Power supply +	I+	Analog current input +
L-	Power supply -	⊥	Mass
DO	Digital output	DI	Digital input
Sens	Sensor	A	PROFIBUS DP Signal A (green)
In	Universal input	B	PROFIBUS DP Signal B (red)

The 24 V DC power supply uses a polarity reversal protection diode to supply the internal supply voltage of 5 V for circuit 1 and 3.3 V and 8.2 V for circuit 2. Circuits 1 and 2 are isolated from the power supply and from one another. Circuit 1 consists of a microcontroller (µC2), which is responsible for PROFIBUS communication. It is connected to the microcontroller (µC1) in circuit 2 by a serial, isolated coupling. At the heart of this circuit is a signal processor with integrated analog-to-digital converter for high-speed recording and evaluation of the available signals. Furthermore, an EEPROM for storage of data even in the case of power failure and the display are actuated and the buttons are read in.

The six digital outputs are individually isolated and act as normally open contacts, i.e. they are either low resistance or high resistance. The maximum of four acoustic emission sensors are connected to the four-pole "Sens1" to "Sens4" blocks. In each case, two terminals provide the supply for the sensor electronics and two terminals are used to connect the sensor signal.

Different standard signals can be connected at each of the four universal inputs "In 1" to "In 4". The wiring of the four terminals must be adapted depending on the signal or sensor type (0/4 to 20 mA, digital signal 24 V, normally open contact, NAMUR proximity sensor).

Installation

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4.1 Safety information for installation

Ambient temperature

⚠ WARNING

Fire hazard

Fire hazard resulting from hot surfaces. When installing the sensor, take note of the surface temperature of the installation site.

Overview

The SITRANS DA400 and the sensor are mounted in different ways. In general:

Note

Protection against harmful outside influences

To protect the SITRANS DA400 against harmful outside influences, a housing should be fitted. Harmful external influences can occur if you install the SITRANS DA in the open air, where it can be influenced by intensive frost, heat or rain.

4.2 Mounting the device

Condition

To mount the device, you need three screws with a diameter of 6 mm. These are not supplied with the device.

Mounting the device

1. Screw the three screws through the mounting holes to mount the device. The position of the mounting holes and the mounting dimensions in millimeters are indicated on the rear of the housing.
2. Mount the device preferably at a right angle with the cable gland pointing downward.

4.3 Mounting the acoustic emission sensor

Condition

To mount the acoustic emission sensor, you need the following:

- One hexagon socket-head screw M6x16
- One positioning pin ∅ 3x10

They are included in the scope of delivery.

Mounting the acoustic emission sensor

1. Mount each acoustic emission sensor individually on the pipe or chute.
2. Mount the acoustic emission sensor preferably near a bend or in a position where a high sound level is produced by impact.

Note

Do not mount the sensor in the vicinity of restrictive points, such as:

- partially shut control valves
- baffles
- other places with reduced pressure

There is a good acoustic coupling if no elastic elements such as seals or the like are located between the sensor and the wall. Thus, there are good ferrous connections. The wall must be made of metal or some other highly sound conductive material.

The acoustic emission is coupled to the sensor via the sensor base. Therefore, the housing foundation must be uniformly even, smooth, and be at least as large as the sensor base.

It is not permissible to have an air gap between the sensor base and housing or wall.

If necessary, use a viscous lubricating grease to improve the coupling. The lubricating grease is not included in the scope of delivery.

The following figure demonstrates an optimal mounting of the acoustic emission sensor:

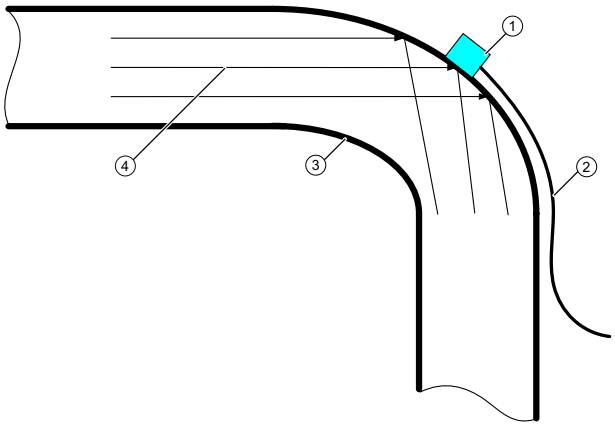

Figure 4-1 Optimal mounting of a acoustic emission sensor

① Acoustic emission sensor
② Connection cable
③ Pipe
④ Flow direction

Connecting

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5.1 Safety notes and conditions

Safety notes

⚠ WARNING

To ensure safe operation of this device, it must be properly installed and commissioned by qualified personnel in adherence to the warning notices. This includes both the general safety regulations for working on high voltage systems (e.g. DIN VDE) and the regulations relating to proper use of tools and the use of personal protective equipment (goggles, protective gloves etc.).

Caution - the power supply is to be shut off before opening the device. Non-compliance can result in death, severe physical injury and/or significant damage.

Note

All connecting leads inside the device should be kept short.

To ensure the degree of protection according to IP65 for the device, only the permissible cable diameters may be used.

Required tools

You will need the following screwdrivers:

- To open the housing: Screwdriver for M4 slotted screws
- For connecting terminals: Screwdriver for M2.5 slotted screws
- Shielding connections: T10 screwdriver for M3 torx-slotted screws
- Earthing: T20 screwdriver for M4 torx-slotted screws

5.2 Terminal assignment

Terminal connection diagram

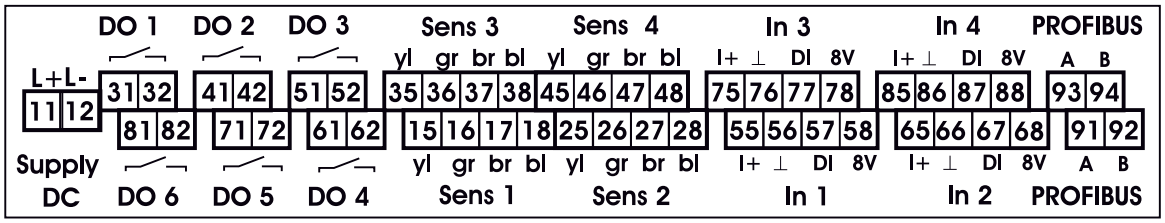


Figure 5-1 Terminal connection diagram

L+	Power supply +	br	Brown
L-	Power supply -	bl	Black
DO	Digital output	I+	Analog current input +
Sens	Sensor	⊥	Mass
In	Universal input	DI	Digital input
yl	Yellow	A	PROFIBUS DP Signal A (green)
gr	Green	B	PROFIBUS DP Signal B (red)

See also

Connecting signal inputs (Page 25)
Connecting the power supply (Page 28)
Connecting PROFIBUS DP (Page 27)

5.3 Cable gland

General procedure

The leads are generally connected as follows:

1. Unscrew the cover and place it next to the device.
2. Loosen the cable gland.
3. Remove the sealing stopper.
4. Connect the desired lead.
5. Tighten the cable gland.

Arrangement of cable glands

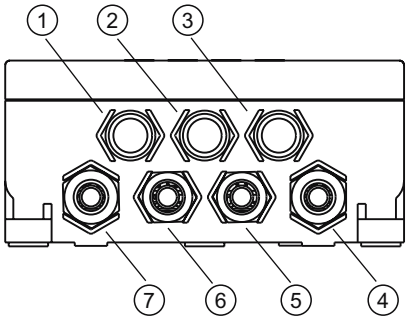


Figure 5-2 Arrangement of cable gland

①	Cable gland for digital outputs "DO 1" to "DO 6"
②	Cable gland for signal inputs "In 1" and "In 3"
③	Cable gland for signal inputs "In 2" and "In 4"
④	Cable gland for PROFIBUS
⑤	Cable gland for sensors 2 and 4
⑥	Cable gland for sensors 1 and 3
⑦	Cable gland for power supply L+ and L- and earthing

See also

Connecting PROFIBUS DP (Page 27)
Connecting acoustic emission sensors (Page 24)
Terminal assignment (Page 22)

5.4 Connecting acoustic emission sensors

Procedure

The procedure for connecting the acoustic emission sensors is as follows:

1. Select the corresponding cable gland:
   Sensor 1 and 3 through cable gland ⑥
   Sensor 2 and 4 through cable gland ⑤
2. Completely loosen one screw on the mounting plate (Torx T10).
3. Use this screw to attach the cable lug for the shielding connection.
4. Connect the four lines to a four-way block, "Sens1" to "Sens4".
   Observe the color scheme.

Cable color	Terminal symbol	Sensor 1	Sensor 2	Sensor 3	Sensor 4
Yellow	yl	15	25	35	45
Green	gr	16	26	36	46
Brown	br	17	27	37	47
Black	bl	18	28	38	48

See also

Cable gland (Page 23)

5.5 Connecting digital outputs

Procedure

For up to six digital outputs, it is recommended that you use a 12-wire cable, which is fed through a cable gland ①.

See also

Cable gland (Page 23)

Terminal assignment (Page 22)

5.6 Connecting signal inputs

General information

- The cable glands ② and ③ , each with two openings, are available for up to four signal inputs "In 1" to "In 4".
- Cable gland ② should be used for signal inputs "In 1" and "In 3".
- Cable gland ③ should be used for signal inputs "In 2" and "In 4".
- When wiring several signal sources (analog current and 24 V digital signal), it must be ensured that the four inputs relate to a common internal mass. Terminals 56, 66, 76 and 86 (if used) should therefore lead to a central star point in the system.

Connecting the analog current 0/4 to 20 mA

Connect the analog current line in accordance with the following table:

Current signal	Terminal symbol	In 1	In 2	In 3	In 4
I+	I+	55	65	75	85
I-	⊥	56	66	76	86

Connecting the 24 V digital signal

Connect the signal line in accordance with the following table:

Digital signal	Terminal symbol	In 1	In 2	In 3	In 4
+	DI	57	67	77	87
-	⊥	56	66	76	86

Connecting the digital signal in line with NAMUR

NOTICE
Polarity The signal sensor is supplied from the 8.2 V source and the current produced is measured. Correct polarity must be ensured.

Connect your signal in accordance with the following table:

Digital signal	Terminal symbol	In 1	In 2	In 3	In 4
+	8V	58	68	78	88
-	I+	55	65	75	85

Connecting the passive normally open contact

Note

Polarity

A normally open contact switches the 8.2 V signal to the digital input. A particular polarity is not necessary.

Connect your signal in accordance with the following table:

Digital signal	Terminal symbol	In 1	In 2	In 3	In 4
Contact 1	8V	58	68	78	88
Contact 2	DI	57	67	77	87

See also

Cable gland (Page 23)

Terminal assignment (Page 22)

5.7 Connecting PROFIBUS DP

Condition

NOTICE
Bus cable Use only certified bus cables for PROFIBUS DP (e.g. 6XV1830-0EH10).

Procedure

The procedure for connecting PROFIBUS DP is as follows:

1. Strip the bus cable as shown in the figure below.
2. Loosen the right-hand cable clamp.
3. Pass the bus cable through the cable gland ④.
4. Attach the cable shield to the cable clamp and reconnect the earth cable.
5. Connect the green wire to terminal 91 and the red wire to terminal 92.

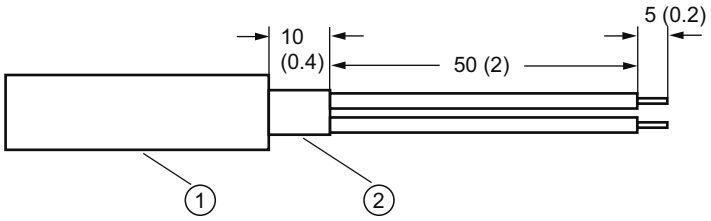


Figure 5-3 PROFIBUS cable, dimensions in mm (inches)

① Bus cable
② Cable shield

Note

If the device is the last in a PROFIBUS stream, set both coding bridges to "Ron" position, otherwise to "Roff" position.

See also

Cable gland (Page 23)

Terminal assignment (Page 22)

5.8 Connecting the power supply

Procedure

The procedure for connecting the power supply is as follows:

1. Pass the connecting leads L+, L- and the earth cable through the cable gland ⑦.
2. Connect L+ to terminal 11 and L- to terminal 12.
3. Connect the earth cable to the earthing clamp on the mounting plate.

Note

Electromagnetic Compatibility

To guarantee high EMC interference immunity, the earth cable should be kept as short as possible.

In addition, a compensating line with as large a cross-section as possible is strongly recommended between the sensors and the earthing point.

See also

Cable gland (Page 23)

Terminal assignment (Page 22)

Operation

6

6.1 Overview of digital display and buttons

Introduction

The acoustic diagnostics unit has eight measurement channels. These measurement channels are operated and configured via the measuring menu, parameter menu and trace menu. All signals received from the eight measurement channels are displayed in the measuring menu.

The measuring menu, parameter menu and trace menu are accessed via the operator buttons. The following sections describe how these menus are operated and what can be set and configured using these menus. All important information on the parameters is described in the parameter list in the "Parameter list" section.

