DIQ/S 281

UNIVERSAL TRANSMITTER FOR ONE DIGITAL SENSOR

YSI®

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1   Overview

1.1   Structure and function

One digital single sensor (one sensor for one main parameter) can be connected to the universal transmitter DIQ/S 281.

This means one main parameter (e.g. pH, D.O., turbidity value...) and one secondary parameter in addition (e.g. temperature) can be displayed and administrated.

Each sensor is automatically recognized after being connected and immediately starts measuring.

 Suitable sensors for the universal transmitter DIQ/S 281 are listed in the YSI catalog or on the Internet.

For connection to existing process control systems, the universal transmitter DIQ/S 281 has the following outputs:

DIQ/S 281 variant	Outputs
DIQ/S 281 -CR2	2 relay outputs 2 current outputs
DIQ/S 281-MOD	2 relay outputs

Components to extend the system

	Function	Component
Passive compo- nents	Power supply module	MIQ/PS
	Radio link (with power supply unit)	MIQ/WL PS
	Branching (interfaces for sensors)	DIQ/JB, MIQ/JB
Active compo- nents	Relays	DIQ/CR3, MIQ/CR3
	Current outputs	DIQ/CR3, MIQ/CR3, MIQ/C6
More compo- nents	Valve output	DIQ/CHV

Maximum extensibility of the system:

● Passive components: no limitation

● Valve outputs: maximum 1 output per sensor

● Active components: 1

Branches

The DIQ/JB branching module (accessory) is a simple passive module for the branching or extending of SNCIQ lines.

Relay and current outputs

The relay- and current outputs can be linked with the sensor. Linked outputs can be used to monitor sensors and for the output of measured values.

A relay output can be programmed as:

● Monitoring relay

● Limit monitor

● Proportional output of measured values (pulse width or frequency output)

● Control unit of a sensor cleaning system driven by compressed air.

A current output can be programmed as:

● Analog output

● PID controller

Modbus

Only for the variant DIQ/S 281-MOD
For details, see operating manual "Field bus linking"

Compressed air-driven cleaning system

The universal transmitter DIQ/S 281 is prepared for the compressed air-driven, time-controlled sensor cleaning function. For this, a DIQ/CHV valve module and if necessary a CH cleaning head is required (both available as accessories). The cleaning procedure is controlled by the Universal Transmitter. The universal transmitter provides the supply voltage and control relay for the compressed air

valve in the DIQ/CHV valve module. This enables a simple setup and uncompli-
cated wiring.

**Example of a
simple system**

Universal transmitter
DIQ/S 281CR2

DIQ/JB

IQ sensor, digital
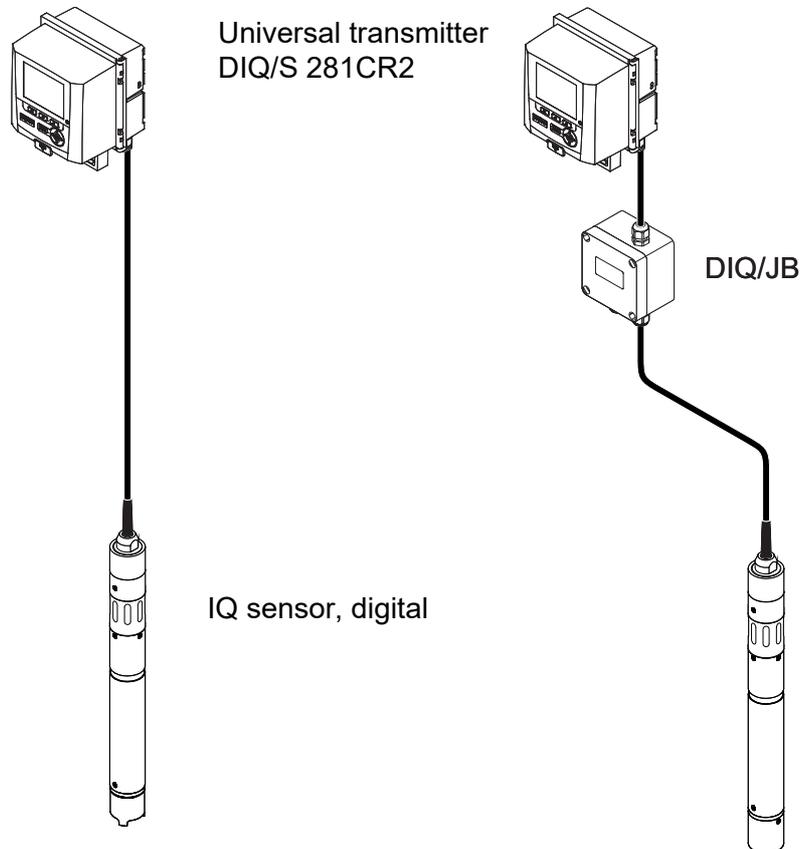
figure 1-1 Simple systems with one sensor

1.2   Interfaces

1.2.1   USB interface

The USB interface of the DIQ/S 281 provides the following functions:

● Connection of a USB memory device to carry out a software update (see
section 4.11)

● Connection of a USB memory device to be used as an electronic key for sim-
ple access to the system when access control is switched on (see
section 5.3.3)

● Connection of a USB hub for the reproduction of the USB interface.

Note:
*The USB interface is designed for USB memory devices with a maximum power
consumption of 1 watt. USB memory devices with a higher power consumption
have to be supplied with power by an extra power supply. If these instructions
are not complied with, the availability of the system can be adversely affected.*

> The USB interface is equipped with a protective cover.
> Only remove the protective cover when you want to connect a USB device. Immediately close the USB connection again when you have removed the USB device.
> When the USB connection is open, there is a danger of corrosion.

1.2.2 Fieldbus interface (DIQ/S 281-MOD)

The following variants of the DIQ/S 281 have a fieldbus interface:

DIQ/S 281 variant	Fieldbus connection
DIQ/S 281-MOD	Modbus RTU/RS 485

1.3 Behavior of the system to a power failure

- The system configuration is permanently retained. It consists of the following settings:
  - Sensor settings
  - Settings and links of the relay outputs
  - Settings of the current outputs
  - System settings (display language, air pressure/altitude, passwords etc.)
- Linked relay outputs switch to the non-active condition (open).
- Current outputs switch to the non active-condition (0 mA).
- A restart is carried out automatically when the power returns. The continues working with the settings of the time prior to the power failure.
  If the power failure lasted several hours the system clock has to be reset.

2   Safety

2.1   Safety information

2.1.1   Safety information in the operating manual

This operating manual provides important information on the safe operation of the product. Read this operating manual thoroughly and make yourself familiar with the product before putting it into operation or working with it. The operating manual must be kept in the vicinity of the product so you can always find the information you need.

Important safety instructions are highlighted in this operating manual. They are indicated by the warning symbol (triangle) in the left column. The signal word (e.g. "CAUTION") indicates the level of danger:

	WARNING indicates a possibly dangerous situation that can lead to serious (irreversible) injury or death if the safety instruction is not followed.

	CAUTION indicates a possibly dangerous situation that can lead to slight (reversible) injury if the safety instruction is not followed.

indicates a situation where goods might be damaged if the actions mentioned are not taken.

2.1.2   Safety signs on the product

Note all labels, information signs and safety symbols on the product. A warning symbol (triangle) without text refers to safety information in this operating manual.

2.1.3   Further documents providing safety information

The following documents provide additional information, which you should observe for your safety when working with the measuring system:

● Operating manuals of other components of the measuring system

● Safety datasheets of calibration and maintenance equipment (e.g. cleaning solutions).

2.2   Safe operation

2.2.1   Authorized use

The authorized use of the DIQ/S 281 Universal Transmitter consists of its use in online analysis. Only the operation and running of the sensor according to the instructions and technical specifications given in this operating manual is authorized (see chapter 9 TECHNICAL DATA). Any other use is considered unauthorized.

2.2.2   Requirements for safe operation

Note the following points for safe operation:

● The product may only be operated according to the authorized use specified above.

● The product may only be operated under the environmental conditions mentioned in this operating manual.

● The product may only be supplied with power by the energy sources mentioned in this operating manual.

● The product may only be opened if this is explicitly described in this operating manual (example: connecting electrical lines to the terminal strip).

2.2.3   Unauthorized use

The product must not be put into operation if:

● it is visibly damaged (e.g. after being transported)

● it was stored under adverse conditions for a lengthy period of time (storing conditions, see chapter 9 TECHNICAL DATA).

2.3   User qualification

Target group   The DIQ/S 281 Universal Transmitter was developed for online analysis. Some maintenance activities, e.g. changing the membrane caps in D.O. sensors, require the safe handling of chemicals. Thus, we assume that the maintenance personnel is familiar with the necessary precautions to take when dealing with chemicals as a result of their professional training and experience.

Special user qualifications   The following installation activities may only be performed by a qualified electrician:

● Connection of the DIQ/S 281 to the power supply.

● Connecting external, line voltage-carrying circuits to relay contacts.

3   Installation

3.1   Scopes of delivery

The following parts are included in the scope of delivery:

● Universal transmitter DIQ/S 281

● Accessory kit with:

– Contact carrier with screws

– ISO cap nuts with screws and ring washers

– Cable glands with sealing gaskets

● Operating manual.

3.2   Basic principles of installation

3.2.1   Requirements of the measurement location

The measurement location must meet the environmental conditions specified in section 9.1 DIQ/S 281.

Controlled environmental conditions   Work on the open instrument (e.g. during mounting, installation, maintenance) may only be carried out under controlled environmental conditions:

Temperature	+ 5 °C ... + 40 °C (+ 41 ... +104 °F)
Relative humidity	≤ 80 %

3.3   Safety requirements of the electrical installation

Electrical equipment (such as motors, contactors, cables, lines, relays, switches, instruments) must meet the following requirements:

● Compliance with national regulations (e.g. NEC, VDE and IEC)

● Suitability for the electrical conditions at the place of installation

– Maximum operational voltage

– Maximum operational current

● Suitability for the ambient conditions at the place of installation

– Temperature resistance (minimum and maximum temperature)

– Stability against UV light in the case of outdoor usage

– Protection against water and dust (IP type of protection).

● Suitable fuse protection of the electrical circuit

– Overcurrent protection devices

(according to the technical data of the instrument input or output)

– Overvoltage limitations of overvoltage category II

● Suitable external separator (e.g. switch or circuit-breaker) for the power sup-
ply of permanently installed instruments with separate power connection

– compliant with the following regulations
- IEC 60947-1
- IEC 60947-3

– in the vicinity of the instruments (recommendation)

● Flame resistant (cable and lines),
compliant with the following regulations

– UL 2556 VW-1 (for USA, Canada)

– IEC 60332-1-2 (outside the USA, Canada)

3.4   Installation guidelines for lightning protection

During the use of the DIQ/S 281 universal transmitter, particularly in outdoor
areas, adequate protection against (electrical) surges must be provided. A surge
is a summation phenomenon of surge voltage and surge current. It is generated
through the indirect effect of a lightning event or switching operation in the
mains, in the grounding system and in information technology lines.

To be adequately protected against the damaging effects of surges, an inte-
grated concept of the following protective measures is required:

● internal device-related protective measures and

● external protective measures of the installation environment.

The internal device-related protective measures are already integrated in the
YSI online instrumentation as so-called 'lightning protection' (see
chapter 9 TECHNICAL DATA).

The external protective measures of the installation environment can be carried
out with respect to the following guidelines:

1 All lines of systems must be
   a) installed inside (or else close to) the grounded metallic mounting construc-
   tions, e.g. handrails, pipes and posts if possible
   b) or, particularly in the case of longer lines, laid in the ground.

   Background: The formation of highly lightning hazardous inductive loops be-
   tween the cables and ground is avoided through the low clearance of the
   grounded metal construction or by installation in the ground.

2 Only IQ cable material may be used. This cable material is an important pre-
   requisite for the hazard-free discharging of the surge without inadmissibly
   high overvoltages developing along the line at the same time that could have
   a damaging effect on the individual components.

3 All metallic mounting constructions (handrails, pipes, posts etc.) on which

DIQ modules are installed must be connected to the local potential equalization system and the grounding system or must be individually sufficiently grounded locally according to the codes of practice.
For the individual grounding of the measuring point the mounting construction must be solidly connected by means of a large-area auxiliary electrode with the measuring medium.
Metallic control shafts/pipes and other large-area metallic bodies that reach into the measuring medium are, for example, ideal for use in the grounding of the mounting construction.
This creates a set path for the main surge. As a result it is possible to avoid the surge being discharged via the cable and via the valuable sensor in the measuring medium.

4 It is recommended to attach a metallic or nonmetallic sun shield to each outside location of the DIQ modules. Sun shields protect the electric field lines in the area of the DIQ module due to an advantageous development of the electrical field lines in the area of the MIQ module and promote the dissipation of the surge via the mounting construction.

5 The line voltage for the supply of the DIQ/S 281 must comply with overvoltage category II. Generally this is ensured through the public operator of the power supply networks. In company-owned networks, e.g. in all power supply systems owned by wastewater treatment plants, this must be kept separate by a potential equalization and a surge protection system for the plant.

6 Part of the safety and lightning protection concept is based on the high-quality protective insulation of the DIQ/S 281. It does not have or require a protective earth or ground connection. Avoid any direct contact of any SENSOR connections or the metallic sensor enclosures with the local grounding or potential equalization system and with metallic construction elements (see point 8).

7 Additional external lightning protection measures, e.g. the use of overvoltage surge arresters, are not necessary for protection against the indirect effects of lightning and could possibly result in malfunctions.

8 For the realization of the internal lightning protection of the system (e.g. wastewater treatment plant control stands) and for the protection of external resources, cable entry points into buildings or distributions coming from the DIQ/S 281 must be carried out as follows:

  – The shield of SNCIQ or SNCIQ-UG cables can be connected to the local potential equalization with a gas overvoltage arrester. Use shield clamps for the contacting of the shield. The shield of the cable must not be opened under any circumstances.

  – 0/4-20 mA interfaces must be realized with shielded cables. The cable shield must be connected directly to the potential equalization(s) provided. If plant potential equalization systems are provided on both sides, the shield must also be connected on both sides. The inner conductors must have no contact with the potential equalization.

  – Relay lines should be connected to the local potential equalization in order to provide general and consistent protection via gas overvoltage surge

arresters.

3.5   Connecting system components

3.5.1   General information

The connection of the system components is described in the following sections exclusively with examples of the connection of MIQ modules.

These descriptions similarly apply to system components that are not mentioned separately in the examples (e.g. universal transmitter DIQ/S 281).

The IQ SENSORNET system components are connected to form a functioning unit in the following ways:

● **Stacked mounting of MIQ modules**
  Up to three MIQ modules can be installed and mechanically connected with one another to form a stack at a single location. The contacts on the front and rear automatically create the electrical connection between the MIQ modules in the stack (section 3.5.2).

● **Distributed mounting of MIQ modules**
  Individual MIQ modules or an assembled module stack are installed at various locations (for example, a central control unit and an MIQ branching module for connecting IQ sensors at the edge of the basin). The spatial distance is bridged with the aid of the SNCIQ or SNCIQ/UG cable (section 3.5.3).

Distributed mounting is only allowed in a star configuration. The system must nowhere be closed to form a ring. Only use the assembly material provided for the installation.

● **Connection of IQ sensors:**
  IQ sensors are connected to an MIQ module with the aid of the SACIQ cable. This cable is available in different lengths. The MIQ module must have a free SENSORNET connection on the terminal strip. On the sensor side, the connection is made with a plug that is standard for all IQ sensors (section 3.5.4).

3.5.2   Stacked mounting of DIQ and MIQ modules

For optimum stability, a maximum of three modules (DIQ/MIQ) can be mounted in any one stack. Only one MIQ power supply module may be mounted per module stack.

Mounting direction   MIQ modules can be stacked on top of one another from both sides. All the required installation materials are contained in the scope of delivery of the MIQ modules.

Variant 1 - stack expansion forwards.

The back of an MIQ module is attached to the lid of another MIQ module (see page 18).
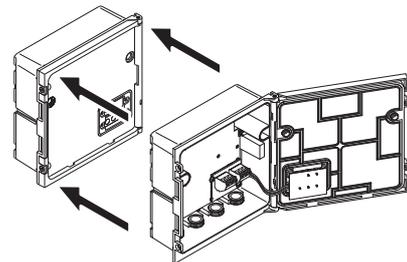
Variant 2: - stack expansion backwards.

The lid of an MIQ module is attached to the back of another MIQ module (see page 22).
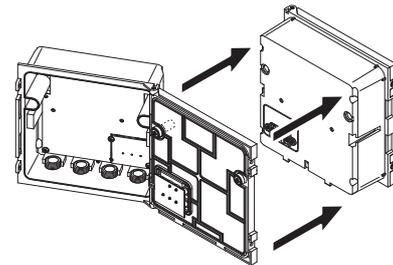
Which variant is suitable for a specific case depends on whether and how an MIQ module is already permanently installed at a location (e.g. on a wall or in a panel), among other factors.

In the case of panel mounting, the front MIQ module can only be installed individually in the switch cabinet aperture. Only then can further MIQ modules be added to its back (variant 2). If necessary, dismantle the front MIQ module from an already mounted stack before mounting.

Materials required   ● 2 x ISO blind nuts (M4)

● 2 x cheese-head screws (M4x16) with plastic washer

● 1 x contact base with two plastic tapping screws.

Tools   ● Phillips screwdriver.

Both installation variants are described below. To dismantle a module stack, proceed in the reverse order to mounting the stack.

Variant 1: Stack expansion forwards

Preparing the
stack mounting

figure 3-1   Preparing MIQ modules for stack mounting (variant 1)

1   Covers of the drilled mounting holes (rear MIQ module)

2   Contact cover (rear MIQ module)

3   Covers of the drilled mounting holes (front MIQ module)

4   Label (front MIQ module)
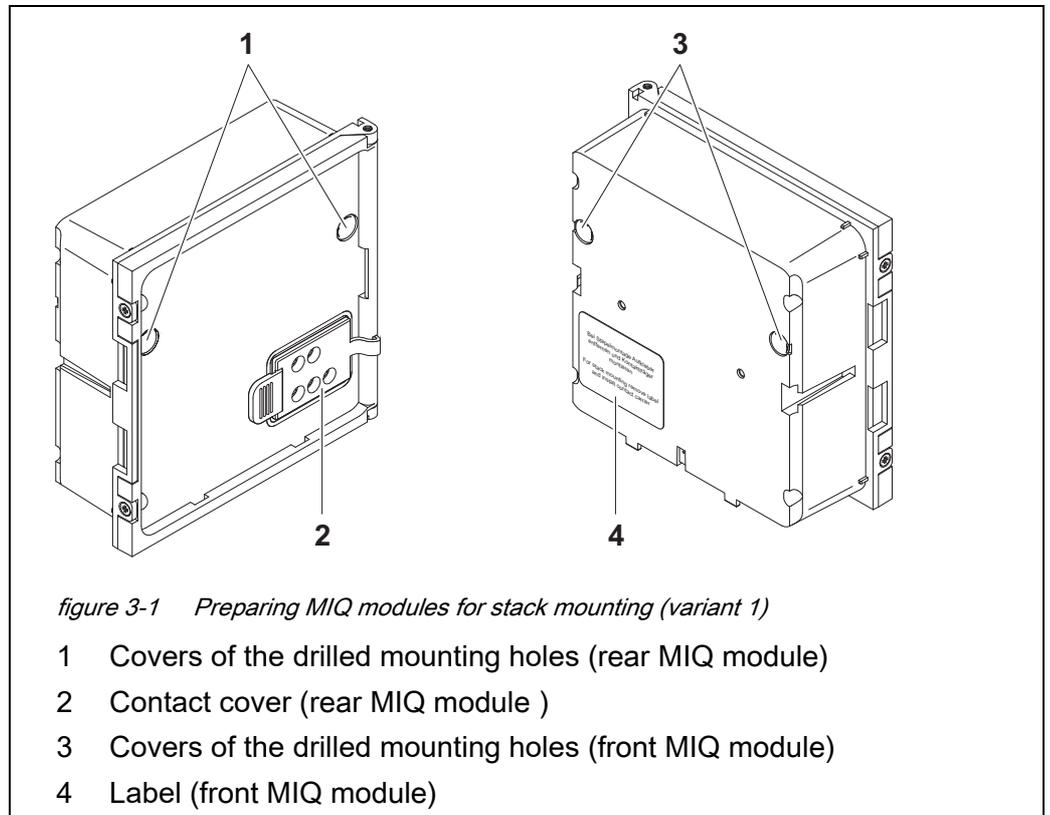
1   Remove the covers from the drilled mounting holes (pos. 1 and 3 in
         figure 3-1).

2   Remove the contact cover (pos. 2).

3   Pull off the adhesive label (pos. 4).

Mounting the contact base

figure 3-2   Mounting the contact base (variant 1)

5   Contact base

6   Tapping screws

7   Countersunk screws
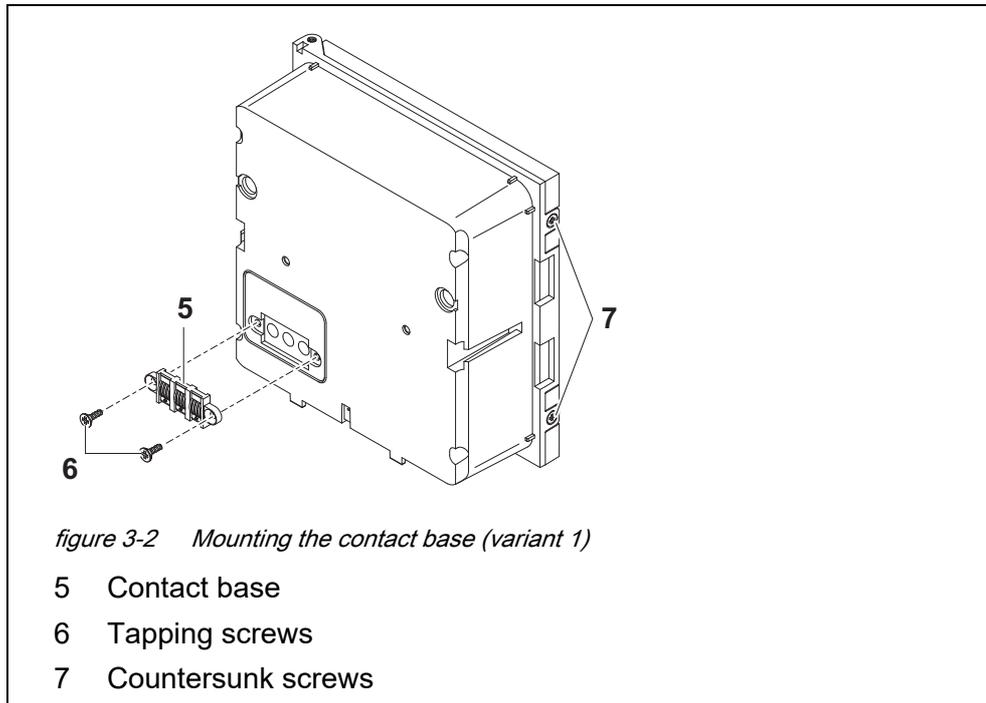
Only IQ Sensor Net products may be used in the IQ Sensor Net.

4   Attach the contact base (pos. 5 in figure 3-2) on the front MIQ module with the two plastic tapping screws (pos. 6).

5   On the front MIQ module, remove the two countersunk screws (pos. 7 in figure 3-2) and swing open the module lid.

Premounting the ISO blind nuts

figure 3-3   Mounting the contact base (variant 1)

8   Cheese-head screws
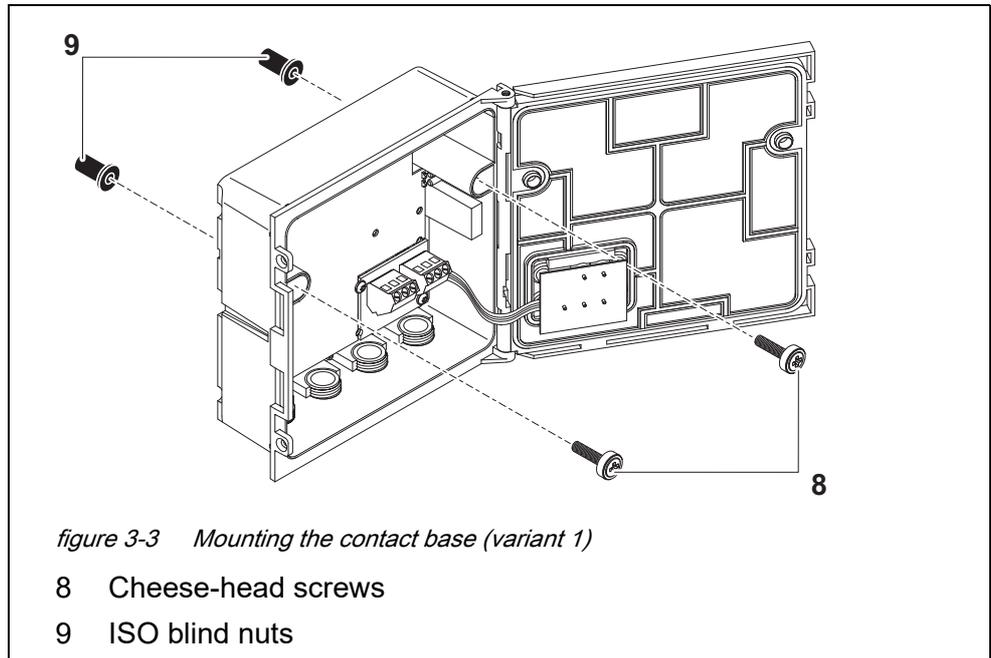
9   ISO blind nuts

6   Insert the cheese-head screws (pos. 8 in figure 3-2) with the plastic washers in the drilled mounting holes in the enclosure and loosely screw in the ISO blind nuts (pos. 9).

Stacking the MIQ modules

figure 3-4   Stacking the MIQ modules (variant 1)
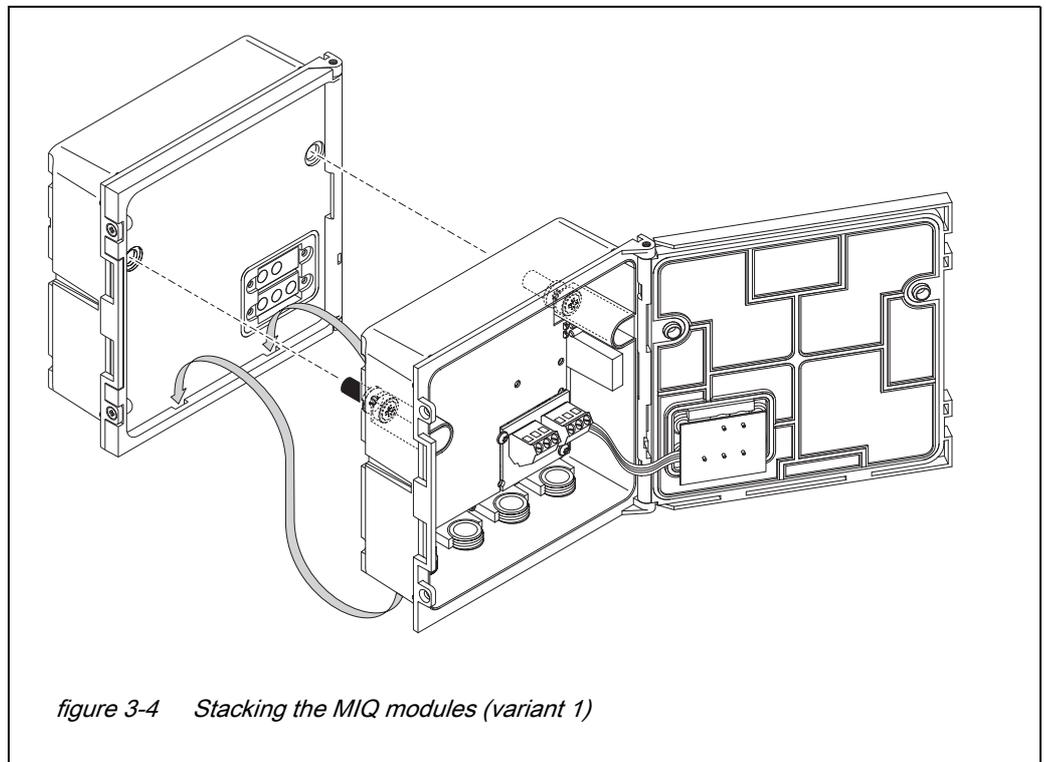
7   Attach the prepared MIQ module to the lid of the back MIQ module. At the same time, ensure that the two clips on the front MIQ module click into place in the lid of the back MIQ module. Subsequently, tighten the two screws (pos. 8 in figure 3-3).

figure 3-5   Closing the enclosure (variant 1)

10   Countersunk screws
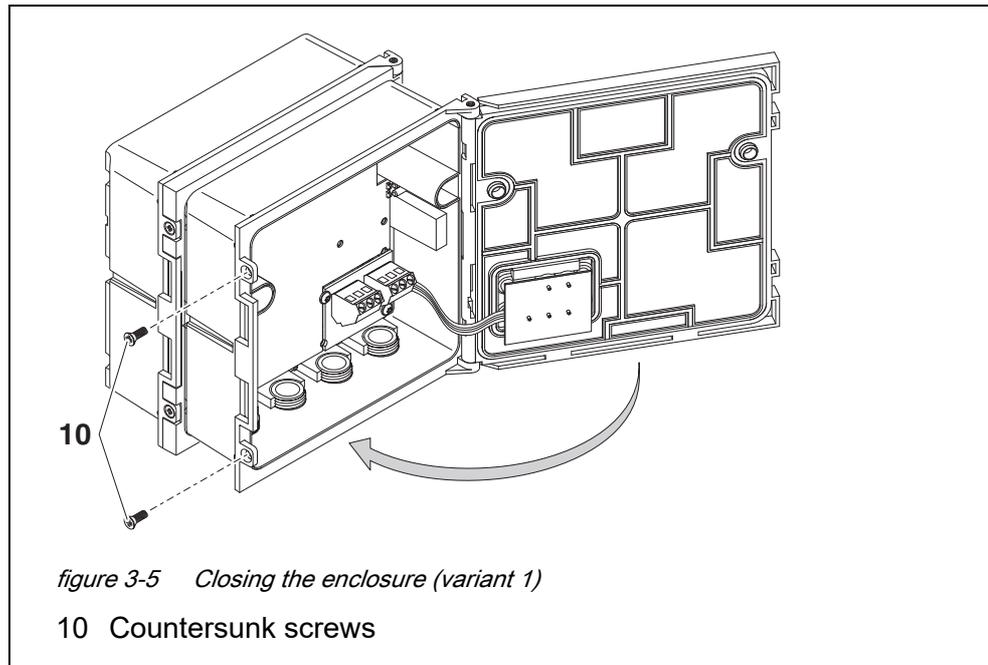
8   Close the lid of the front MIQ module and fix it with the two countersunk screws (pos. 10 in figure 3-5).

<u>Variant 2:</u> **stack expansion backwards**

Preparing the
stack mounting

figure 3-6   Preparing MIQ modules for stack mounting (variant 2)

1   Covers of the drilled mounting holes (rear MIQ module)

2   Contact cover (rear MIQ module)

3   Covers of the drilled mounting holes (front MIQ module)

4   Label (front MIQ module)

5   Countersunk screws
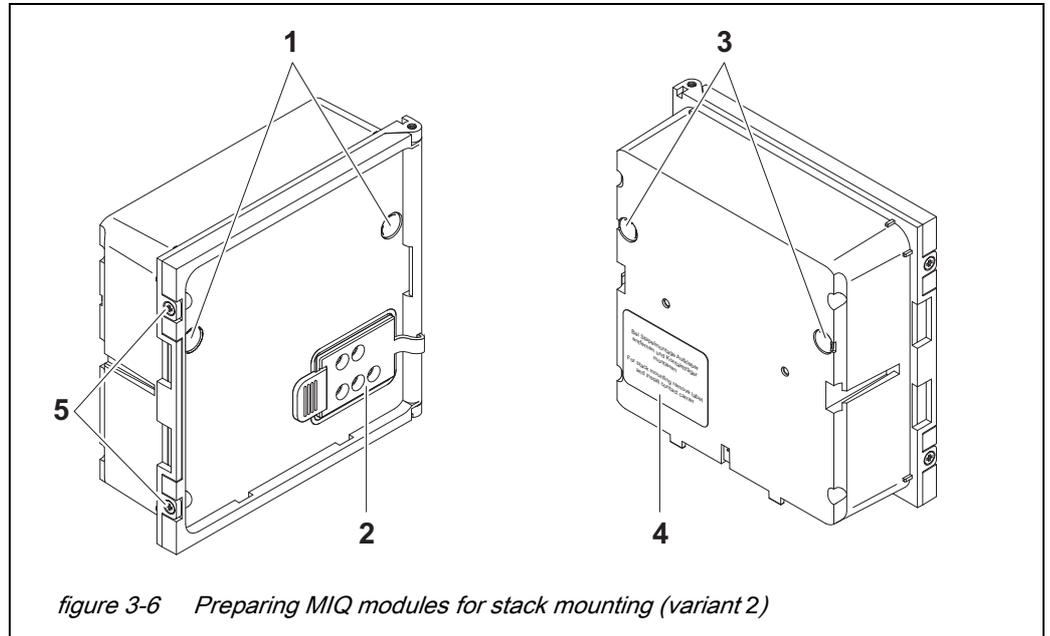
1   Remove the covers from the drilled mounting holes (pos. 1 and 3 in figure 3-6).

