

DIQ/S 181

UNIVERSAL TRANSMITTER FOR ONE DIGITAL SENSOR

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1 Overview

1.1 Structure and function

With the universal transmitter DIQ/S 181, one digital sensor can be operated. The universal transmitter has three relay outputs and two current outputs to be connected to existing process control systems. The universal transmitter DIQ/S 181 serves as a terminal and controller in the system 181.

Sensor

One digital single sensor (one sensor for one main parameter) at a time can be connected to the universal transmitter DIQ/S 181. 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 181 are listed in the WTW catalog or on the Internet.

The sensor is connected directly to the universal transmitter DIQ/S 181.

Relay and current outputs

The relay and current outputs can be linked with the connected sensor. Linked outputs can be used to monitor the connected sensor 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 output or frequency output)
- Control unit of a sensor cleaning system driven by compressed air.

A current output can be programmed as an analog output.

For quick orientation, the states of all relay and current outputs are clearly indicated on the display.

Compressed air-driven cleaning system

The universal transmitter DIQ/S 181 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 universal transmitter DIQ/S 181 controls the cleaning process. 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 uncomplicated wiring.

1.2 Behavior of the DIQ/S 181 in case of power failure

- The system configuration is permanently retained. It consists of the following settings:
 - Sensor settings
 - Settings and links of the relay outputs
 - Settings and links of the current outputs
 - System settings (display language, air pressure/altitude, passwords etc.)
- Linked relay outputs switch to the non active condition (open).
- Linked current outputs switch to the non active condition (0 mA).
- A restart is carried out automatically when the power returns. The DIQ/S 181 continues working with the settings of the time prior to the power failure (except for the time).

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.

NOTE

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 DIQ/S 181 (accessories)
- 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 181 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 supplied with power by the energy sources mentioned in this operating manual.
- The product may only be operated under the environmental conditions mentioned in this operating manual.
- The product may not be opened.

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 181 system 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 181 to the power supply.
- Connection of external, live circuits to relay contacts (see module operating manual of the relay output module).

3 Installation

3.1 Scope of delivery

The following parts are included in the scope of delivery of the DIQ/S 181:

- Universal transmitter DIQ/S 181
- Accessory kit with:
 - 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 181.

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 (Nema or 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 supply 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 181 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 integrated 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 WTW 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 constructions, 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 between 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 prerequisite 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 181 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 One part of the safety and lightning protection concept is based on high-grade protective insulation of the DIQ/S 181. It does not have or require any protective ground conductor or earth terminal. 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 181 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 the sensor

General installation instructions

The sensor is connected to the SENSOR connection of the universal transmitter DIQ/S 181.

All 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.

NOTE

The sensor cable may only be connected to the SENSOR connections. 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 181, remove the two countersunk screws and open the enclosure.

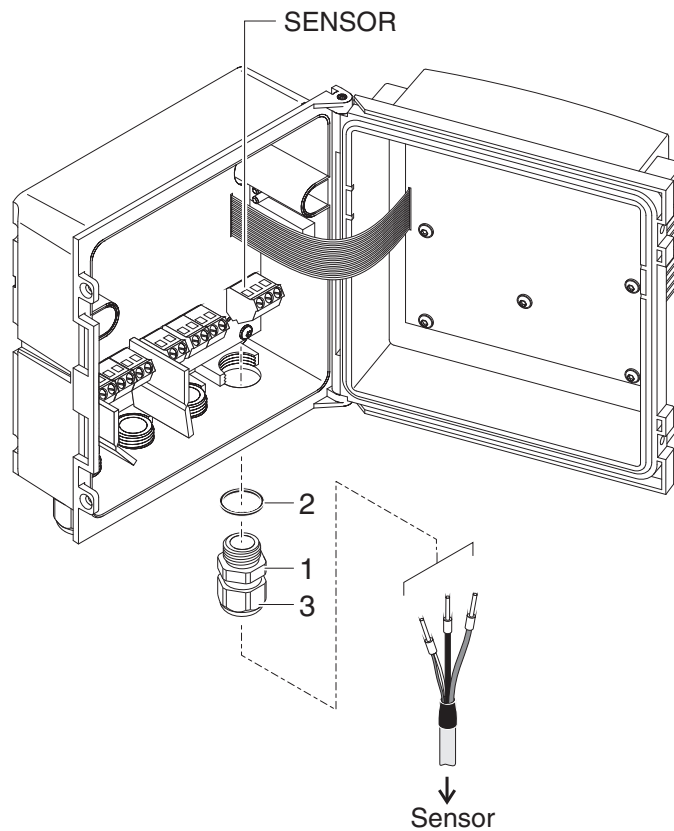


Fig. 3-1 Connect the cable (example DIQ/S 181)

2	Screw the cable gland (no. 029 212, pos. 1 in Fig. 3-1) with the sealing (pos. 2) into the enclosure at the mounting position for the SENSOR connection (see label on the bottom of the enclosure)
3	Loosen the cap nut (pos. 3 in Fig. 3-1).
4	Feed the sensor cable through the cable gland into the enclosure.