Digital display and buttons

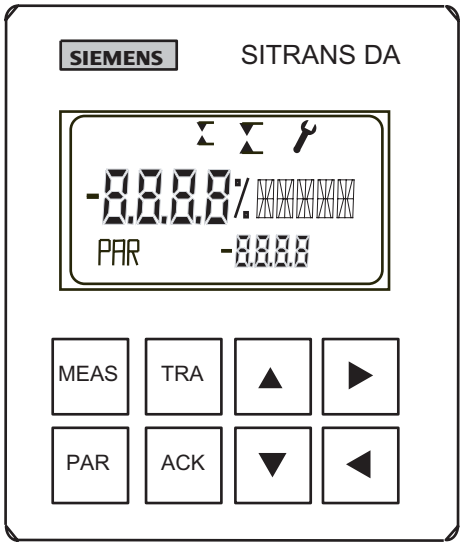


Figure 6-1 Digital display and buttons

Meaning of buttons

<MEAS>	Measuring: return to measuring menu
<PAR>	Parameters: call up the parameter menu
<TRA>	Trace: call up the trace menu to display and reset various timers
<ACK>	Acknowledge In the measurement menu: Acknowledge an alarm that has been set off In the trace menu: Resetting timers
▲	Value is larger
▼	Value is smaller
▶	Scroll forwards in measurement channel list, parameter list and trace list
◀	Scroll backwards in measurement channel list, parameter list and trace list

See also

Parameter list (Page 44)

6.2 Digital display

Introduction

The sections below give an overview of the elements that appear in the digital display.

Layout

Pressing the <MEAS> button in the measuring menu activates a test of the digital display, see the following figure:

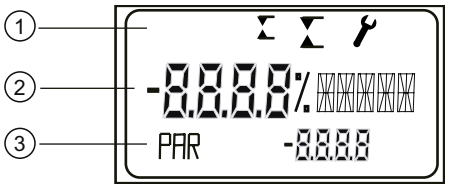


Figure 6-2 Digital display

① Upper section
② Middle section
③ Lower section

Description

In the upper section ① of the digital display, alarm messages are indicated using symbols:

- Pre-alarm
- Main alarm
- Summation alarm

In the middle section ②, the digital display shows the following, depending on the selected menu:

- Measured value or fault symbol, parameter value, timer value (trace)
- Channel number, parameter name, timer name (trace)

In the lower section ③, the digital display shows the following, depending on the selected menu:

- PAR in parameter menu only
- Value for main alarm or limit value, parameter number, time unit in trace menu.

6.3 Measurement menu

6.3.1 Overview and digital display in the measuring menu

Introduction

The measuring menu is used to:

- Display measured values of the measurement channels.
- Display alarms.
- Acknowledge alarms from the acoustic channels.

Elements of the digital display in the measuring menu

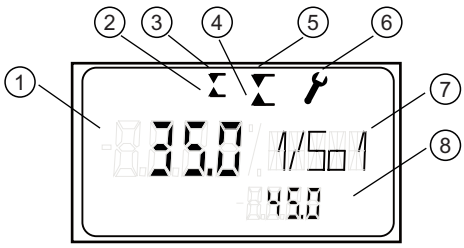


Figure 6-3 Digital display, acoustic channel

①	Measured value	⑤	Main alarm received
②	Pre-alarm not received	⑥	Summation alarm received
③	Pre-alarm received	⑦	Number and name of the measurement channel
④	Main alarm not received	⑧	Value of the main alarm threshold in measuring mode

6.3.2 Measurement channel list

The acoustic diagnostics unit has a total of eight measurement channels:

- 4 acoustic channels
- 4 universal inputs

All eight measurement channels are listed in the following measurement channel list. There is a brief explanation of which functions are available in each channel.

Table 6-1 Measurement channel list

Measurement channel	Meaning	Digital display figure	Terminal assignment figure	Available functions
1	Acoustic channel 1	1/So1	Sens 1	Measuring mode, simulation mode, test mode, acknowledge alarm
2	Acoustic channel 2	2/So2	Sens 2	
3	Acoustic channel 3	3/So3	Sens 3	
4	Acoustic channel 4	4/So4	Sens 4	
5	Universal input 1	5/In1	In 1	Measuring mode
6	Universal input 2	6/In2	In 2	
7	Universal input 3	7/In3	In 3	
8	Universal input 4	8/In4	In 4	

6.3.3 Operating the measuring menu

Procedure

The measured value of a measurement channel is displayed as follows:

1. Press the <MEAS> button to switch to the measuring menu.
2. Select the measurement channel with the ◀ and ▶ buttons. The measured value of the measurement channel is shown in the digital display.

Note

Disconnected measurement channels

Measurement channels configured with "oFF" are not displayed. This is set in the parameters P.1 to P.4 and P.26 to P.29. If all measurement channels are "oFF", "oFF/ALL" appears in the digital display.

Note

Switching the device on

After you have switched on the device, the device automatically switches to the measuring menu.

Automatic switching of the measurement channel

If a pre or main alarm is set on a measurement channel, the digital display automatically switches over to this acoustic channel. If a main alarm is set, the measured value flashes in the display.

Summation alarm

The summation alarm is set if one of the main alarms of an acoustic channel is set.

Sensor fault

If a measurement channel is defective, e.g. due to separation of the sensor cable or infringement of the valid measuring range, the digital display will appear as follows:

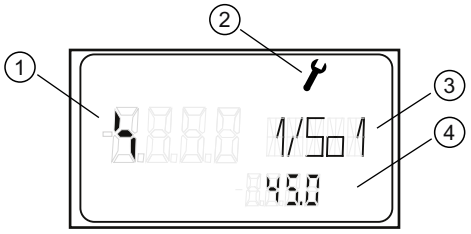


Figure 6-4 Digital display, acoustic channel defective

① Symbol for sensor fault
② Summation alarm, received from other acoustic channels
③ Number and name of the measurement channel
④ Associated value of the main alarm in dB

Function test of the digital display

The digital display is tested as follows:

Press the <MEAS> button. If all elements of the digital display are visible, the digital display is functioning correctly.

6.3.4 Acoustic channels

6.3.4.1 Measuring mode

Introduction

The current measured values from the signal processing are displayed in the measuring mode.

Condition

The measurement channel must be in measuring mode. The measurement channel is in measuring mode if the parameter P.1 to P.4 associated with the measurement channel is set to "on L", "on H", "on_L" or "on_H".

Elements of the digital display in measuring mode

Once you have configured the acoustic channel, the digital display shows the following, for example, depending on the setting selected:

Figure 6-5 Digital display measuring mode, acoustic channel

35.0	Measured value in dB; flashes if main alarm received
1/So1	Set measured channel 1
45.0	Limit value of the main alarm in dB set in measurement channel 1

Acknowledging alarms

Alarms are acknowledged as follows:

Press the <ACK> button for 5 seconds to reset the alarm. "rES" flashes in the digital display for 5 seconds. The alarm is then reset.

Note

If no alarm was set, "noAL" is shown to the left in the middle section of the digital display.

Note

Condition

Alarms can only be acknowledged if the parameter value is set to "P.14/ACK" = "¬St.Ac" or "St.Ac".

See also

Parameter list (Page 44)

6.3.4.2 Simulation mode

Introduction

The simulation mode supports the commissioning of the device. In simulation mode, you can check the following without real measured values:

- The correct setting of the alarm thresholds.
- The correct parameterization of the digital outputs.

In simulation mode, a simulated measured value is displayed in the digital display, which is adjustable with the ▼ and ▲ buttons.

Note

Adjusting simulated measured values

A acoustic emission sensor does not need to be connected to simulate a measured value.

Condition

The measurement channel must be in simulation mode. The measurement channel is in simulation mode if the parameter P.1 to P.4 associated with the measurement channel is set to "SIMU".

Elements of the digital display in simulation mode

The following figure shows the elements of the digital display:

Figure 6-6 Digital display simulation mode, acoustic channel

35.0	Simulated measured value in dB; flashes if main alarm received
1/So1	Set measured channel 1
SIMU	Note that the simulation mode is active.

Procedure

In order to simulate the measured values, proceed as follows:

1. **Setting parameters for simulation mode**

   Press the <PAR> button for 5 seconds. "MEnu" is shown to the left in the middle section of the digital display. "PARAM" is shown to the right in the middle. "MEnu" flashes.

2. Use the ◀ and ▶ buttons to select the parameters for the measurement channel to be simulated. For measurement channel "1/So1", this is "P. 1" (SoCH1) for example.

3. Using the ▲ and ▼buttons, set the parameter value to "SIMU". "SIMU" is shown to the left in the middle section of the digital display. The digital display appears as follows:

   Middle section: SIMU SoCH1

   Lower section: PAR P. 1

   Simulation mode is set.

4. Briefly press the <MEAS> button. This returns you to the measuring menu.
5. **Setting the measurement channel**

   Use the ◀ and ▶ buttons to select the measurement channel which you wish to simulate. Measurement channels 1 to 4 (1/So1 to 4/So4) are possible. For example, if measurement channel 1 is selected, "1/So1" is displayed to the right in the middle section of the digital display. "SIMU" is shown in the lower section of the digital display.
6. Using the ▲ and ▼ buttons, set the desired measured value.
7. Check whether the alarms are displayed accordingly in the digital display.
8. Make sure that the correct digital output is de-energized.
9. **Switch to the measurement mode to exit the simulation mode**

   Switch to the parameter menu by pressing the <PAR> button for five seconds. The parameter "P.1" (SoCH1) remains selected.
10. Using the ▲ and ▼ buttons, set the parameter value "on L", "on H", "on_L" or "on_H".
11. Briefly press the <MEAS> button. This returns you to the measuring menu.

Note

Exiting the simulation mode

The simulation mode is not automatically ended. Exit the simulation mode as described above.

Note

Timers

If pre or main alarms are set in simulation mode, the timers count the trace function. If necessary, set the counters back manually.

6.3.4.3 Test mode

Introduction

Test mode is used to check whether:

- The acoustic emission sensor is assigned to the correct acoustic channel.
- The acoustic emission sensor is functioning.

In test mode, the acoustic emission sensor is sensitive to both temporary knocking noise as well as permanent flow-generated noise. The maximum sound pressure level measured is saved and displayed.

Condition

The measurement channel must be in test mode. The measurement channel is in test mode if the parameter P.1 to P.4 associated with the measurement channel is set to "tESt".

Elements of the digital display in test mode

Figure 6-7 Digital display test mode, acoustic channel

35.0	Generated measured value in dB; flashes if main alarm received
1/So1	Set measured channel 1
tESt	Notification that the test mode is activated.

Procedure

The measurement channel is tested as follows:

1. **Setting parameters for test mode**

   Press the <PAR> button for 5 seconds. "MEnu" and "PARAM" are shown in the middle section of the digital display to the left and right respectively. "MEnu" flashes.

2. Use the ◀ and ▶ buttons to select the parameters for the measurement channel to be simulated. For measurement channel "1/So1", this is "P. 1" (SoCH1) for example.

3. Use the ▲ and ▼ buttons to set the parameter value "tESt". "tESt" is shown to the left in the middle section of the digital display. The digital display appears as follows:

   Middle section: tESt SoCH1

   Lower section: PAR P. 1

   Test mode is set.

4. Briefly press the <MEAS> button. This returns you to the measuring menu.
5. **Setting the measurement channel**

   Use the ◀ and ▶ buttons to select the measurement channel which you wish to test. Measurement channels 1 to 4 (1/So1 to 4/So4) are possible. For example, if measurement channel 1 is selected, "1/So1" is displayed to the right in the middle section of the digital display. "tESt" is shown in the lower section of the digital display.
6. Create a test noise, for example by knocking on the sensor with a screw driver or blasting the sensor with compressed air.
7. Check whether the measured value displayed to the left in the middle section of the digital display has increased. The maximum measured value generated is saved and displayed in the digital display. The measured value is reset to zero by pressing the <ACK> button for 5 seconds.
8. **Switch to the measurement mode to exit the test mode**

   Switch to the parameter menu by pressing the <PAR> button for five seconds. The parameter "P.1" (SoCH1) remains selected.
9. Using the ▲ and ▼ buttons, set the parameter value "on L", "on H", "on_L" or "on_H".
10. Briefly press the <MEAS> button. This returns you to the measuring menu.

Note

Exiting the test mode

The test mode is not automatically exited. This must be carried out manually via parameterization. This takes place via parameters P.1 to P.4.

Note

Timers

If pre or main alarms are set in test mode, the timers count the trace function. These counters must be manually reset if necessary.

See also

Parameter list (Page 44)

6.3.5 Universal inputs

6.3.5.1 General

The four universal inputs are used to monitor analog signals and digital signals for limit values.

6.3.5.2 Analog input

Introduction

You may use external transmitters with the following analog output signals:

- Analog signal 0-20 mA
- Analog signal 4-20 mA

Condition

The measurement channel must be configured as an analog input. The measurement channel is configured as an analog input if the parameter P.26 to P.29 associated with the measurement channel is set to the value "0-20", "4-20", "20-0" or "20-4".