2   Remove the contact cover (pos. 2).

3   Pull off the adhesive label (pos. 4).

4   On the back MIQ module, remove the two countersunk screws (pos. 5 in figure 3-6) and swing open the module lid.

**Mounting the
contact base**

figure 3-7   Mounting the contact base (variant 2)

6   Contact base
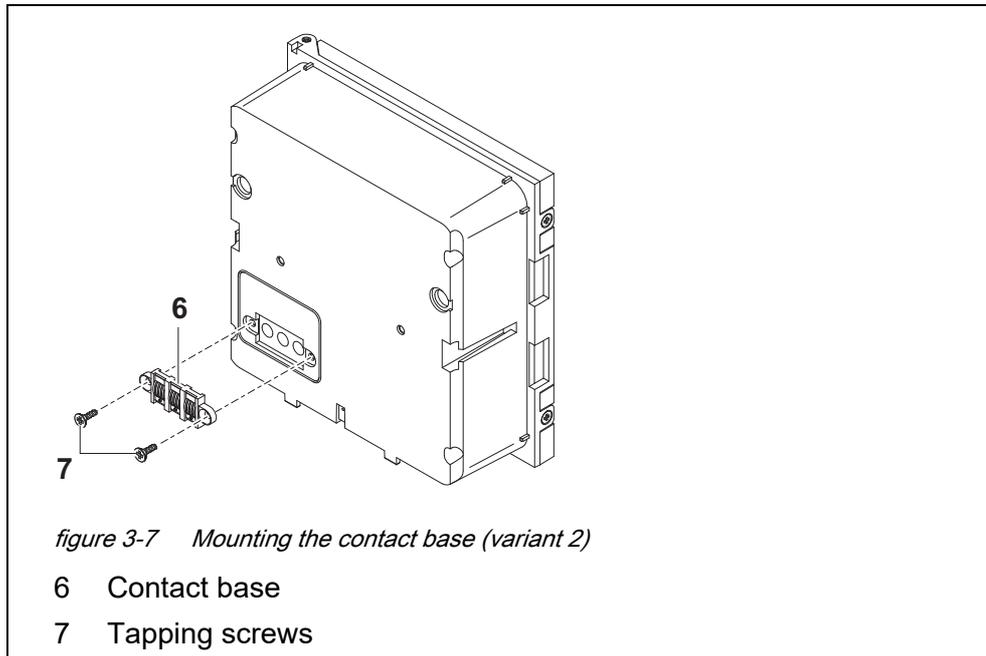
7   Tapping screws

> Only use the plastic tapping screws supplied for attaching the contact base. They ensure the correct fit.

5   Attach the contact base (pos. 6 in figure 3-7) on the front MIQ module
         with the two plastic tapping screws (pos. 7).

Premounting the
ISO blind nuts

figure 3-8   Premounting the ISO blind nuts (variant 2)

8   Cheese-head screws
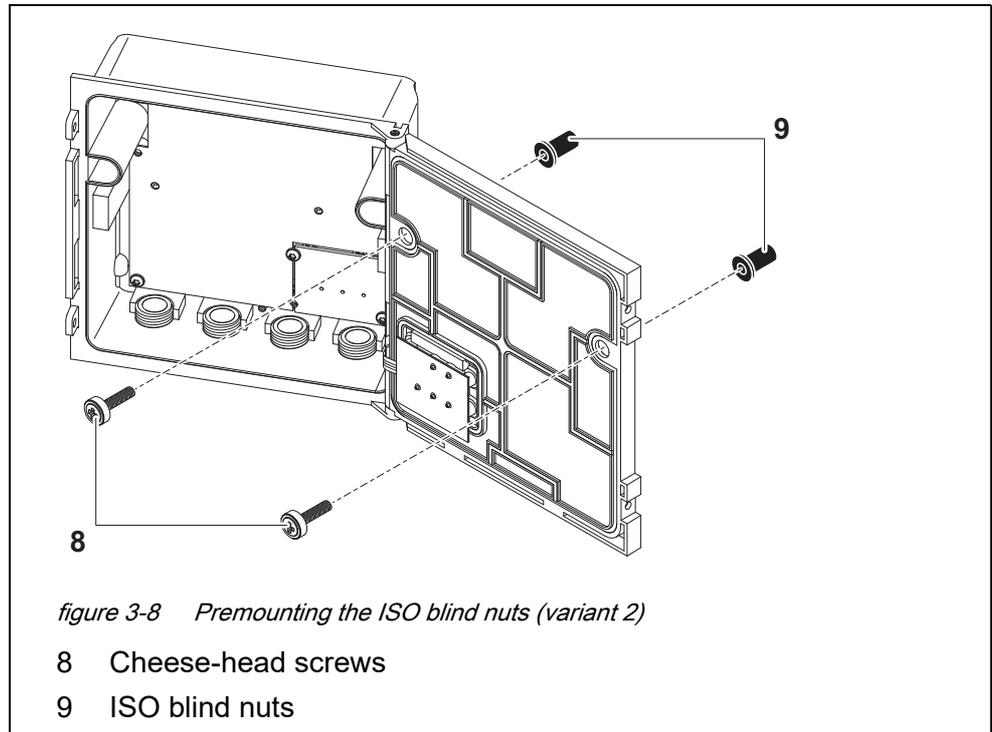
9   ISO blind nuts

6   Insert the cheese-head screws (pos. 8 in figure 3-8) with the plastic
      washers in the drilled mounting holes in the module lid and loosely
      screw in the ISO blind nuts (pos. 9).

**Stacking the
MIQ modules**
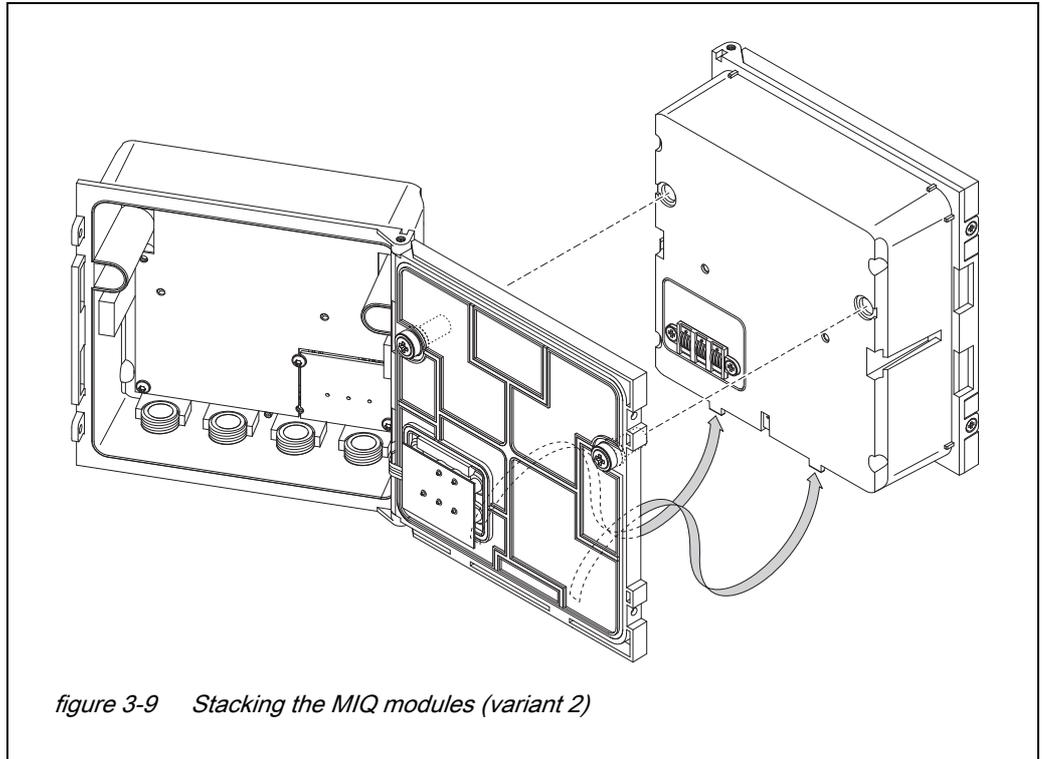
figure 3-9   Stacking the MIQ modules (variant 2)

7   Attach the prepared MIQ module to the back of the front MIQ module.
       At the same time, ensure that the two clips on the front MIQ module
       click into place in the lid of the back MIQ module. Subsequently, tighten
       the two screws (pos. 8 in figure 3-8).

figure 3-10   Closing the enclosure (variant 2)

5   Countersunk screws
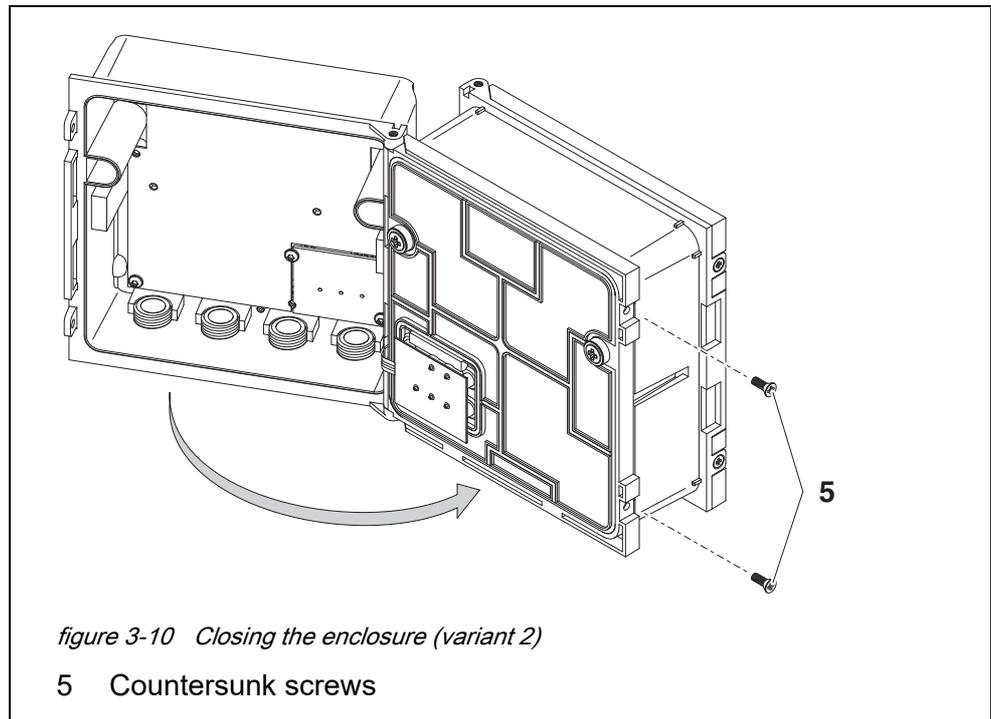
8   Close the back MIQ module and fix it with the two countersunk screws
         (pos. 5 in figure 3-10).

3.5.3   Distributed mounting of MIQ modules

**General
information**

The following IQ SENSORNET cables can be used for distributed mounting:

● SNCIQ cable

● SNCIQ/UG earth cable - suitable for underground laying in accordance with
  VDE 01816, Part 2 and DIN/VDE 0891, Part 6.

The cables are delivered as piece goods (please specify length when ordering!).

Each MIQ module has a row of terminal strips in the housing. The two 3-fold
terminal strips on the right are always reserved for the connection of further
IQ SENSORNET components (designation "SENSORNET 1" and
"SENSORNET 2").

Some MIQ modules have additional "SENSORNET" connections
("SENSORNET 3" and "SENSORNET 4") on the left of the terminal strip.

The IQ SENSORNET cable may only be connected to the SENSOR-
NET connections. No wire of the cable may be connected with an
external electrical potential. Otherwise, malfunctions could occur.

Materials required ● 1 x SNCIQ or SNCIQ/UG connection cable (see chapter 10 ACCESSORIES AND OPTIONS)

● Wire end sleeves for 0.75 mm^2 wire cross-section with matching crimping tool

● 1 x cable gland with seal (scope of delivery of MIQ module).

Tools ● Cable stripping knife

● Wire stripper

● Phillips screwdriver

● Small screwdriver.

Preparing the cable ends

1 Cut off the cable to the required length.

2 Remove approx. 45 mm of cable insulation (in the case of the SNCIQ/UG earth cable, remove both the inner <u>and</u> outer insulation).

3 Only for the SNCIQ/UG earth cable:
   strip the outer insulation for a further 35 mm.

4 Shorten the exposed shielding braid up to the cable sheath.

5 Shorten the two fillers (plastic inlays) up to the cable sheath.

6 Bare the red and green wires and fit them with wire end sleeves.

7 Fit the filler stranded wire with a wire end sleeve.

figure 3-11   Prepared cable end
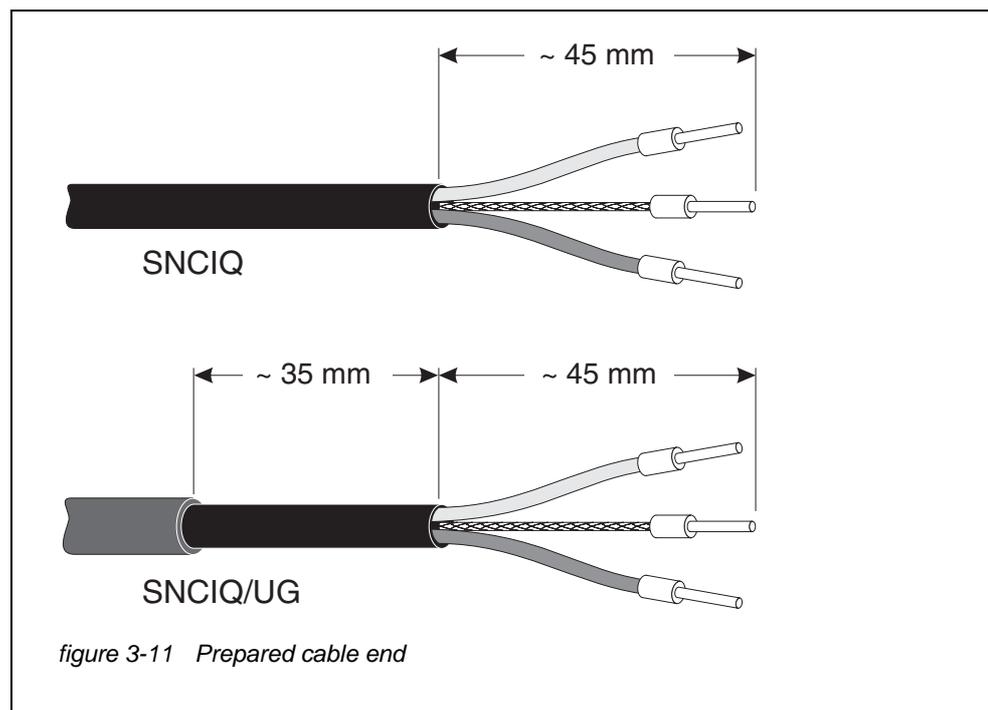
Connecting the cables   The SNCIQ and SNCIQ/UG cables are connected to the terminal strip in the same way as the SACIQ sensor connection cable (see section 3.5.4):

1   Open the module (DIQ, MIQ).

2   Select any SENSORNET connection. At the same time, look out for the SENSORNET designation.

figure 3-12   Connecting cables to the MIQ module

1   Cable gland
2   Seal
3   Coupling ring
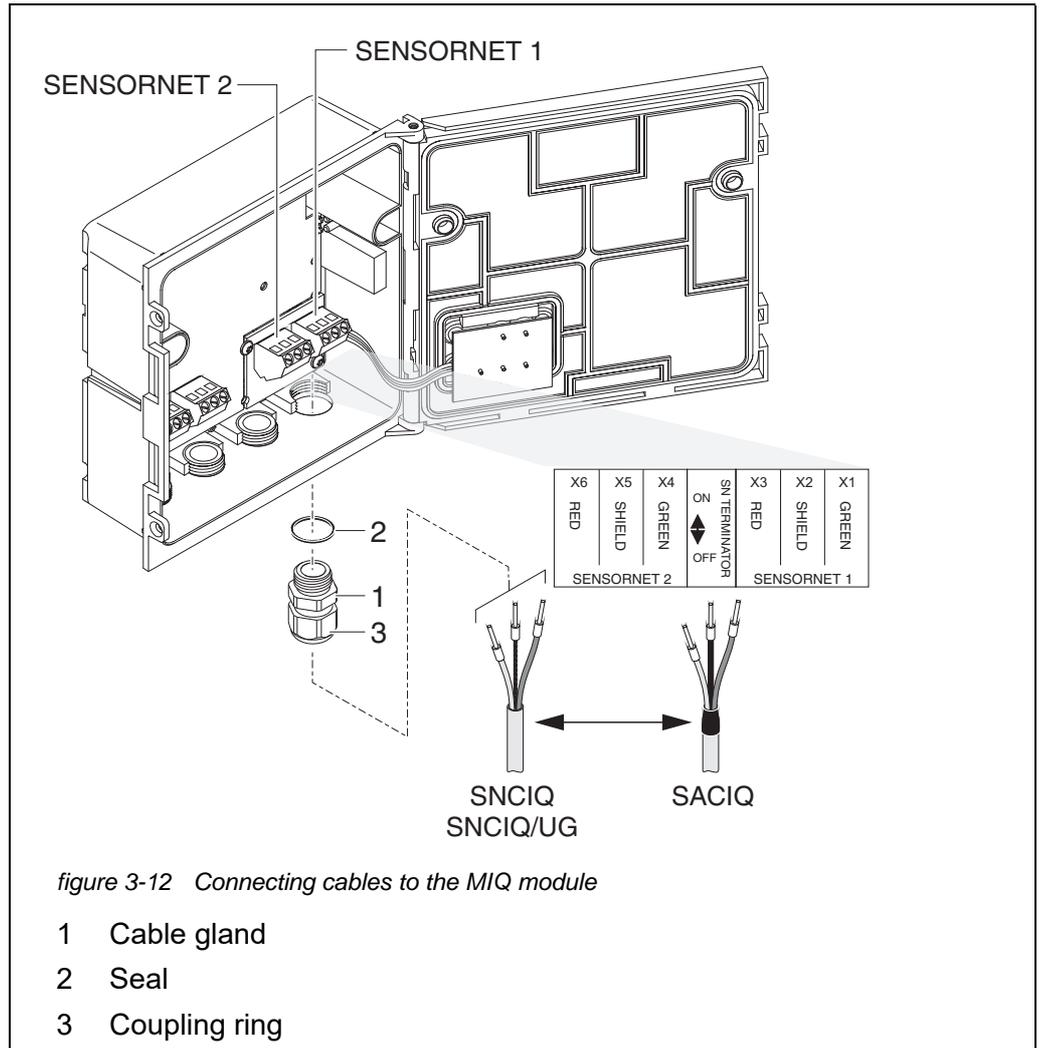
3   Screw the cable gland (pos. 1 in figure 3-12) with the sealing ring (pos. 2 in figure 3-12) into the module housing.

4   Loosen the cap nut (pos. 3 in figure 3-12).

5   Feed the cable through the cable gland into the module housing.

6   Connect the cable ends to the terminal strip. At the same time, look out for the designations of the terminals (red / shield / green).

7   Tighten the cap nut (pos. 3 in figure 3-12).

8   Close the MIQ module.

figure 3-13   Closing the cable opening

1   Coupling ring
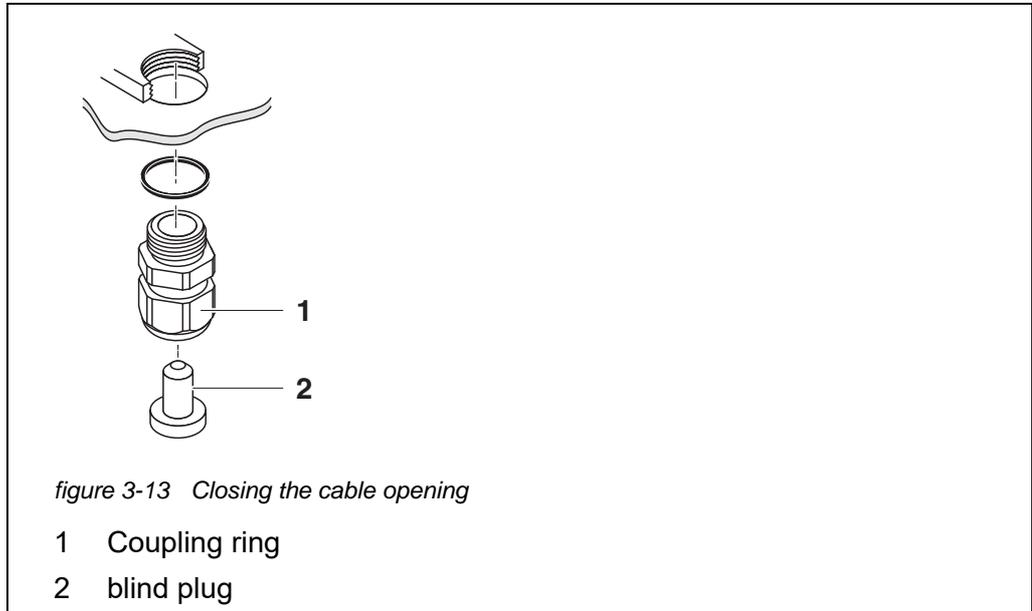
2   blind plug

9   Screw the remaining cable glands with the sealing rings into the remaining free openings and close them with the enclosed blind plugs (pos. 2 in figure 3-13), and tighten the cap nut (pos. 1 in figure 3-13).

Installation with conduits

Cables in conduits can be connected with a conduit adapter available as an accessory (for details, see the operating manual of the flexible conduit adapter CC-Box).

3.5.4   Connecting the sensor

The sensor is connected to the SENSORNET connector of the DIQ/S 281.

General installation instructions

Lines must always be installed separately at a minimum distance of 20 cm from other lines that carry a voltage greater than 60 V.

The free end of the sensor cable was stripped in the factory and all the wires are fitted with wire end sleeves.

Tools

● Phillips screwdriver

● Small screwdriver.

3.5.5   IQ sensor with SNCIQ cable

NOTE
The sensor cable may only be connected to the *SENSORNET* connector. *No wire of the cable may be connected with an external electrical potential. Otherwise, malfunctions could occur.*

1   On the left-hand side of the DIQ/S 281, remove the two countersunk screws and open the enclosure.
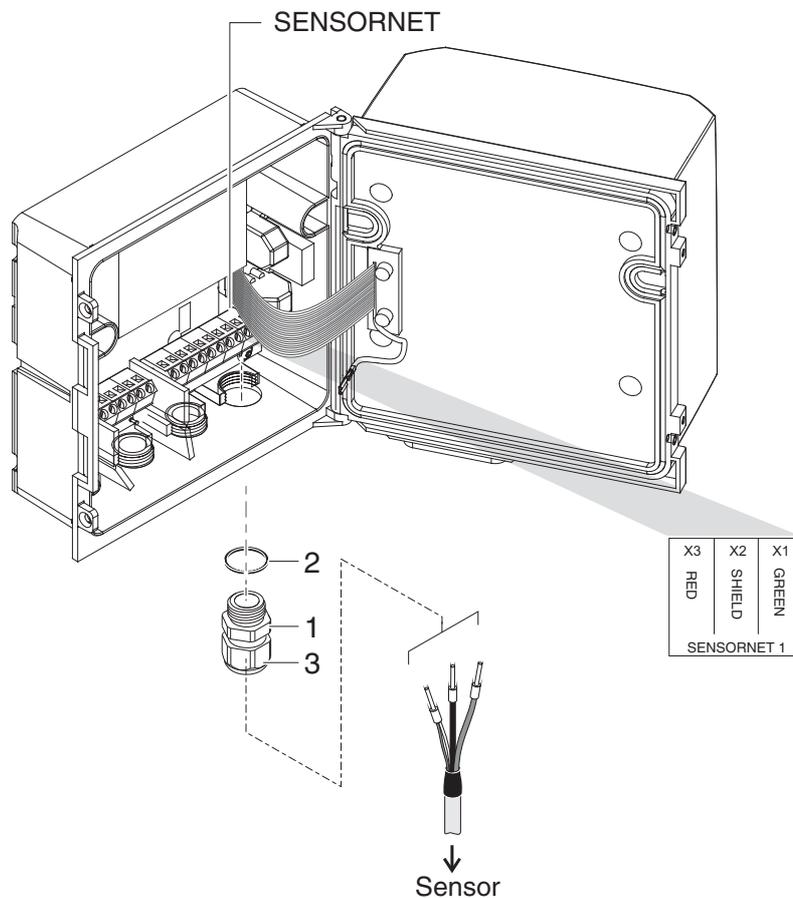
figure 3-14   Connecting the cable (example DIQ/S 281CR2)

2   Screw the cable gland (pos. 1 in figure 3-14) with the sealing (pos. 2) into the housing at the mounting position for the SENSORNET connection (see label on the bottom of the housing)

3   Loosen the cap nut (pos. 3 in figure 3-14).

4   Feed the sensor cable through the cable gland into the enclosure.
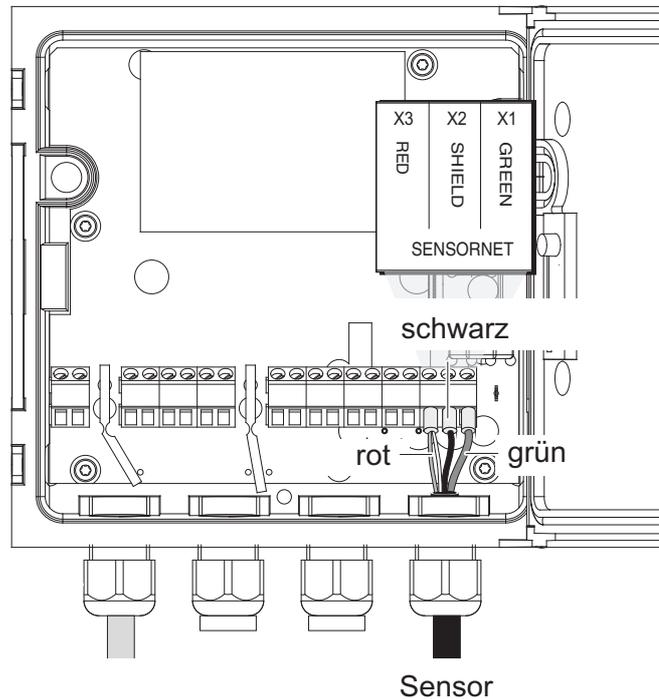
figure 3-15   SENSORNET connector (example DIQ/S 281 CR2)

5   Connect the cable ends to the terminal strip. At the same time, look out for the designations of the terminals (red / shield / green).

6   Tighten the cap nut (pos. 3 in figure 3-14).

7   Close the enclosure.

> The complete assignment of the terminal strip is shown in section 3.12.
>
> For further instructions on the mounting of the sensor at the application location, please refer to the relevant manual (immersion depth, etc.).

3.5.6   IQ sensor with permanently mounted cable

NOTE
The sensor cable may only be connected to the *SENSORNET* connector. *No wire of the cable may be connected with an external electrical potential. Otherwise, malfunctions could occur.*

1   On the left-hand side of the DIQ/S 281, remove the two countersunk screws and open the enclosure.

SENSORNET

2

1

3

X3 X2 X1
RED SHIELD GREEN
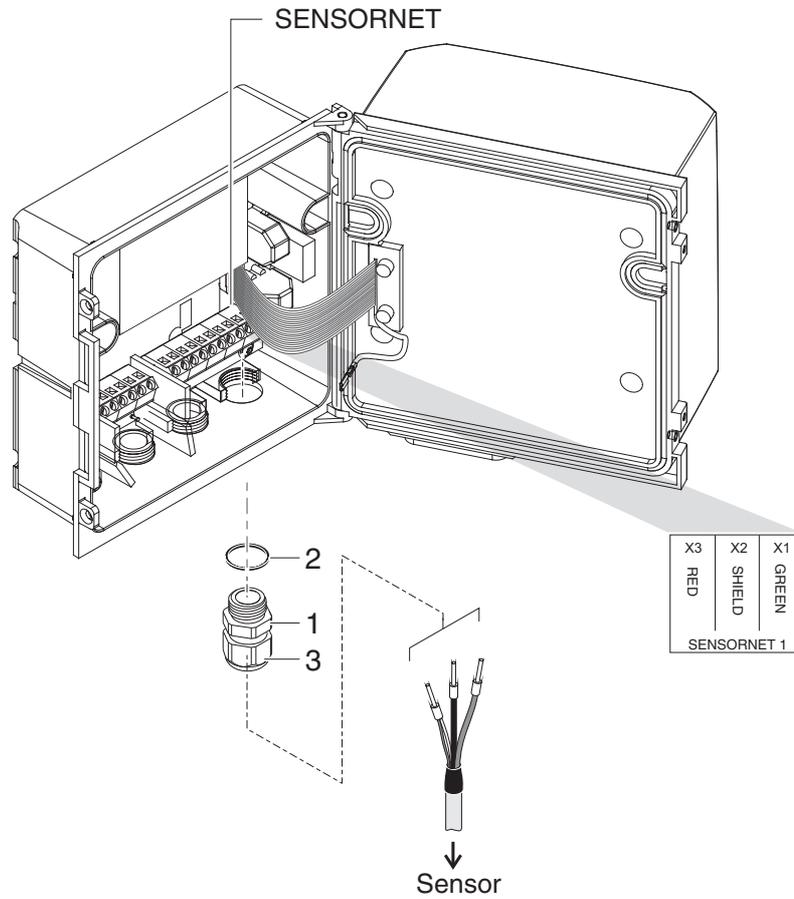
SENSORNET 1

Sensor

figure 3-16   Connecting the cable (example DIQ/S 281CR2)

2   Screw the cable gland (pos. 1 in figure 3-16) with the sealing (pos. 2) into the housing at the mounting position for the SENSORNET connection (see label on the bottom of the housing)

3   Loosen the cap nut (pos. 3 in figure 3-16).

4   Feed the sensor cable through the cable gland into the enclosure.
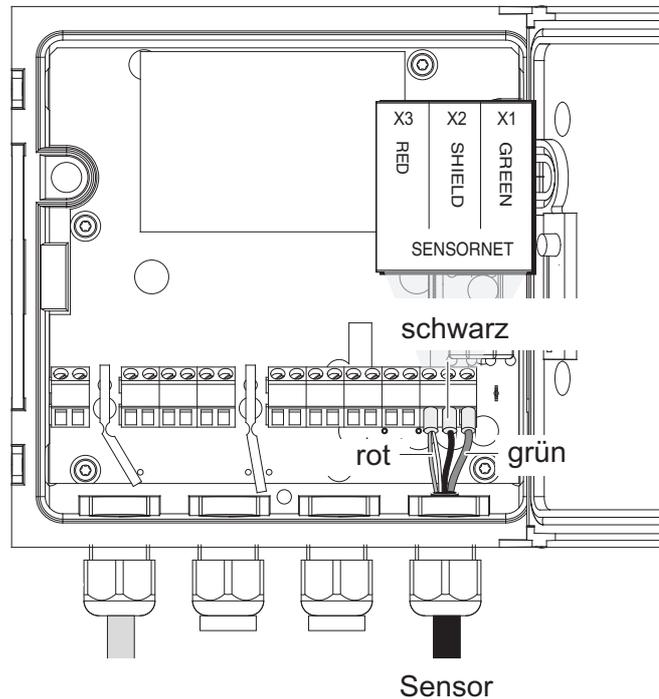
figure 3-17   SENSORNET connection

5   Connect the cable ends to the terminal strip. At the same time, look out for the designations of the terminals (red / shield / green).

6   Tighten the cap nut (pos. 3 in figure 3-14).

7   Close the enclosure.

> The complete assignment of the terminal strip is shown in section 3.12.
>
> For further instructions on the mounting of the sensor at the application location, please refer to the relevant manual (immersion depth, etc.).

3.6   On-site mounting of the DIQ/S 281

3.6.1   General information

The universal transmitter DIQ/S 281 is designed for stationary installation. With the aid of mounting accessories, the setup can be adjusted to meet various requirements.

NOTE

Components installed outside must always be protected by a sun shield against the effects of the weather (snow, ice and direct solar radiation). Otherwise, mal-

*functions can result. Always mount the universal transmitter in an upright posi-
tion. Do not under any circumstances install the universal transmitter without
rain protection with the lid facing upwards (danger of retained humidity and pen-
etration of moisture).*

*No contact base may be mounted on the back of the module (danger of short-
circuit!) if the module is mounted on a wall, a sun shield, or a top hat rail.*

**Installation
options**

The most important types of installation for the universal transmitter are
described in the following chapters:

- **Mounting with sun shield SSH/IQ:**
  (see section 3.6.2).

- **Mounting to the sun shield SD/K 170**
  The sun shield SD/K 170 provides room for the universal transmitter. The sun
  shield can be mounted to round or square section pipes (e.g. rails) with the
  aid of the MR/SD 170 mounting kit (section 3.6.3).

- **Wall mounting:**
  The universal transmitter is permanently fixed to a wall. For wall mounting,
  use the WMS/IQ mounting set (see chapter 10 Accessories and options).

- **Panel mounting:**
  The universal transmitter is mounted in the aperture of a switch panel. The
  dimensions of the aperture are 138 mm x 138 mm. The panel may not be
  thicker than 10 mm (section 3.6.5).
  To mount the interface (-MOD) of the DIQ/S 281-MOD behind the switch
  panel, use the PMS/IQ-X accessory (see section 10).

- **Top hat rail mounting:**
  The universal transmitter is mounted on a 35 mm top hat rail with the aid of a
  bracket, e.g. in a control cabinet. The connection can be released again with
  one simple movement (section 3.6.4).

The following chapters describe the mounting of the universal transmitter.

3.6.2   Mounting on a mounting stand with the SSH/IQ sun shield

**Materials and tools
required**

- SSH/IQ sun shield (see chapter 10 Accessories and options).

- 4 mm set screw wrench

- Phillips screwdriver.

Mounting the sun shield on a mounting stand
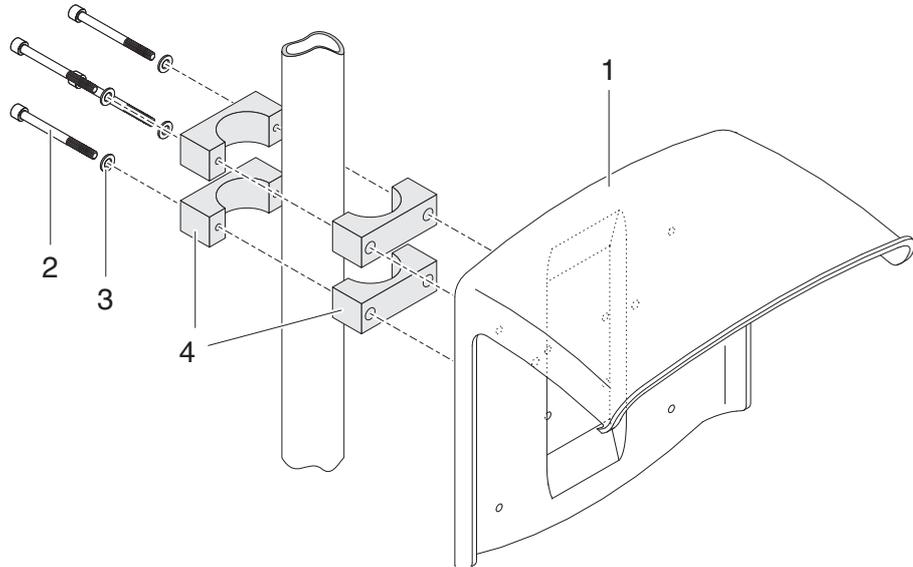
figure 3-18   Mounting the SSH/IQ sun shield on a mounting stand

1   Screw the sun shield (pos. 1 in figure 3-18) with the four hexsocket head screws (pos. 2), the washers (pos. 3) and the clamps (pos. 4) at the required height on the mounting stand from the back.

Premounting the ISO blind nuts
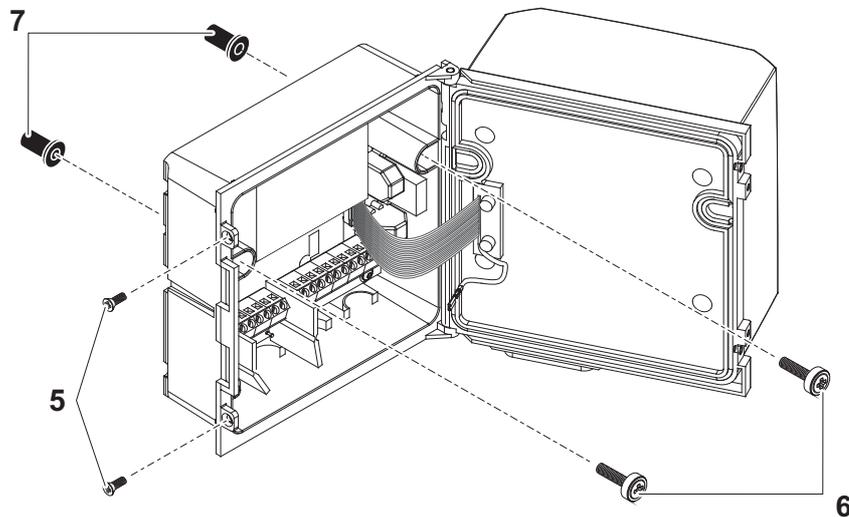
figure 3-19   Mounting the sun shield: Premounting the ISO blind nuts

2   Remove the two countersunk screws (pos. 5 in figure 3-19) and swing open the lid.

3   Insert the cheese-head screws (pos. 6 in figure 3-19) with the plastic washers in the drilled mounting holes and loosely screw in the ISO blind nuts (pos. 7).

**Mounting the DIQ/
S 281 on the sun
shield**
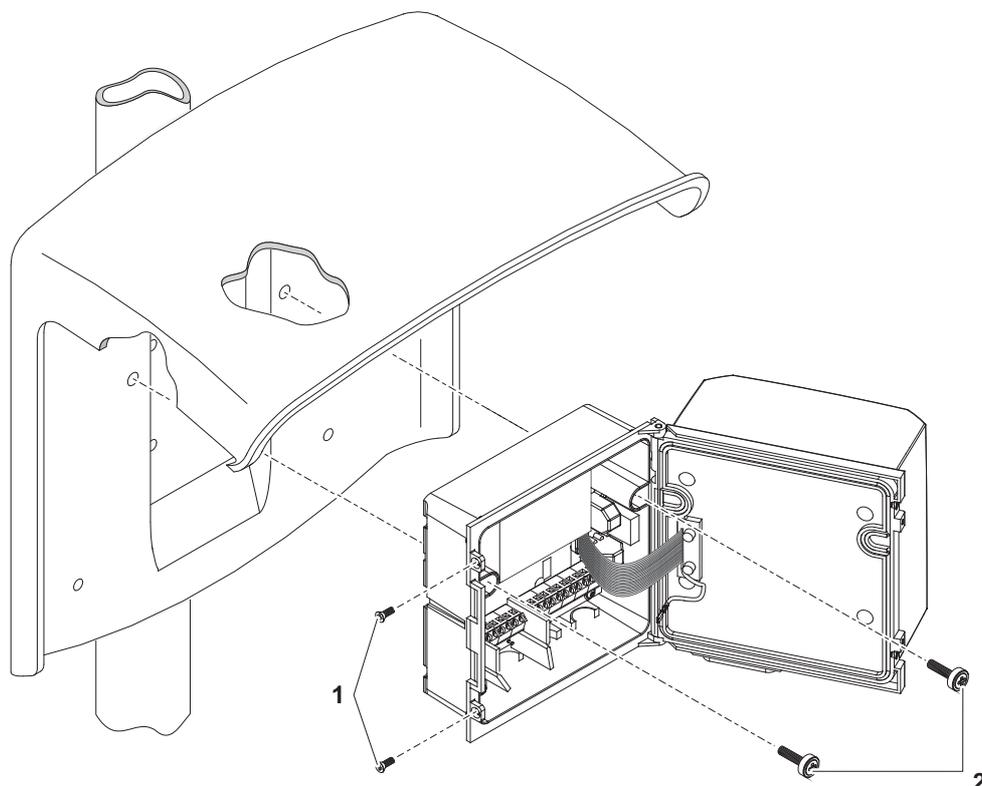
figure 3-20   Mounting the *DIQ/S 281* on the sun shield *SSH/IQ*

4   Position the universal transmitter on the sun shield and fix it into place
          with the two screws (pos. 2 in figure 3-20).

5   Close the lid and fix it with the two countersunk screws (pos. 1in figure
          3-20).

3.6.3   Mounting under the SD/K 170 sun shield

The SD/K 170 sun shield can be mounted directly on a wall, on a mounting stand
or on a railing. The MR/SD 170 mounting kit is also required for mounting on a
mounting stand or railing.

> How to mount the sun shield at the installation location is described
> in the instructions for the sun shield or mounting kit.

Materials required   ● SD/K 170 sun shield (see chapter 10 Accessories and options)

                          ● The MR/SD 170 mounting kit is also required for mounting the sun shield on
                            a mounting stand or railing (see chapter 10 Accessories and options).

Tools   ● Phillips screwdriver.

**Mounting the DIQ/
S 281 with sun
shield**
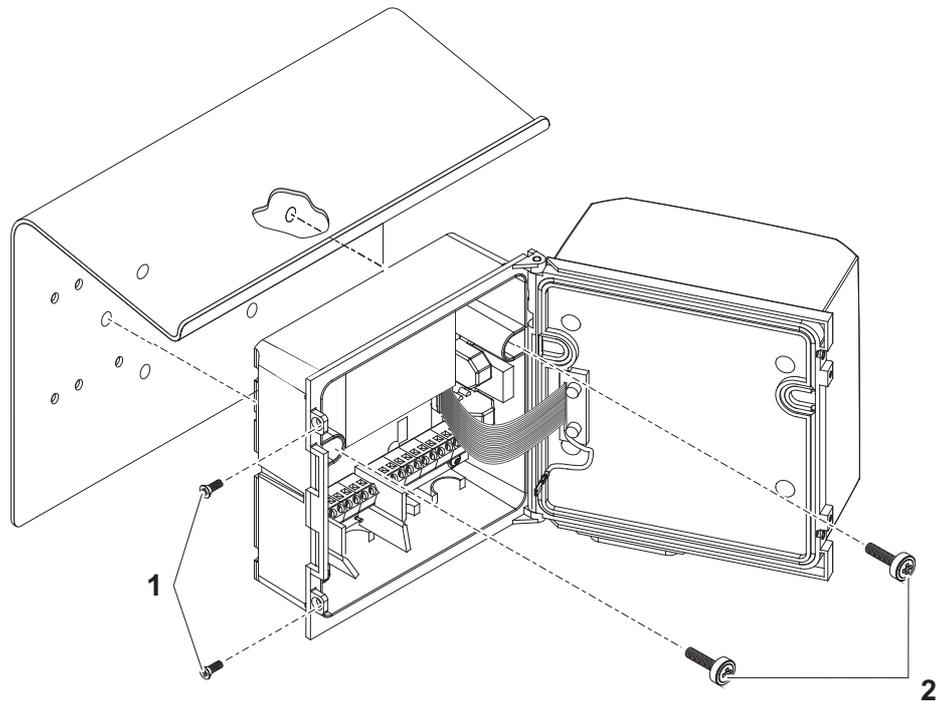
figure 3-21   Mounting the DIQ/S 281 with sun shield SD/K 170

1   Remove the two countersunk screws (pos. 1 in figure 3-21) and swing
         open the module lid.

2   Position the universal transmitter on the sun shield and fix it into place
         with the two screws (pos. 2 in figure 3-21).

3   Close the lid and fix it with the two countersunk screws (pos. 1 in figure
         3-21).

3.6.4   Top hat rail mounting

Materials required ● THS/IQ kit for top hat rail mounting (see chapter 10 ACCESSORIES AND
                          OPTIONS).

Tools ● Phillips screwdriver.

Mounting the **DIQ/
S 281 on a top hat
rail**
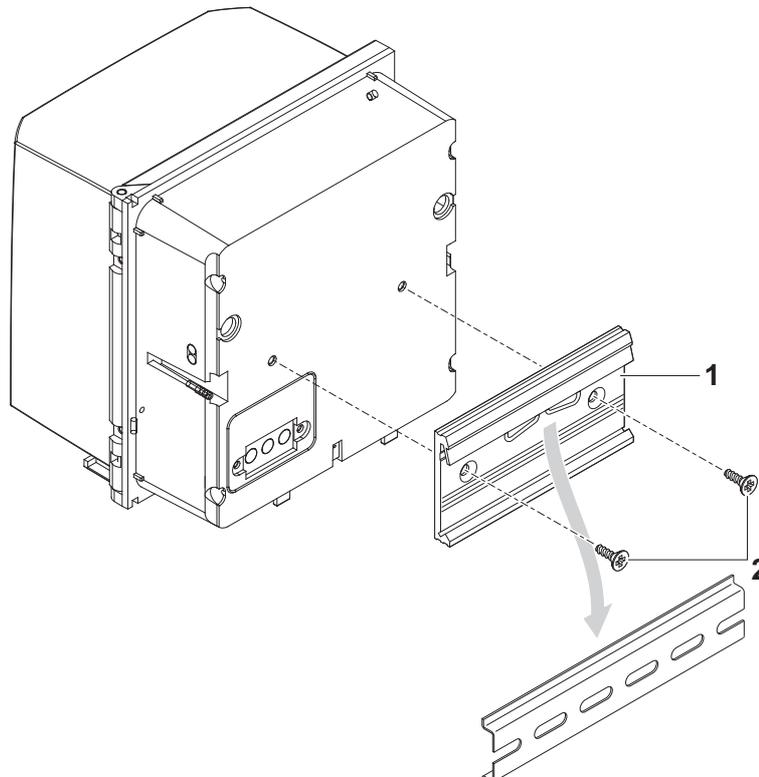
figure 3-22   Mounting the DIQ/S 281 on a top hat rail

1   Screw the clamping assembly (pos. 1 in figure 3-22) on the back of the
        universal transmitter with the two plastic tapping screws (pos. 2).

2   Attach the universal transmitter to the top hat rail from above using the
        clamping assembly and press against the rail until the clamping
        assembly clicks into place. The universal transmitter can be moved
        sideways afterwards.

3   To unhook the universal transmitter, press it downward and pull it
        forward at the bottom.

3.6.5   Panel mounting

Variants of the DIQ/S 281 without fieldbus interface can be mounted to a switch
panel with the PMS/IQ mounting set.

For variants of the DIQ/S 281 with fieldbus interface, we recommend using the
PMS/IQ-X mounting set. It enables to mount the DIQ/S 281 in the switch panel
so that the fieldbus interface is accessible behind the switch panel.

Switch panel mounting sets	Variant DIQ/S 281	Switch panel mounting set	Switch panel aperture	Max. thickness of the switch panel
	DIQ/S 281 -CR2	PMS/IQ	138 x 138 mm	10 mm
	DIQ/S 281-MOD	PMS/IQ-X	186 x 186 mm	8 mm

Switch panel mounting with PMS/IQ-X Details on panel mounting with the PMS/IQ-X mounting set are given in the operating manual of the PMS/IQ-X.

Switch panel mounting with PMS/IQ Panel mounting with the PMS/IQ mounting set is described below:

Materials required ● PMS/IQ kit for panel mounting (see chapter 10 ACCESSORIES AND OPTIONS).

Tools ● 3 mm set screw wrench (contained in the panel installation kit).

Switch panel aperture
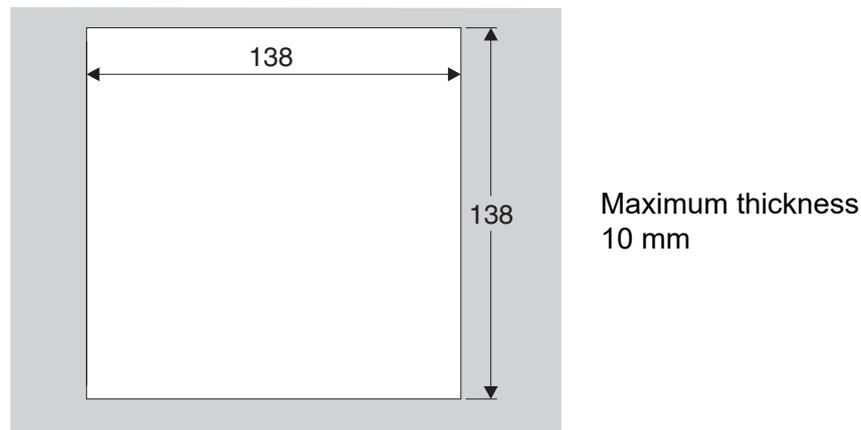
figure 3-23   Mounting aperture in the switch panel (dimensions in mm)

Mounting the DIQ/ S 281 in a switch panel
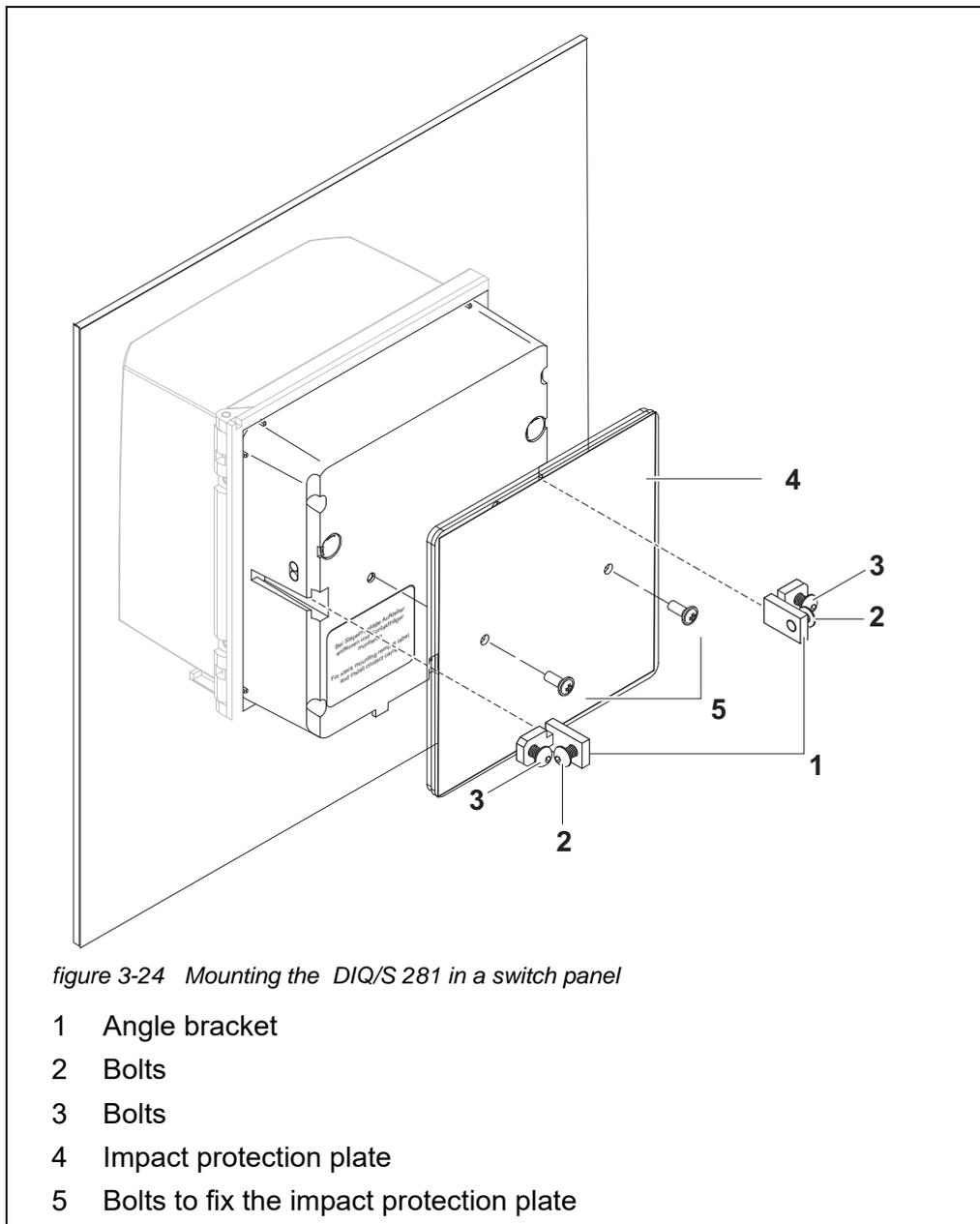
figure 3-24   Mounting the DIQ/S 281 in a switch panel

1   Angle bracket

2   Bolts

3   Bolts

4   Impact protection plate

5   Bolts to fix the impact protection plate

1   Insert the universal transmitter in the panel aperture from the front.

2   Slightly unscrew the bolts (pos. 2 and 3) of the two angle brackets (pos. 1 in figure 3-24), but do not remove them.

3   Push in the two angle brackets - as shown in figure 3-24 - into the lateral guides of the universal transmitter up to the stop.

4   Tighten the bolts (pos. 2).

5   Screw in the bolts (pos. 3) until the bolts rest snugly against the panel.

6   Fix the impact protection plate (Pos. 4) to the back of the DIQ/S 281 with the bolts (Pos. 5).

3.7   Electrical connections: General instructions

Cable glands   All electric cables are fed from below through openings prepared in the enclosure of the DIQ/S 281 and the DIQ modules. Cable glands with different clamping ranges are included with the DIQ/S 281 to provide sealing between the cable and enclosure as well as for strain relief. Select the suitable cable gland for the relevant cable type and cable diameter:

● **Small**, clamping range 4.5 to 10 mm.
This cable gland is suitable for all cables (earth cable after stripping the outer insulation, see section 3.6) and sensor connection cables.

sealing ring 20 x 15 x 1 mm

cable gland M16

blind plug
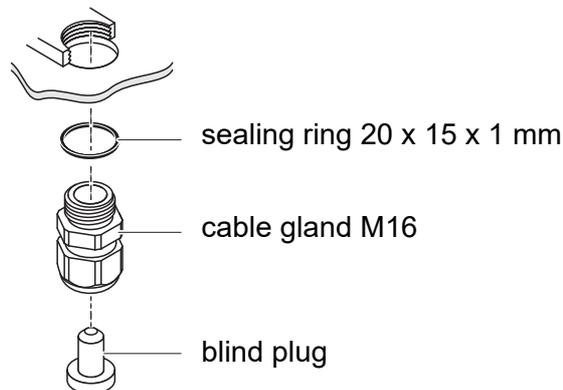
● **Large**, clamping range 7 to 13 mm.
This cable gland is required for cable sheaths with an outside diameter of more than 10 mm and is screwed into the enclosure via an extension piece.

sealing ring 20 x 15 x 1 mm

extension piece M16/M20

sealing ring 24 x 19 x 2 mm
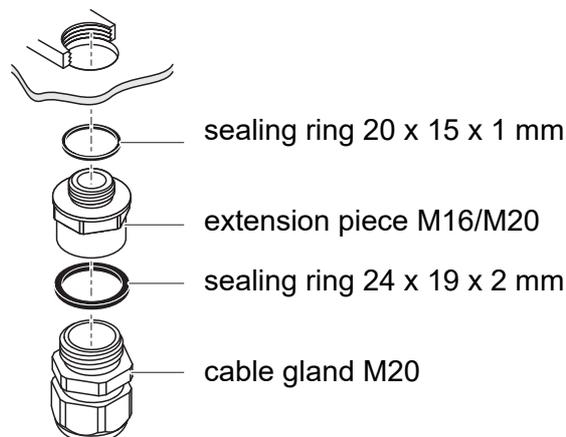
cable gland M20

If necessary, you can order more big cable glands (see chapter 10 ACCESSORIES AND OPTIONS).

General   Observe the following points when attaching connecting wires to the terminal
installation   strip
instructions
● Shorten all wires to be used to the length required for the installation

● Always fit all the ends of the wires with wire end sleeves before connecting
them to the terminal strip

● Any wires that are not used and project into the enclosure must be cut off as
closely as possible to the cable gland.

● Screw a small cable gland with sealing ring into each remaining free opening
and close it with a blind plug.

WARNING
**No free wires are allowed to project into the housing. Oth-
erwise, there is a danger that areas safe to contact could
come into contact with dangerous voltages. Always cut
off any wires that are not in use as closely as possible to
the cable gland.**

3.8   Connecting the voltage supply

The two following paragraphs describe how to connect both models of the DIQ/
S 281 universal transmitter to the voltage supply.

3.8.1   DIQ/S 281 (line power version)

WARNING

If the power supply is connected incorrectly, it may represent a danger to life from electric shock. Pay attention to the following points during installation:

● **The DIQ/S 281 universal transmitter may only be connected by a trained electrician.**

● **The connection of the DIQ/S 281 universal transmitter to the power supply may only be carried out when it is not carrying any voltage.**

● **The power supply must fulfill the specifications given on the nameplate and in chapter 9 TECHNICAL DATA.**

● **When installed in a building, a switch or power switch must be provided as an interrupt facility for the DIQ/S 281.**
  The interrupt facility must

  – **be installed in the vicinity of the DIQ/S 281 universal transmitter, easily accessible by the user, and**

  – **be labeled as the interrupt facility for the DIQ/S 281 universal transmitter.**

● **After the DIQ/S 281 universal transmitter has been installed, it may only be opened if the line voltage has been switched off beforehand.**

Materials required
● Wire end sleeves, suitable for the power line, with suitable crimping tool

● 1 x cable gland with sealing ring (included in scope of delivery of the DIQ/S 281).

Tools
● Cable stripping knife

● Wire stripper

● Phillips screwdriver

● Small screwdriver.

Preparing the power cable

1   Cut off the cable to the required length.

2   Strip the cable insulation for approx. 45 mm.

3   Bare the wires of phases L and N and fit them with wire end sleeves.

4   If present, cut off the ground wire at the end of the cable sheath.
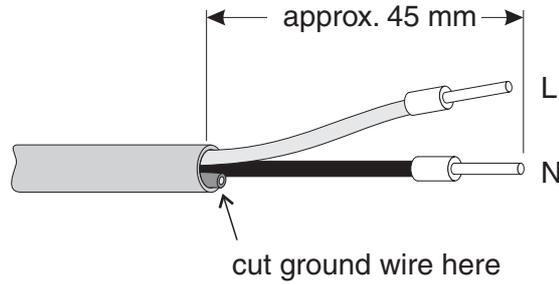
figure 3-25   Prepared power cable.

The ground wire must not project into the enclosure. Otherwise, malfunctions could occur.

Connecting the   5   On the left-hand side of the DIQ/S 281, remove the two countersunk
power line   screws and open the enclosure.
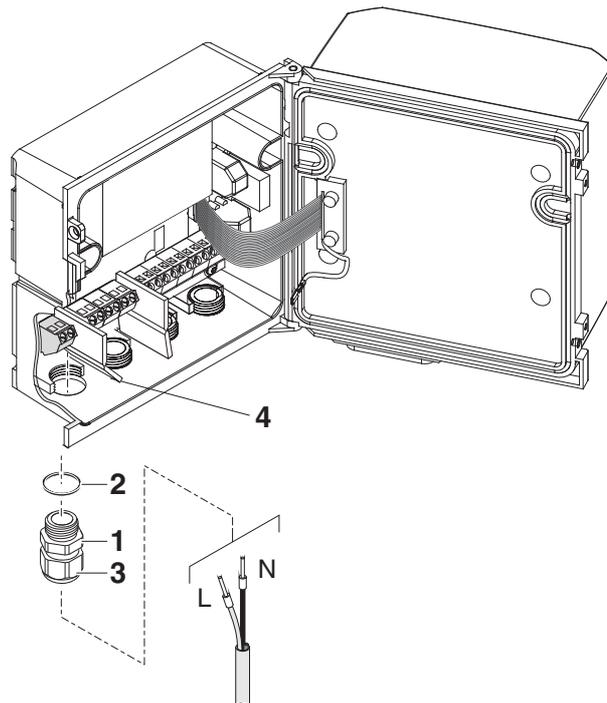
figure 3-26   Inserting the supply line.

6   Screw a cable gland (pos. 1 in figure 3-26) with sealing ring (pos. 2) into
    the enclosure below the power supply connection.

7   Loosen the coupling ring (pos. 3).

8   Feed the power line through the cable gland into the enclosure. When
    doing so bend the flexible divider (pos. 4) to the right.
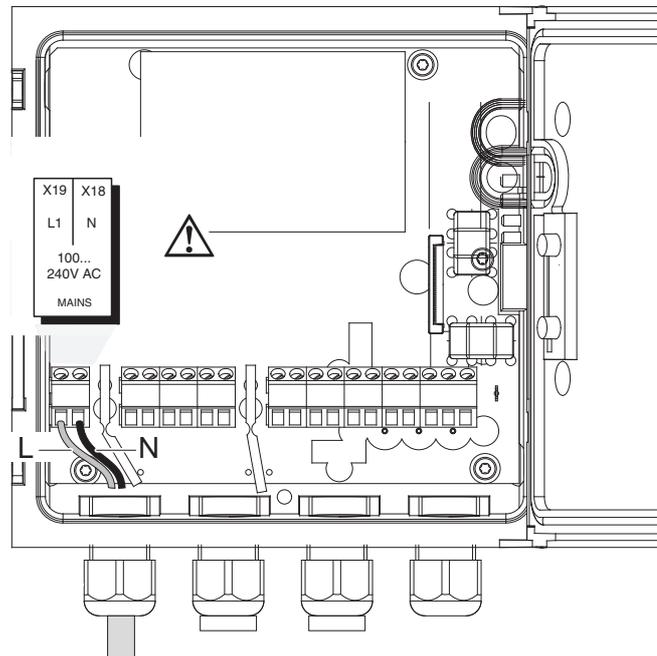
figure 3-27   Line power connection.

> The complete assignment of the terminal strip is shown in section 3.12.

9   Connect phases L and N to the terminal strip. Make sure that the cable assignment agrees with the specification on the terminal label under the terminal strip.

10   Tighten the cap nut (pos. 3 in figure 3-26).

WARNING
No free wires are allowed to project into the housing. Otherwise, there is a danger that areas safe to contact could come into contact with dangerous voltages. Always cut off any wires that are not in use as closely as possible to the cable gland.

---

11   Close the enclosure of the DIQ/S 281.

3.8.2 DIQ/S 281/24V (24 V version)

> **WARNING**
> **If the 24 V AC/DC supply is connected incorrectly, it may represent a danger to life from electric shock. Pay attention to the following points during installation:**
> - **The DIQ/S 281 universal transmitter may only be connected by a trained electrician.**
> - **The 24 V AC/DC supply must meet the specifications quoted on the name plate and in chapter 9 TECHNICAL DATA** (protective low voltage SELV).
> - **The connection of the DIQ/S 281 universal transmitter to the power supply may only be carried out when it is not carrying any voltage.**
> - **When installed in a building, a switch or power switch must be provided as an interrupt facility for the universal transmitter DIQ/S 281.**
>   **The interrupt facility must**
>   – be installed in the vicinity of the DIQ/S 281 universal transmitter, easily accessible by the user, and
>   – be labeled as the interrupt facility for the DIQ/S 281 universal transmitter.

Rechargeable battery systems should have a deep discharge protection. The DIQ/S 281 CR2/24V does not have any built-in deep discharge protection.

Materials required
- Wire end sleeves, suitable for the 24 V AC/DC feed line, with suitable crimping tool
- 1 x cable gland with sealing ring (included in scope of delivery of the DIQ/S 281).

Tools
- Cable stripping knife
- Wire stripper
- Phillips screwdriver
- Small screwdriver.

Preparing the 24 V AC/DC line

1   Cut off the cable to the required length.

2   Strip the cable insulation for approx. 45 mm.

3   Bare the wires 1 and 2 and fit them with wire end sleeves.
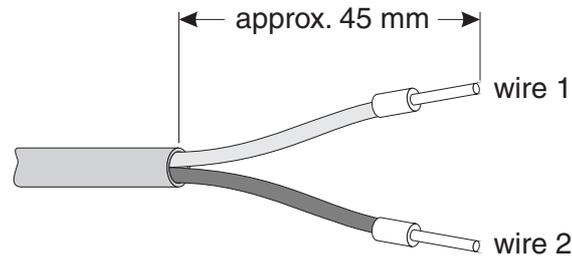
figure 3-28   Prepared 24 V AC/DC line.

Connecting the   4   On the left-hand side of the DIQ/S 281, remove the two countersunk
24 V AC/DC line   screws and open the enclosure.
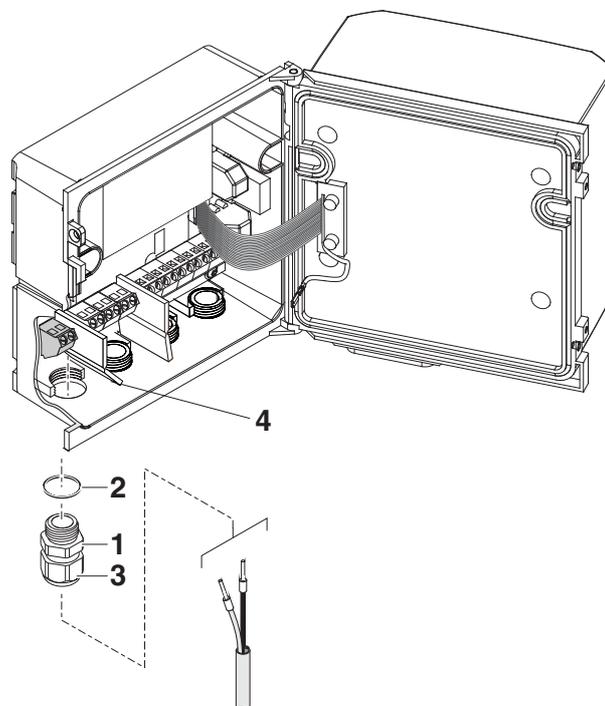
figure 3-29   Inserting the 24V AC/DC line

5   Screw a cable gland (pos. 1 in figure 3-29) with sealing ring (pos. 2) into
         the enclosure below the 24 V AC/DC connection.

6   Loosen the coupling ring (pos. 3).

7   Feed the 24 V AC/DC line through the cable gland into the enclosure.
         When doing so bend the flexible divider (pos. 4) to the right.
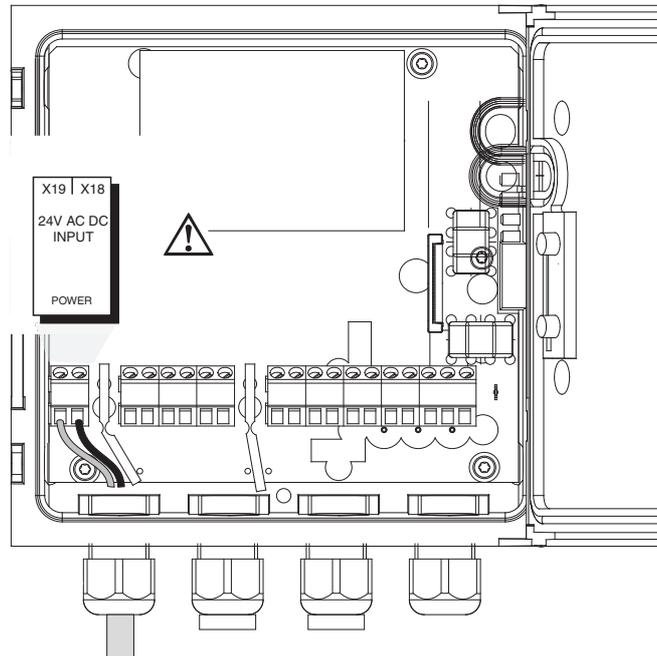
figure 3-30   24 V AC/DC connection.