Elements of the digital display with analog inputs

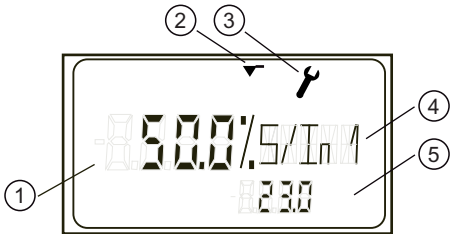


Figure 6-8 Measuring menu digital display, analog input

① Standardized measured value; flashes if alarm received. The measuring range selected with the parameter 26 to 29 is standardized to 0 to 100%.
② Limit value exceeded.
③ Summation alarm received from acoustic channels.
④ Number and name of the measurement channel
⑤ Associated limit value (here, parameter "P.30/ALI1").

See also

Parameter list (Page 44)

6.3.5.3 Digital input

Introduction

You may use external transmitters with the following digital output signals:

- Digital signal as per NAMUR
- Digital signal 24 V
- Passive normally open contact

Condition

The measurement channel must be configured as a digital input. The measurement channel is configured as a digital input if the parameter P.26 to P.29 associated with the measurement channel is set to the value "24 V" or "¬24 V".

Elements of the digital display with digital inputs

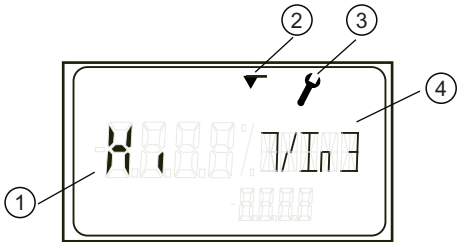


Figure 6-9 Measuring menu digital display, digital input

① Measured value Lo or Hi
② Hi limit value exceeded
③ Summation alarm received from acoustic channels
④ Number and name of the measurement channel

See also

Parameter list (Page 44)

6.4 Parameter menu

6.4.1 Parameter menu overview

Introduction

The parameter menu is used to set the function of the device and the measurement channels with the parameters.

Elements of the digital display in the parameter menu

Figure 6-10 Parameter menu digital display

① Parameter value
② Parameter name
③ Parameter number

6.4.2 Parameter list

Parameter no.	Parameter name	Parameter value	Factory setting	Meaning
P. 0	SWREV	3.00.00		SW version (not adjustable)
P. 1	SoCH1		oFF	Acoustic channel 1
		oFF		Channel switched off
		on L		Channel in measurement mode, normal measuring sensitivity
		on H		Channel in measurement mode, normal measuring sensitivity, pre and main alarm received in event of sensor fault
		SIMU		Channel in simulation mode
		tESt		Channel in test mode
P. 2	SoCH2	oFF, on L, on H	oFF	Acoustic channel 2 / See P.1
P. 3	SoCH3	oFF, on L, on H	oFF	Acoustic channel 3 / See P.1
P. 4	SoCH4	oFF, on L, on H	oFF	Acoustic channel 4 / See P.1
P. 5	PrAL1	0 to 99.9	99.9	Pre-alarm channel 1
P. 6	AL1	0 to 99.9	99.9	Main alarm channel 1
P. 7	PrAL2	0 to 99.9	99.9	Pre-alarm channel 2
P. 8	AL2	0 to 99.9	99.9	Main alarm channel 2
P. 9	PrAL3	0 to 99.9	99.9	Pre-alarm channel 3
P.10	AL3	0 to 99.9	99.9	Main alarm channel 3
P.11	PrAL4	0 to 99.9	99.9	Pre-alarm channel 4
P.12	AL4	0 to 99.9	99.9	Main alarm channel 4
P.13	TIME	0 to 9999	0	Response time for alarms coming from acoustic channels in seconds
P.14	AcK		oFF	Type of alarm acknowledgement
		oFF		Alarm not stored, no acknowledgement
		¬St.Ac		Alarm not stored, acknowledgement stops until next response
		St.Ac		Alarm stored, acknowledgement stops until next response
P.15	doPR1	oFF, do1, do2, do3, do4, do5, do6, ¬do1, ¬do2, ¬do3, ¬d04, ¬do5, ¬do6	oFF	Status signal assignment: Pre-alarm 1 to hardware output (do : digital output / ¬ : inverse)
P.16	doAL1	As P.15	do1	Main alarm 1
P.17	doPR2	As P.15	oFF	Pre-alarm 2
P.18	doAL2	As P.15	do2	Main alarm 2
P.19	doPR3	As P.15	oFF	Pre-alarm 3
P.20	doAL3	As P.15	do3	Main alarm 3
P.21	doPR4	As P.15	oFF	Pre-alarm 4
P.22	doAL4	As P.15	do4	Main alarm 4
P.23	doFAI	As P.15	oFF	Input fault summation signal
P.24	doFAu	As P.15	oFF	Internal fault summation signal

Parameter no.	Parameter name	Parameter value	Factory setting	Meaning
P.25	P ouT	PoS / inv	PoS	Output polarity
P.26	INP1		oFF	Function of universal input 1:
		oFF		Without function
		24 V		24 V digital signal > 7 V -> High, passive normally open contact closed-> High
		¬24 V		¬24 V digital signal < 4.5 V -> High, passive normally open contact open -> High
		nAM		Namur digital signal > 2.1 mA -> High
		¬nAM		Namur digital signal < 1.1 mA -> High
		0-20		Analog signal 0 to 20 mA->0 to 100%
		4-20		Analog signal 4 to 20 mA->0 to 100%
		20-0		Analog signal 20 to 0 mA->0 to 100%
		20-4		Analog signal 20 to 4 mA->0 to 100%
		noPA		Parameter lock
P.27	INP2	As P.26		Function of universal input 2
P.28	INP3	As P.26		Function of universal input 3
P.29	INP4	As P.26		Function of universal input 4
P.30	AL I1	-5.0% to 105.0%	105.0%	Universal input 1 alarm (analog current function only)
P.31	AL I2	-5.0% to 105.0%	105.0%	Universal input 2 alarm (analog current function only)
P.32	AL I3	-5.0% to 105.0%	105.0%	Universal input 3 alarm (analog current function only)
P.33	AL I4	-5.0% to 105.0%	105.0%	Universal input 4 alarm (analog current function only)
P.34	do I1	oFF, do1, do2, do3, do4, do5, do6, ¬do1, ¬do2, ¬do3, ¬d04, ¬do5, ¬do6	oFF	Status signal assignment Universal input 1
P.35	do I2	As P.34	oFF	Status signal assignment Universal input 2
P.36	do I3	As P.34	oFF	Status signal assignment Universal input 3
P.37	do I4	As P.34	oFF	Status signal assignment Universal input 4
P.38	bUSNr	0 to 126	126	PROFIBUS address
P.41	DMP1	0 to 30	0	Low-pass filter time acoustic channel 1
P.42	DMP2	0 to 30	0	Low-pass filter time acoustic channel 2
P.43	DMP3	0 to 30	0	Low-pass filter time acoustic channel 3
P.44	DMP4	0 to 30	0	Low-pass filter time acoustic channel 4

See also

Parameter lock (Page 47)

6.4.3 Setting parameters

Procedure

The procedure for setting a parameter is as follows:

1. Press the <PAR> button for five seconds to switch to the parameter menu.

   "MEnu" and "PARAM" are shown in the middle section of the digital display to the left and right respectively. "MEnu" flashes. After these 5 seconds, the appearance of the digital display is as shown below.
2. Select the parameters with the ◀ and ▶ buttons.
3. Set the value of the parameter using the ▼ and ▲ buttons.

Note

Adjustment of the parameter value takes effect immediately.

Press the <MEAS> button to return to the measured value display. At this point, the adjusted parameters are saved to ensure operation even in case of power failure.

If the parameter lock is effective, "noPA" appears in the digital display when you attempt to make the adjustment and it is not possible to adjust the parameter.

6.4.4 Displaying the software version

Introduction

The software version has the format "xx.yy.zz" (e.g., "3.00.01").

Procedure

When the parameter P.0 is selected, "xx.yy" (e.g., "3.00") appears in the digital display.

By simultaneously pressing the ▲ and ▼ buttons, ". .zz" (e.g. ". .01") appears in the digital display.

6.4.5 Parameter lock

You can activate a parameter lock by special use of a universal input.

To do that, an electrical connection must be set up (e.g., wire jumper in the device, external key switch) and an appropriate input parameter must be assigned.

input	Configuration	Connecting terminals
In 1	P.26/INP1 = noPA	57 = 58
In 2	P.27/INP2 = noPA	67 = 68
In 3	P.28/INP3 = noPA	77 = 78
In 4	P.29/INP4 = noPA	87 = 88

If several inputs are parameterized with the function "noPA," the function will be activated upon switching on ("ORing").

See also

Parameter list (Page 44)

6.5 Trace menu

6.5.1 Trace menu overview

Introduction

The trace menu is used to display and reset timers. The following timers are displayed in the trace menu:

- Operating time of the device
- Times at which the alarms were activated

Elements of the digital display in the trace menu

Figure 6-11 Trace menu digital display

① Timer value
② Timer name
③ Time unit

6.5.2 Trace menu list

Timer value	Time unit	Timer name	Meaning
0 to 9999	SEc	P1-UP	"*UP" is the time before receipt of the final alarm, in which the associated alarm limit has been exceeded.
0 to 60 Hours.Minutes Days.Hours	Min h_M d_h	P1-T	"*-T" is the accumulated time since the associated alarm was received.
0 to 9999	SEc	A1-UP	See remark for timer name "P1-UP"
0 to 60 Hours.Minutes Days.Hours	Min h_M d_h	A1-T	See remark for timer name "P1-T"
0 to 9999	SEc	P2-UP	See remark for timer name "P1-UP"

Timer value	Time unit	Timer name	Meaning
0 to 60 Hours.Minutes Days.Hours	Min h_M d_h	P2-T	See remark for timer name "P1-T"
0 to 9999	SEc	A2-UP	See remark for timer name "P1-UP"
0 to 60 Hours.Minutes Days.Hours	Min h_M d_h	A2-T	See remark for timer name "P1-T"
0 to 9999	SEc	P3-UP	See remark for timer name "P1-UP"
0 to 60 Hours.Minutes Days.Hours	Min h_M d_h	P3-T	See remark for timer name "P1-T"
0 to 9999	SEc	A3-UP	See remark for timer name "P1-UP"
0 to 60 Hours.Minutes Days.Hours	Min h_M d_h	A3-T	See remark for timer name "P1-T"
0 to 9999	SEc	P4-UP	See remark for timer name "P1-UP"
0 to 60 Hours.Minutes Days.Hours	Min h_M d_h	P4-T	See remark for timer name "P1-T"
0 to 9999	SEc	A4-UP	See remark for timer name "P1-UP"
0 to 60 Hours.Minutes Days.Hours	Min h_M d_h	A4-T	See remark for timer name "P1-T"
0 to 60 Hours.Minutes Days.Hours Years.Days	Min h_M d_h y_d	oP-T	Resettable. The resettable timer "oP-T" (operation time) can be used to display the operating time after re-installation or repair.
- - - -	ALL	RESET	
0 to 60 Hours.Minutes Days.Hours Years.Days	Min h_M d_h y_d	LIV-T	Not resettable. The LIV-T Timer (live time) is not resettable, and shows the running time of the device.

Explanation of timer names using example of "P1-UP" and "P1-T"

P	Pre-alarm (PrAL)
1	Acoustic channel 1
UP	This is the time before the sounding of the final alarm, in which the associated alarm limit is exceeded.
T	This is the accumulated time since the associated alarm was received.

Explanation of timer names using example of "A3-UP" and "A3-T"

A	Main alarm (AL)
3	Acoustic channel 3
UP	This is the time before the sounding of the final alarm, in which the associated alarm limit is exceeded.
T	This is the accumulated time since the associated alarm was received.

6.5.3 Displaying and resetting timers

Procedure

The procedure for displaying a timer is as follows:

1. Press the <TRA> button for five seconds to switch to the trace menu.

   "MEnu" and "TRACE" are shown in the middle section of the digital display. "MEnu" flashes. After these 5 seconds, the appearance of the digital display is as shown below.

2. Choose the timer with the ◀ or ▶ buttons.

Note

Timers for acoustic channels that are configured with "oFF" (possible for parameters P.1 to P.4) are not displayed.

Resetting timers

The <ACK> button is used to reset the selected value. "rES" flashes in the digital display for 5 seconds. The value is then set to 0. If the parameter lock is activated, "noRE" is displayed and the value is not reset.

It is possible to reset all timers using the following setting in the trace menu:

All the timers except the runtime meter of the device are reset ("LIV-T" timer).

6.6 Examples

6.6.1 Example Acoustic channel 1

Acoustic channel 1 (1/So1) should:

- Work with normal measuring sensitivity.
- Trigger a measured value alarm in the event of a sensor fault.
- A pre-alarm from measured value 20 dB.
- A master alarm from measured value 40 dB.
- Alarm after value exceeded for 60 s.
- Save alarm.
- Not report pre-alarm.
- Report main alarm with digital output 1.