> The complete assignment of the terminal strip is shown in
> section 3.12.

8   Connect wires 1 and 2 to the terminal strip. Make sure that the cable
        assignment agrees with the specification on the terminal label under the
        terminal strip.

9   Tighten the cap nut (pos. 3 in figure 3-29).

No free wires are allowed to project into the housing. Otherwise there is the dan-
ger of short circuits that can cause a fire. Always cut off any wires that are not in
use as closely as possible to the cable gland.

10   Close the enclosure of the DIQ/S 281.

3.9 Connections to the relay and current outputs

3.9.1 General installation instructions

<table>
<tr>
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WARNING

If external electrical circuits that are subject to the danger of physical contact are incorrectly connected to the relay contacts, there may be a danger of life threatening electric shock. Electrical circuits are regarded to be subject to the danger of physical contact when there are voltages higher than the Safety Extra Low Voltage (SELV).

Pay attention to the following points during installation:

- **Electrical circuits subject to the danger of physical contact may only be connected by a qualified electrician.**

- **Electrical circuits subject to the danger of physical contact may only be connected when they are voltage-free.**

- **If electrical circuits subject to the danger of physical contact are switched with a relay, no circuit that is not subject to this danger (e. g. the DIQ/CHV module) may be operated on the further relays.**

- **Switching voltages and switching currents on the relay contacts must not exceed the values specified in chapter 9 TECHNICAL DATA. Protect electrical circuits against currents that are too high with an electrical fuse.**

- **Only single-phase consumers can be switched with the relays. Under no circumstances may multiphase consumers be switched with the aid of several relays (example: three-phase current driven pumps). Always switch multiphase consumers via a protective relay.**

- **After the Universal Transmitter DIQ/S 281 has been installed, it may only be opened if all external voltages have been switched off beforehand.**

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Materials required
- Wire end sleeves, suitable for the connecting wires, with suitable crimping tool

- 4 x cable gland with sealing ring (scope of delivery of the DIQ/S 281)

Tools
- Cable stripping knife

- Wire stripper

- Phillips screwdriver

- Small screwdriver

Connecting lines to the terminal strip

1   On the left-hand side of the DIQ/S 281, remove the two countersunk screws and open the enclosure.
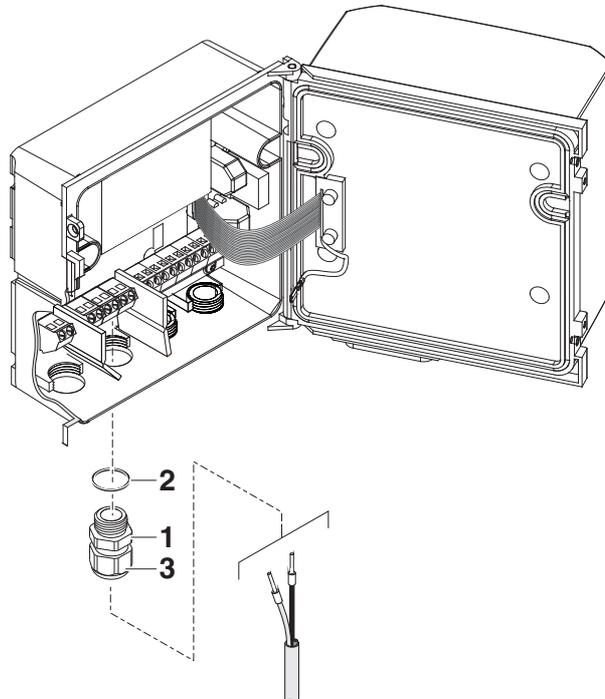
figure 3-31   Inserting lines

The complete assignment of the terminal strip is shown in section 3.12.

2   Screw a cable gland (pos. 1 in figure 3-31) with the sealing ring (pos. 2) into the enclosure below the respective connections.

3   Loosen the coupling ring (pos. 3).

4   Feed the line through the cable gland in the enclosure.

5   Connect the wires to the terminal strip. While doing so, pay attention to the specifications on the label located under the terminal strip.

6   Tighten the coupling ring (pos. 3).

> ⚠ **WARNING**
> **No free wires are allowed to project into the housing. Otherwise, there is a danger that areas safe to contact could come into contact with dangerous voltages. This could result in life threatening electric shock when working with the universal transmitter DIQ/S 281. Always cut off any wires that are not in use as closely as possible to the cable gland.**

7   Close the enclosure of the DIQ/S 281.

3.9.2   Usage of the auxiliary voltage

The universal transmitter DIQ/S 281 has a 24 V output (designation HILFSSPANNUNG or AUXILIARY VOLTAGE on the terminal strip). You can use this auxiliary voltage for the relay-controlled opening of the valve in a DIQ/CHV valve module for the compressed air-driven sensor cleaning function. To do so, you have to connect the auxiliary voltage output, a free relay contact and the valve connection in the DIQ/CHV in series. Bridge a terminal of the auxiliary voltage output with a terminal of a relay output and run a control line from the remaining terminals to the valve module.

The auxiliary voltage must not be used for other purposes.

Connection scheme for one sensor with compressed air cleaning
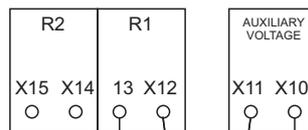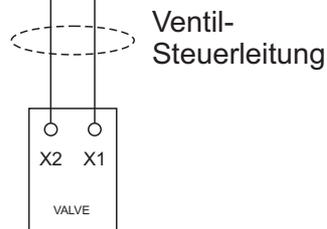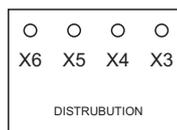
Run the bridge below the divider so the bridge does not bump against the circuit board in the lid when the enclosure is closed.

Separating plate

Relais contact   Auxiliary voltage output

Bridge

Valve control line
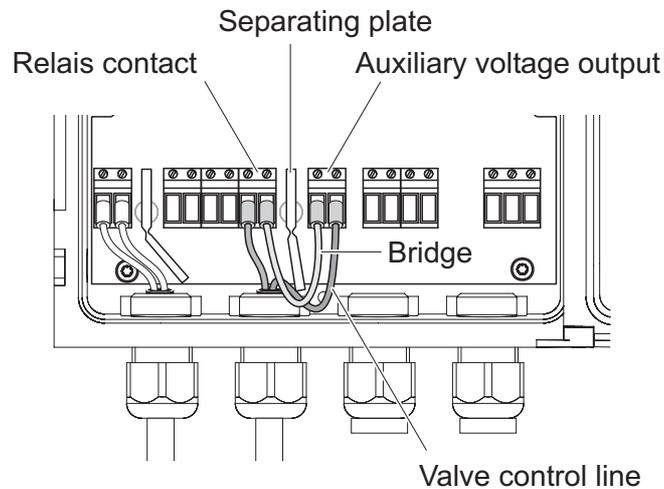
3.10 Commissioning

Start checklist and system start

Before starting the system, carry out the system check using the following checklist. Always carry out the check:

● before the initial commissioning

● before any further commissioning if the system has been previously extended or modified.

Start checklist:

1 Are all components correctly connected with each other (see section 3.5.4, if necessary, section 3.6)?

2 Is the universal transmitter correctly connected to the power supply (see section 3.8)?

3 Do the line voltage and line frequency agree with the data on the name plate of the universal transmitter?

4 Is the sensor ready for measuring, e.g. a D.O. sensor filled with electrolyte solution?

Starting the system

Switch on the power supply of the DIQ/S 281. As soon as the system is successfully initialized, the measured value display appears. With a sensor not yet providing any measurement values, "Init" appears temporarily:

Select your system language during the first system start. The selected system language can be changed in the *Einstellungen/ Settings* menu at any time.

Initial start phase   The Universal Transmitter is initialized during the first start phase. All compo-
nents are automatically registered with the Universal Transmitter DIQ/S 281.
The system then performs a self test. This process can take several seconds.
During this period, the following display appears:
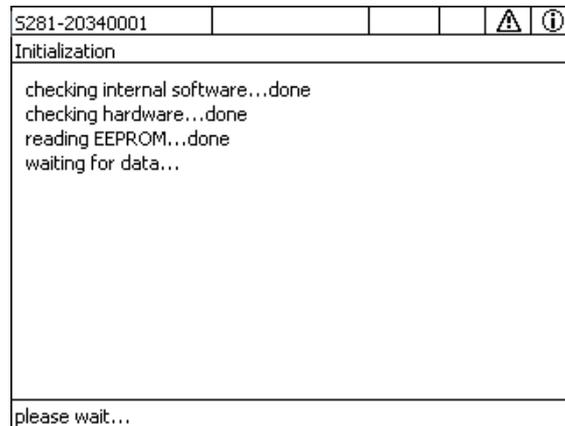
figure 3-32   Display during the initialization process

Second start   As soon as the Universal Transmitter is successfully initialized, the measured
phase   value display appears. In the case of IQ sensors that are not yet providing mea-
sured values, "Init" appears temporarily
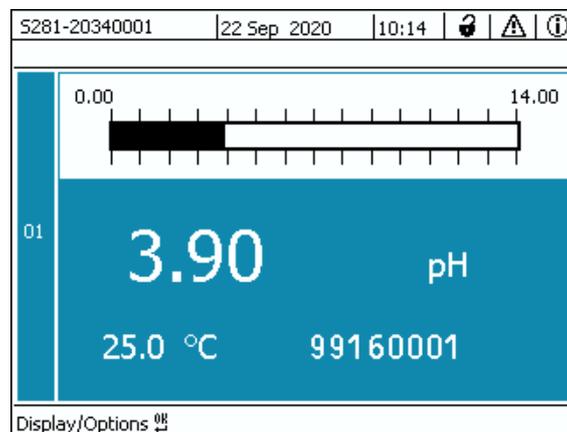
figure 3-33   Display after initialization of the terminal

If the system start failed, see chapter 8 WHAT TO DO IF ....

3.11 Installation examples

3.11.1 Connection of a sensor without compressed air cleaning

Maximum total cable length
SNCIQ(/UG) plus SACIQ = 250 m
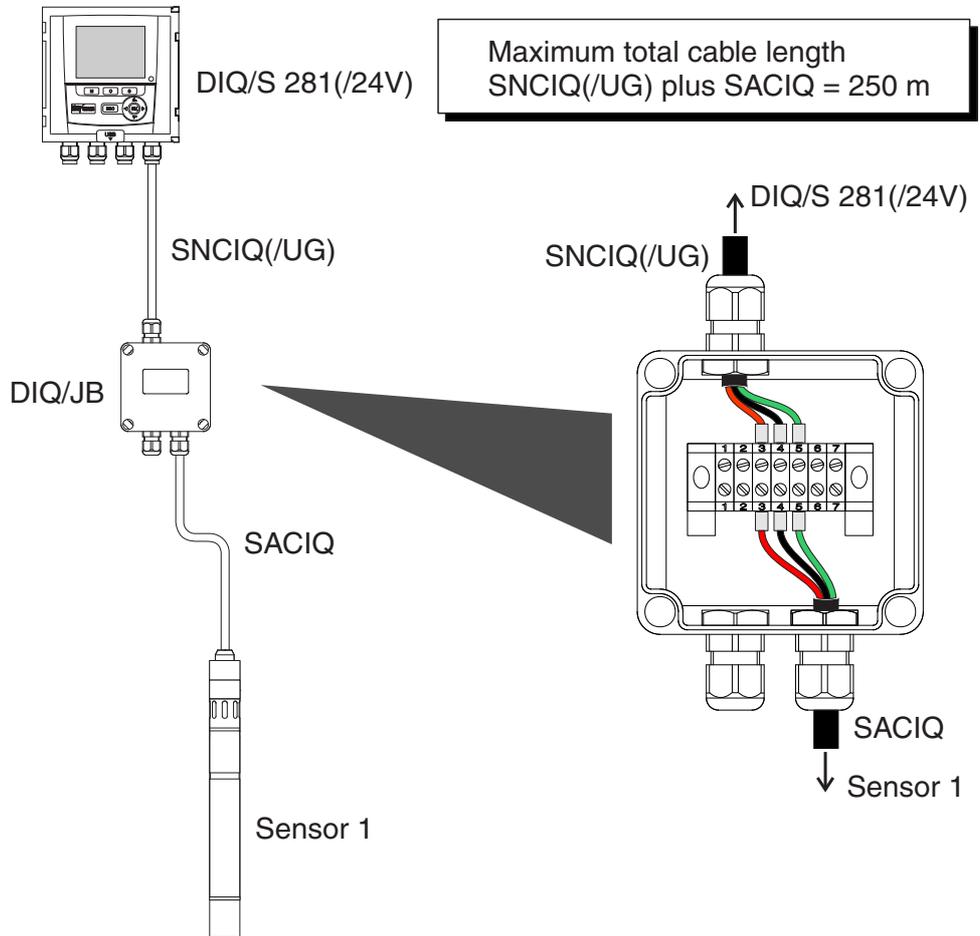
Connection diagram, terminal strip DIQ/JB

3.11.2 Connection of a sensor with compressed air cleaning

Maximum total cable length
SNCIQ(/UG) plus SACIQ = 250 m

DIQ/S 281(/24V)

SNCIQ(/UG)

Valve control line

DIQ/JB

DIQ/CHV

SACIQ

Air
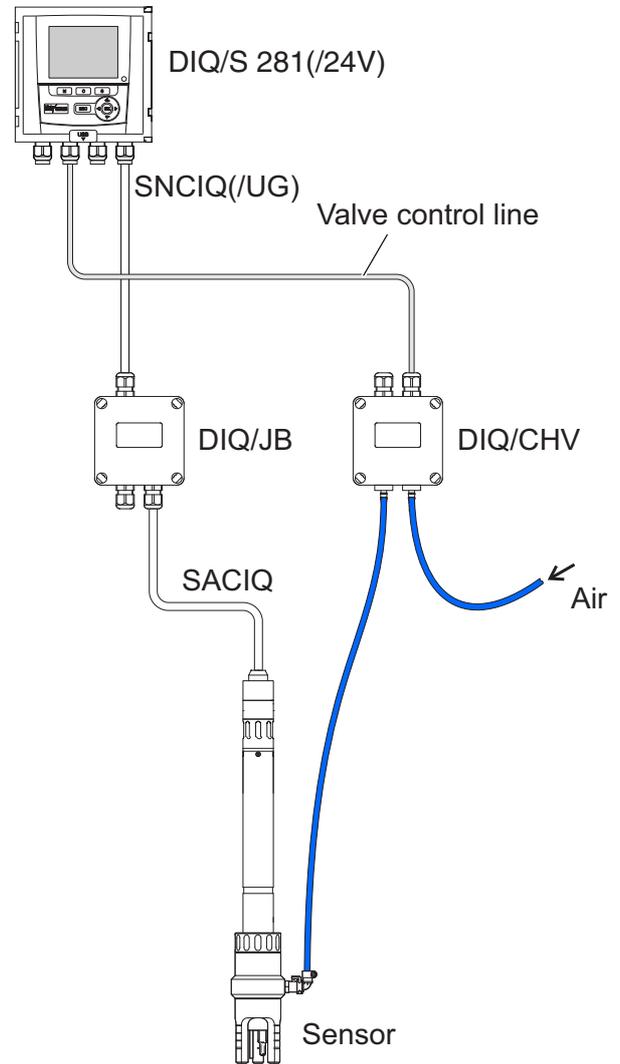
Sensor

Connection scheme of valve control

Example:
Relay 1 controls the cleaning of the sensor.

In this configuration, the free switching contact (here: R2) may be used to switch SELV voltages only.

No free wires are allowed to project into the housing. Otherwise, there is a danger that areas safe to contact could come into contact with dangerous voltages. Always cut off any wires that are not in use as closely as possible to the cable gland.

Klemmleiste
DIQ/S 281

R2	R1	AUXILIARY VOLTAGE
X15 X14	13 X12	X11 X10
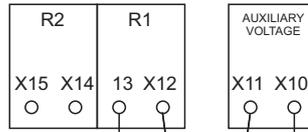
Ventil-
Steuerleitung

Klemmleiste
DIQ/CHV

X6 X5 X4 X3
DISTRUBUTION

X2 X1
VALVE

**Connection
diagram,
terminal strip
DIQ/JB**

Shield/filler strand

SNCIQ(/UG)

red green

X1 X2 X3 X4 X5 X6 X7

red green

Sensor

black

Shield/filler strand

SNCIQ(/UG)

red green

X1 X2 X3 X4 X5 X6 X7

white & brown green

Sensor

black
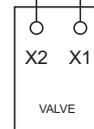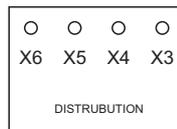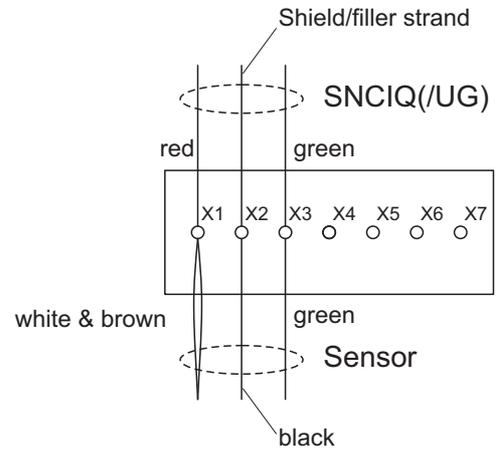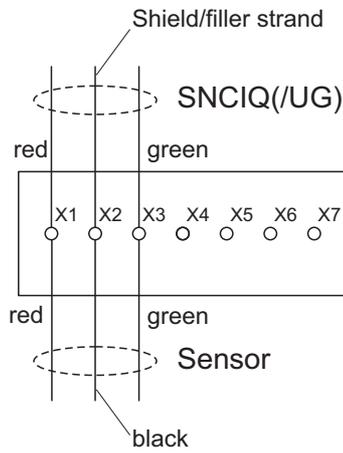
3.11.3 Connection of a sensor that is located at a distance (without compressed air cleaning)
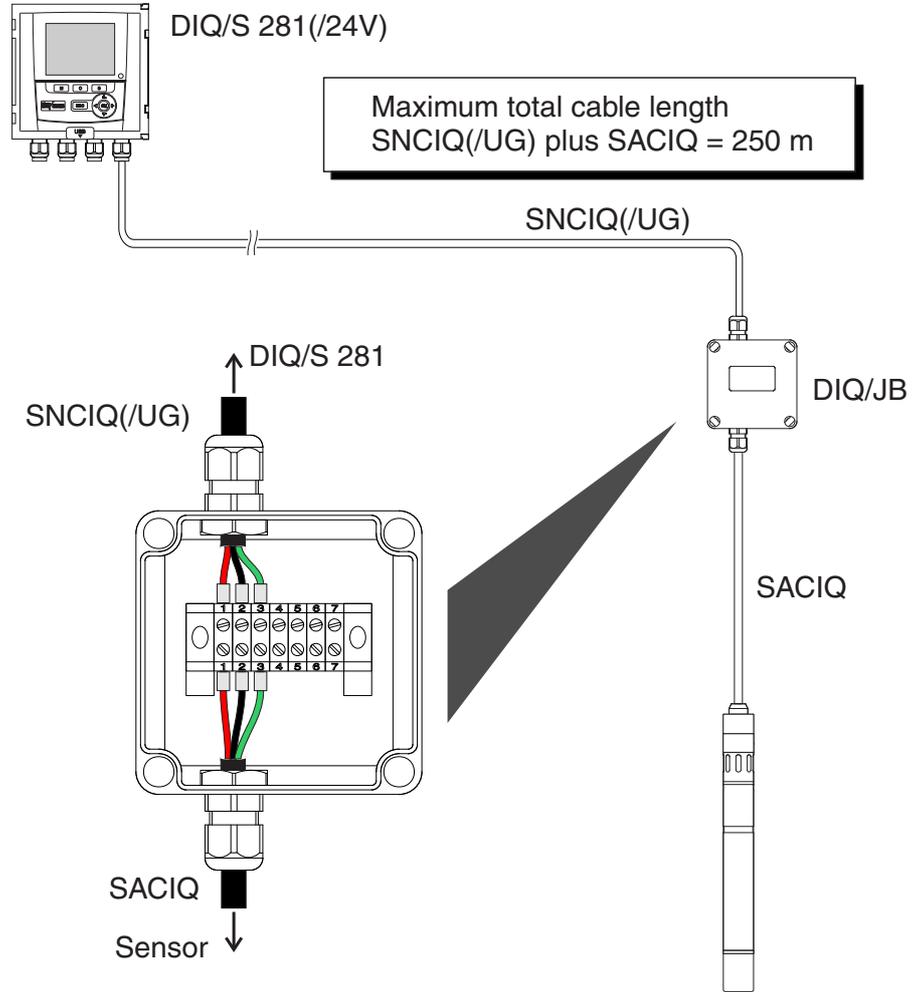
Connection diagram, terminal strip DIQ/JB
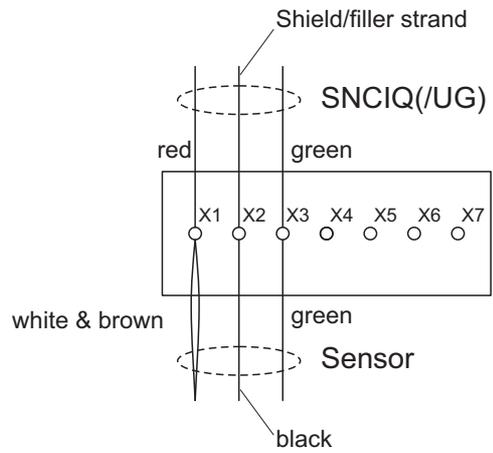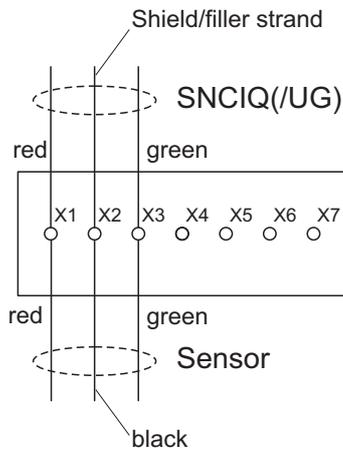
3.12   Figures of the terminal strips

DIQ/S 281 -CR2

X19	X18		X15	X14	X13	X12		X11	X10		X7	X6	X5	X4		X3	X2	X1
L1	N		≤ 240V AC		≤ 240V AC			AUXILIARY VOLTAGE			0/4...20mA		0/4...20mA			RED	SHIELD	GREEN
		⚠	≤ 2A AC		≤ 2A AC													
100... 240V AC											+ REC - C2		+ REC - C1					
MAINS			R2		R1			AUXILIARY								SENSORNET 1		

DIQ/S 281 -CR2 /24V

X19	X18		X15	X14	X13	X12		X11	X10		X7	X6	X5	X4		X3	X2	X1
24V AC DC INPUT		⚠	≤ 240V AC ≤ 2A AC		≤ 240V AC ≤ 2A AC			AUXILIARY VOLTAGE			0/4...20mA		0/4...20mA			RED	SHIELD	GREEN
POWER			R2		R1			AUXILIARY			+ REC - C2		+ REC - C1			SENSORNET 1		

DIQ/S 281 -MOD

X19	X18		X15	X14	X13	X12		X11	X10				X3	X2	X1
L1	N		≤ 240V AC ≤ 2A AC		≤ 240V AC ≤ 2A AC			AUXILIARY VOLTAGE					RED	SHIELD	GREEN
100... 240V AC		⚠													
MAINS			R2		R1			AUXILIARY					SENSORNET 1		

DIQ/JB

(7 passive, potential-free terminals for line extension)

DIQ/CHV

(AUXILIARY)				VALVE	
X6	X5	X4	X3	X2	X1

4   Operation

4.1   Operating elements

4.1.1   Overview of the operating elements

The Universal Transmitter is equipped with a large display for the clear presentation of current measured values, the graph of measured values, status displays and message texts.

The 5 keys **<M>**, **<C>**, **<S>**, **<ESC>**, **<OK>** and the arrow keys **<▲ ▼ ◄► >** are used to operate the DIQ/S 281 Universal Transmitter.

figure 4-1   Operating elements of the DIQ/S 281

1   Display (see section 4.1.2 DISPLAY)

2   Keypad
    Arrow keys and 5 keys **<M>**, **<C>**, **<S>**, **<ESC>**, **<OK>** (see section 4.1.3 KEYS)
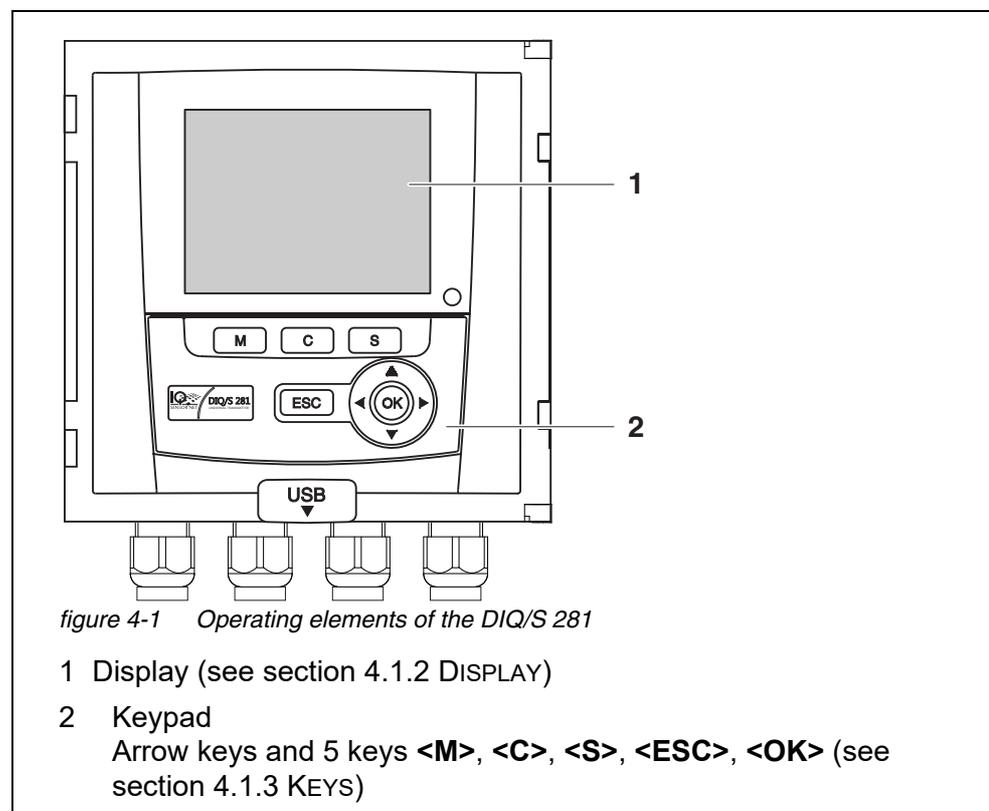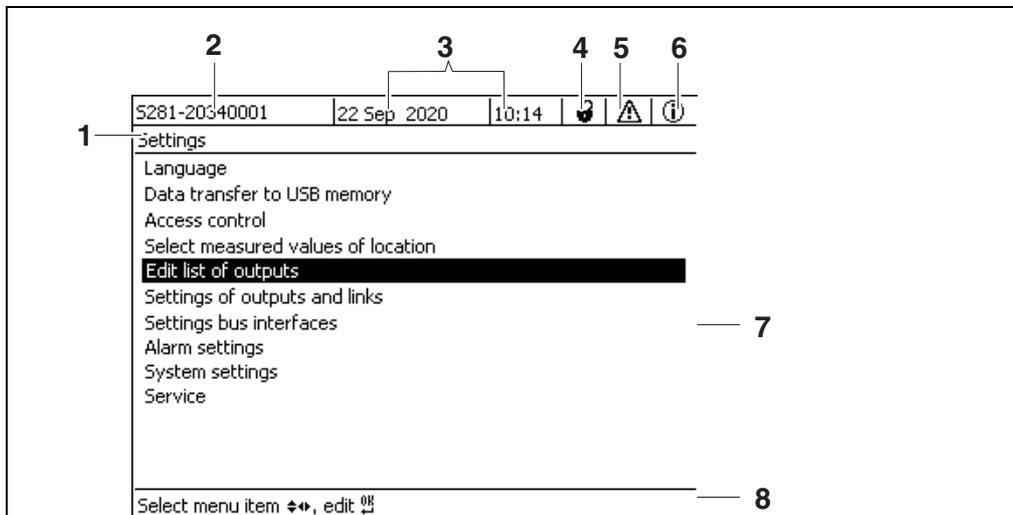
4.1.2   Display

figure 4-2   Display

1 Name of the display indication (is skipped in the measured value display)

2   Name of the instrument (and series number, e.g. S281-20340001)

3   Date, time

4   User right (details see below)

5   Error symbol ⚠ :
If the error symbol flashes, a new or unacknowledged error message is present in the log book that requires immediate action (see section 4.5.3).

6   Info symbol ⓘ :
If the info symbol flashes, new or unacknowledged information is present in the log book (see section 4.5.3).

7   Display range for measured values, menus, lists, etc.

8   Help line with operating instructions

Detail on the user right (4)

🔓	Lock open: No access control, settings released System settings can be changed
👑	Crown: Administrator authorization Configuration and running operation of the system
⊶	Tool: Maintenance authorization Running operation of the system and maintenance activities
👁	Eye: Monitoring permission Only read permission, no operation of the system

Measured value display   The measured value display contains the following information:
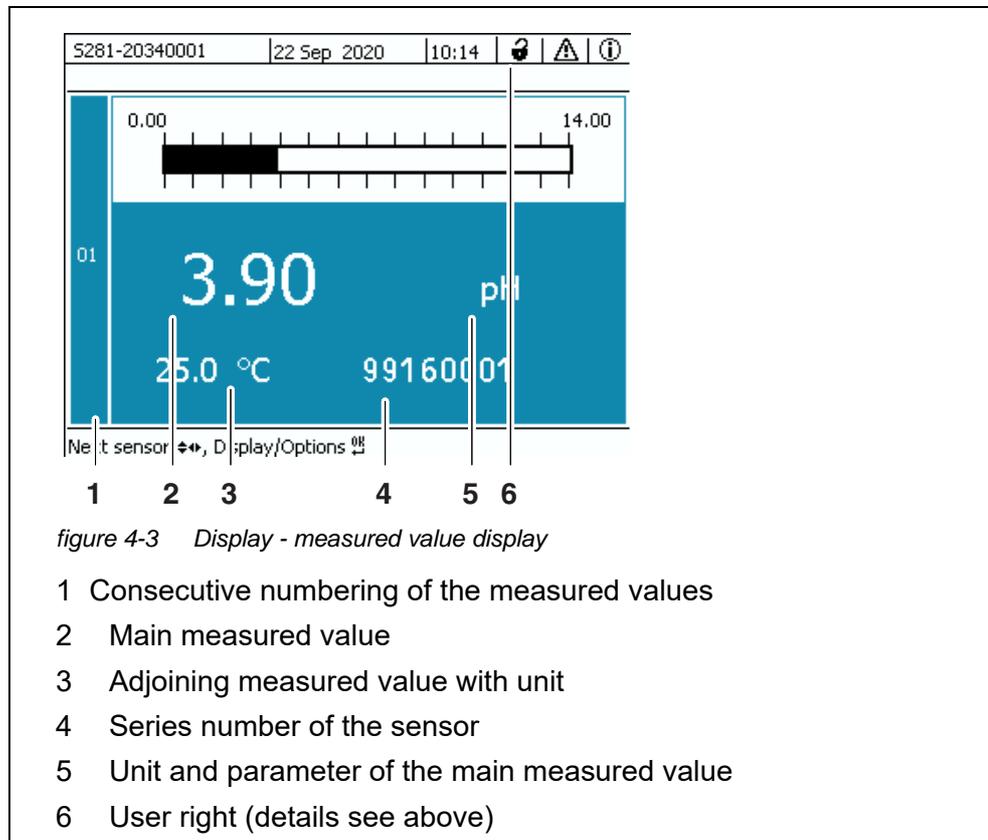
figure 4-3   Display - measured value display

1   Consecutive numbering of the measured values

2   Main measured value

3   Adjoining measured value with unit

4   Series number of the sensor

5   Unit and parameter of the main measured value

6   User right (details see above)

Special displays

Init	Sensor is being initialized ● during commissioning or ● if a new IQ sensor is recognized that is not yet giving measured values
----	Invalid measured value
Cal	Sensor is being calibrated
Clean	Cleaning system active, sensor is offline
Error	Sensor is inactive or defective
OFL	Measuring range undercut or exceeded (overflow)
Display flashes	Sensor in maintenance condition

4.1.3 Keys

Key	Function
<M>	Display measured values
<C>	Start calibration of the IQ sensor shown in the measured value display
<S>	Open the *Einstellungen/Settings* menu
<ESC>	Change to the higher menu levels or abort entries without storing them
<OK>	Confirm selection
<▲▼◄► > (arrow keys)	Highlight and select: ● Menu items ● Entries ● Columns or fields ● Letters or numerals

The selection highlighted with the arrow keys is displayed as white text on a blue background.

4.2   General operating principles

The operation of the DIQ/S 281 is standardized and user-friendly.

● Select an item with the arrow keys **<▲▼◄► >**

  – Highlight individual elements in menus, lists and tables, e.g. menu entries, list elements, columns or fields

  – Select a setting in selection fields

  – Select a character in text entry fields

● Confirm a selection with the **<OK>** key.

● Break off an action and change to the next higher level with the **<ESC>** key.

● Start a calibration procedure with the **<C>** key.

● Switch to the settings with the **<S>** key.

● Change to the measured value display and break off current actions with the **<M>** key.

Short operating instructions are given in the help lines on the display.

Examples of the operating principles are given below:

● Navigation in menus, lists and tables (see chapter 4.2.1)

● Entering text and numerical values (see chapter 4.2.2)

4.2.1 Navigating in menus, lists and tables

1   Open the *Einstellungen/Settings* menu with **<S>**.
        Menus appear in the form of a list on the display, e.g. the *Einstellungen/Settings* menu shown here.
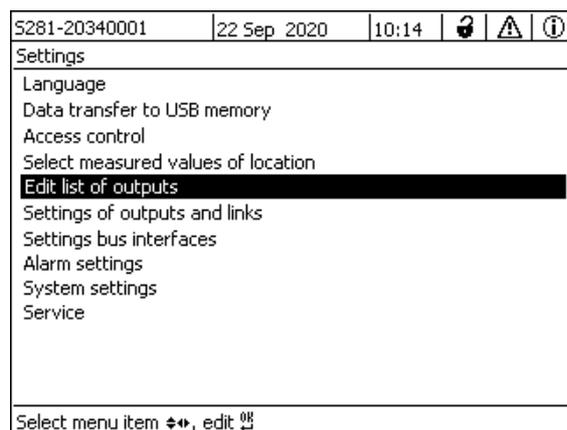
figure 4-4   Einstellungen

2   Select a menu item (e.g. *System settings*) with **<▲▼◄► >**.
        Move the highlighting (reverse video display, blue background) in the list of menu items with the arrow keys **<▲▼◄► >**.

3   Confirm the menu item (e.g. *System settings*) with **<OK>**.
        The display (e.g. *System settings*) opens.
        Confirm the selection and move to a new display by pressing the **<OK>** key.

4   Return to a higher level with **<ESC>**.
        or:
        Switch to the measured value display with **<M>**.

4.2.2   Entering texts or numerals

You can assign names to the outputs. Example:

1   Open the *Einstellungen/Settings* menu with **<S>**.

2   Select the *Edit list of outputs* menu item with **<▲▼◀▶ >**.

3   Confirm the *Edit list of outputs* menu item with **<OK>**.
         The *Edit list of outputs* display opens. A column is highlighted.

4   Select the *Name* column with **<▲▼◀▶ >**.

5   Confirm the *Name* column with **<OK>**.
         An output name is highlighted.

6   Select an output name with **<▲▼◀▶ >**.

S281-20340001	22 Sep 2020	10:14			
Edit list of outputs					
No.	Model/Channel	Ser. no.	Name		
D01	DIQ/S281-CR2/R1	99200004			
D01	DIQ/S281-CR2/R2	99200004			
D01	DIQ/S281-CR2/C1	99200004			
D01	DIQ/S281-CR2/C2	99200004			
Select ⬍⬌, edit output names					

figure 4-5   Edit list of outputs

7   Confirm the selection with **<OK>**.
         The name of the selected output is edited.

figure 4-6   Edit list of outputs

The following letters, numerals and special characters can be entered: `AaBb..Zz0..9µ%&/()+-=><!?_ °`.

8   Select a letter or numeral with **<▲▼◄► >**.

9   Confirm the letter with **<OK>**.
     The character ⊃ appears behind the last letter.

figure 4-7   Edit list of outputs

10   ● Add a new character
      Select the character to be added with **<▲▼◄► >** and confirm with
      <OK>.

      or
      ● Delete the last character
      Select the character with **<▲▼◄► >** and confirm with **<OK>**.

      or
      ● Adopt the name
      Select the character with **<▲▼◄► >** and confirm with **<OK>**.

11   Repeat steps 8 to 10 until the whole name has been entered.

      You can break off entering the name with **<ESC>**. The old name is
      retained.

4.3   Access to the DIQ/S 281 with active access control

      Access control is switched off in the delivery condition. No login to
      the DIQ/S 281 is required.

As soon as an access control of any type is enabled, access to the DIQ/S 281
is protected completely or partly.

Access to the system is enabled as follows:

● Connecting the electronic key to the USB interface (Universal Transmitter),
  if the administrator has enabled this function

● Entering a password

      Extended access control:

      In the *Display/Options* | *Change user rights* menu, enter the
      password with the arrow keys and confirm with OK.

      Extended access control with instrument block:

      Press the any button.
      In the password query, enter the password with the arrow keys
      and confirm with OK.

Further details on access control (see section 5.3)

4.4   Display of current measured values

The measured value is displayed numerically and as a rod.
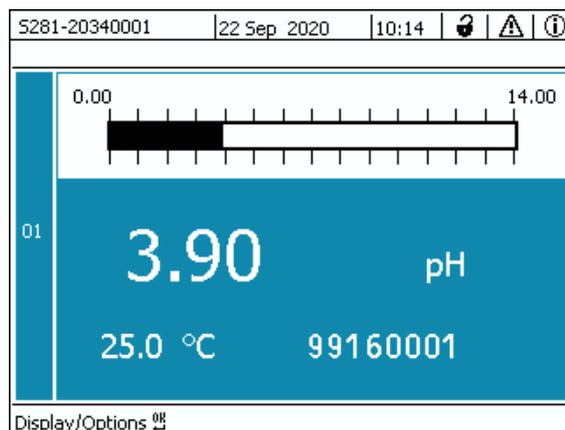
figure 4-8   Measured value

4.5   Messages and log book

The DIQ/S 281 Universal Transmitter continuously monitors the status of the entire system. If the DIQ/S 281 identifies any system changes, a message appears. New messages can be recognized by the flashing information symbol or error symbol on the display.

All messages are recorded in the log book.

4.5.1   Message types

The system differentiates two types of messages:

- **Error** ⚠
  Indicates a critical status requiring immediate action in the system or an individual system component.
  In the case of new error messages, the error symbol flashes on the display.

- **Information** ⓘ
  Information that does not require immediate action.
  In the case of new information, the info symbol flashes on the display.

In the case of errors, immediately open the detailed message text in the log book and perform the recommended actions. If the actions have been performed, mark the message as read (see section 4.5.3).

4.5.2 Log book

The log book is a list with all the messages from all modules. The log book contains up to 1000 entries. If there are more than 1000 messages, the oldest entries are deleted.

New messages can be recognized by the flashing information symbol or error symbol. The log book always contains the latest message in the first position. They do not yet have a checkmark in the status field.

The flashing of the info or error symbol only stops after all detailed message texts in the log book have been opened and marked with a checkmark (✔) (see section 4.5.3).

Structure of the log book

figure 4-9 Log book of entire system

1 Message category (error or info symbol)

2 Module that triggered the message.
   SYS system (Universal Transmitter, controller)
   S01 IQ sensor (number 01)
   D01 DIQ/S 281 output (number 01)

3 Message code

4 Date and time of the message

5 Status field of the message
   ✔   Message was acknowledged
   No checkmark Message was not acknowledged

The system provides the following log books:

- *Log book of entire system*:
  List of all messages from all modules

- *Log book of sensor*:
  List of all messages of the IQ sensor.

There is a detailed message text for each message of a module that is ready for operation. The detailed message text on each message is given in the log book (see section 4.5.3) and in the operating manual of the registering module.

Structure of the message code   The message code consists of 6 characters and can contain numerals and letters, e.g.: II21171.

Type number ───┐
Type ─────────┐ │   ┌── Component code
ategory ──────┐ │ │   ┌─┘

II2 171

Posi-tion	Information	Explanation
1 - 3	Short message form	The short form of the message contains the following information of the message: Category, type and type number
	1: possible categories	• Info message (I) • Error message (E)
	2: possible types	• Calibration data (C) • Installation and commissioning (I) • Instructions for service and repair (S) • Application instructions (A)
	3: Type number	Each type contains subtypes (0..9A..Z)
4 - 6	Module code	The three-digit module code designates the module that generated the message. The module code can be found in the chapter LISTS of the respective component operating manual.

Example: The "171" module (Universal Transmitter DIQ/S 281) sends a message with the
Message code short message form "II2".
II2171 This is an info message (I) of the type Installation (I) with the type number (2).
The detailed message text of the short form message (II2) can be found in the
log book and in the operating manual of the component that sent it.

> **ℹ** The detailed message text in the log book contains a precise
> description of the message code and, if required, any further
> actions.
>
> The detailed message texts can also be found in the component
> operating manuals of the individual components.

> **ℹ** The log book shows the current status at the point of time it was
> opened. If new messages arrive while a log book is open, these do
> not appear in the log book. As usual, you are informed of new
> messages by flashing info or error symbols. The current log book
> with the new messages can be viewed by closing and reopening the
> log book.

4.5.3 Viewing detailed message texts

1   Switch to the measured value display with **<M>**.

2   Open the *Display/Options* menu with **<OK>**.

3   Using **<▲▼◀▶ >** and **<OK>**, select and open the *Log book of entire
        system*.
        A list of log book entries appears.

4   Using **<▲▼◀▶ >** and **<OK>** select and confirm a new log book entry
        (unchecked).
        The message text with further information on the selected log book
        entry appears.

figure 4-10   Log book of entire system

5   Acknowledge the message with **<OK>**. A checkmark appears in the log book entry.

6   Exit the message text with **<ESC>**.

> Acknowledgment of a new message text in the log book marks the message as read. When all errors or information messages are acknowledged, the symbols no longer flash.

With the *Acknowledge all messages* function you can acknowledge all messages at the same time (see section 4.5.4).

> Message texts are stored in the modules that caused them. Therefore, further information on a log book entry for an IQ sensor such as, e.g. calibration messages, instructions and help texts are only accessible in the case of connected components that are ready for operation.

If a message text is not available because, e.g. a module is not connected with the system, you can look up the detailed text of the message as follows:

● Messages of the system are given in this operating manual (see section 11.1).

● Messages of a module are given in the respective component operating manual of the module.

4.5.4   Acknowledge all messages

1   Switch to the measured value display with **<M>**.

2   Open the *Einstellungen/Settings* menu with **<S>**.

3   Using **<▲▼◄► >**, select the menu item, *Service* and confirm with
           <OK>.

4   Using **<▲▼◄► >**, select the menu item, *Acknowledge all messages*
           and confirm with **<OK>**. A security prompt opens.

5   Using **<▲▼◄► >**, select *Acknowledge* and confirm with **<OK>**. All
           messages are acknowledged. Error symbol and info symbol do no
           longer flash.

4.6   Calibration data

           Details on calibration are given in the operating manual for the
           IQ sensor.

Each calibration of IQ sensors that are able to be calibrated causes an entry to
be made in the log book. Log book entries contain the following information:

● Calibration date

● Calibration successful or not successful.

The detailed calibration data of the last calibrations are integrated in the
Calibration history of sensor overview.

           All calibration data are stored in the IQ sensor. In order to view the
           calibration data of an IQ sensor, the IQ sensor must be connected
           to the DIQ/S 281 and must be ready for operation.

4.6.1   Calibration entries in the log book

The date and time of a calibration are entered in the log book. The respective
message text contains an indication as to whether a calibration was successful
or not. The values determined with calibration can be viewed in the calibration
history (see section 4.6.2).

1   Call up the measured value display with **<M>**.

2   Confirm with **<OK>**.
           The *Display/Options* menu opens.

3   Using **<▲▼◄► >**, highlight the menu item, *Log book of sensor*, and
           confirm with **<OK>**. Calibration entries in the log book are held in
           message code (ICxxxx and ECxxxx).

4   Select and open a calibration entry (ECxxxx or ICxxxx) with **<▲▼◄► >** and **<OK>**.

5   Exit the *Log book of sensor* window with **<M>** or **<ESC>**.

4.6.2   Calibration history

The calibration history contains the detailed calibration data of the last calibrations.

1   Call up the measured value display with **<M>**.

2   Confirm with **<OK>**.
        The *Display/Options* menu opens.

3   Using **<▲▼◄► >**, highlight the menu item, *Calibration history of sensor*, and confirm with **<OK>**.
        The calibration history with the results of the last calibration procedures opens.

4   Exit the *Calibration history of sensor* window with **<M>** or **<ESC>**.

4.7   Status info of sensors and outputs

The display of the instrument status provides a simple overview of the current status of the sensor (sensor info) the outputs.

The status display can be reached in the *Einstellungen/Settings|Service|List of all components* menu.

1   Call up the measured value display with **<M>**.

2   Open the *Einstellungen/Settings* menu with **<S>**.

3   Using **<▲▼◄► >**, highlight the menu item, *Service*, and confirm with **<OK>**. The *Service* dialog window opens.

4   Using **<▲▼◄► >**, highlight the menu item, *List of all components*, and confirm with **<OK>**.
        The *List of all components* dialog window opens.

5   Highlight the required component with **<▲▼◄► >** and confirm with **<OK>**.
        ● Output module: The *Status of output channels* window opens up.

        ● Sensor: The sensor info opens up
           (for details, refer to the operating manual of the selected sensor).

```
S281-20340001        22 Sep 2020      10:31  |  🔓 | ⚠ | ⓘ
Status of output channels
No. | Name          | Chan. | Status
D01 |               | R1    | open
D01 |               | R2    | open
D01 |               | C1    | 0.00 mA
D01 |               | C2    | 0.00 mA




Return ESC
```

figure 4-11   List of all components with sensor info

6   Exit the *Status of output channels* window with **<M>** or **<ESC>**.

4.8   General course when calibrating, cleaning, servicing or repairing an IQ sensor

When an IQ sensor is calibrated, cleaned, serviced or repaired, the maintenance condition for the IQ sensor should always be switched on.

In the maintenance condition

● the system does not react to the current measured value or the condition of the selected IQ sensor

● linked outputs are frozen

● IQ sensor errors do not prompt changes in the conditions of linked outputs.

The maintenance condition for IQ sensors is automatically activated

● during calibration. After calibration the IQ sensor remains in the maintenance condition until the maintenance condition is switched off manually (see section 4.8.3)

● during a compressed air cleaning cycle.

Therefore, keep to the following course when you calibrate, clean, service or

repair an IQ sensor.

Outlet   1   Switch on the maintenance condition for the IQ sensor (see
              section 4.8.2).
              The display of the sensor in the measured value display flashes.

          2   Pull the sensor out of the sample.

          3   Perform the calibration in the laboratory, cleaning, maintenance or
              repair (removing and replacing) of the sensor (about these topics, see
              the component operating manual of the corresponding sensor).

          4   Submerse the sensor in the sample again.

          5   Wait until the measured value no longer changes.

          6   Switch off the maintenance condition for the sensor (see section 4.8.3).
              The display of the sensor in the measured value display no longer
              flashes.

4.8.1   Maintenance condition of IQ sensors

The following diagram gives you an overview of when an IQ sensor is in the
maintenance condition.

Sensor cleaning active	Measured value display The measured value stops flashing.	Maintenance condition ON manual

Measured value display

Clean flashes

Sensor cleaning OFF

(automatic sequence)

Ⓒ   ⒺⓈⒸ/Ⓜ

Maintenance condition OFF manual

Measured value display

The measured value flashes.

Ⓒ

Display mesage Switch on the maintenace condition Continue / Cancel

ⓄⓀ

Calibration

Step 1

Ⓜ

ⓄⓀ   ⒺⓈⒸ

Calibration

Step n end

ⓄⓀ/Ⓜ/ⒺⓈⒸ

🟦 = Maintenance condition ON   ⬜ = Maintenance condition OFF

4.8.2   Switching on the maintenance condition

Switch on the maintenance condition manually when you want to clean, service or repair (remove and replace) an IQ sensor.

1   Call up the measured value display with **<M>**.

2   Open the *Display/Options* menu with **<OK>**.

3   Using **<▲▼◄► >**, highlight the menu item, *Switch maintenance condition on/off*, and confirm with **<OK>**.
       A window that informs you about the maintenance condition opens up.

4   Use **<OK>** to confirm *Continue*.
        The selected sensor is in the maintenance condition. Linked outputs are
        frozen.

5   Call up the measured value display with **<M>**.
        The display of the sensor in the measured value display flashes.

Subsequently, perform the cleaning, maintenance or repair work (removal and
replacement).

When you have finished calibrating, cleaning, servicing or repairing the sensor,
switch off the maintenance condition manually (see section 4.8.3).

4.8.3   Switching off the maintenance condition

1   Call up the measured value display with **<M>**.
        The display of the sensor in the measured value display flashes.

2   Open the *Display/Options* menu with **<OK>**.

3   Using **<▲▼◄► >**, highlight the menu item, *Switch maintenance
        condition on/off*, and confirm with **<OK>**.
        A window that informs you about the maintenance condition opens up.

4   Use **<OK>** to confirm *Continue*.
        The maintenance condition of the sensor is switched off. Linked outputs
        are released.

5   Call up the measured value display with **<M>**.
        The display of the sensor in the measured value display does not flash.

> If a power failure occurs, the outputs automatically are in the non-
> operative condition (relays: open, current output: 0 A; see compo-
> nent operating manual of the output module). After the end of the
> power failure the outputs work as defined by the user again.
>
> If a power failure occurs while an IQ sensor that is linked with an out-
> put is in the maintenance condition, the current and relay outputs
> work as defined by the user after the maintenance condition has
> been switched off only (see section 4.8.3).

4.9   USB interface

The USB interface on the DIQ/S 281 can be used for the following actions:

● Carrying out a software update
  (see section 4.11)

● Accessing the system with the Electronic Key
(see section 4.3)

4.10 Info on software versions

The system informs you of the current versions of the software of the individual components.

1 Call up the measured value display with **<M>**.

2 Open the *Einstellungen/Settings* menu with **<S>**.

3 Using **<▲▼◄► >**, highlight the menu item, *Service*, and confirm with **<OK>**. The *Service* dialog window opens.

4 Using **<▲▼◄► >**, highlight the menu item, *List of all components*, and confirm with **<OK>**.
The *List of all components* dialog box opens.

S281-20340001	22 Sep 2020	10:14			
List of all components					
No.	Model	Ser. no.	Softw. vers.		
SYS	CTRL TC2020	99000001	9.01		
S01	SensoLyt700IQ	99160001	2.18		

Select ◆◗, view component status

figure 4-12   List of all components

5 Exit the *List of all components* dialog box with **<M>** or **<ESC>**.

If the software version of a component is not up-to-date, you can carry out a software update via the USB interface (see section 4.11).

4.11 Software-Update for the DIQ/S 281 and sensors

With a Software-Update, you maintain the latest state of the instrument software for the Universal Transmitter DIQ/S 281 and all active components.

The update packet with the current instrument software for active components and detailed instructions on how to proceed are available on the Internet at www.YSI.com.

The instrument software is transferred to the DIQ/S 281 via the USB port and with the aid of a USB memory device.

A Software-Update does not change the measurement settings, measurement data and calibration data.

You can view the software versions of all components in the dialog box, *List of all components* (see section 4.10).

5   Settings/setup

5.1   Selecting the language

A list shows all the available system languages.

1   Open the *Einstellungen/Settings* menu with **<S>**.

2   Using **<▲▼◄► >** and **<OK>**, select and confirm the menu item,
         Language.
         The *Language* display opens.
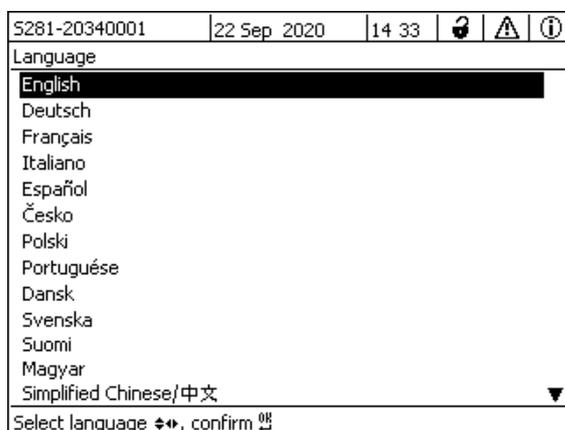
figure 5-1   Language

3   Select a language from the list with **<▲▼◄► >** and confirm with **<OK>**.
         The active language is marked with a checkmark.

4   Switch to the higher menu level with **<ESC>**.
         or:
         Switch to the measured value display with **<M>**.

> If the selected system language is not available in a component, all
> indications of this component (e.g. sensor, Universal Transmitter,
> output module) appear in the standard language, *English*. To acti-
> vate the selected system language for this component, a software
> update of the component is required (see section 4.11).

5.2   Terminal settings of the DIQ/S 281

The terminal settings include:

● *Terminal name*

● *Illumination brightness*

● *Illumination brightness (standby)*
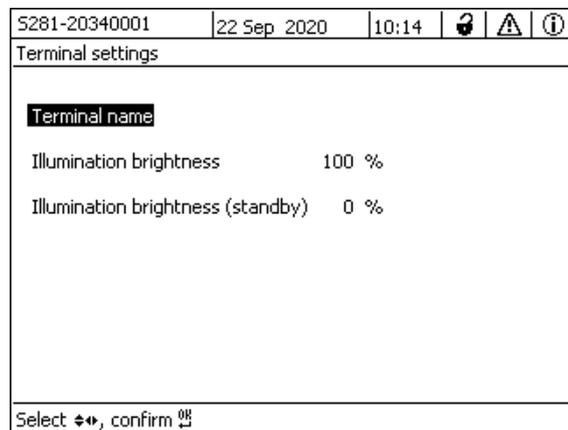
figure 5-2   Terminal settings

Setting	Selection/Val-ues	Explanation
Terminal name	AaBb..Zz 0..9µ%&/() +-=><!?_ °	User-defined character string with max. 15 characters
Illumination brightness	Auto 0 ... 100 %	Brightness of the display during operation of the terminal
Illumination brightness (standby)	Auto 0 ... 50 %	Brightness of the display during operation if no key is pressed for a longer period of time

5.3   Access control

Use the *Access control* function to define the safety settings for the DIQ/S 281.

The DIQ/S 281 provides the following levels of system security:

● Access control
(4 authorization levels, see section 5.3.1):

– No access control

– Administrator authorization

– Maintenance authorization

– Read permission

● Access control with instrument block (see section 5.3.2):

	Access to the system with active access control (see section 4.3).

Default settings   Access control is switched off in the delivery condition.
Every user can carry out all functions.

Saving the password   If access control for the DIQ/S 281 is active and the administrator password is lost, rapid administrator access to the
DIQ/S 281 is no longer possible.

To avoid losing the administrator password, we recommend saving it. This also applies to the use of the electronic key.

To save the administrator password, you can save it on an electronic key, for example, and/or note it down on paper or on a PC. Keep the passwords in a safe place.

	If the DIQ/S 281 is locked and the administrator password lost, you can unlock the system with a master password. Please contact the service department.

The master password is valid for 7 days.

If you have unlocked the DIQ/S 281 with the master password, we recommend to note down the normal administrator password and keep it in a safe place.

5.3.1   Activating the access control

Access control provides three preconfigured user rights in the system. Each user type can be protected with its own password.

User right   The current user right is shown on the display with the following symbols.

Validity	User right	Symbol	User rights
System-wide	Settings are unlocked (access control swiched off)	🔓	All functions in the system are accessible to all users
	Administration	👑	● Access only with password ● Change system settings ● Assign user rights ● Calibration ● View measured values ● Carry out software updates

Validity	User right	Symbol	User rights
	Maintenance	⊢⊣	● Access only with password ● Calibration ● View measured values
	Viewer	👁	● Without instrument block: Access without password ● With instrument block: Access only with password ● View measured values
For the instrument on which the function was activated	Instrument block		● Instrument block switched off: User rights as for *Viewer*. ● Instrument block active: The DIQ/S 281 is blocked. Only the IQ SENSORNET logo is displayed. Access only with password.

Switching on the access control

1   Open the *Einstellungen/Settings* menu with **<S>**.

2   Using **<▲▼◄► >** and **<OK>**, select and confirm the menu item, *Access control*.
The *Extended access control* dialog window opens.
User right and instrument block can be selected.

```
┌─────────────────────────────────────────────────────┐
│ S281-20340001  │22 Sep 2020│15 25│ 🔓 │ ⚠ │ ① │
│ Extended access control                               │
│                                                       │
│ User right                          Access code       │
│ Administration                      1111              │
│ Maintenance                         2222              │
│ Viewer                              3333              │
│                                                       │
│ Device lock                         active            │
│ Extended access control             active            │
│                                                       │
│ ███Apply settings██████████████████████████████      │
│                                                       │
│                                                       │
│ Select menu item ⬍⬌, edit ⌸                          │
└─────────────────────────────────────────────────────┘
```
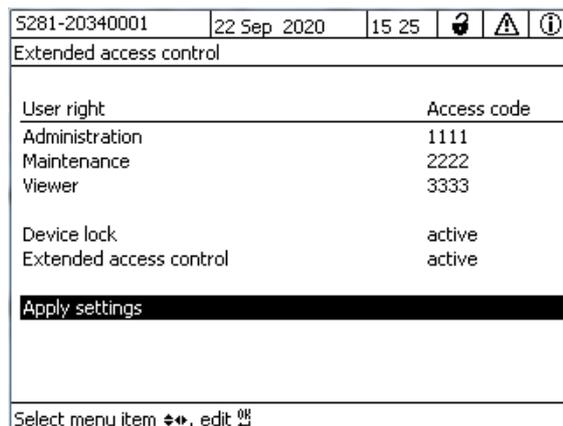
figure 5-3   Einstellungen -> Access control -> Extended access control

The instrument automatically generates a password for each user right. This

password can be accepted or changed.

3   Press **<▲▼◄► >** to select an user right and confirm with **<OK>**.
        If necessary, change the password in the selection dialog and/or save
        the password to a connected USB memory.

4   Note passwords.
        For reasons of safety the administrator password at least should be
        saved in such a way that it can be accessed in an emergency.

5   Press **<▲▼◄► >** to select the *Apply settings* function and confirm with
        <OK>.
        A security prompt opens.

6   Using **<▲▼◄► >**, select *OK* and confirm with **<OK>**.
        The settings are adopted.
        The *Extended access control* window is still open.
        The current passwords are visible.
        The *Viewer* user right is active.

Switching off the   1   Press **<OK>** to open the *Display/Options | Change user rights* menu.
access control   The password query is displayed.

2   Enter and confirm the administrator password with **<▲▼◄► >** and
        <OK>.

3   Open the *Einstellungen/Settings* menu with **<S>**.
        Deactivate the access control.
        Take over the setting.

5.3.2   Activating the instrument block

With the function *Device lock* you can protect the Universal Transmitter no only
against unauthorized operating bus also against unauthorized reading of the
current measured values. By activating the instrument block the password for
viewing the measured values is activated.

After a selected interval without user entries, the system is automatically
blocked. The display shows only the IQ SENSORNET logo.

Switching on the   1   Call up the access control (see section 5.3.1).
instrument block

2   Press **<▲▼◄► >** to select the *Device lock* function and confirm with
        <OK>.
        A checkmark appears next to the function.

3   Press **<▲▼◄► >** to select the *Apply settings* function and confirm with
     <OK>.
     A security prompt opens.

4   Using **<▲▼◄► >**, select *OK* and confirm with **<OK>**.
     The settings are adopted.
     The *Access control* dialog window is still open.
     The current passwords are visible.

Switching off the   1   Press **<OK>** to open the *Display/Options | Change user rights* menu.
instrument block   The password query is displayed.

                         2   Enter and confirm the administrator password with **<▲▼◄► >** and
                              <OK>.

                         3   Open the *Einstellungen/Settings* menu with **<S>**.
                              Deactivate the access control.
                              Take over the setting.

5.3.3   Electronic key

The administrator can simplify access to the DIQ/S 281 by saving the password
to USB memory. The USB memory thereby becomes an electronic key.

When the electronic key is connected to the DIQ/S 281, the user right stored
there with the relevant password is automatically read out. The user of the elec-
tronic key is logged on to the system with his user right without any further pass-
word prompt.

When the electronic key is disconnected, the DIQ/S 281 automatically switches
to the lowest user right.

Passwords for different IQ SENSORNET systems can be saved to every elec-
tronic key.
For each IQ SENSORNET system only one password can be saved to each elec-
tronic key.

Saving a password   1   Connect the USB memory to the USB-A interface.
to an electronic
key

                              Administrator rights are required when the access control is active.

                         2   Open the *Einstellungen/Settings* menu with **<S>**.

3   Using **<▲▼◄►>** and **<OK>**, select and confirm the menu item, *Access control*.
      The *Access control* dialog window opens.

4   Press **<▲▼◄►>** to select an authorization level and confirm with **<OK>**.

5   Using **<▲▼◄►>**, select the menu item, *Save access code on USB memory* and confirm with **<OK>**.
      The password for the selected authorization level is saved to the USB memory device.

5.3.4   Access to the **DIQ/S 281 with active access control**

● Administrator access through entering the password:

    – After 10 minutes without key-pressing, the highest protection level is automatically activated.

    – Select the menu *Display/Options* / *Viewing only*.
      The highest level of protection is activated.

● Administrator access through connecting the electronic key: The protection is restored by disconnecting the electronic key

5.4   Settings for sensors

Sensor settings include the measured parameter, measuring range and, if necessary, compensations.

Sensor settings   The following diagram shows the operating steps to call up the sensor setting

menu and enhanced sensor functions:
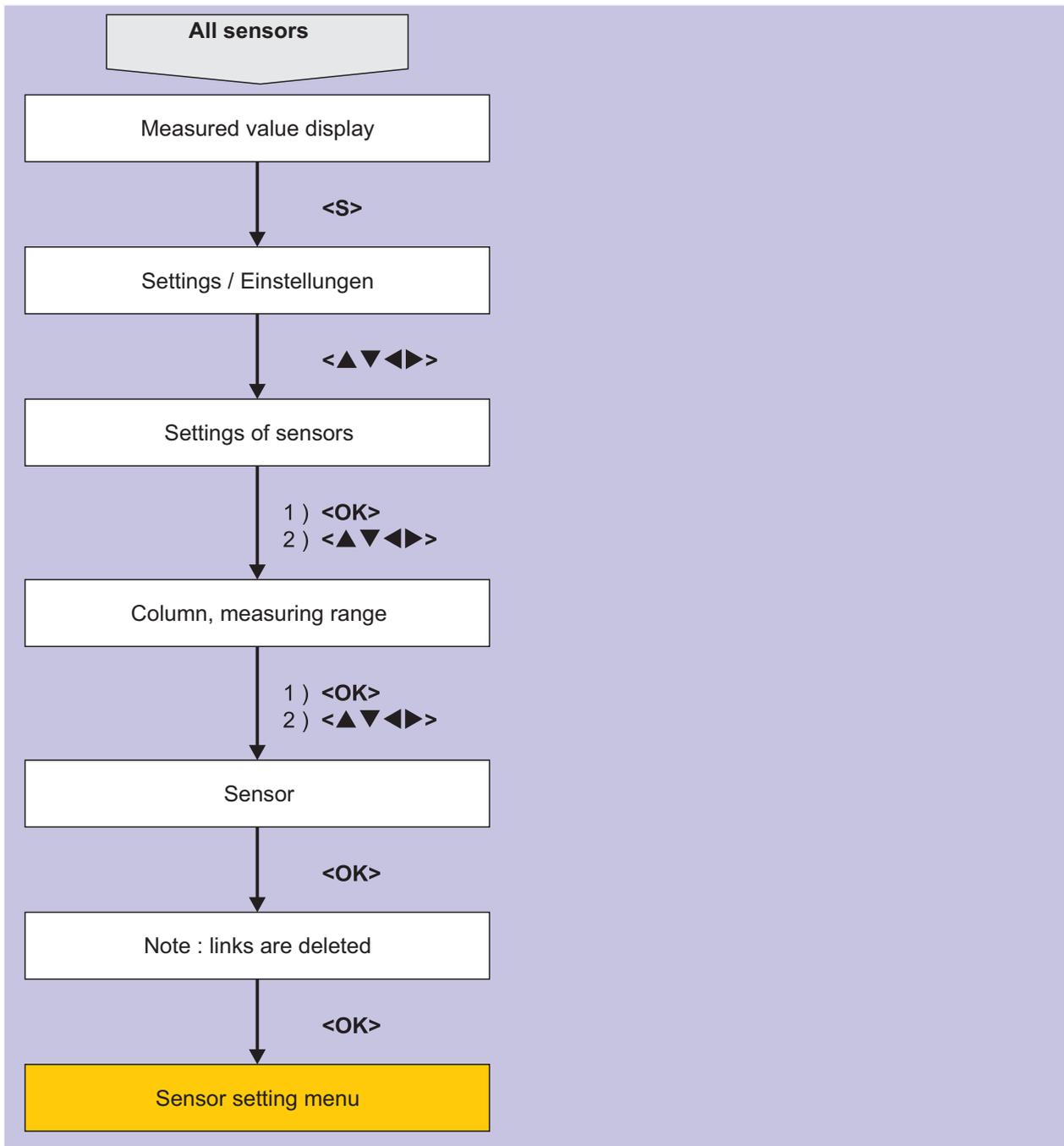
figure 5-4 Calling up the sensor settings

If the measuring mode or measured parameter are changed, a link of the sensor with a relay is erased!

Details on sensor settings are given in the operating manual for the IQ sensor.

5.5   Editing the list of outputs

The *Edit list of outputs* display provides an overview of all outputs, links and
inactive datasets.

Linking outputs and sensors (seesection 6.4).

For the easier identification of the outputs, you can assign an individual name to
each output in the *Edit list of outputs* display.

1   Open the *Einstellungen/Settings* menu with **<S>**.

2   Using **<▲▼◄► >** and **<OK>**, select and confirm the menu item, *System
         settings -> Edit list of outputs*.
         The *Edit list of outputs* overview opens.