Procedure

1. Connect the acoustic emission sensor, as described in the "Connecting acoustic emission sensors" section.
2. Press the <PAR> button for five seconds to switch to the parameter menu.
3. Using the ◀ and ▶ buttons, set parameter "P. 1".
4. Using the ▲ and ▼ buttons, set the parameter value "on H".
5. Using the ◀ and ▶ buttons, set parameter "P. 5".
6. Using the ▲ and ▼ buttons, set the parameter value "20". A pre-alarm is triggered from 20 dB.
7. Using the ◀ and ▶ buttons, set parameter "P. 6".
8. Using the ▲ and ▼buttons, set the parameter value "40". A main alarm is triggered from 40 dB.
9. Using the ◀ and ▶ buttons, set parameter "P. 13".
10. Using the ▲ and ▼ buttons, set the parameter value "60". The alarm is triggered after 60 seconds.
11. Using the ◀ and ▶ buttons, set parameter "P. 14".
12. Using the ▲ and ▼ buttons, set the parameter value "St.Ac". Alarms are saved.
13. Using the ◀ and ▶ buttons, set parameter "P. 15".
14. Using the ▲ and ▼ buttons, set the parameter value "oFF". Pre-alarms are not reported.
15. Using the ◀ and ▶ buttons, set parameter "P. 16".
16. Using the ▲ and ▼ buttons, set the parameter value "doAL1". Main alarms are reported with digital output 1.

See also

Connecting acoustic emission sensors (Page 24)

6.6.2 Example universal input 1

Procedure

1. Connect the transmitter, as described in the "Connecting signal inputs" section.
2. Press the <PAR> button for 5 seconds. This opens the parameter menu.
3. Use the ◀ and ▶ buttons to select the parameters P.26 to P.29 associated with the universal input.

   Example: If the external transmitter is connected to terminals 55 to 58, select parameter P.26.
4. Using the ▲ and ▼ buttons, set the associated parameter value. If, for example, a transmitter with an output signal 0 to 20 mA is connected, set the parameter value "0-20".
5. Next the alarm limit is set. This is done via one of the parameters P.30 to P.33. Again use the ◀ and ▶ buttons, to select the associated parameter. In our example, parameter P.30 is to be selected for universal input 1.
6. Using the ▲ and ▼ buttons, set the desired parameter value. The parameter value set is displayed to the left in the middle section of the digital display.
7. As a final step, you must set the digital output at which the alarm is to be displayed. This is done via one of the parameters P.34 to P.37. Use the ◀ and ▶ buttons to select the associated parameter. In our example, parameter P.34 is to be selected for universal input 1.
8. Using the ▲ and ▼ buttons, set the desired parameter value. For example, "do1" for displaying the alarm at digital output 1.
9. Press the <MEAS> button to return to the measuring menu.

Note

Alarm limit

The alarm limits set via parameters P.30 to P.33 are only effective with analog inputs. With digital inputs, the values given in the "Specification" apply as switching thresholds.

See also

Connecting signal inputs (Page 25)

Signal processing

7

7.1 Evaluating acoustic channels

Introduction

Essentially, the four sensor inputs are evaluated according to the same principle, with the only differences being in the signal names and/or the associated parameters. If a channel is disconnected due to its configuration (P.1, P.2, P.3 or P.4 set to "oFF"), the measured value is set to "0" and no alarm is generated.

The evaluation takes place in two steps:

1. Calculation of the measured value as shown in the "Block diagram for calculation of the measured value" figure.
2. Formation of the alarm messages as shown in "Block diagram for the formation of alarm messages" figure.

Step 1: Calculation of the measured value

In accordance with the "Block diagram for calculation of the measured value" figure, the electrical signals from the sensors are amplified, filtered and converted into a digital signal by an analog-to-digital converter. The sensors are simultaneously checked for cable failure. The level is calculated from the signal and then filtered and further processed to a measured value. The upper limit frequency of the filter is defined with parameters P.40 to P.44. Depending on the parameters (P.1 to P.4), the sound level to be output as the measured value is defined separately for each measurement channel:

- A simulated value in simulation mode.
- The maximum value in test mode.
- The low-filtered sound level in normal measurement mode.

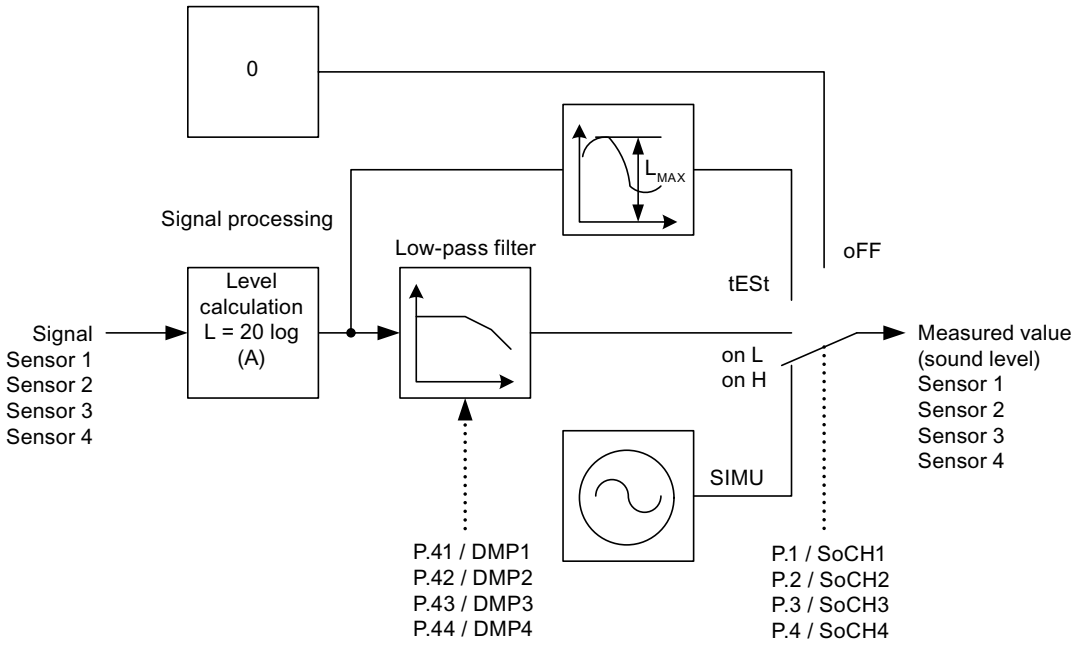


Figure 7-1 Block diagram for calculation of the measured value

Step 2: Formation of the alarm messages

In accordance with the "Block diagram for the formation of alarm messages" figure, the measured value is then monitored with a limit monitor with hysteresis for exceeding of a pre-alarm "PrAL*" (parameters P.5, P.7, P.9, P.11) and a main alarm "AL*" (parameters P.6, P.8, P.10, P.12).

The resulting signals "PrAL'*" and "AL'*" are used for evaluation by various trace timers. The final alarms "PrAL*" and "AL*" are generated only when the signals "PrAL'*" and "AL'*" are present for the configurable time "P.13/Time". The same response time also applies if the value is below the alarm values. When the main alarm responds, the pre-alarm is also activated.

Depending on parameter P.14/AcK, the alarms "PrAL*" and "AL*" are saved and can be reset with the "ACK" button.

In the event of a sensor fault (cable failure), the alarm for the damaged channel will be generated in addition to the fault summation message depending on configuration (P.1, P.2, P.3, P.4).

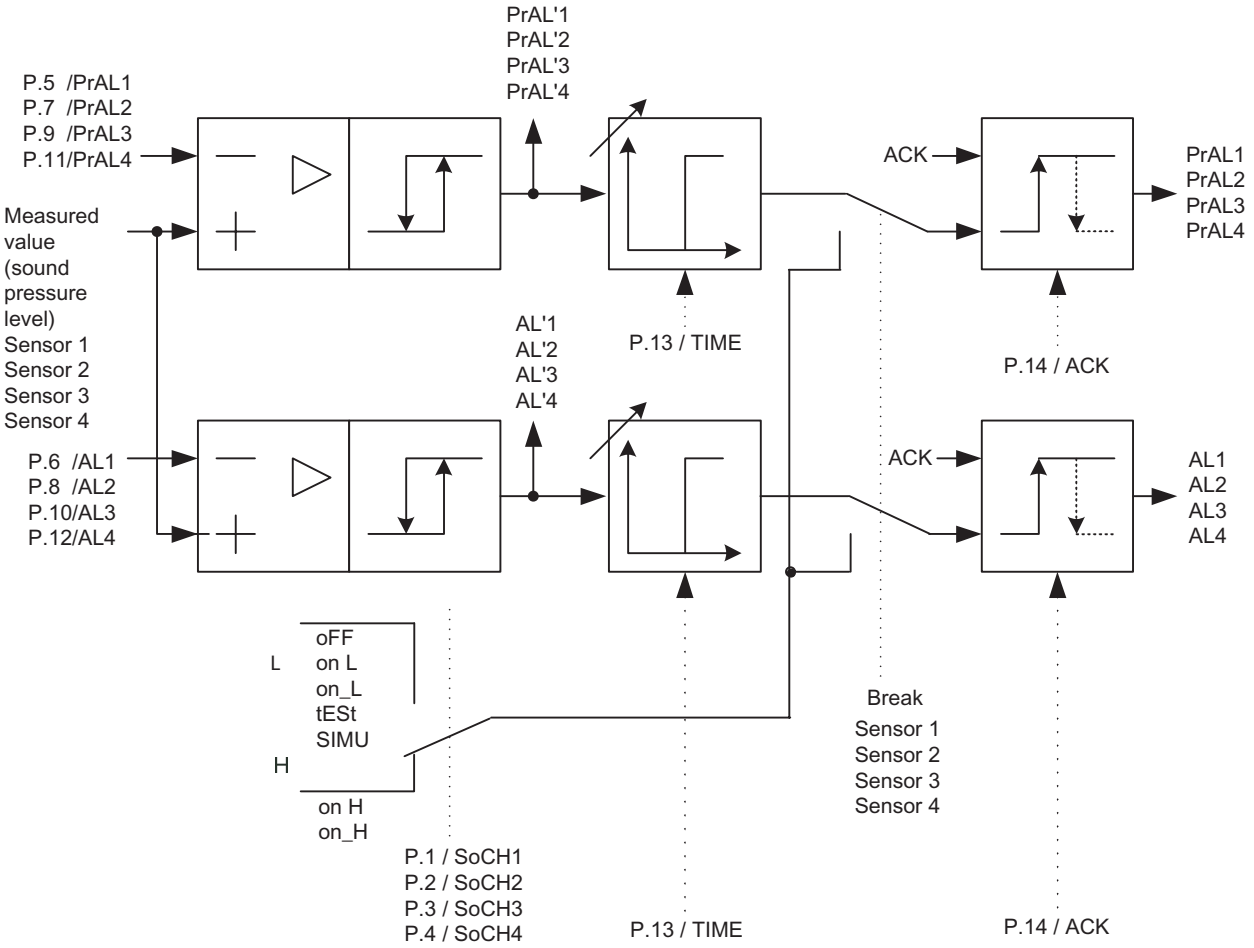


Figure 7-2 Block diagram for formation of the alarm messages

7.2 Evaluation universal inputs

7.2.1 Universal input evaluation overview

Essentially, the four universal inputs are evaluated according to the same principle, with the only differences being in the signal names and/or the associated parameters.

The wiring and configuration (P.26 to P.29) should be adapted for the relevant signal type.

7.2.2 Evaluation of analog current signals

Relates to parameters

Parameter no.	Parameter name	Adjustment/display range	Comment
P.26 to P.29	"INP1" to "INP4"	0-20 4-20 20-0 20-4	Analog signal 0 to 20 mA->0 to 100% Analog signal 4 to 20 mA->0 to 100% Analog signal 20 to 0 mA->0 to 100% Analog signal 20 to 4 mA->0 to 100%
P.30 to P.33	"ALI1" to "ALI4"	-5.0% to 105.0%	Alarm for universal inputs 1 to 4

Procedure

The analog current signal is changed by internal measurement resistance into a voltage that is strengthened, filtered, and changed via an analog-digital exchanger into a digital signal. This measured value passes through a low pass filter with a fixed time constant. The measured value is then monitored for under and overflow, which is used to derive a fault message if appropriate. The following standardization is performed depending on the setting for the selected parameter:

P.*	0 %	100%
0 to 20	0 mA	20 mA
4 to 20	4 mA	20 mA
20 to 0	20 mA	0 mA
20 to 4	20 mA	4 mA

The percentage value obtained can then be displayed. It is then monitored to see if it exceeds the associated alarm "P.30/ALI*" to "P.33/ALI*". The digital signal "dol*" is then obtained. If the state is "0", the ▲ symbol (alarm not received) is displayed, if the state is "1", the ▼ symbol (alarm received).