3   Press **<▲▼◄► >** to highlight a name in the *Name* column and confirm
         with **<OK>**.

S281-20340001	22 Sep 2020	10:14	🔒	⚠	ⓘ
Edit list of outputs					

No.	Model/Channel	Ser. no.	Name
D01	DIQ/S281-CR2/R1	99200004	
D01	DIQ/S281-CR2/R2	99200004	
D01	DIQ/S281-CR2/C1	99200004	
D01	DIQ/S281-CR2/C2	99200004	

Select ↕↔, edit output names

figure 5-5   Edit list of outputs -> enter a name

4   Enter the name with **<▲▼◄► >** and **<OK>** and confirm with **<OK>** (see
         also section 4.2.2).

figure 5-6   Edit list of outputs -> enter a name

5.6   Alarm settings

5.6.1   General information

Under this menu item you can specify reactions on certain alarm events.

An alarm event is when a certain measured value (limiting value) of a sensor is exceeded or undercut.

Alarm events can be relayed as follows:

● As a message on the display

● As a relay action

> An alarm message via display or relay cannot be acknowledged or switched off. An alarm only disappears if the cause for the alarm was eliminated or the *Alarm settings* were changed or erased.

5.6.2   Setting up / editing alarms

1   Open the *Einstellungen/Settings* menu with **<S>**.

2   Using **<▲▼◄► >** and **<OK>**, select and confirm the menu item, *Alarm settings*.
        The *Alarm link overview* dialog window opens.
        Alarms that have already been set up have entries in the *Sensor* column.

```
┌─────────────────────────────────────────────────────────────┐
│ S281-20340001      │ 22 Sep  2020  │ 10:14 │ 🔓 │ ⚠ │ ① │
├─────────────────────────────────────────────────────────────┤
│ Alarm link overview                                           │
├────────┬──────────────────┬──────────────────────────────────┤
│ Alarm  │ Sensor           │ Designation                       │
├────────┼──────────────────┼──────────────────────────────────┤
│ A01    │                  │                                    │
│ A02    │ S01 20341000     │ lack of oxygen                    │
│ A03    │                  │                                    │
│ A04    │                  │                                    │
│ A05    │                  │                                    │
│ A06    │                  │                                    │
│ A07    │                  │                                    │
│ A08    │                  │                                    │
│ A09    │                  │                                    │
│ A10    │                  │                                    │
├────────┴──────────────────┴──────────────────────────────────┤
│ Select ⬍⬌, Set alarm ⌕                                        │
└─────────────────────────────────────────────────────────────┘
```

figure 5-7   Alarm settings -> Alarm link overview

> The sensor number and serial number is displayed in the *Sensor* column.

3   Select an alarm *A01* to *AXX* to be edited with **<▲▼◄► >**. To set up a new alarm without entry select in the *Sensor* column. Then confirm with **<OK>**. When a new alarm is set up a list with all sensors appears first. Alarm links that are already available can be erased or edited (for editing continue with step 5).

```
┌─────────────────────────────────────────────────────────────┐
│ S281-20340001      │ 22 Sep  2020  │ 10:14 │ 🔓 │ ⚠ │ ① │
├─────────────────────────────────────────────────────────────┤
│ Select sensor for alarm link                                  │
├──────┬──────────────────┬───────────┬────────────────────────┤
│ No.  │ Model            │ Ser. no.  │ Sensor name             │
├──────┼──────────────────┼───────────┼────────────────────────┤
│ S01  │ SensoLyt700IQ    │ 99160001  │ Zulauf                  │
│      │                  │           │                         │
│      │                  │           │                         │
│      │                  │           │                         │
│      │                  │           │                         │
│      │                  │           │                         │
├──────┴──────────────────┴───────────┴────────────────────────┤
│ Select sensor ⬍⬌, confirm ⌕                                   │
└─────────────────────────────────────────────────────────────┘
```

figure 5-8   Select sensor for alarm link

4   To set up a new alarm, select a sensor from the list with **<▲▼◄► >** and confirm with **<OK>**. The *Set alarm link* display opens.

```
S281-20340001        22 Sep 2020      10:14    🔓   ⚠   ⓘ
Set alarm link
Measured variable                    Main variable
Limit value                          Upper limit
Upper limit                          48.0 mg/l
Hysteresis                           6.00 mg/l
Designation
Relay output                         D01 R1
Accept
Cancel



Adjust setting ⬍⬌, confirm ⌗
```

figure 5-9   Set alarm link

5   Edit the setting table. The required operating steps are described in
     detail in section 4.2 GENERAL OPERATING PRINCIPLES.

Alarm links setting
table

Menu item	Selection/Values	Explanations
Measured variable	● *Main variable* ● *Adjoining variable*	*Main variable* designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). *Adjoining variable* designates an additional measured parameter (e.g. temperature).
Limit value	● *Lower limit* ● *Upper limit*	Type of the alarm event. *Lower limit*: An alarm is triggered if the defined limit value is undercut. *Upper limit*: An alarm is triggered if the defined limit value is exceeded.
Lower limit | *Upper limit*	within the measuring range (sensor-dependent)	Limit value for the alarm event
Hysteresis	0 - 10 % of the measuring range	Hysteresis for the limit value
Designation	(max. 20 characters)	User-defined designation for easier identification in the alarm message.

Menu item	Selection/Values	Explanations
Relay output	Dxx / .../Ry ... ... *No relay output*	Opens a list with all relay outputs where the *Alarm contact* is set. Dxx: number of the output module .../Ry: relay output channel Here you can select a relay output. When the alarm event occurs, it carries out the specified action (Open or Close). For details, see section 5.6.3 ALARM OUTPUT TO DISPLAY.
Accept		The settings are taken over in the setting table by pressing **<OK>**. The display switches to the next higher level.
Cancel		The display switches to the next higher level without storing the new settings.

5.6.3 Alarm output to display

When an alarm event occurs, a window with a text message appears.

```
ALARM A02    00:04   30 Sept 2005 ──── 1
Oxygen depletion                  ──── 2

S02 TriOxmatic700IQ               ──── 3
01341000 Site 1                   ──── 4

< 2.2 mg/l O2                     ──── 5
                          1/1
```
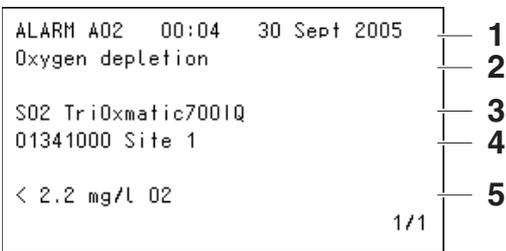
figure 5-10   Example of an alarm message on the display

1   Alarm no. Axx and date and time of the alarm event

2   User-defined designation

3   Sensor number and model name of the sensor that triggered the alarm event

4   Series number and name of the sensor that triggered the alarm event

5   Description of the event with specification of the limiting value:
    "<" = Undercut
    ">" = Exceeded

Operating instructions   If there are several alarm messages indicated on the display, you can scroll through the messages with <▲▼◄► >. This can be recognized from the page

number in the right lower corner. The latest message is always on the first position.

Pressing **<M>** hides the alarm messages and switches to the measured value display. After one minute the alarm messages appear again if what caused them is still present.

5.6.4   Alarm output as relay action

The relay outputs of the DIQ/S 281 can be configured so a relay action is triggered when an alarm event occurs (Open or Close). For this the *Alarm contact* function must be set for the relay output in the *Settings of outputs and links*.

The *Alarm contact* function is only available for relays that are not linked with a sensor. If necessary, an existing link must be erased. For details please refer to the operating manual of the output module.

5.7   System settings

System settings include:

● *Language* (see section 5.1)

● *Date/Time* (see section 5.7.1)

● *Location altitude/Air pressure* (see section 5.7.2)

● *Settings bus interfaces* (variant DIQ/S 281-MOD)

● *Function code*

5.7.1   Setting the date and time

The real time clock is used for the display of date and time in the measured value display and in log book entries.

1   Open the *Einstellungen/Settings* menu with **<S>**.

2   Using **<▲▼◄► >** and **<OK>**, select and confirm the menu item, *System settings -> Date/Time*.
        The *Date/Time* display opens.

3   Press **<▲▼◄► >** to select *Set date* or *Set time*.

4   Confirm the selection with **<OK>**.
        A field is highlighted, e.g. *Year*.

```
┌─────────────────────────────────────────────────────┐
│ S281-20340001    │22 Sep 2020 │10:14 │ 🔒 │ ⚠ │ ⓘ │
│ Date/Time                                             │
│ ─────────────────────────────────────────────────── │
│  ▐Set date▌                                           │
│   Year                         2020                   │
│   Month                         Sep                   │
│   Day                            22                   │
│                                                       │
│   Set time                                            │
│   Hour                           10                   │
│   Minute                         43                   │
│                                                       │
│                                                       │
│                                                       │
│                                                       │
│ ─────────────────────────────────────────────────── │
│ Select ⬍⬌, confirm ᴼᴷ                                 │
└─────────────────────────────────────────────────────┘
```

figure 5-11   Date/Time

5   Press **<▲ ▼ ◄ ► >** and **<OK>** to select and confirm a number.
         The next field is highlighted, e.g. *Month*.

6   Complete the entries on the display *Date/Time*.

> ℹ️   The clock in the DIQ/S 281 bridges periods of power failure of up to
>   several hours. After a longer power failure, the clock starts precisely
>   at the time of the failure. A message and an entry in the log book
>   provide information on the power failure and the necessity for reset-
>   ting the clock.

5.7.2   Location altitude / average air pressure

Air pressure values can be set within a range of 500 to 1100 mbar.

1   Open the *Einstellungen/Settings* menu with **<S>**.

2   Using **<▲ ▼ ◄ ► >** and **<OK>**, select and confirm the menu item, *System
         settings -> Location altitude/Air pressure*.
         The *Location altitude/Air pressure* display opens.

```
S281-20340001        22 Sep 2020      10:14   🔒 ⚠ ①
Location altitude/Air pressure

 Set altitude of location
 Loc. altitude:              590 m      amsl

 Set air pressure
 Air pressure:              1013  mbar




Select ⬍↔, confirm OK
```

figure 5-12   Location altitude/Air pressure

3   Press **<▲▼◄►>** to select *Set altitude of location* or *Set air pressure* and confirm with **<OK>**.

4   Press **<▲▼◄►>** to change the values for *Loc. altitude:* or *Air pressure:* and confirm with **<OK>**.

5.7.3 *Function code*

Function for the service staff.

6   Outputs

6.1   Outputs of the DIQ/S 281

Functioning of the outputs

● Relay outputs work as openers or closers.

● Current outputs provide a current depending on the measured value.

On the DIQ/S 281 you can do the following:

● Assign names for the outputs (see section 6.3).

● Link any outputs with the sensor (see section 6.4)

● Erase links between outputs and the sensor (seesection 6.5)

● Set up outputs (see section 6.6 and section 6.7)

● Check the conditions of the outputs (see section 6.8)

Basis information on the use of relay outputs is given in section 6.2.

Functions for current and relay outputs

Relay output (see section 6.6)

● *System monitoring*

● *Sensor monitoring*

● *Limit indicator*

● *Frequency controller*

● *Pulse-width output*

● *Cleaning*

● *Sensor-controlled*

● *Manual control*

● *Alarm contact*

Current output (see section 6.7)

● *Recorder*

● *PID controller*

● *Fixed current value*

6.2   Basic information on relay functions

This chapter describes general basic information concerning the following relay functions:

- Monitoring (see section 6.2.1)

- Limit indicator (see section 6.2.2)

- Proportional output (see section 6.2.3)

6.2.1   Monitoring

When using a relay for monitoring, a relay action (*Open*, *Close*) occurs when certain states occur. This function is suitable, for example, for the monitoring of errors in the system.

> For monitoring functions, use the relay preferably as normally closed (see section 6.6.1). In the case of an error, the relay opens. As a result, the monitoring function operates even if, for instance, the supply voltage fails.

6.2.2   Limit indicator

With a limit indicator, a relay switches when a specified limiting value is exceeded or undercut.

Limit indicators can be used in the following way:

- Monitoring a limiting value using a relay:
  when a limiting value (upper or lower limiting value) is exceeded or undercut, a relay switches. The *Open* or *Close* relay actions are possible in each case (see page 98).

- Monitoring two limiting values using two relays:
  If the upper limiting value is exceeded or undercut, a relay switches, and if the lower limiting value is exceeded or undercut, another relay switches. The *Open* or *Close* relay actions are possible in each case (see page 98).

> If the simple monitoring function (*Open*, *Close*) with one or two relays is not sufficient, use proportional output (see section 6.2.3).

Monitoring limit-ing values using one or two relays
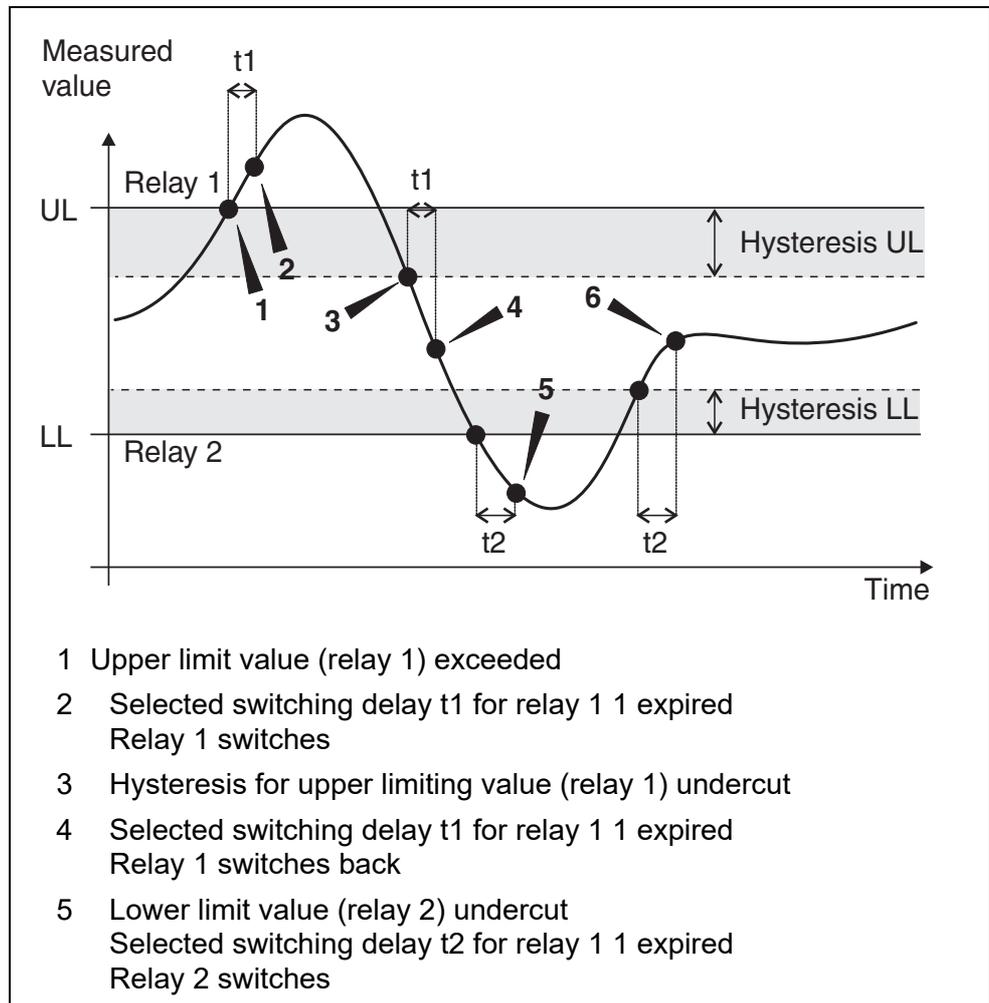
figure 6-1   Switching points for relays with the function of a limit indicator

A switching delay (t) can be set up for each relay for switching processes. This is the time period for which a limiting value must be exceeded before the relay switches. This prevents frequent switching if the measured values are close to the limiting value.

6.2.3 Proportional output

In the case of proportional output, a relay switches cyclically on and off in a defined measured value range (proportional range). At the same time, the relay switches with a:

● duration of operation that corresponds to the measured value (pulse-width output, see page 100) or

● switching frequency (frequency output, see page 100).

Proportional outputs can be used in the following way:

● Output with one relay:
  An output range is defined with a *Start value* and an *End value*. No output takes place above and below the output range (see page 99).

● Output with two relays:
  An output range is defined for each relay with a *Start value* and an *End value*. One relay outputs in the upper output range and a further relay in the lower output range (see page 99).

Output with one relay

figure 6-2   Output with one relay

Output with two relays

1 *Start value*
  Measured value with a minimum pulse width or switching frequency

2 *End value*
  Measured value with a maximum pulse width or switching frequency
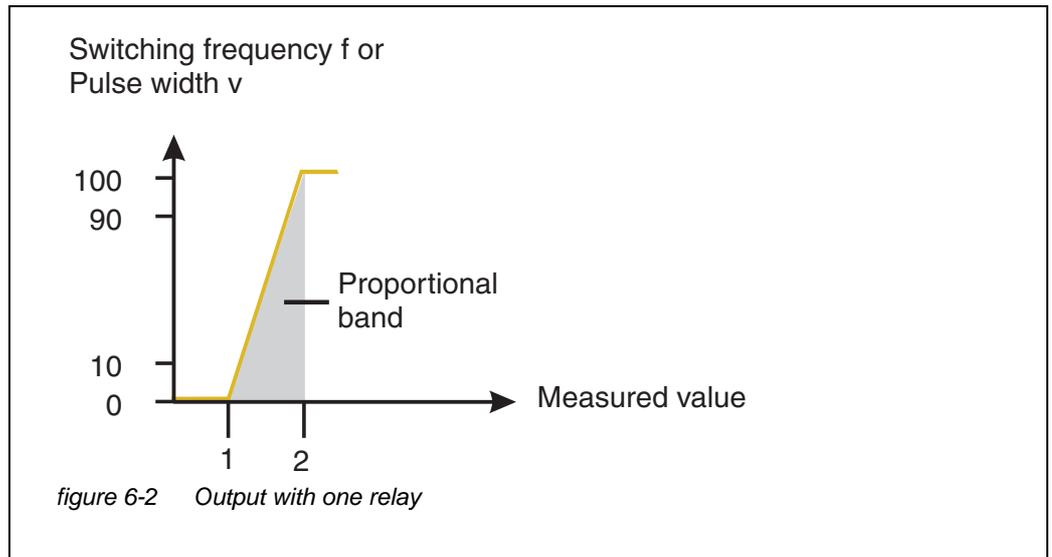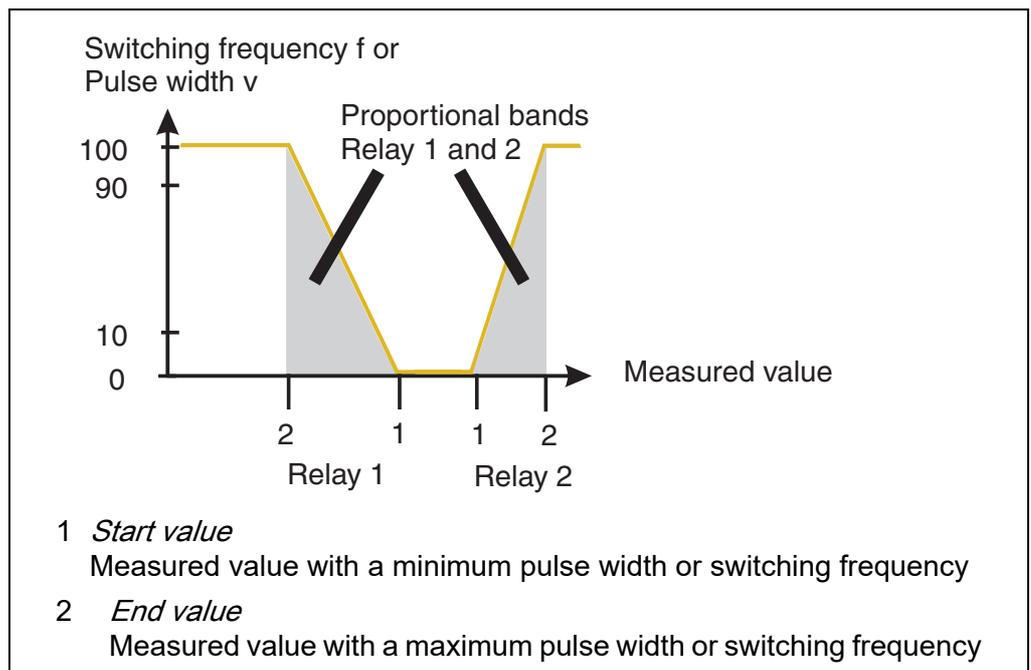
figure 6-3   Output with two relays

Pulse width output   The output of the pulse width is used, e.g. for controlling valves.

Pulse-width regulation changes the duration of operation (t_{on}) of the output signal. Depending on the position of the measured value in the proportional range, the relay is operated for a longer or shorter period.
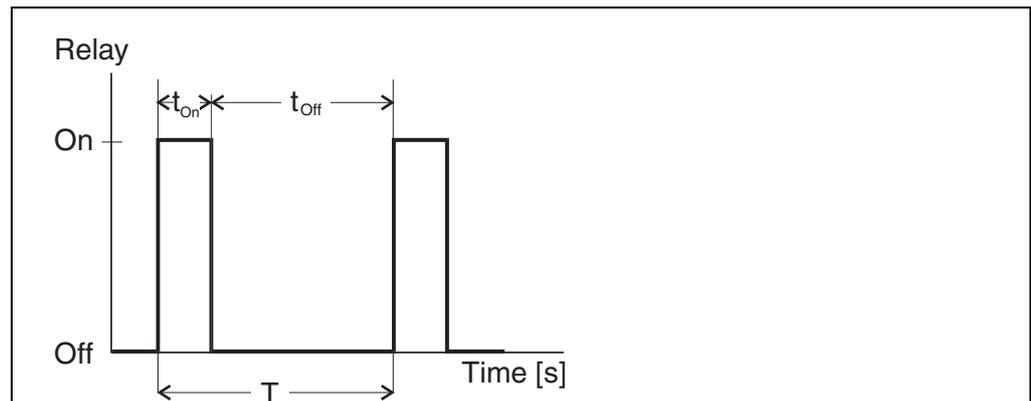
figure 6-4   Relay output of the pulse-width output

The cycle duration (T) is made up of the turn-on and turn-off switching duration (t_{on}, t_{off}) of the relay together. While the selected cycle duration (T) remains constant, the turn-on duration (t_{on}) changes depending on the measured value and, with it, the pulse width (v). The pulse width can be set from 0 % to 100 %.

$v = (t_{on} / T) * 100 \%$

v = pulse width, T = cycle duration, t_{on} = turn-on duration

● If the measured value is at the end of the proportional range (*End value*), the turn-on duration (t_{on}) is long, the turn-off duration is short. This means the relay operates for a longer period.

● If the measured value is at the beginning of the proportional range (*Start value*), the turn-on duration (t_{on}) is short, and the relay operates for a correspondingly shorter period.

> If the duration of the closing or opening pulse is shorter than 0.1 s, the relay remains open or closed for the complete cycle duration.

Frequency output   Switching frequency output is used, e.g. for controlling dosing pumps.

In contrast to the pulse-width output, the pulse width is not modulated with the frequency output but the switching frequency of the output signal. Depending on the position of the measured value in the proportional range, the relay is

switched more often or less often.

Relay

t_{On} = 0.3 s

On

Off

Time [s]

← T →

figure 6-5   Relay output of frequency output

While the selected switching duration (t_{on} = 0.3 s) always remains con-
stant, the switching frequency at which the relay switches changes
depending on the measured value.

● If the measured value is at the end of the proportional range (*End
  value*), the switching frequency is higher.

● If the measured value is at the beginning of the proportional range
  (*Start value*), the switching frequency is low.

Characteristic   Through the selection of the *Start value* and *End value*, the proportional output
curves   can be operated with a positive or negative characteristic curve.

● Positive characteristic curve:
  Select the *End value* to be greater than the *Start value*.
  The turn-on duration or frequency increases with an increasing measured
  value (see page 103).

● Negative characteristic curve:
  Select the *End value* to be smaller than the *Start value*.
  The turn-on duration or frequency decreases with an increasing measured
  value (see page 104).

The maximum values for the pulse width or switching frequency are assigned to
the *End value* value and the minimum values for turn-on duration or frequency
are assigned to the *Start value* value.
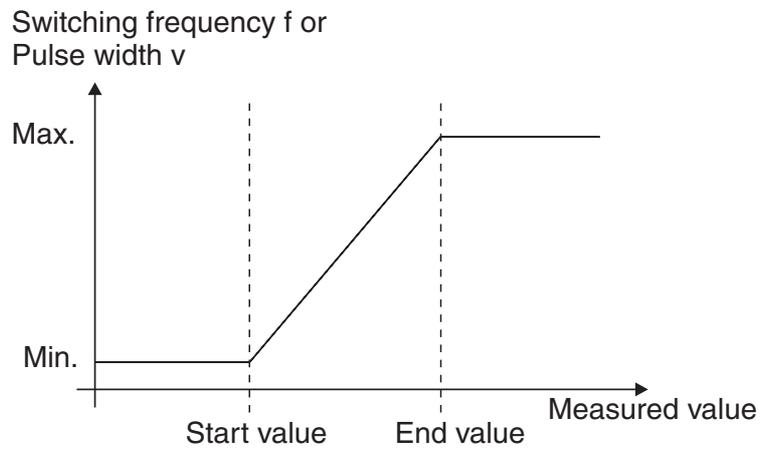
figure 6-6   Positive characteristic curve
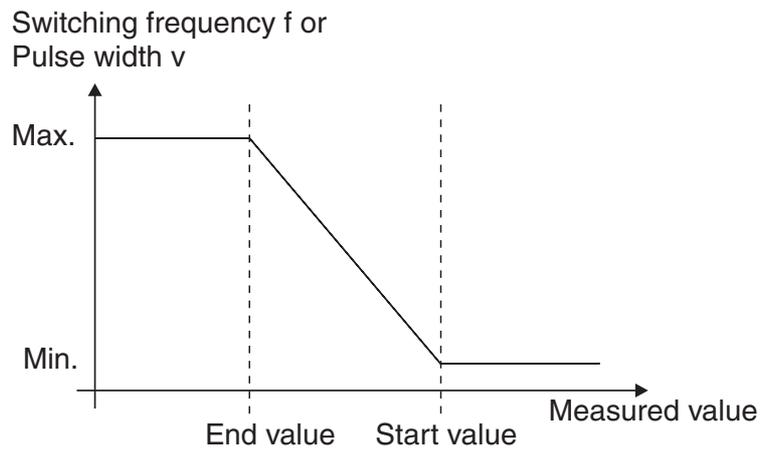
figure 6-7   Negative characteristic curve

Positive character-istic curve
The proportional output range begins above the initial value. If the proportional range is undercut or exceeded, the selected behavior comes into force.

Pulse width v [%]

100
90

50

10
0

1   Measured value   2

figure 6-8   Pulse width output

90 %   10 %

Cycle duration T

50 %   50 %

t_{On} t_{Off}

10 %   90 %

Time →

Switching frequency f [1/min]

120

60

0

Proportional band

1   Measured value   2

figure 6-9   Frequency output

Maximum switching frequency

50 % of maximum switching frequency

Time

Minimum switching frequency

1   *Start value*
    Measured value with a minimum pulse width or switching frequency

2   *End value*
    Measured value with a maximum pulse width or switching frequency
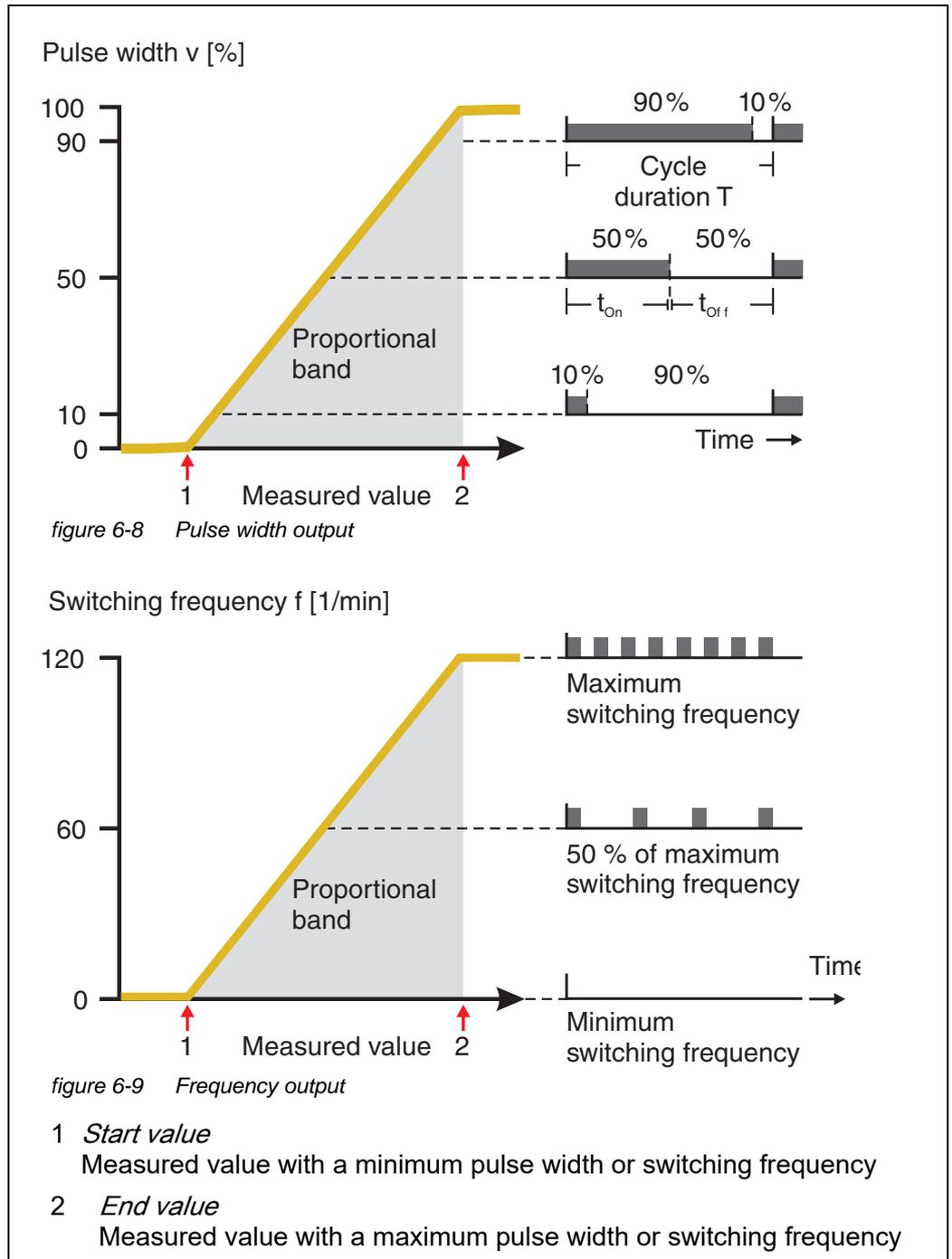
Negative charac-
teristic curve

The proportional output range begins below the initial value. If the proportional range is undercut or exceeded, the selected behavior comes into force.

Pulse width v [%]

figure 6-10   Pulse width output

Switching frequency f [1/min]

figure 6-11   Frequency output

1   *Start value*
   Measured value with a minimum pulse width or switching frequency

2   *End value*
   Measured value with a maximum pulse width or switching frequency
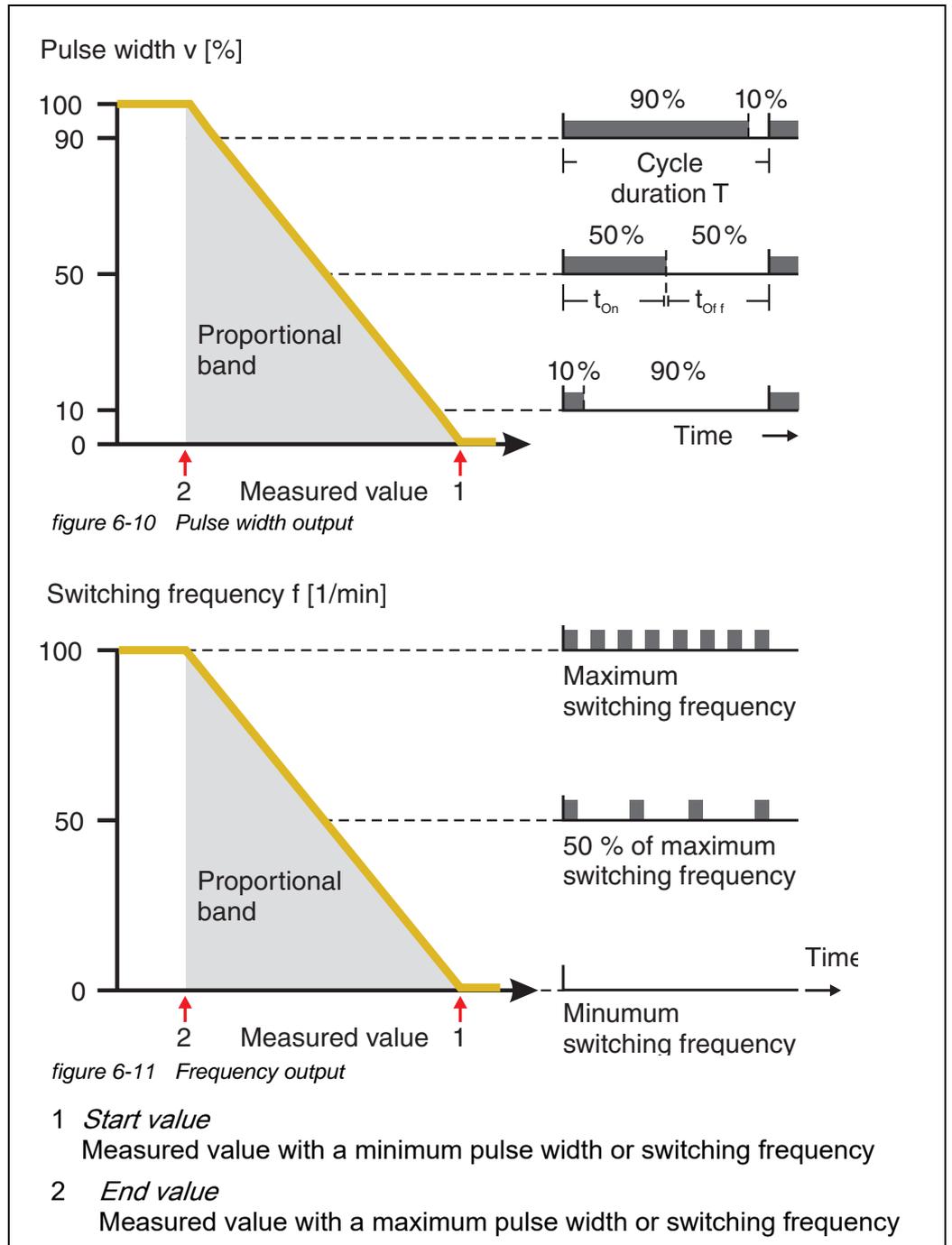
6.3 Entering / editing the name of an output

For easier identification of the outputs, an individual name can be given to each output in the *Edit list of outputs* overview.

1   Open the *Einstellungen/Settings* menu with **<S>**.

2   Using **<▲ ▼ ◄► >** and **<OK>**, select and confirm the menu item, *System settings -> Edit list of outputs*.
     The *Edit list of outputs* display opens.

3   Press **<▲ ▼ ◄► >** to highlight a name in the *Name* column and confirm with **<OK>**.

```
┌────────────────────────────────────────────────────┐
│ S281-20340001    │22 Sep 2020│ 10:14 │ 🔓 │ ⚠ │ ① │
│ Edit list of outputs                                 │
│ No. │Model/Channel   │Ser. no. │Name                │
│ D01 │DIQ/S281-CR2/R1 │99200004 │████████████████████│
│ D01 │DIQ/S281-CR2/R2 │99200004 │                    │
│ D01 │DIQ/S281-CR2/C1 │99200004 │                    │
│ D01 │DIQ/S281-CR2/C2 │99200004 │                    │
│                                                      │
│                                                      │
│                                                      │
│                                                      │
│ Select ⬍↔, edit output names ⌸                       │
└────────────────────────────────────────────────────┘
```

figure 6-12   Edit list of outputs

4   Select a letter, number or special character with **<▲ ▼ ◄► >** and confirm with **<OK>**.

5   Complete the name of the output and confirm with **<OK>**.

6.4   Linking the output with a sensor

1   Open the *Einstellungen/Settings* menu with **<S>**.

2   Using **<▲▼◄► >** and **<OK>**, select and confirm the menu item, *System
         settings -> Settings of outputs and links*.
         The *Settings of outputs and links* display opens.

3   Press **<▲▼◄► >** to highlight the *&* column and confirm with **<OK>**.

4   Select an output with **<▲▼◄► >** and confirm with **<OK>**. The *Link
         with...* display opens.
         The display shows a list of sensors that can be linked.

```
S281-20340001    22 Sep 2020    09 47  🔓 ⚠ ①
Link with...
  No. Sensor name         Measuring range
  S01 99190001          COND   AutoRange




Select sensor ⬍⬌, confirm ⏎
```

figure 6-13   Settings of outputs and links: Link with...

5   Using **<▲▼◄► >**, select a sensor and confirm with **<OK>**.
         The output is linked with the sensor.

> ℹ   In the overview *Settings of outputs and links*, field *Ser. no.*, outputs
>   that are linked with sensors have the name of the linked sensor.

6.5   Deleting a link with an output

If a link between a current or relay output and a sensor is no longer required, you can erase the link.

1   Open the *Einstellungen/Settings* menu with **<S>**.

2   Using **<▲▼◀▶ >** and **<OK>**, select and confirm the menu item, *System settings* -> *Settings of outputs and links*.
The *Settings of outputs and links* display opens.

3   Press **<▲▼◀▶ >** to highlight the *&* column and confirm with **<OK>**.

4   Select a linked output with **<▲▼◀▶ >** and confirm with **<OK>**.

```
┌────────────────────────────────────────────────────────┐
│ S281-20340001      │22 Sep  2020 │09 50 │ 🔒 │ ⚠ │ ⓘ │
├────────────────────────────────────────────────────────┤
│ Settings of outputs and links                          │
├────┬────┬────────────┬──────┬───────────────────────────┤
│ &  │No. │Name        │Chan. │Feature                    │
├────┼────┼────────────┼──────┼───────────────────────────┤
│ S01│ ┌──────────────────────────────────────────┐       │
│────│ │                                          │       │
│────│ │ No further link possible!                │       │
│────│ │                                          │       │
│────│ │                                          │       │
│    │ │ Erase link                               │       │
│    │ │ Cancel                                   │       │
│    │ │                                          │       │
│    │ │                                          │       │
│    │ └──────────────────────────────────────────┘       │
├────────────────────────────────────────────────────────┤
│ Linked sensor                                          │
├────┬────┬────────────┬──────┬───────────────────────────┤
│    │S01 │99190001    │COND  AutoRange                   │
├────────────────────────────────────────────────────────┤
│ Select ✦◆, edit link ⌸                                 │
└────────────────────────────────────────────────────────┘
```
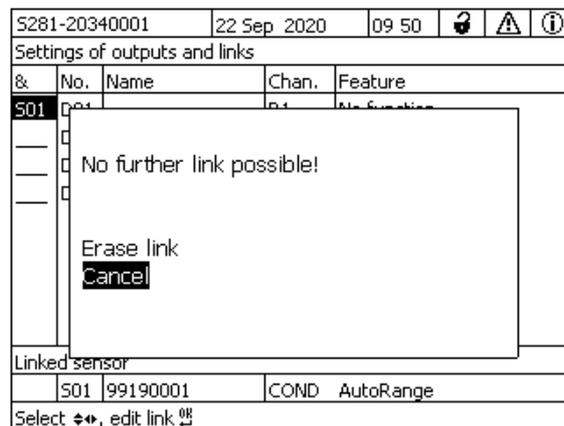
figure 6-14   Settings of outputs and links: Erase link

5   Using **<▲▼◀▶ >**, select *Erase link* and confirm with **<OK>**.
A safety query appears.

6   Using **<▲▼◀▶ >**, select *Erase link* and confirm with **<OK>**.
The link is deleted.

6.6   Setting the relay outputs

1   Call up the measured value display with **<M>**.

2   Open the *Einstellungen/Settings* menu with **<S>**.

3   Using **<▲▼◄► >**, highlight the menu item, *Settings of outputs and links*, and confirm with **<OK>**. The *Settings of outputs and links* display appears.

4   Using **<▲▼◄► >**, highlight the *Feature* column. Confirm with **<OK>**.

5   Using **<▲▼◄► >**, highlight a line for a relay output (Rx) in the column *Feature*. Confirm with **<OK>**.
        The *Settings of outputs and links* display opens.

6   Using **<▲▼◄► >**, highlight the menu item, *Relay function*, and confirm with **<OK>**.

```
S281-20340001      22 Sep 2020    09 58   🔒  ⚠  ⓘ
Settings of outputs and links
 Relay function                             No function

 Save and quit
 Quit




Select setting ⬍◆
```
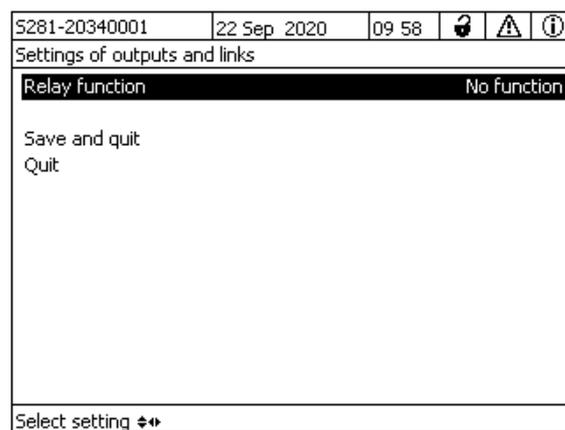
figure 6-15   Settings of outputs and links

7   Using **<▲▼◄► >**, select one of the functions listed below. Confirm with **<OK>**.

Function	Description
No function	The relay output is not used.
System monitoring	see section 6.6.2
Sensor monitoring	see section 6.6.3
Limit indicator	see section 6.6.4
Frequency controller	see section 6.6.5
Pulse-width output	see section 6.6.6
Cleaning	see section 6.6.7
Manual control	see section 6.6.8
Alarm contact	see section 6.6.9

8   Make the settings for the relay outputs with **<▲▼◄► >** and **<OK>**. The settings comprise the relay action (see section 6.6.1) and sensor dependent settings.

9   Using **<▲▼◄► >** and **<OK>**, highlight and confirm *Save and quit*. The new settings are stored.

As soon as a function was selected for a relay output, you can select a relay action (see section 6.6.1).

6.6.1   Relay action

The following actions of the relay can be defined in the *Action* setting:

Settings	Explanations
Open	The relay should open on every event.
Close	The relay should close on every event.

Preferably set up the relay output as normally closed for monitoring functions (*ActionOpen*).

6.6.2   *System monitoring*

Function   The *System monitoring* function enables the monitoring of system errors. In order to set up the *System monitoring* function for a relay output, the relay output must not be linked with a sensor (see section 6.4).

It can be used to monitor the following system errors.

Settings

Settings	Selection	Explanations
Power failure	*On* *Off*	The function *Power failure On* monitores the supply voltage on the DIQ/S 281. The relay switches when the voltage drops below the critical value.
Communication	*On* *Off*	The *Communication On* function monitors the functioning of the DIQ/S 281.
Collective error message	*On* *Off*	*Collective error message On* function simultaneously monitors the proper functioning of all sensors and the functioning of the combination output module to be monitored. (for details, see below this table)
Action	*Open*	For all functions of the *System monitoring*, the relay action is set to *Open*.

Collective error message   In the case of a *Collective error* message, the relay opens if one of the following malfunctions occurs:

● The sensor, which is properly registered to the DIQ/S 281, does not provide a valid main measured value

● The sensor, which is properly registered to the DIQ/S 281, does not provide a valid secondary measured value

● The internal output module has not received any new data DIQ/S 281 for 2 minutes.

In any case, the relay remains open for 10 seconds and only closes when the malfunction is no longer present.

In the following cases, the relay does <u>not</u> open despite an invalid measured value:

● The sensor is being calibrated

● The sensor is in the maintenance condition

● The sensor is being cleaned with the aid of a valve module in the system (compressed air operated cleaning system).

6.6.3 *Sensor monitoring*

Function   The *Sensor monitoring* function enables the monitoring of sensor errors and the maintenance condition.

In order to set up the *Sensor monitoring* function for a relay output, the relay output must be linked with the sensor (see section 6.4).

Settings

Setting	Selection	Explanation
Error	*Special*	Special sensor errors are monitored and can prompt a relay action.
	All	All sensor errors (special ones and general ones) are monitored and can prompt a relay action.
	Off	Sensor errors are not monitored.
Mainten. Condition	*On* *Off*	Switching on and off the maintenance condition (see section 4.8) is monitored and can prompt a relay action.
Action	*Open* *Close*	Relay action (see section 6.6.1)

Preferably set up the relay output for monitoring functions as an opener (*Action Open*, see section 6.6.1).

Sensor messages include errors and information that are registered by the sensor.

Special sensor errors   The special sensor errors are sensor-dependent. Details of this are given in the component operating manual of the respective sensor.

General Sensor errors

Init	This can prompt a relay action for a short time, depending on the starting behavior of the system
----	Invalid measured value, or defective sensor
Error	Communication with sensor interrupted
OFL	Measuring range undercut or exceeded (overflow)

6.6.4 *Limit indicator*

Function The characteristic of the limit indicator is laid down in the *Limit value UL*, *Limit value LL*, *Hysteresis UL* and *Hysteresis LL* settings. The fundamentals of the function are described in the introductory chapter (see section 6.2.2).

In order to set up the *Limit indicator* function for a relay output, the relay output must be linked with a sensor (see section 6.4).

Settings

Setting	Selection/Values	Explanation
Limit values	*UL main variable* *LL main variable* *UL adjoining var.* *LL adjoining var.*	*Main variable* designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). *Adjoining variable* designates an additional measured parameter (e.g. temperature).
Limit value UL *Limit value LL*	Upper or lower limiting value Any value within the measuring range (sensor-dependent)	Minimum difference between the upper and lower limit value: 5 % of the measuring range
Hysteresis UL *Hysteresis LL*	0 - 5% of the measuring range	Hysteresis for *Limit value UL* and *Limit value LL*.
Behavior at error	*Open* *Close* *Unchanged*	The relay opens, closes or remains unchanged in the case of system errors or sensor errors (see page 125).
Action	*Open* *Close*	Relay action (see section 6.6.1)
Switching delay	0 ... 3600 s	The time period for which a limiting value must be exceeded before the relay operates. Prevents frequent switching for measured values that are close to the limiting value.

6.6.5 *Frequency controller*

Function The characteristic of the frequency output is laid down in the *Start value*, *End value*, *Frequency (f) min.* and *Frequency (f) max.* settings. The fundamentals of

the function are described in the introductory chapter (see section 6.2.3).

In order to set up the *Frequency controller* function for a relay output, the relay output must be linked with a sensor (see section 6.4).

Settings

Setting	Selection/Values	Explanation
Measured variable	*Main variable* *Adjoining variable*	*Main variable* designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). *Adjoining variable* designates an additional measured parameter (e.g. temperature).
Start value *End value*	within the measuring range (sensor-dependent)	Minimum spacing: 5 % of the measuring range
Frequency (f) min. *Frequency (f) max.*	0 to 120 1/min	Minimum spacing: 10 1/min
Frequency with error	0 to 120 1/min	In case of system errors or sensor errors (see page 125), the relay switches with the frequency specified.
Action	*Open* *Close*	Relay action (see section 6.6.1)

Characteristic curve

If a value for *End value* that is greater than the *Start value* is entered, the output has a positive characteristic curve.

In order to obtain a negative characteristic curve, a value for *End value* must be entered that is smaller than the value for *Start value*.

6.6.6 *Pulse-width output*

Function The characteristic of the pulse width output is laid down in the *Start value*, *End value*, *Pulse width (v) min.* and *Pulse width (v) max.* settings. The fundamentals of the function are described in the introductory chapter (see section 6.2.3).

In order to set up the *Pulse-width output* function for a relay output, the relay output must be linked with a sensor (see section 6.4).

Settings

Setting	Selection/Values	Explanation
Measured variable	*Main variable* *Adjoining variable*	*Main variable* designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). *Adjoining variable* designates an additional measured parameter (e.g. temperature).
Start value *End value*	within the measuring range (sensor-dependent)	Minimum spacing: 5 % of the measuring range
Pulse width (v) min. *Pulse width (v) max.*	0 ... 100 %	Minimum spacing: 10 % of the *Cycle duration (T)*
Cycle duration (T)	5 ... 100 s	Length of the switching period T $T = (t_{on} + t_{off})$
Error pulse width	0 ... 100 %	In case of system errors or sensor errors (see page 125), the relay switches with the pulse-width specified.
Action	*Open* *Close*	Relay action (see section 6.6.1)

Characteristic curve You can specify the minimum and maximum pulse width (v). This determines the steepness of the characteristic curve of the output.

6.6.7 *Cleaning*

Function The *Cleaning* function enables the time controlled automatic start of the sensor cleaning function with the aid of a relay of the combination output module. The relay controls the DIQ/CHV valve module and switches the compressed air for the CH sensor cleaning head on or off.

In order to set up the *Cleaning* function for a relay output, the relay output must be linked with a sensor (see section 6.4).

The relay of the combination output module assigned always works as a closer.

The cleaning cycle consists of *Cleaning duration* and *Adjustment time*.

During the cleaning cycle the *Clean* display flashes. The outputs linked with this sensor are frozen. The maintenance condition (see section 4.8) is active.

After the *Cleaning duration*, the relay is opened. During the following *Adjustment time* the outputs remain blocked.
The outputs linked with this sensor are only released when the cleaning cycle is complete. The *Clean* display disappears. The maintenance condition is finished.

Testing the operativeness

You can test the operativeness of the cleaning system as follows: Manually open or close the relay with the *Manual control* function (see section 6.6.8) and, while doing so, check the behavior of the cleaning system.

Alternatively, you can test the operativeness of the cleaning system by checking the performance of the function at the start time set up (reference time ± interval). To perform a test immediately, the reference time can be set so that the next cleaning cycle will start in a few minutes (settings: see following table).

Settings

Setting	Selection/Values	Explanation
Reference time (h)	0 ... 23 h	Time at which a cleaning cycle is started. Further cleaning cycles will be performed at the times specified by the cleaning interval.
Reference time (min)	0 ... 60 min	
Interval unit	1 .. 7 d 1 .. 24 h 5 .. 60 min	Selection of range and unit for the *Reinigungsintervall*.
Cleaning interval	1/2/3/4/5/6/7 d or: 1/2/3/4/6/8/12/24 h or: 5/10/15/20/30/60 min	Repeat interval for the cleaning function: Time between the start time of a cleaning cycle and the start time of the next cleaning cycle*.
Cleaning duration	0 ... 300 s	Duration of the cleaning
Adjustment time	0 ... 900 s	Time extension to allow the sensor to adjust to the test sample after cleaning.

* With short cleaning intervals, the adjustable values for the *Cleaning duration* and *Adjustment time* are limited. The following values apply:

Cleaning interval	*Cleaning duration*	*Adjustment time*
≤ 10 min	max. 60 s	max. 120 s
≤ 20 min	max. 180 s	max. 300 s

With this, the cleaning times are fixed. They only change when the *Reference time (h)* is changed.

The reference time and all further cleaning times relate to the date and time of the system clock. How to set the system clock is described in the system operating manual.

Example

Setting		Result
Reference time (h):	12	Reference time: 12:00 hours
Reference time (min):	0	This specifies the following start times:
Interval unit:	*Hours (h)*	04:00, 12:00 and 20:00 hours
Cleaning interval:	8 h	

1 Reference time
  Begin of a cleaning cycle (**t1**)
  Begin of the specified *Cleaning duration* (**t1a**)

2 End of the specified *Cleaning duration* (**t1a**)
  Begin of the specified *Adjustment time* (**t1b**)

3 End of the specified *Adjustment time* (**t1b**)
  End of the cleaning cycle (**t1**)

4 Reference time ± *Cleaning interval* (**t2**)
  Begin of a cleaning cycle
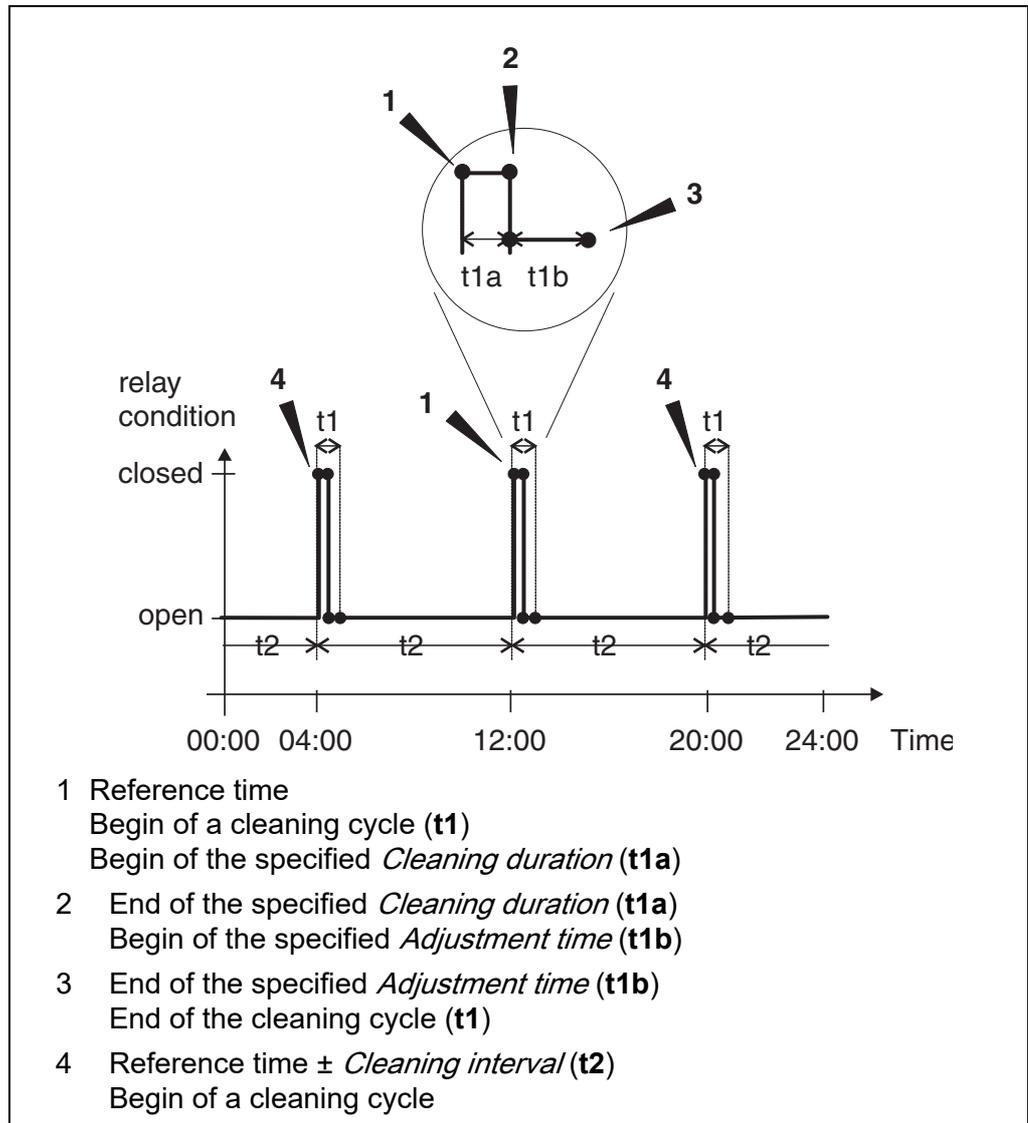
Canceling the cleaning
A running cleaning cycle is canceled:

● Automatic

– if the sensor switches to the inactive condition during the cleaning cycle

● Manual

– By pressing the **<C>** key

– By switching on the maintenance condition

Each time the cleaning cycle is canceled, the relay opens immediately.

If the cleaning cycle is canceled automatically, the outputs linked to the sensor are released immediately.
If the cleaning cycle is canceled manually, the sensor is in the maintenance condition. The linked outputs are only released after the maintenance condition was terminated manually.

The next cleaning cycle will be performed at the time set up.

> In case of a power failure, all relays open. The cleaning cycle is canceled. The outputs linked with the sensor change to the non-active condition (see section 6.9.2). As soon as the power is available, the outputs are released again. The next cleaning cycle will be performed at the time set up.

6.6.8 *Manual control*

Function The *Manual control* function can be used to test the operativeness of an instrument that is connected to the relay. To do so, close or open the relay manually and, while doing so, check the behavior of the connected instrument.

Setting	Selection/Values	Explanation
Relay function	*Manual control*	The selected relay action is carried out with *Save and quit*.
Action	*Open* *Close*	Relay action (see section 6.6.1)

> The settings for other functions in the *Relay function* menu as, for example, *Frequency controller* and *Pulse-width output* are retained while the *Manual control* is carried out.

6.6.9 *Alarm contact*

Function The *Alarm contact* function triggers a relay action (opening or closing) if a defined alarm event takes place. The *Alarm contact* function is only available for relays that are not linked with a sensor. If necessary, an existing link must be erased.

Setting	Selection/Values	Explanation
Relay function	*Alarm contact*	The selected relay action is carried out with *Save and quit*.
Action	*Open* *Close*	Relay action (see section 6.6.1)

6.7   Setting the current outputs

1   Call up the measured value display with **<M>**.

2   Open the *Einstellungen/Settings* menu with **<S>**.

3   Using **<▲▼◄► >**, highlight the menu item, *Settings of outputs and links*, and confirm with **<OK>**. The *Settings of outputs and links* display appears.

4   Using **<▲▼◄► >**, highlight the *Feature* column. Confirm with **<OK>**.

5   Using **<▲▼◄► >**, highlight a line for a current output (Cx) in the column *Feature*. Confirm with **<OK>**.
      The *Settings of outputs and links* display opens.

6   Using **<▲▼◄► >**, highlight the menu item, *Current output*, and confirm with **<OK>**.

```
S281-20340001       22 Sep  2020    10 07    🔒  ⚠  ⓘ
Settings of outputs and links
Current output                                No function

Save and quit
Quit




Select setting ⬍⬌
```
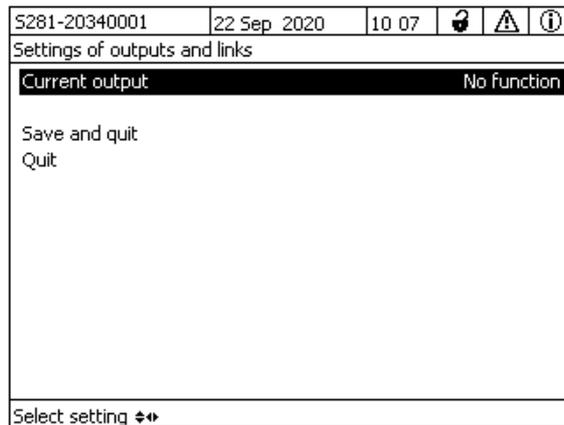
figure 6-16   Settings of outputs and links

7   Select and confirm a function with **<▲▼◄► >** and **<OK>**.

Function	Settings
No function	The current output is not used.
Recorder	see section 6.7.1
PID controller	see section 6.7.2
Fixed current value	see section 6.7.3

8   Make the settings for the current output with **<▲▼◄► >** and **<OK>**.

9   Using **<▲▼◀▶ >** and **<OK>**, highlight and confirm *Save and quit*.
        The new settings are stored.

6.7.1   *Recorder*

Function   The measured values of the linked sensor at the current output are set up as cur-
rent intensity in the *Recorder* application. The output of measured values is laid
down in the *Recorder type*, *Start value* and *End value* settings.

Settings

Setting	Selection/Values	Explanation
Recorder type	0 to 20 mA or 4 to 20 mA	
Start value	(sensor dependent)	Minimum spacing: ≤ 5 % of the measuring range (sensor-dependent)
End value		
Measured variable	*Main variable* *Adjoining variable*	*Main variable* designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). *Adjoining variable* designates an additional measured parameter (e.g. temperature).
Attenuation	0 ... 40 mA/s	Speed of change of the output current (mA/s) in the case of erratic changes of the input signal.
I -> UFL/OFL	*Error*	Current values outside the range between *Start value* and *End value* are regarded as an error. The current output reacts as specified under *Behavior at error* (see below).
	Limitation	The current at the output is limited to the *Start value* or *End value*.
Behavior at error	*Fixed current value*	In the case of system errors and sensor errors, the current output delivers the fixed current value that was specified. Possible values: 0 ... 21 mA.
	Unchanged	The current at the output remains unchanged.

6.7.2 *PID controller*

Function   The *PID controller* function can use an output as a controller output. The regulator can be configured as a **P**roportional regulator with switchable **I**ntegral and **D**ifferential regulator parts (**PID** Controller).

The control response of the PID controller is described by the following formula:

$$I_{Regler} = I_0 + K \left(x_e + \frac{1}{T_i} \int x_e dt + T_d \frac{dx_e}{dt} \right)$$

with:

$$K = \frac{I_{max} - I_{min}}{X_p}$$

$$x_e = x_{soll} - x_{ist}$$

$$I_{min} \leq I_{Regler} \leq I_{max}$$

$I_{Controller}$	Current on the controller output at time t
I_0	*Current on the output if $x_{actual} = x_{set}$*
K	Amplification
X_p	Proportional range
x_e	Control difference
x_{actual}	Actual value (current measured value)
x_{set}	Set value
ti	Integral algorithm
td	Differential control part
t	Time
I_{min}	Lower current limitation
I_{max}	Upper current limitation

The adjustable control parameters are x_{set}, I_0, X_p, I_{min}, I_{max}, *ti* and *td* (see setting table on page 124).
By activating or deactivating the **I**ntegral (*ti*) and **D**ifferential (*td)* controller part, the following controller types can be configured:

Regulator type	*td* [s]	*ti* [s]
P controller	0	0

Regulator type	td [s]	ti [s]
PI controller	0	1 to 9999
PD controller	1 to 9999	0
PID controller	1 to 9999	1 to 9999

Characteristic curve of the proportional controller

For a pure P controller the correlation between the measured value and current I on the controller output results in the following characteristic curve:

figure 6-17   Proportional controller (negative characteristic curve)
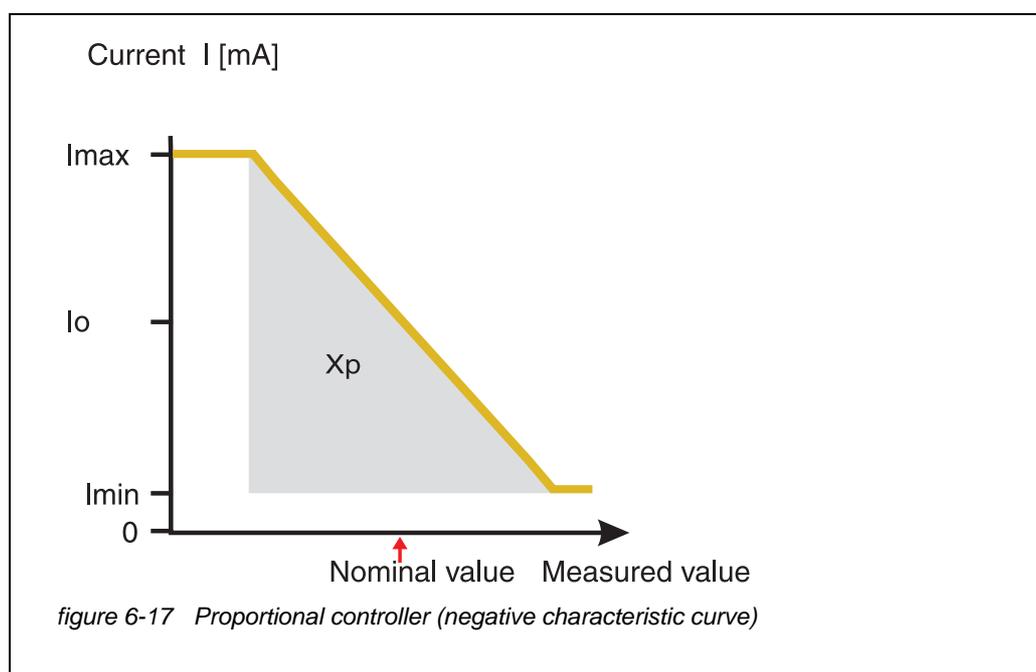
The proportional range Xp is limited by the measurement range of the linked sensor. If a value is entered for the parameter Xp that is greater than zero, the controller has a positive characteristic curve (example figure 6-17). To obtain a positive characteristic curve, a negative value must be entered for Xp.

Application example

● Regulation of the oxygen concentration

● Sensor: TriOxmatic 700 IQ (measuring range: 0 to 60 mg/l)

Control parameter	Value
Nominal value	4 mg/l
Xp	10 % of the measuring range or 6 mg/l
Imin	8 mA
Imax	14 mA
Io	12 mA

ti	0 s (no I algorithm)
td	0 s (no D algorithm)

The control parameters result in the following (negative) characteristic curve:

figure 6-18   Characteristic curve for application example
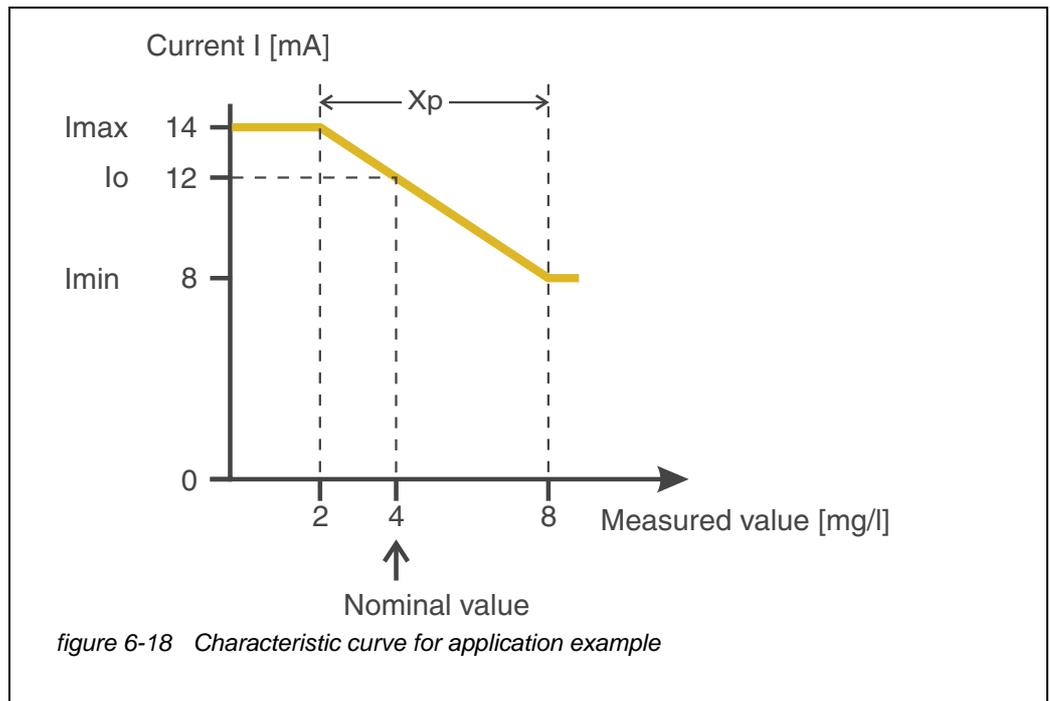
The controller works with the following amplification:

$$K = \frac{6\ mA}{6\ mg/l} = 1\,\frac{mA}{mg/l}$$

Within the proportional range an increase of the concentration by 1 mg/l causes a reduction of the output current by 1 mA. If the measured concentration is 5 mg/l, for example, 11 mA is output:

$$I_{Regler} = 12\ mA + 1\,\frac{mA}{mg/l} \cdot \left(4\ mg/l - 5\ mg/l\right)$$

$$I_{Regler} = 12\ mA + 1\,\frac{mA}{mg/l} \cdot \left(-1\ mg/l\right) = 11\,mA$$

The highest concentration at which the controller still works in the proportional range is 8 mg/l (corresponding to *Imin* = 8 mA) and the lowest is 2 mg/l (corresponding to *Imax* = 14 mA).