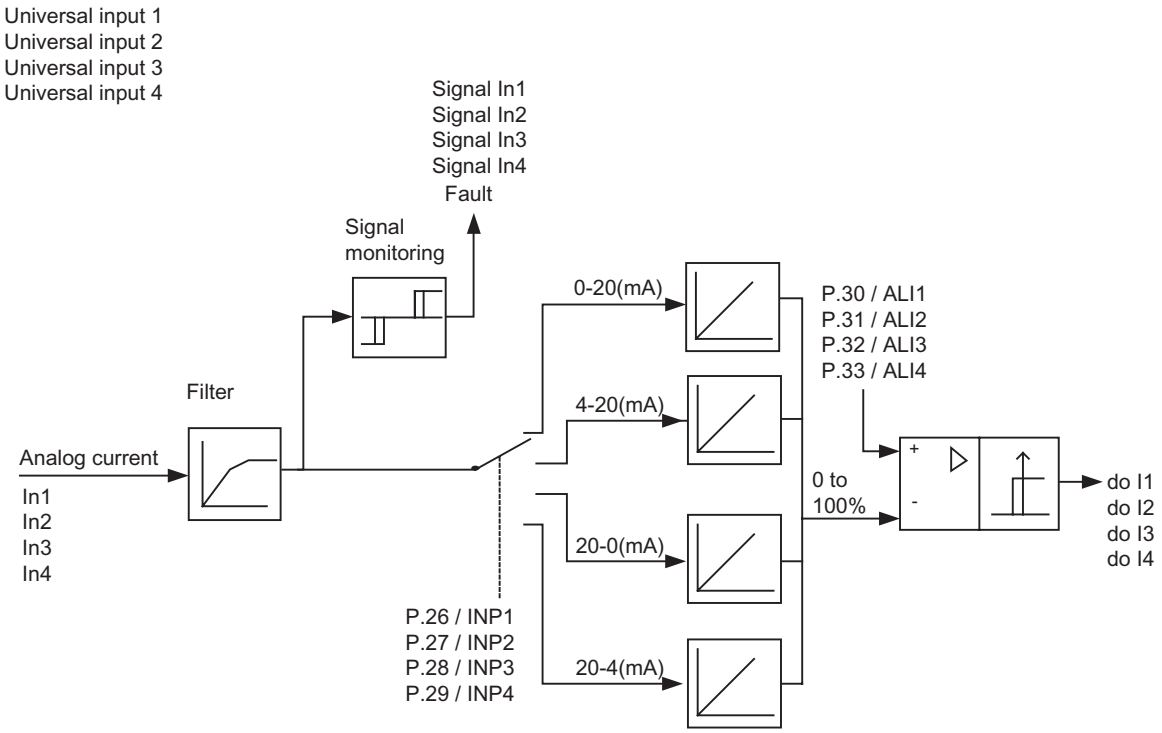


Figure 7-3 Universal input function diagram

7.2.3 Evaluation of 24 V digital signals

Relates to following parameters

Parameter no.	Parameter name	Adjustment/display range	Remark
P.26 to P.29	"INP1" to "INP4"	"24V" and "¬24V"	24 V-Digital signal >7 V -> High ¬24 V-Digital signal <4.5 V -> High

Evaluation

The electrical (voltage) signal is converted into a current by a multiplier and measured. This is described in the "Evaluation of analog current signals" section. A comparator then uses this value to determine the Low or High level for the signal. The threshold value is set so that a normally open contact also generates a High signal via the 8.2 V source. With the parameter setting "¬24 V", the digital signal is inverted.

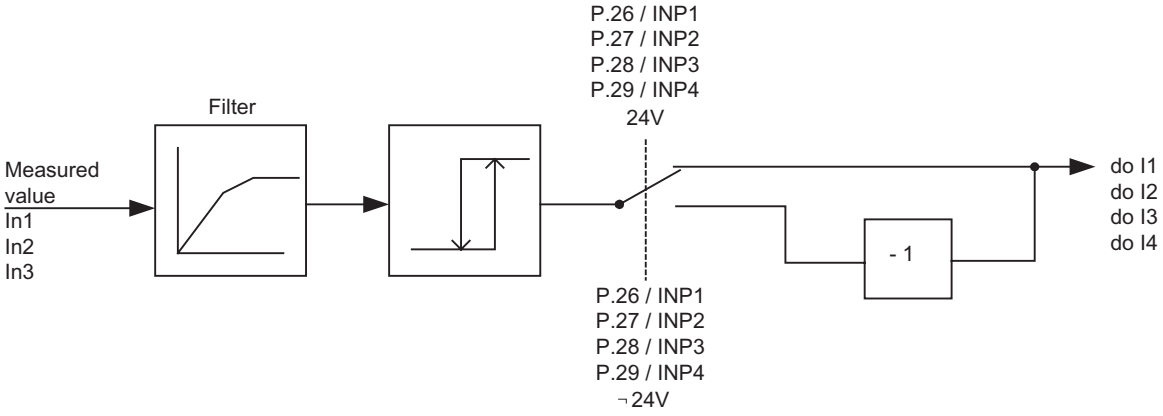


Figure 7-4 24 V digital signal function diagram

See also

Evaluation of analog current signals (Page 56)

7.2.4 Evaluation of digital signals in line with NAMUR

Relates to following parameters

Parameter no.	Parameter name	Adjustment/display range	Remark
P.26 to P.29	"INP1" to "INP4"	nAM ¬nAM	NAMUR digital signal >2.1 mA -> High ¬NAMUR digital signal <1.1 mA -> High

Evaluation

With an 8.2 V supply, NAMUR signal sensors deliver an output current of < 1.1 mA (state "0") or > 2.1 mA (state "1") for the two digital states. This current is measured as described under "Evaluation of analog current signals". The measured value is monitored to check that it stays within the area delimitation. If necessary, a fault message is generated. The measured value is then checked for its two signal states and the corresponding digital signal is generated. If the configuration "¬nAM" is selected, the digital signal is inverted.

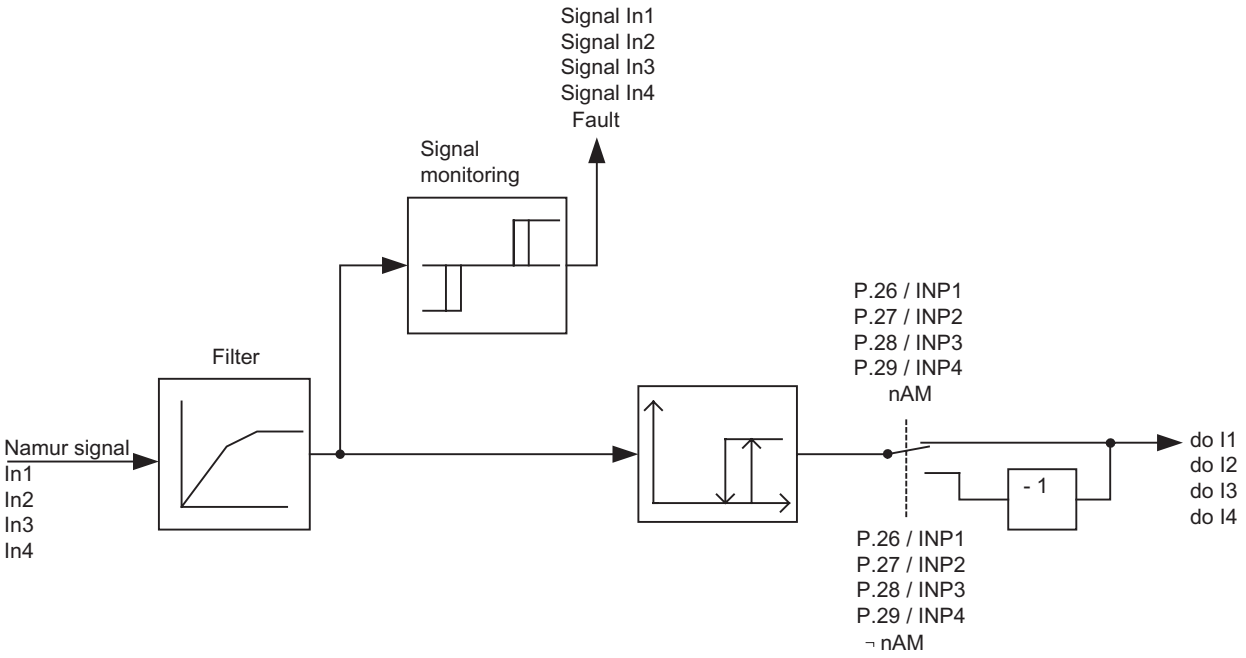


Figure 7-5 NAMUR digital signal function diagram

7.3 Processing input faults

Input fault message

The fault signal "doFAI" is created from the OR of the following input fault messages:

- Failure of the acoustic emission sensors
- Universal input signal fault, e.g. > 21 mA for analog current

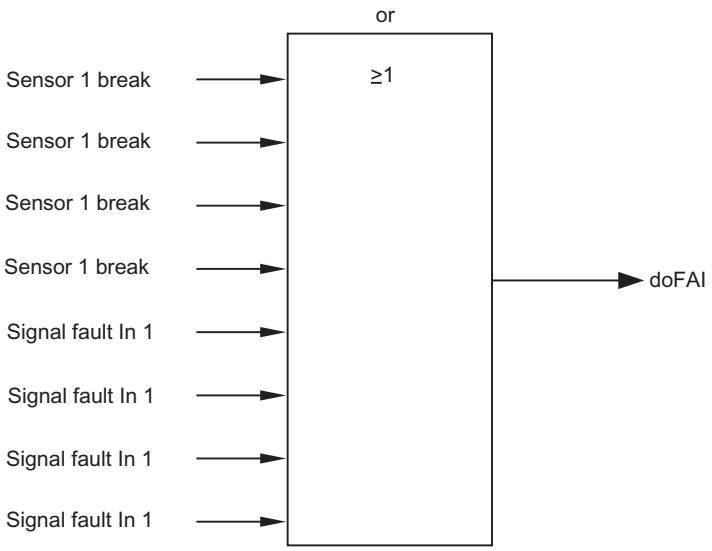


Figure 7-6 Input faults

7.4 Activation of digital outputs

Actuation of digital outputs

The following internal digital signals are output at the 6 digital outputs "DO 1" to "DO 6":

- Pre-alarms "PrAL1" to "PrAL4"
- Main alarms "AL1" to "AL4"
- Limit exceeded/digital signal "doI1" to "doI4" from universal inputs
- Group fault signal for "doFAI" inputs
- Internal fault report (storage device/microcontroller) "doFAU"

The signal flow corresponds to positive logic. This means that a positive signal at the digital output results in low-impedance closing.

You can use the parameters P.15 to P.24 and P.34 to P.37 to select the digital output to be used to output the associated signal. You can also select whether the signal is to be output inverted.

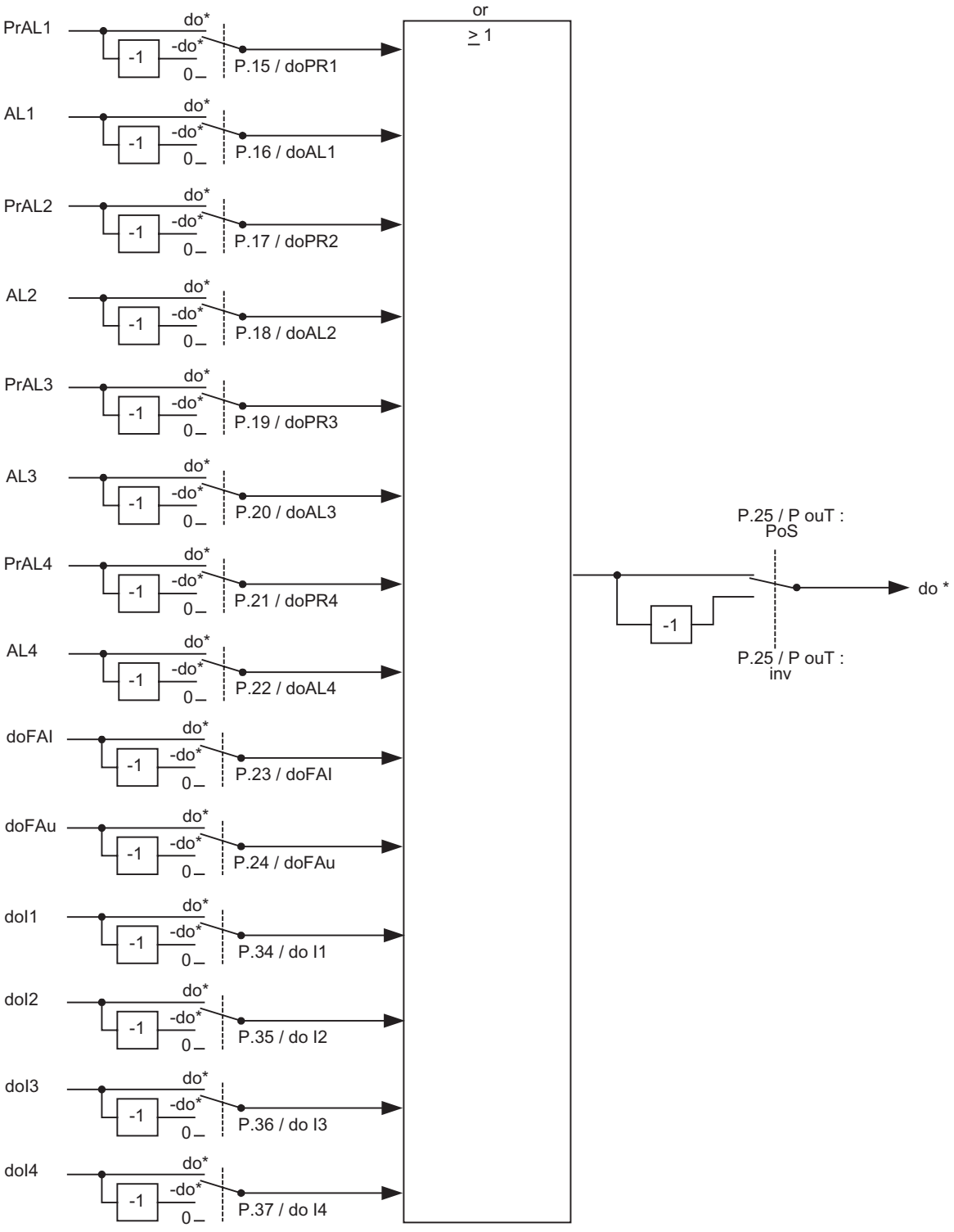


Figure 7-7 Digital output function diagram

* for digital outputs 1 to 6

Example

P.20/doAL3 = do4	The main alarm on acoustic channel 3 is output on digital output 4.
P.22/doAL4 = ¬do6	The main alarm on acoustic channel 4 is output inverted on digital output 6.