Settings	**Setting**	**Selection/Values**	**Explanation**
	Measured variable	*Main variable* *Adjoining variable*	*Main variable* designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). *Adjoining variable* designates an additional measured parameter (e.g. temperature).
	Nominal value	within the measuring range (sensor-dependent)	Nominal value the measured value is regulated to
	Xp	5 ... 100 % -5 ... -100 % % of the measuring range	Proportional range of the controller. Negative values result in a positive characteristic curve.
	Imin	0 ... 20 mA	Lower current limitation *
	Imax	0 ... 20 mA	Upper current limitation * * Note: Spacing between *Imin* and *Imax*: at least 5 mA
	Io	0 ... 20 mA	Current value on the output if the measured value equals the *Nominal value*
	ti	0 ... 9999 s	Hold-back time: Integral part of the controller (*0* = not effective)
	td	0 ... 9999 s	Reset time: Differential part of the controller (*0* = not effective)
	Behavior at error	*Fixed current value*	In the case of an error, the current output supplies the current value defined in the *Current with error* field (any in the range *0 ... 21 mA).*
		Unchanged	In the case of an error, the current on the output remains unchanged.

6.7.3   *Fixed current value*

Function   The *Fixed current value* function can be used to test the operativeness of the instruments connected to the outputs: output different current values to the output and, while doing so, check the behavior of the connected instrument.

Setting	Selection/Values	Explanation
Current output	*Fixed current value*	Using *Save and quit*, the nominal amperage that was input as *Inom* is output.
Inom	0 ... 20 mA	The nominal amperage that is output.

> The settings for other functions in the *Current output* menu as, for example, *PID controller* and *Recorder* are retained while the *Fixed current value* is carried out.

6.8   Checking the condition of the outputs

This function provides a simple overview of the conditions of all outputs of the combination output module (see section 4.7).

For the relays, the displayed condition is *open* or *closed*.

For the current outputs, the current value present at the outputs is displayed.

6.9   Behavior of linked outputs

6.9.1   Behavior in case of error

For linked relay outputs or current outputs, you can determine the behavior of the outputs in case of errors.

Depending on the use of the output, the behavior in case of errors is set in the following menus:

Output	Menu
Frequency controller	*Frequency with error* (see section 6.6.5)
Pulse-width output	*Error pulse width* (see section 6.6.6)
Recorder	*Current with error* (see section 6.7.1)

Error events   The specified behavior occurs with the following events or conditions:

- The linked sensor does not provide any valid measured value
  (display of *Init*, *Error*, *"-----"*, or *OFL)*

- Communication with the DIQ/S 281 is interrupted for more than 2 minutes.

- The supply voltage for the DIQ/S 281 is too low.

- In the function *Recorder*, the measured value of the linked sensor is outside
  the range between *Start value* and *End value*.

**Freezing the
conditions of the
outputs**

Irrespective of the behavior in case of error that was defined, the following situations cause the conditions of the outputs to be frozen:

- The linked sensor is in the maintenance condition
  (display of *Cal*, *Clean*, or flashing measured value).

- Communication with the DIQ/S 281 is temporarily interrupted. After an interruption of 2 minutes the output changes to the behavior defined for error.

**Restoring the
normal functioning**

The relay or current output automatically returns to its normal condition as soon
as all errors have been eliminated and all conditions that caused the freezing of
the outputs were eliminated.

6.9.2   Behavior in non-operative condition

An output is non-operative when no function is activated for the output.

An output becomes non-operative in case of

- Power failure
  (As soon as the supply voltage is sufficient again, the non-operative condition
  of the outputs ends. The outputs function as specified by the user again.)

- Erasing a link to a sensor

- Changing the *Messmodus* sensor setting for a linked sensor

- Changing the *Messbereich* sensor setting for a linked sensor

> Before editing sensor settings a note appears on the display to
> inform you that links will be erased when you change the
> *Messmodus* or *Messbereich* sensor setting.

**Settings in the
non-active
condition**

Current output	Relay output
Current: 0 A	Relay: Open

7   Maintenance and cleaning

7.1   Maintenance

Maintenance activities

Component	Maintenance
IQ sensors	Depending on the type of sensor (see the component operating manual of the sensor)
DIQ modules	No maintenance required

7.2   Cleaning

DIQ modules   Clean components mounted in the open of gross contamination as necessary. We recommend cleaning the worst of the dirt on the enclosure and the area directly around it each time before opening in order to prevent contamination from entering the open enclosure.

To clean the module, wipe the enclosure surfaces with a damp, lint-free cloth. If compressed air is available on site, blow off the worst of the dirt beforehand. Keep the enclosure closed while doing so.

Do not use high-pressure water blasters for cleaning (danger of water penetration!). Also do not use aggressive cleaning agents such as alcohol, organic solvents or chemical detergents. These types of cleaning agent can attack the surface of the housing.

The enclosure and the window of the display are made of plastic. Thus, avoid contact with acetone and similar detergents. Remove any splashes immediately.

IQ sensors   The cleaning of the IQ sensors depends greatly on the respective application. Instructions for this are given in the respective component operating manual.

A valve module for the compressed air-operated cleaning of sensors is available as an accessory.

8 What to do if ...

8.1 Information on errors

Log book

The DIQ/S 281 system performs a comprehensive cyclical self test during operation. While doing so, the system identifies all states that deviate from normal operation and enters corresponding messages in the log book (information or error message).

With the aid of the log book, you can call up instructions on how to clear the error directly on the Universal Transmitter. The log book is described in detail in section 4.5 MESSAGES AND LOG BOOK.

Information on possible errors of IQ sensors is given in the chapter WHAT TO DO IF ... of the respective component operating manual.

8.2 Errors: causes and elimination

The system no longer reacts to entries

Cause	Remedy
– System error	Reset the system: – Switch off the power supply and switch it on again after 10 s

"Error" in the measured value display

Cause	Remedy
– Communication with the IQ Sensor interrupted	– Check the cable connection
– Error in the IQ sensor	– Disconnect the IQ sensor and reconnect it after 10 s

The selected system language was not activated for all components

Cause	Remedy
– A system language was selected that is not available in at least one component (sensor, Universal Transmitter, output module). The standard language, *English*, was activated instead of the selected system language.	– Contact the service department, as a software update is required for the relevant components.

8.3   Replacing system components

It is always possible to replace components and assign a substitute if the software state of the substitute component is as high as or higher than the software version of the original component.

8.3.1   Replacing passive components

Passive components include all components that the universal transmitter can-not recognize.
These include:

● DIQ/JB (branching module)

● DIQ/CHV (module for automatic compressed air cleaning)

● Cables (SNCIQ, SACIQ).

> **WARNING**
> **If the universal transmitter DIQ/S 281 is opened during op-eration, there is a danger to life due to possible hazard of electric shock. The Universal Transmitter DIQ/S 281 may only be opened while the mains voltage is switched off. Secure the line voltage against being switched on again.**
> **Only ever replace components while the DIQ/S 281 is switched off. Defective components are removed in the re-verse order to the installation (see chapter 3 INSTALLATION).**

8.3.2   Replacing the IQ sensor

Inactive datasets of IQ sensors   If an IQ sensor is removed from the system, its settings remain stored in the Uni-versal Transmitter. A dataset contains the following information:

● Serial number of the IQ sensor (and, with it, the type of sensor)

● All sensor settings

● All characteristics of the link with an output.

If no suitable inactive dataset is available, a newly connected IQ sensor is auto-matically recognized as a new component.

The current calibration data of the IQ sensor is always stored in the sensor. If an IQ sensor is connected that is ready for operation and calibrated, this can be used immediately without the need for recal-ibration.

When an IQ sensor is connected to the system, the system checks whether an

inactive dataset is available for the sensor type.

If an inactive dataset for the sensor type is available, the inactive dataset is automatically assigned to the newly connected sensor. The IQ sensor starts operating with the settings from the inactive dataset.

Examples:
● The sensor is reconnected after completion of some maintenance- or repair work.

● The sensor is being replaced by another sensor of the same type. The replacement sensor should at least have the software status of the active IQ sensor.

This mechanism ensures that the IQ sensor retains its settings and links if it was removed for maintenance or if the system was temporarily switched off.

9 Technical data

9.1 DIQ/S 281

Dimensions
DIQ/S 281-CR2   Front view: Lateral view:
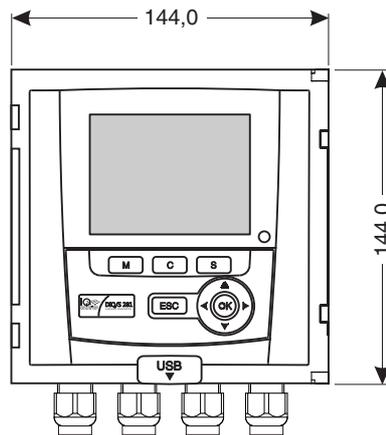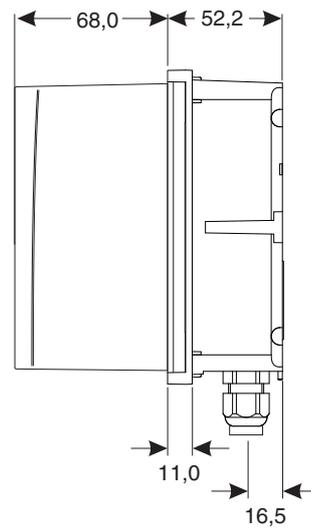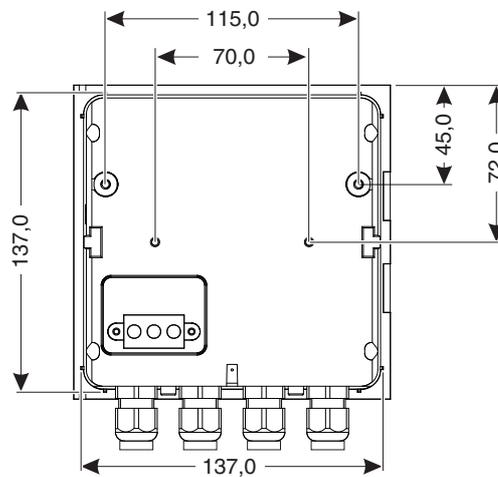
Rear view:

figure 9-1   Dimension drawing of the DIQ/S 281 (dimensions in mm)

Dimensions DIQ/S 281-MOD

Front view:
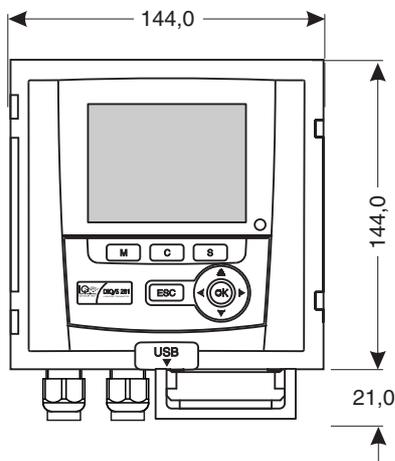
Lateral view:
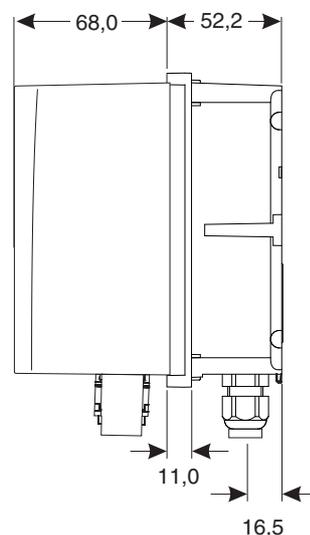
Rear view:
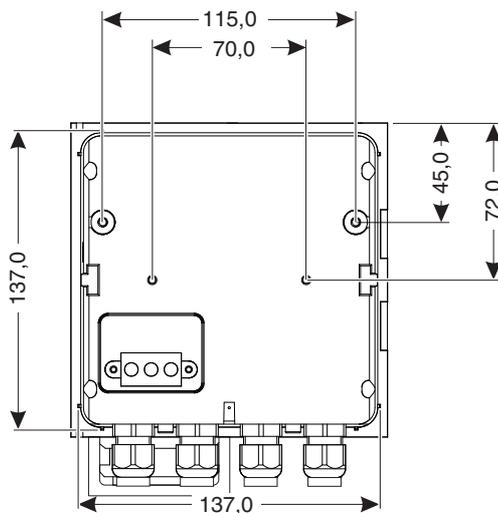
figure 9-2   Dimensional drawing DIQ/S 281-MOD (dimensions in mm)

Mechanical structure

Enclosure material	Polycarbonate with 20 % glass fiber
Weight	Approx. 1.2 kg
Type of protection	IP 67 (not directly suitable for conduit connection) Conduits have to be connected with the flexible CC-Box adapters, or with CC-PM adapters. (see chapter 10 ACCESSORIES AND OPTIONS)

Test certificates   cETLus, CE

Ambient conditions

Temperature

Mounting/installation/maintenance	+ 5 °C ... + 40 °C (+ 41 ... +104 °F)
Operation	- 20 °C ... + 55 °C (- 4 ... + 131 °F)
Storage	- 25 °C ... + 65 °C (- 13 ... + 149 °F)

Relative humidity

Mounting/installation/maintenance	$\leq 80\ \%$
Yearly average	$\leq 90\ \%$
Dew formation	Possible
Site altitude	Max. 2000 m above sea level

Electrical data DIQ/S 281CR2 (240 V AC/DC mains version)

Power supply	Nominal voltage: 100 ... 240 VAC ± 10 %
	 Frequency:50/60 Hz according to DIN IEC 60038
	 Line power connection:2 pin, N and L
	 Line cross-section of mains connection:
	     Europe:1.5 ... 4.0 mm^2
	     USA:AWG 14 ... 12
	 Fuse rating on the operator side: max. 16 A

Protective class	II
Overvoltage category	II
Power consumption	max. approx. 20 W

Electrical data DIQ/S 281CR2 /24V (24 V AC/DC version)

Supply	Nominal voltage: 24 V AC/DC ± 10 %
	     protective low voltage
	     SELV (Safety Extra Low Voltage)
	 AC frequency:50/60 Hz according to DIN IEC 60038
	 Connection:2 pin
	 Line cross-section of connections:
	     Europe:1.5 ... 4.0 mm^2
	     USA:AWG 14 ... 12
	 Fuse rating on the operator side: max. 16 A
	 Switch-on current: 1.5 A AC/DC (100 ms)

Power consumption	max. approx. 20 W

Electrical connections DIQ/S 281-CR2

The electrical connections are inside the housing.

Assignment of the terminal strips: See section 3.12.

Relay (2 x)

Output	Galvanically separated
Max. switching voltage	240 VAC or 24 VDC
Max. switching current	2 A (AC and DC)
Installation require-ments	Fuse rating on the operator side: max. 2 A
Relay functions	Programmable as: – Opener or closer – Limit monitor – Monitoring of the warning and error signals of the DIQ/S 281 – Proportional frequency output – Proportional pulse width output

Current outputs (2 x)

Output	Galvanically separated from the sensors
Output current	Can be switched between 0 - 20 mA and 4 - 20 mA In the case of errors, can be set to: 0 ... 21 mA
Max. initial output volt-age	13 V, in the case of missing or incorrect burden
Accuracy	0.3 % of current value ± 50 µA, load max. 500 Ω
Functions	Programmable: – Recorder attenuation, adjustable 0 - 40 mA/s – Error behavior can be set as required 0 ... 21 mA – Error behavior according to Namur NE43 can be selected – Positive and negative characteristic curve – PID controller

Connecting terminals

Terminal type	Screw-type terminal strip, accessible by raising the lid

	Terminal ranges	Solid wires:	0.2 ... 4.0 mm^2
			AWG 24 ... 12
		Flexible wires:	0.2 ... 2.5 mm^2

Cable glands	Suitable for cable diameter	4.5 ... 10 mm or 7 ... 13 mm

EMC product and system characteristics	EN 61326	EMC requirements for electrical resources for control technology and laboratory use
		– Resources for industrial areas, intended for indispensable operation
		– Interference emission limits for resources of class A
	System lightning protection	Extended protective characteristics as opposed to EN 61326
	FCC, class A	

Meter safety	Applicable norms	– EN 61010-1
		– UL 61010-1
		– CAN/CSA C22.2#61010-1

USB-A interface	Version	USB 2.0
	Usage	Software updates, Electronic Key

Immediately close the USB connection with the protective cover when you have removed the USB device.
When the USB connection is open, there is a danger of corrosion.

	DIQ/S 281 variant	**Fieldbus connection**
Fieldbus connection	DIQ/S 281-MOD	Modbus RTU (RS 485)[*]

[*] Connection via 9-pin D-SUB socket on the underside of the housing, compatible with Phoenix connector (IP67).

9.2   DIQ/JB
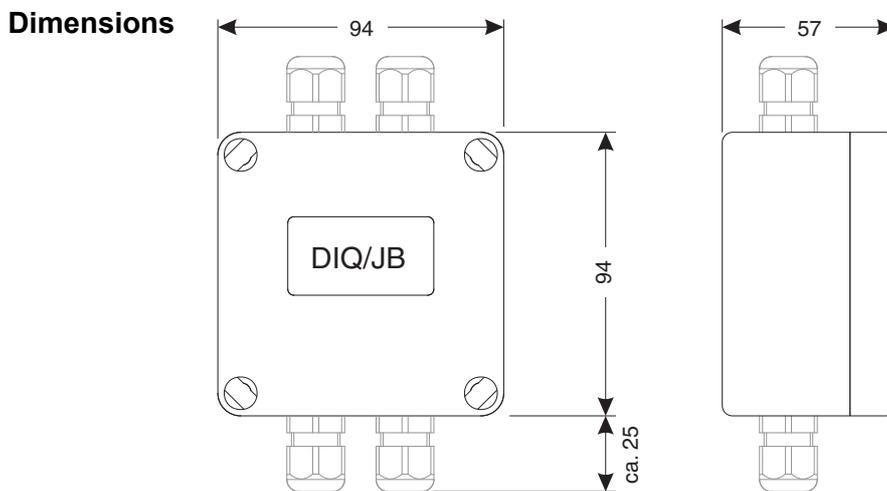
Dimensions

figure 9-3   Dimension drawing of DIQ/JB (dimensions in mm)

Mechanical structure

Enclosure material	Polystyrene
Weight	Approx. 0.2 kg
Type of protection	IP 66 (not directly suitable for conduit connection) Conduits have to be connected with the flexible CC-Box adapters, or with CC-PM adapters. (see chapter 10 ACCESSORIES AND OPTIONS)

Electrical connections
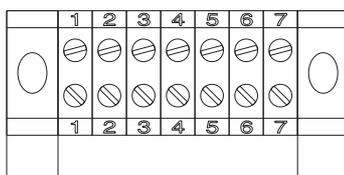
(7 passive, potential free terminals for line extension or branching)

Connecting terminals

Terminal type	Screw-type terminal strip	
Terminal ranges	Solid wires:	$0.2 ... 4.0 \text{ mm}^2$ AWG 24 ... 12
	Flexible wires:	$0.2 ... 2.5 \text{ mm}^2$
Cable feeds	Prepared openings for installing two screwed cable glands M16 x 1.5 both on the upper and underside	

9.3   DIQ/CHV

Dimensions
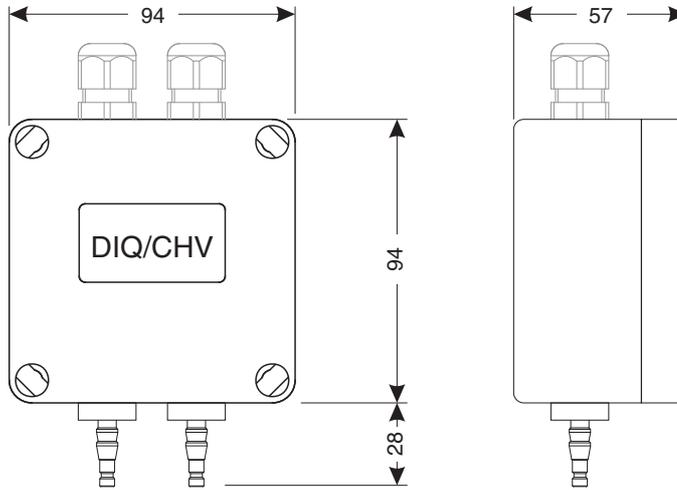
figure 9-4   Dimension drawing of DIQ/CHV (dimensions in mm)

Mechanical structure

Enclosure material	Polystyrene
Weight	Approx. 0.3 kg
Type of protection	IP 66 (not directly suitable for conduit connection) Conduits have to be connected with the flexible CC-Box adapters, or with CC-PM adapters. (see chapter 10 ACCESSORIES AND OPTIONS)

Electrical connections

● 1 x valve switching contact

● 4 x potential free terminals to connect the interface cable

Terminal strip inside the enclosure:
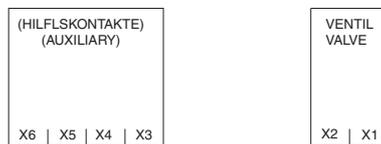
Connecting terminals

Terminal type	Screw-type terminal strip	
Terminal ranges	Solid wires:	0.2 ... 4.0 mm^2 AWG 24 ... 12
	Flexible wires:	0.2 ... 2.5 mm^2
Cable feeds	Prepared openings for installing two screwed cable glands M16 x 1.5 on the upper side	

Valve circuits	Switching voltage	Approx. 22 V
	Max. switching current	Approx. 40 mA

NOTE
The valve may only be operated with the auxiliary voltage of the DIQ/S 281 universal transmitter.

Compressed air	Required air quality	Dry, free of dust and oil
	Operating pressure	Max. 5 x10^5 Pa (5 bar) absolute
	Connections on the DIQ/CHV	6 mm hose nozzles

9.4 Space required by mounted components

9.4.1 DIQ/S 281

Wall mounting and top hat rail mounting
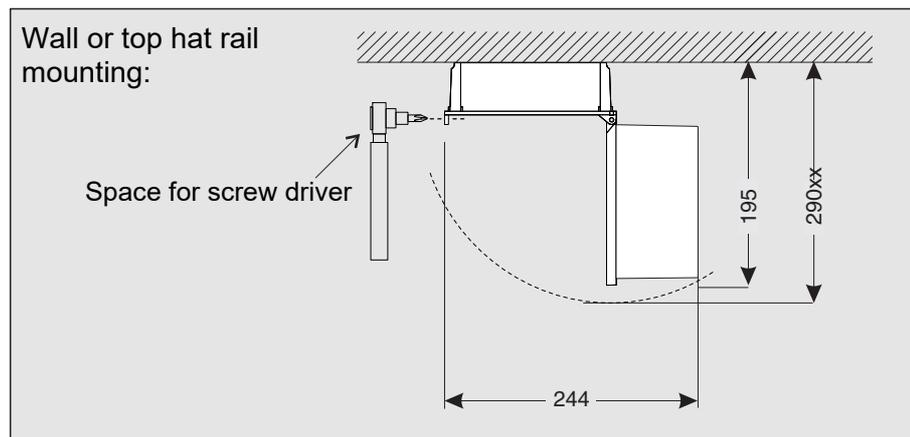
figure 9-5 Space required for wall and top hat rail mounting: (dimensions in mm)

Panel mounting (PMS/IQ)
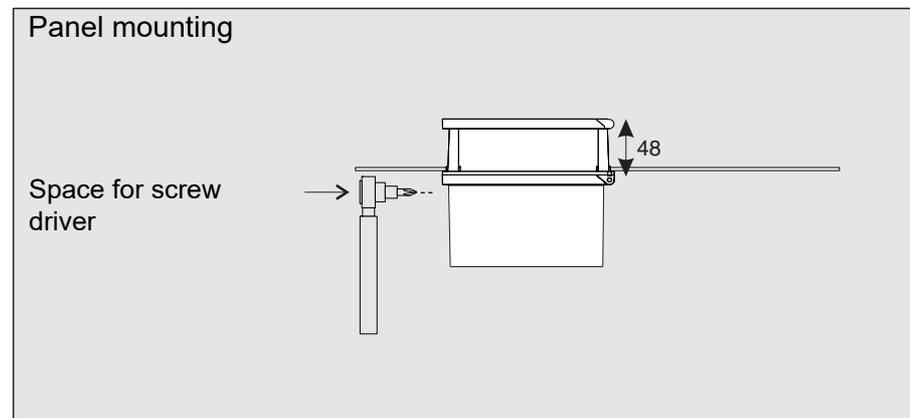
figure 9-6 Space required for panel mounting (PMS/IQ) (dimensions in mm)

9.4.2 DIQ/S 281 with an additional component (stack mounting)

Wall mounting and top hat rail mounting
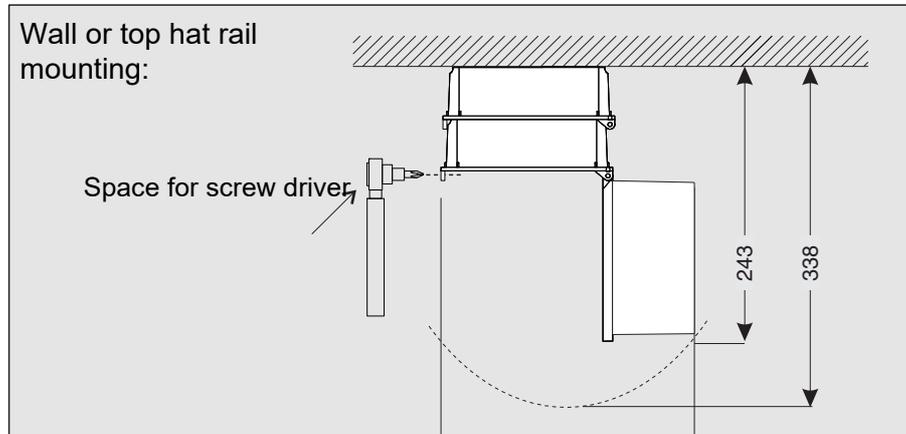
figure 9-7   Space required for wall and top hat rail mounting: (dimensions in mm)

Panel mounting (PMS/IQ)
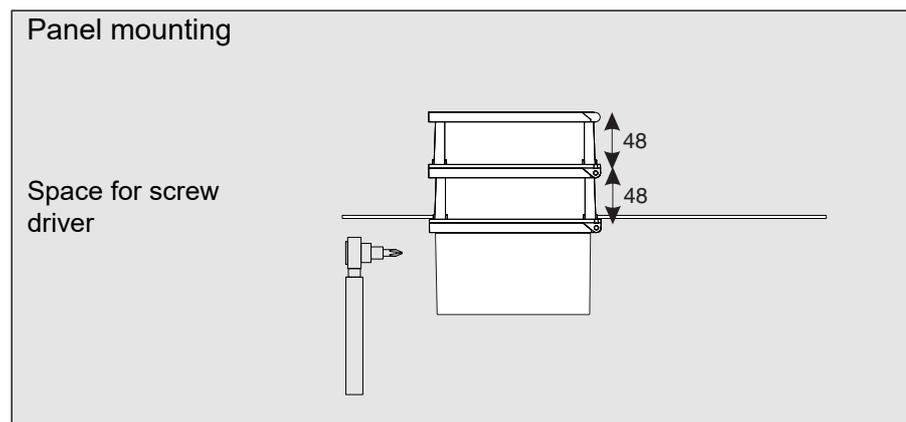
figure 9-8   Space required for panel mounting (PMS/IQ) (dimensions in mm)

10   Accessories and options

Description	Model	Order no.
IQ SENSORNET cable - please specify required length in m when ordering	SNCIQ SNCIQ/UG	480046Y 480047Y

IQ sensor connection cable
  1.5 m
  7.0 m
  15.0 m
  Special length up to max. 100 m
  20 m (seawater version)
  25 m (seawater version)
  50 m (seawater version)
  Special length (seawater version)
	
	SACIQ-1.5
	SACIQ-7.0
	SACIQ-15.0
	SACIQ-SO
	SACIQ-20.0 SW
	SACIQ-25.0 SW
	SACIQ-50.0 SW
	SACIQ-SO SW
		
		480040Y
		480042Y
		480044Y
		480041VY
		480045Y
		480066Y
		480060Y
		480064VY

Set of 4 cable glands M20 for cable sheaths with an outer diameter greater than 10 mm	EW/1	480051Y
Branching module	DIQ/JB	472005Y
Valve module	DIQ/CHV	472007Y
Sun shield for a unit of up to two stacked DIQ modules plus docked Universal Transmitter	SSH/IQ	109295Y
Sun shield for a single DIQ module plus docked Universal Transmitter	SD/K 170	109284Y
Mounting kit for fixing the SD/K 170 sun shield on horizontal or vertical pipes	MR/SD 170	109286Y
Kit for wall mounting of a DIQ module	WMS/IQ	480052Y
Set for panel mounting of DIQ modules	PMS/IQ	480048Y
Set for panel mounting of the DIQ/S 281-MOD. The interface (-MOD) is mounted behind the switch panel.	PMS/IQ-X	480049Y
Kit for mounting of DIQ modules on a 35 mm top hat rail in accordance with EN 50022	THS/IQ	480050Y
Flexible conduit adapter for IQ SENSORNET components	CC-Box	900120Y
Flexible conduit adapter for fieldbus plugs	CC-PM	900125Y

11   Messages

11.1   Explanation of the message codes

The log book contains a list with all the messages from all modules. Each message consists of message code, date and time. You can obtain more detailed information by opening the full message text (see section 4.5).

The full message text comes from the component that has triggered the message. Therefore, these texts are only available from components which are connected to the system and ready for operation.

If a message text is not available, because the component is not connected to the system, you can look up the texts of the messages in the operating manual of the respective component.

The following lists contain the message codes and the related message texts that are shown on the display. Error messages and info messages are listed separately.

General explanations on the subjects of messages, message codes and log book are given in section 4.5 of this system operating manual.

Module code	Component
171	DIQ/S 281

11.1.1 Error messages

Message code	Message text
EI4171	*Max. components of this component type exceeded* *Danger of system overload* ** Check and adapt the components for this type*
EI5171	*Component cannot be reached or not present* ** Component has been removed from the system, insert component again* ** Connex. to component cut.,* *Check sys. installation acc. to op. manual*
EI6171	*Incompatible terminal software* ** Contact service*
EI7171	*Incompatible controller software* ** Contact service*

Message code	Message text
EI8171	*Connection to the component instable* ** Check installation and cable lengths,* *Follow installation instructions* ** Set SN terminator switch acc. to operating manual* ** Check environmental effects* ** Component defective, contact service*
EI9171	*Power failure occurred* ** Check date and time and, if necessary, adjust them*

11.1.2 Informative messages

Message code	Message text
II1171	*Language not available,* *Default language German* ** Contact service*
II2171	*New IQ Sensor Net component identified*
II3171	*New IQ Sensor Net component recorded* ** See component lists*
II4171	*IQ Sensor Net component recorded as replacement component* ** See component lists*
II5171	*Link sensor - output has been erased* ** if necessary, link sensor again*
II9171	*Date and time have been set*

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13   Contact Information

13.1   Ordering & Technical Support

Telephone: (800) 897-4151
                    (937) 767-7241
                    Monday through Friday, 8:00 AM to 5:00 PM ET

Fax: (937) 767-1058

Email: info@ysi.com

Mail: YSI Incorporated
                    1725 Brannum Lane
                    Yellow Springs, OH 45387
                    USA

Internet: www.ysi.com

When placing an order please have the following information available:

-     YSI account number (if available)
-     Model number or brief description
-     Quantity
-     Name and Phone Number
-     Billing and shipping address
-     Purchase Order or Credit Card

13.2   Service Information

YSI has authorized service centers throughout the United States and Internationally. For the nearest service center information, please visit www.ysi.com and click 'Support' or contact YSI Technical Support directly at 800-897-4151.

When returning a product for service, include the Product Return form with cleaning certification. The form must be completely filled out for an YSI Service Center to accept the instrument for service. The Product Return form may be downloaded at www.ysi.com and clicking on the 'Support' tab.

Xylem |ˈzīləm|

1) The tissue in plants that brings water upward from the roots;
2) a leading global water technology company.

We're 12,500 people unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

For more information on how Xylem can help you, go to www.xyleminc.com

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