Note

The parameter "P.25/P ouT" reverses the direction of action for all outputs.

7.5 Alarm acknowledgement

The effect of the parameter "P.14/AcK" is described below. For simplification, no hysteresis is plotted in the time diagram. The parameter value "P.13/TIME" for the response time is 0. The parameter "P.14/AcK" can be set to three values:

oFF	Acknowledgment here with the <ACK> button is not possible. The alarm occurs exclusively upon exceeding or not reaching the alarm value.
St.Ac	Stored and can be acknowledged Time 1: Alarm value exceeded, alarm is output. Time 2: Acknowledgement with <ACK> button, alarm is reset. Time 3: Alarm is only set if the alarm value is exceeded again. Time 4: Value below alarm value, alarm remains saved. Time 5: Acknowledgement with <ACK> button, alarm is reset.
¬St.Ac	Not stored but can be acknowledged Time 1: Alarm value exceeded, alarm is output. Time 2: Acknowledgement with <ACK> button, alarm is reset. Time 3: Alarm is only set if the alarm value is exceeded again. Time 4: Value below alarm value and alarm canceled.

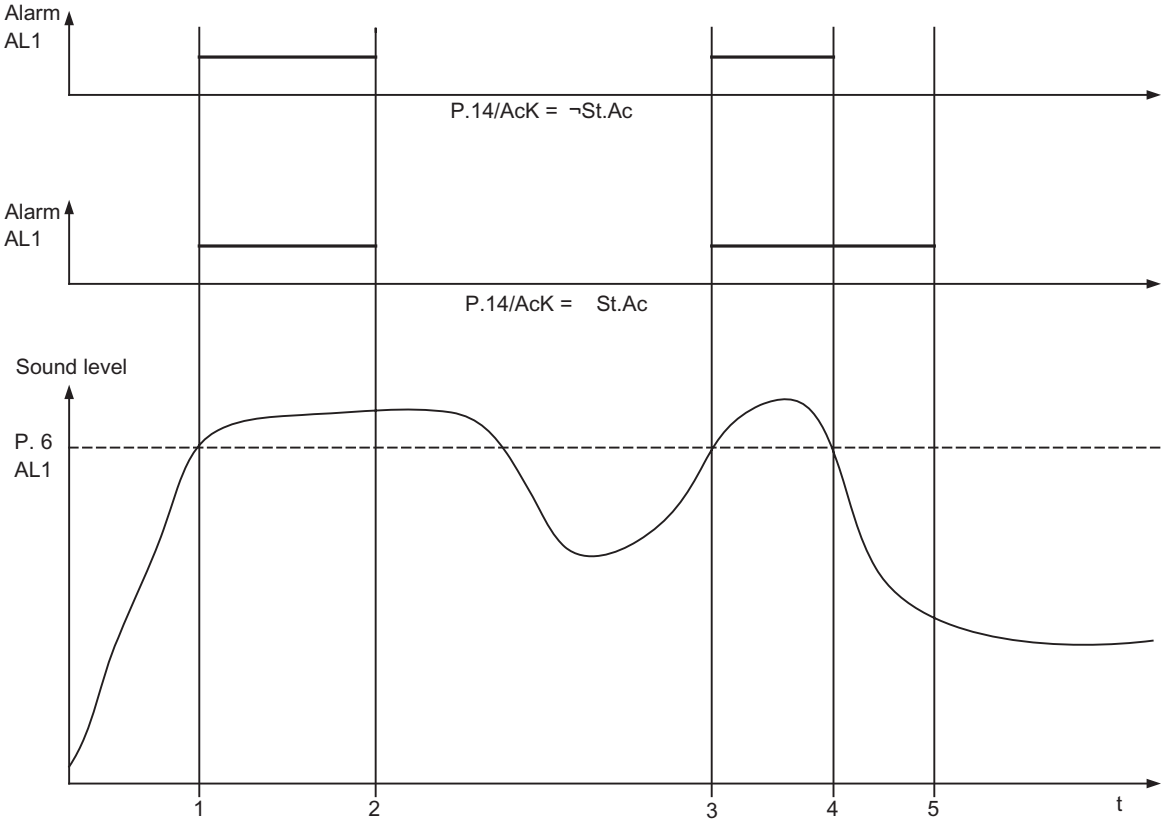


Figure 7-8 Acknowledgement evaluation

7.6 Trace function

Timer control

The effect of the parameter "P.13/TIME" and the function of the trace timers "A1-UP" and "A1-T" are described below using the example of acoustic channel 1 and the main alarm "P.6/AL1". The same function applies to all other channels, alarms (AL) and pre-alarms (PrAL).

The "*-UP" timers can be used to identify a temporary violation, before the final alarm is triggered. The "*-T" timers indicate how long the alarm has been responding for. This can be used to derive a schedule for repairs.

Time 1	The measured value exceeds the alarm value and timer "A1-UP" begins counting.
Time 2	The measured value falls below the alarm value hysteresis without the time criterion "P.13/TIME" being reached. The timer "A1-UP" stops and retains its value.
Time 3	As for time 1
Time 4	As for time 2
Time 5	As for time 1
Time 6	The time criterion "P13/TIME" is met. The alarm "AL1" is output. Timer "A1-UP" retains its value. Timer "A1-T" starts to count the time.
Time 7	The measured value falls below the alarm value hysteresis and activates the time criterion "P.13/TIME" again.
Time 8	The time "P13/TIME" has expired. The alarm is reset. Timer "A1-T" stops.

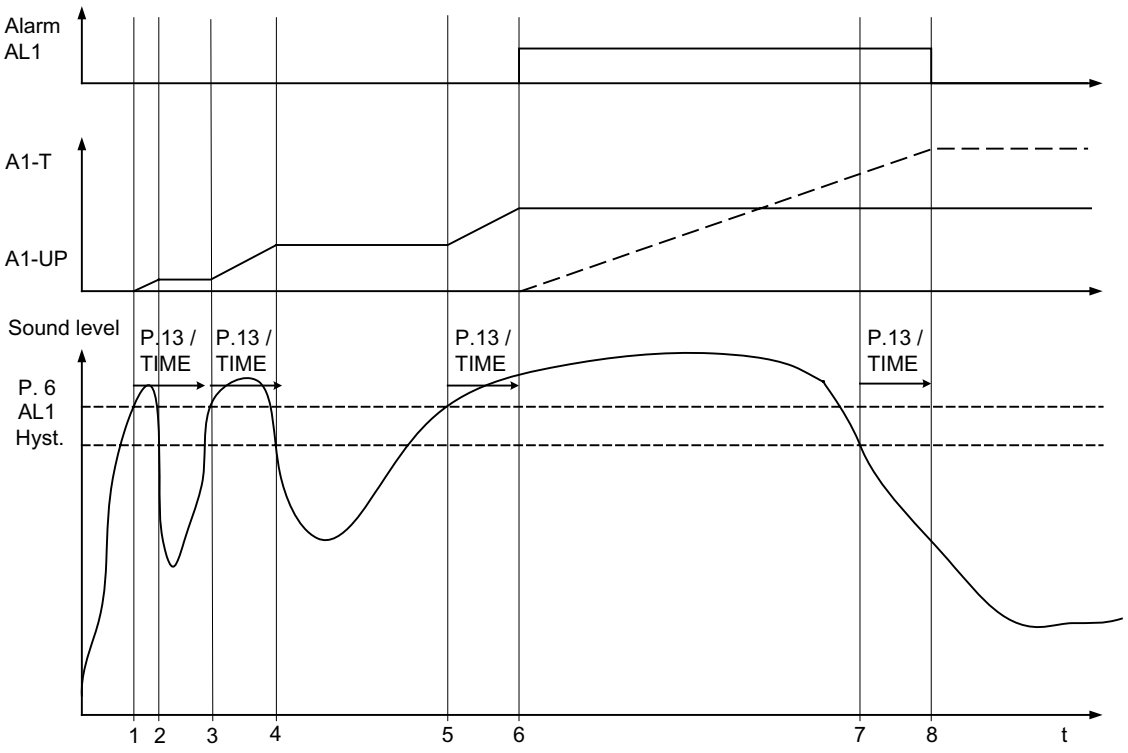


Figure 7-9 Trace evaluation

Commissioning

8

8.1 Overview

Introduction

The following description is limited to the most critical information for commissioning/mass flow detection.

The device does not need any tools or special equipment for commissioning.

The procedure for configuration is described in more detail in the "Operation" section. The setting can only be optimized while the system is in operation. This is described below.

Note

The limits for the acoustic channels are set at the factory at the maximum value of 99.9 (no alarm). All universal inputs are set to "oFF" (no signal assignment).

Condition

The notes and values specified serve only as a guide. It is necessary to define settings that are appropriate for your requirements and purpose.

NOTICE

Signal sensitivity

Your personal specifications and settings determine the signal sensitivity of the diagnostics unit. Limits that are too narrowly defined may lead to frequent fault signals. Limits that are too generously defined may result in the alarm being late or not being triggered at all.

NOTICE

Ensure that all electrical connections and the installation of the sensors have been carried out properly and the cover is closed.

Note

Regularly check the settings defined after the commissioning and correct them if necessary.

8.2 Recommendation for choosing parameters

8.2.1 Preparation

Note

After turning on the power supply, the device performs a self-test "SELF Test". After completion of the self-test, approximately 5 seconds, the device is ready to use. Acoustic channel 1 "1/SO1" is shown in the digital display.

Procedure

1. Turn on the power supply on the device.
2. Be certain that there is sufficient material flowing in the pipe or duct to specify the limit.
3. For each measurement channel used, set the parameters P.1 to P.4 associated with the measurement channel to the value "on L" or "on H". Leave measurement channels not used on "oFF".
4. For each measurement channel used, set the parameters P.41 to P.44 associated with the measurement channel to the value "0 s".
5. Observe the measured value for each acoustic channel for about one minute. The subsequent procedure depends on the measured values read here. These are described in the following sections.

8.2.2 Damping using parameters P.41, P.42, P.43 and P.44

These parameters are used to optimally adjust the response time of the diagnostics unit. The greater the set parameter value is, the less the effect of brief fluctuations on the measured value.

Increase the parameter associated with the measured value until the fluctuations of the measured value are less than ±3 dB under normal operating conditions.

8.2.3 Main alarm threshold via parameters P.6, P.8, P.10 and P.12

When the set value is exceeded (longer period of time than the response time P.13), the main alarm signals that there is a sufficient mass flow or a permissible mass flow has been exceeded.

Not every signal necessarily indicates permanent shortfall or exceedance.

Thus, set the value for the main alarm in such a way that small sound level increases will not produce a signal. In this case, use a pre-alarm if necessary. Set the limit value for the main alarm at a value which is around 3 dB over the largest of the measured values read off.

8.2.4 Pre-alarm threshold via parameters P.5, P.7, P.9 and P.11

Damage development can be detected with the pre-alarm. Frequency and time intervals are used here as statistical aids.

Select the limit value such that it performs the task you want it to. We recommend that you set the pre-alarm to half the value of the main alarm limit.

8.2.5 Response time via parameter P.13

Time that has to pass before the value exceeding or falling below the limits causes an alarm to be output or an alarm to be reset.

The signal behavior of the diagnostics unit can be optimized by using the response time. This allows you to prevent momentary alarms from being triggered.

Note

The response time setting applies to all measurement channels for incoming and outgoing signals.

8.2.6 Alarm storage via parameter P.14

If you activate the alarm memory function, you prevent an alarm that has been triggered once from being deleted again, e.g., when the system was shut off after an alarm signal.

8.2.7 Check installation and configuration

To check the sensors, switch the measurement channel to test mode. This makes it possible to check whether the correct sensor is on the correct measurement channel.

To check the correct configuration of the alarm thresholds and assignments to the digital outputs, the measurement channel can be switched to simulation mode.

8.2.8 Commissioning after a repair

After a repair, you have to reset the timer in the trace menu, if necessary. Use the the menu item "Reset All".

Technical data

9

9.1 Technical data for the device

input	
Acoustic channels	4
• Cycle time	10 ms
• Alarm monitoring hysteresis	1 dB of the alarm parameter
• Measuring range	0 ... 100 dB
Universal inputs	4
• Cycle time	10 ms
• Low pass filter time	1 s
Universal analog current input	
• Load	< 105 Ω
• Resolution	0,1 %
• Accuracy	0,5 %
• Fault message	> 21 mA or< 3.6 mA (at 4 ... 20 mA)
• Alarm monitoring hysteresis	0,5 %
• Static destruction limit	40 mA, 4 V
Universal input 24 V digital signal	
• Input resistance	> 19 kΩ
• Signal level Low	≤ 4.5 V or open
• Signal level High	> 7 V
• Hysteresis	> 1 V
• Static destruction limit	±40 V
8.2 V source for NAMUR signal (DIN EN 60947-5-6)	
• Open circuit voltage	8.2 V ± 0.3 V, short circuit-proof
• Internal resistance	< 950 Ω
• Static destruction limit for incorrect wiring	+20 V/-10 V
Universal NAMUR signal input	
• Signal level Low	< 1.4 mA
• Signal level High	> 1.8 mA
• Hysteresis	> 0.2 mA
• Fault message	< 0.1 mA/>6 mA

Output	
Digital outputs	6
• Semiconductor relay	Individually isolated, short circuit-proof
• Switching voltage	24 V AC/36 V DC, any polarity
• Destruction limit	35 V AC, 50 V DC
• Internal resistance, connected (low resistance)	< 25 Ω
• Internal resistance, open (high impedance)	> 1 MΩ
• Maximum switched current	100 mA

Rated conditions	
Installation conditions	Vertical wall mounting, cables fed in from below
Climate class	Class 4K4 to EN 60721-3-4
Max. permissible ambient temperature	-20 °C ... +60 °C (-4 °F ... 140 °F)
Mechanical load	Class 4M3 to EN 60721-3-4
Degree of protection according to EN 60 529	IP65
Electromagnetic Compatibility	
• Spurious emission and interference immunity	As per EN 61326 and NAMUR NE 21

Construction	
Weight (without options)	approx. 2.5 kg
Dimensions (W x H x D) in mm (inches)	172 x 320 x 80 (6.8 x 12.6 x 3.2)
Housing material	Macrolon (polycarbonate + 20% glass fiber)
Electrical connection via terminal screws	• Rigid 2.5 mm (0.984 inch) • Flexible 1.5 mm (0.590 inch) • Flexible with connector sleeves 1.5 mm (0.590 inch)
Cable inlet via plastic cable glands	• 1 x Pg 13.5 for 1 cable, ∅ 6 ... 12 mm (0.236 ... 0.472") (e.g. PROFIBUS) • 1 x Pg 13.5 for 3 cables, ∅ 4 mm (0.157 inches) • 1 x Pg 11 for 1 cable, ∅ 4 ... 10 mm (0.157 ... 0.394 inches) • 4 x Pg 11 for 2 cables each, ∅ 4 mm (0.157 inches) (e.g. sensors)

Power supply	
Rated voltage	DC 24 V
Operating range	DC 19 V to max. 36 V
Current consumption	< 100 mA

Communication	
PROFIBUS DP	RS485, switchable terminating resistor
Protocol	Cyclic with Master C1 and acyclic with Master C2
PC configuration software	SIMATIC PDM (not supplied with the device)

9.2 Technical data for the sensor

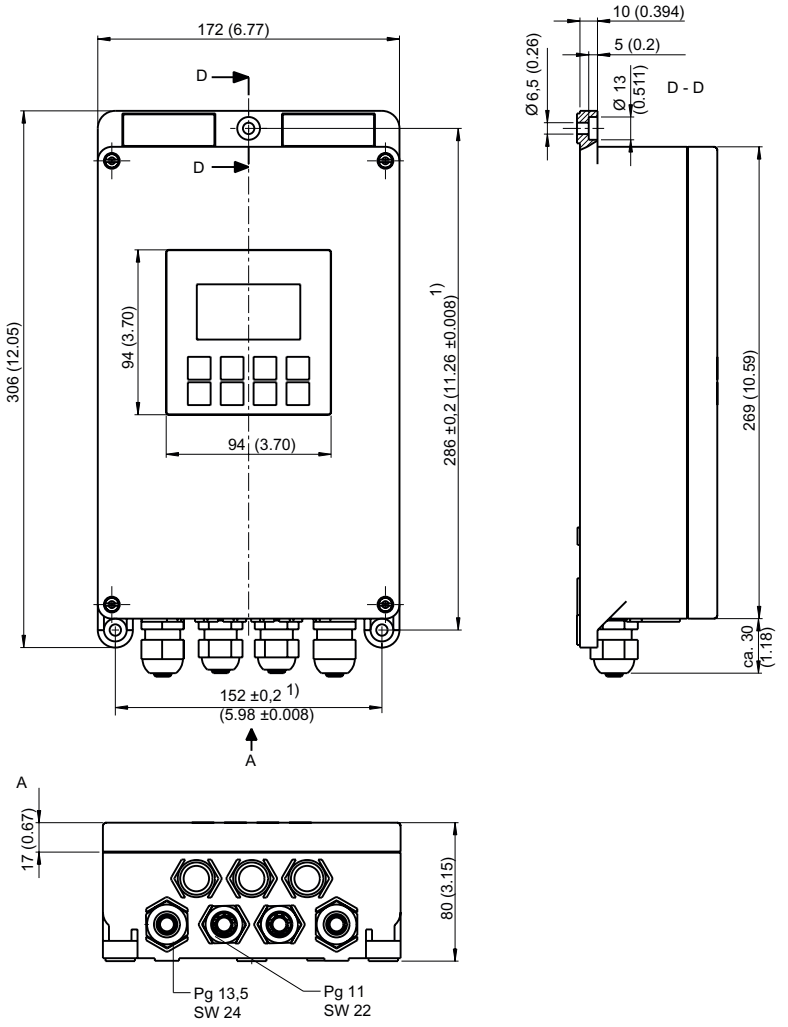
Rated conditions	
Permissible operating temperature	-40 °C ... 110 °C (-40 °F … 230 °F)
Degree of protection according to EN 60529	IP66/IP68
Mechanical load	Class 4M7 to DIN EN 60721-3-4
Climate class	Class 4K4 to DIN EN 60721-3-4

Construction	
• Piezoceramic sensor with pre-amplifier • Encapsulated electronics • 4-wire cable with anti-kink sleeve	
Housing material	Stainless steel 1.4571 (316Ti SST)
Cable	Ends with wire protectors and cable shoe for connection to the SITRANS DA400
Weight	125 g (0.276 lb)
Dimensions (W x H x D) in mm (inches)	26 x 29 x 40 (1.02 x 1.14 x 1.57)

Dimension drawings

10

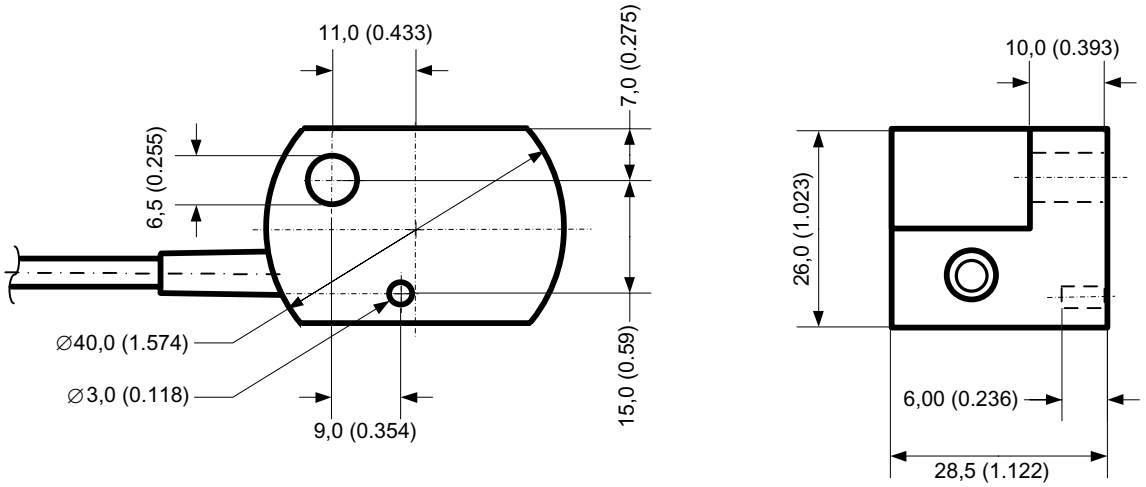
10.1 Dimension drawing of the device



1) 3 mounting holes (M6)

Dimensions in mm (inch)

10.2 Dimension drawing of the sensor



Dimensions in mm (inches)

PROFIBUS DP

11

11.1 Overview

PROFIBUS connection

The PROFIBUS connection allows connection to both a class 1 master (e.g. SIMATIC S7) for cyclic communication of measured values and status and to a class 2 master (e.g. SIMATIC PDM) for acyclic transmission of parameters.

The device master file "SIEM8115.gsd" is available for integration and configuration of the SITRANS DA in a PROFIBUS network. It describes all the required information for cyclic communication (particularly supported baud rates, number of input/output bytes including consistency) with a class 1 PROFIBUS master (e.g. SIMATIC S7).

Integrating the device master file (GSD) into a planning tool (e.g. SIMATIC STEP 7, HW-Config) facilitates simple and fault-free commissioning. The selected module structure allows the user to adapt the type and quantity of communication data to the specific application. This allows the bus and CPU loads to be influenced accordingly.

One of the modules described below must be selected during planning.

1. Module "Status: 4 Sound"

Table 11-1 Config Byte: 0x13 -> 4 byte input

Byte no.	Signal name
0	Sensor 1 status
1	Sensor 2 status
2	Sensor 3 status
3	Sensor 4 status

2. Module "Status: 4 Sound / 4 AI"

Table 11-2 Config Byte: 0x17 -> 8 byte input

Byte no.	Signal name
0	Sensor 1 status
1	Sensor 2 status
2	Sensor 3 status
3	Sensor 4 status
4	Universal input 1 status
5	Universal input 2 status
6	Universal input 3 status
7	Universal input 4 status

3. Module "Status: 4 Sound / 4 AI / Binary"

Table 11-3 Config Byte: 0x17,0x17 -> 16 byte input

Byte no.	Signal name
0	Sensor 1 status
1	Sensor 2 status
2	Sensor 3 status
3	Sensor 4 status
4	Universal input 1 status
5	Universal input 2 status
6	Universal input 4 status
7	Universal input 5 status
8 to 15	8 byte binary status messages

4. Module “4 SoundAmpl+Status”

Table 11-4 Config Bytes: 0x94,0x94,0x94,0x94 -> 20 byte input

Byte no.	Signal name
0 to 3	Sensor 1 measured value
4	Sensor 1 status
5 to 8	Sensor 2 measured value
9	Sensor 2 status
10 to 13	Sensor 3 measured value
14	Sensor 3 status
15 to 18	Sensor 4 measured value
19	Sensor 4 status

5. Module "4 SoundAmpl+St/Binary Status"

Table 11-5 Config Bytes: 0x94,0x94,0x94,0x94,0x17 -> 28 byte input

Byte no.	Signal name
0 to 3	Sensor 1 measured value
4	Sensor 1 status
5 to 8	Sensor 2 measured value
9	Sensor 2 status
10 to 13	Sensor 3 measured value
14	Sensor 3 status
15 to 18	Sensor 4 measured value
19	Sensor 4 status
20 to 27	8 byte binary status messages, bit coded

6. Module "Param/4 SoundAmpl+St/4 AI + St"

Table 11-6 Config Bytes: 0xF2,0x94,0x94,0x94,0x94,0x94,0x94,0x94,0x94 -> 46 byte input / 6 byte output

Byte no.	Signal name
0 to 5	6 byte input/output for indexed reading/writing of parameters
6 to 9	Sensor 1 measured value
10	Sensor 1 status
11 to 14	Sensor 2 measured value
15	Sensor 2 status
16 to 19	Sensor 3 measured value
20	Sensor 3 status
21 to 24	Sensor 4 measured value
25	Sensor 4 status
26 to 29	Universal input 1 measured value
30	Universal input 1 status
31 to 34	Universal input 2 measured value
35	Universal input 2 status
36 to 39	Universal input 3 measured value
40	Universal input 3 status
41 to 44	Universal input 4 measured value
45	Universal input 4 status

7. Module "Param/4 SoundAmpl+St/4 AI + St/Bin"

Table 11-7 Config Bytes: 0xF2,0x94,0x94,0x94,0x94,0x94,0x94,0x94,0x94,0x17 -> 54 byte input / 6 byte output

Byte no.	Signal name
0 to 5	6 byte input/output for indexed reading/writing of parameters
6 to 9	Sensor 1 measured value
10	Sensor 1 status
11 to 14	Sensor 2 measured value
15	Sensor 2 status
16 to 19	Sensor 3 measured value
20	Sensor 3 status
21 to 24	Sensor 4 measured value
25	Sensor 4 status
26 to 29	Universal input 1 measured value
30	Universal input 1 status
31 to 34	Universal input 2 measured value
35	Universal input 2 status
36 to 39	Universal input 3 measured value
40	Universal input 3 status
41 to 44	Universal input 4 measured value
45	Universal input 4 status
46 to 53	8 byte binary status messages, bit coded

11.2 Measured value and status format

Measured value number format: 4 byte float (IEEE)

Table 11-8 Status messages

Value	Meaning	Remark
0x1C	Out of service	For configuration "oFF" (P.1 to P.4 and P.26 to P.29)
0x10	Sensor failure	With cable failure or exceeding/falling below rated range
0x80	Good / no alarm	
0x8A	Good / pre-alarm received, alarm threshold exceeded	Acoustic channels only
0x8E	Good / main alarm received, alarm threshold exceeded	
0x0C	Device defective	
0x3F	Bad / functional check	Acoustic channels only

11.3 Meaning of 8 byte binary status signals

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	Res.	Res.	DO6	DO5	DO4	DO3	DO2	DO1
Byte 2	S2 St.	Res.	PrAL2	AL2	S1 St.	res.	PrAL1	A L1
Byte 3	S4 St.	Res.	PrAL4	AL4	S3 St.	res.	PrAL3	AL3
Byte 4	dol4St.	dol4	dol3St.	dol3	dol2St.	dol2	dol1St.	dol1
Byte 5 [1)]	MUF4	MUF3	MUF2	MUF1	FAI		FAU	
Byte 6 [1)]	Uni4	Uni3	Uni2	Uni1	MUF4	MUF3	MUF2	MUF1
Byte 7								
Byte 8						noPA		Par

1) From PRB Firmware 2.02.00

Meaning of individual bytes

Table 11-9 Byte 1

Byte 1	Code	Meaning
Bit 7	Res.	Reserved
Bit 6	Res.	Reserved
Bit 5	DO6	=1 -> Digital output 6 has responded
Bit 4	DO5	=1 -> Digital output 5 has responded
Bit 3	DO4	=1 -> Digital output 4 has responded
Bit 2	DO3	=1 -> Digital output 3 has responded
Bit 1	DO2	=1 -> Digital output 2 has responded
Bit 0	DO1	=1 -> Digital output 1 has responded

Table 11-10 Byte 2

Byte 2	Code	Meaning
Bit 7	S2 St.	=1 -> Alarms for acoustic channel 2 are valid
Bit 6	Res.	Reserved
Bit 5	PrAL2	=1 -> Pre-alarm received from acoustic channel 2
Bit 4	AL2	=1 -> Main alarm received from acoustic channel 2
Bit 3	S1 St.	=1 -> Alarms for acoustic channel 1 are valid
Bit 2	Res.	Reserved
Bit 1	PrAL1	=1 -> Pre-alarm received from acoustic channel 1
Bit 0	AL1	=1 -> Main alarm received from acoustic channel 1

Table 11-11 Byte 3

Byte 3	Code	Meaning
Bit 7	S4 St.	=1 -> Alarms for acoustic channel 4 are valid
Bit 6	Res.	Reserved
Bit 5	PrAL4	=1 -> Pre-alarm received from acoustic channel 4
Bit 4	AL4	=1 -> Main alarm received from acoustic channel 4
Bit 3	S3 St.	=1 -> Alarms for acoustic channel 3 are valid
Bit 2	Res.	Reserved
Bit 1	PrAL3	=1 -> Pre-alarm received from acoustic channel 3
Bit 0	AL3	=1 -> Main alarm received from acoustic channel 3

Table 11-12 Byte 4

Byte 4	Code	Meaning
Bit 7	doI4St.	=1 -> Status "doI4" valid
Bit 6	doI4	Digital signal from universal input 4
Bit 5	do3St.	=1 -> Status "doI3" valid
Bit 4	doI3	Digital signal from universal input 3
Bit 3	doI2St.	=1 -> Status "doI2" valid
Bit 2	doI2	Digital signal from universal input 2
Bit 1	doI1St.	=1 -> Status "doI1" valid
Bit 0	doI1	Digital signal from universal input 1

Table 11-13 Byte 5

Byte 5	Code	Meaning
Bit 7	MUF4	=1 -> Sensor 4 fault
Bit 6	MUF3	=1 -> Sensor 3 fault
Bit 5	MUF2	=1 -> Sensor 2 fault
Bit 4	MUF1	=1 -> Sensor 1 fault
Bit 3	FAI	=1 -> Fault on at least 1 acoustic channel or universal input
Bit 2		
Bit 1	FAU	=1 -> Internal fault signal
Bit 0		

Table 11-14 Byte 6

Byte 6	Code	Meaning
Bit 7	Uni4	=1 -> Universal input 4 fault
Bit 6	Uni3	=1 -> Universal input 3 fault
Bit 5	Uni2	=1 -> Universal input 2 fault
Bit 4	Uni1	=1 -> Universal input 1 fault
Bit 3	MUF4	=1 -> Sensor 4 fault
Bit 2	MUF3	=1 -> Sensor 3 fault
Bit 1	MUF2	=1 -> Sensor 2 fault
Bit 0	MUF1	=1 -> Sensor 1 fault

Table 11-15 Byte 8

Byte 8	Code	Meaning
Bit 7		
Bit 6		
Bit 5		
Bit 4		
Bit 3		
Bit 2	noPA	=1 -> Parameter lock "noPA" active for front configuration
Bit 1		
Bit 0	Par	=1 -> Device is in "Configuration" menu

11.4 Read/write parameters

Block "Input byte"/"Output byte"

This block, made up of six input bytes and six output bytes, is used to read or write device parameters and diagnostic counters by indexing.

"Master"

Byte no.	Output	
0	Job	0x01 : Read 0x02 : Write
1	Parameter number (index)	
2	Dat 1	Data byte for 1, 2 or 4 byte objects
3	Dat 2	Data byte for 1, 2 or 4 byte objects
4	Dat 3	Data byte for 1, 2 or 4 byte objects
5	Dat 4	Data byte for 1, 2 or 4 byte objects

"Slave" response to "Read" job

Byte no.	input	
0	Job	0x01 : Dat 1-4 valid 0x07 : Invalid parameter number 0x09 : Job invalid
1	Parameter number (index)	Reflected number from read job
2	Dat 1	Data byte for 1, 2 or 4 byte objects
3	Dat 2	Data byte for 1, 2 or 4 byte objects
4	Dat 3	Data byte for 1, 2 or 4 byte objects
5	Dat 4	Data byte for 1, 2 or 4 byte objects

"Slave" response to "Write" job

Byte no.	input	
0	Job	0x01 : Job is executed with values reflected below 0x07 : Invalid parameter number 0x08 : Data invalid 0x09 : Job invalid
1	Parameter number (index)	Reflected number from write job
2	Dat 1	Data byte, reflected from write job
3	Dat 2	Data byte, reflected from write job
4	Dat 3	Data byte, reflected from write job
5	Dat 4	Data byte, reflected from write job

11.5 Examples for PROFIBUS DP

Notation

The notation 0x00 is the code used for hexadecimal in the C programming language.

Example 1

Parameter "P.5" has the value "260" (0x104)
Read parameter "P.5"

Master

Byte no.	Output data	Remark
0	0x01	Read job
1	0x05	Index 5 for P.5
2	0x00	Byte not used
3	0x00	Byte not used
4	0x00	Byte not used
5	0x00	Byte not used

Slave response

Byte no.	Input data	Remark
0	0x01	Response read job present
1	0x05	Reflected index number
2	0x00	Data byte
3	0x00	Data byte
4	0x01	Data byte
5	0x04	Data byte

Example 2

Write parameter P.13 with value 400 (0x190)

Master

Byte no.	Output	Remark
0	0x02	Write job
1	0x0D	Index for P.13
2	0x00	Data byte
3	0x00	Data byte
4	0x01	Data byte
5	0x90	Data byte

Slave response

Byte no.	Input	Remark
0	0x01	Job executed
1	0x0D	Reflected index number
2	0x00	Reflected data byte
3	0x00	Reflected data byte
4	0x01	Reflected data byte
5	0x90	Reflected data byte

11.6 Index of objects

Meaning

Index of parameters

Index no. in byte no.	Meaning	Data in byte no.				Format	Unit	Range of values
1		2	3	4	5			
0	P. 0			x	x			1.00 – 99.99
1	P. 1				x	unsigned integer		0…6
2	P. 2				x	unsigned integer		0…6
3	P. 3				x	unsigned integer		0…6
4	P. 4				x	unsigned integer		0…6
5	P. 5			x	x	unsigned integer	10*dB	0....999
6	P. 6			x	x	unsigned integer	10*dB	0....999
7	P. 7			x	x	unsigned integer	10*dB	0....999
8	P. 8			x	x	unsigned integer	10*dB	0....999
9	P. 9			x	x	unsigned integer	10*dB	0....999
10	P.10			x	x	unsigned integer	10*dB	0....999
11	P.11			x	x	unsigned integer	10*dB	0....999
12	P.12			x	x	unsigned integer	10*dB	0....999
13	P.13			x	x	unsigned integer	sec	0…9999
14	P.14				x	unsigned integer		0…2
15	P.15				x	unsigned integer		0..12
16	P.16				x	unsigned integer		0..12
17	P.17				x	unsigned integer		0..12
18	P.18				x	unsigned integer		0..12
19	P.19				x	unsigned integer		0..12
20	P.20				x	unsigned integer		0..12
21	P.21				x	unsigned integer		0..12
22	P.22				x	unsigned integer		0..12
23	P.23				x	unsigned integer		0..12
24	P.24				x	unsigned integer		0..12
25	P.25				x	unsigned integer		0..1
26	P.26				x	unsigned integer		0..9
27	P.27				x	unsigned integer		0..9
28	P.28				x	unsigned integer		0..9
29	P.29				x	unsigned integer		0..9
30	P.30	x	x	x	x	float	%	-5,0...105,0
31	P.31	x	x	x	x	float	%	-5,0...105,0
32	P.32	x	x	x	x	float	%	-5,0...105,0

Index no. in byte no.	Meaning	Data in byte no.				Format	Unit	Range of values
1		2	3	4	5			
33	P.33	x	x	x	x	float	%	-5,0...105,0
34	P.34				x	unsigned integer		
35	P.35				x	unsigned integer		
36	P.36				x	unsigned integer		
37	P.37				x	unsigned integer		
38	P.38				x	unsigned integer		0...126
42	P.42				x	unsigned integer	sec	0 ... 30
43	P.43				x	unsigned integer	sec	0 ... 30
44	P.44				x	unsigned integer	sec	0 ... 30
45	P.45				x	unsigned integer	sec	0 ... 30

Index of counters

Index no. in byte no.	Meaning	Data in byte no.				Format	Unit
1		2	3	4	5		
128	P1-UP			x	x	unsigned integer	sec
129	P1-T			x	x	unsigned integer	min
130	A1-UP			x	x	unsigned integer	sec
131	A1-T			x	x	unsigned integer	min
132	P2-UP			x	x	unsigned integer	sec
133	P2-T			x	x	unsigned integer	min
134	A2-UP			x	x	unsigned integer	sec
135	A2-T			x	x	unsigned integer	min
136	P3-UP			x	x	unsigned integer	sec
137	P3-T			x	x	unsigned integer	min
138	A3-UP			x	x	unsigned integer	sec
139	A3-T			x	x	unsigned integer	min
140	P4-UP			x	x	unsigned integer	sec
141	P4-T			x	x	unsigned integer	min
142	A4-UP			x	x	unsigned integer	sec
143	A4-T			x	x	unsigned integer	min
144	Alarm ack *				x	unsigned integer	
150	oP-T	x	x	x	x	long integer	h
151	LIV-T	x	x	x	x	long integer	h

* Acknowledgement of alarms (pre and main alarm) with associated bit=1 (P.14=ST.Ac/¬ST.Ac only).

Byte 8	Meaning
Bit 7	
Bit 6	PrAL4 / AL4
Bit 5	
Bit 4	PrAL3 / AL3
Bit 3	
Bit 2	PrAL2 / AL2
Bit 1	
Bit 0	PrAL1 / AL1

Index

V

W

Z