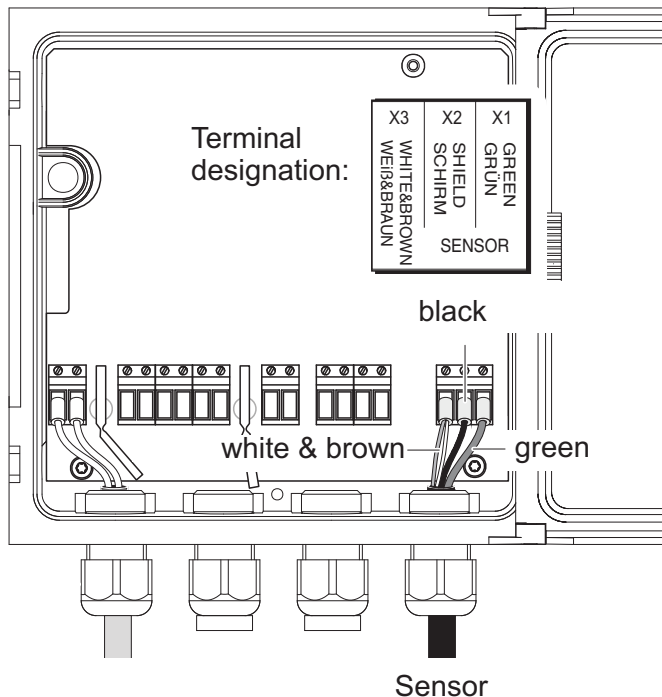


Fig. 3-2 SENSOR connection

- | | |
|---|---|
| 5 | Connect the cable ends to the terminal strip. When doing so, look out for the designations of the terminals (white & brown / shield / green). |
| 6 | Tighten the cap nut (pos. 3 in Fig. 3-1). |
| 7 | Close the enclosure. |



The complete assignment of the terminal strip is shown in section 3.11.



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 181

3.6.1 General information

Mounting accessories are available for the DIQ/S 181. With these accessories, the transmitter can be adjusted to 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, malfunctions can result. Always mount the universal transmitter in an upright position. Do not under any circumstances install the universal transmitter without rain protection with the lid facing upwards (danger of retained humidity and penetration of moisture).

NOTE

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 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).

- **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 required**

- SSH/IQ sun shield (see chapter 10 ACCESSORIES AND OPTIONS).

Tools

- 4 mm set screw wrench
- Phillips screwdriver.

Mounting the sun shield on a mounting stand

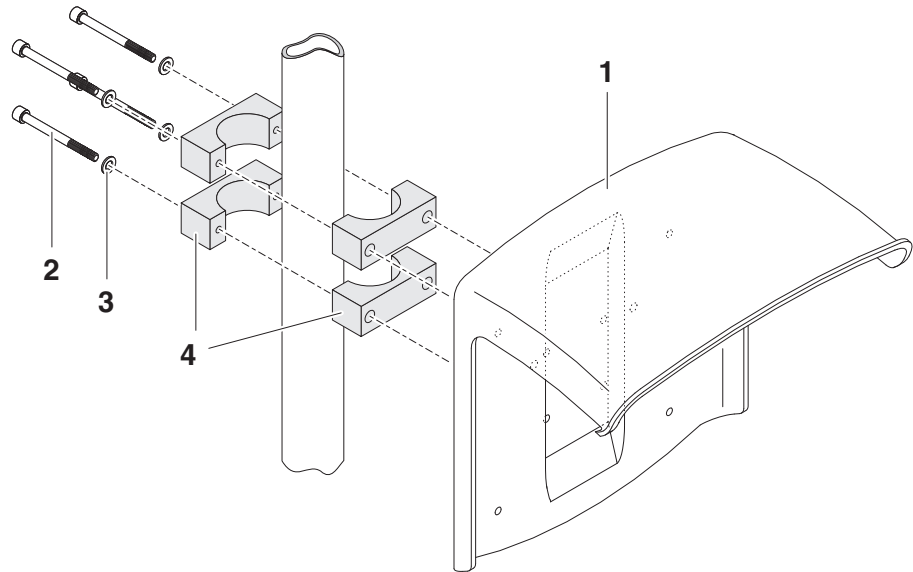


Fig. 3-3 Mounting the SSH/IQ sun shield on a mounting stand

- 1 Screw the sun shield (pos. 1 in Fig. 3-3) 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

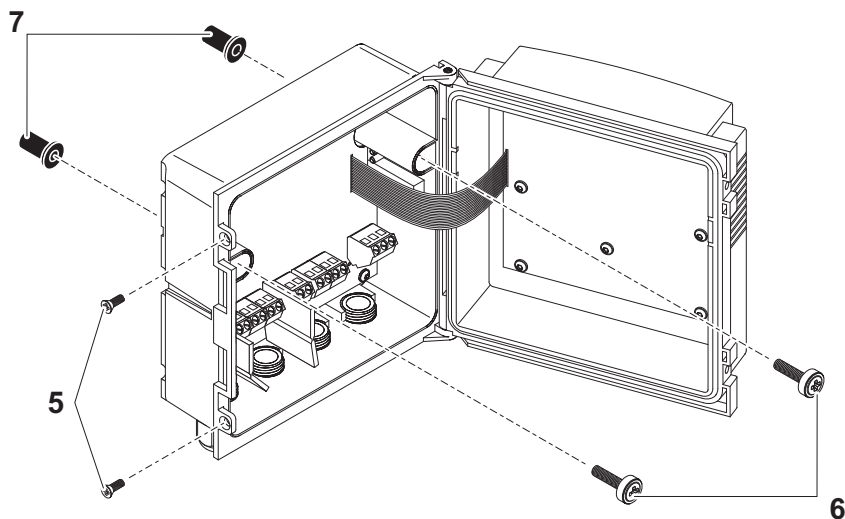


Fig. 3-4 Mounting the sun shield: Premounting the ISO blind nuts

- 2 Remove the two countersunk screws (pos. 5 in Fig. 3-4) and swing open the lid.

- 3 Insert the cheese-head screws (pos. 6 in Fig. 3-4) with the plastic washers in the drilled mounting holes and loosely screw in the ISO blind nuts (pos. 7).

Mounting the DIQ/S 181 on the sun shield

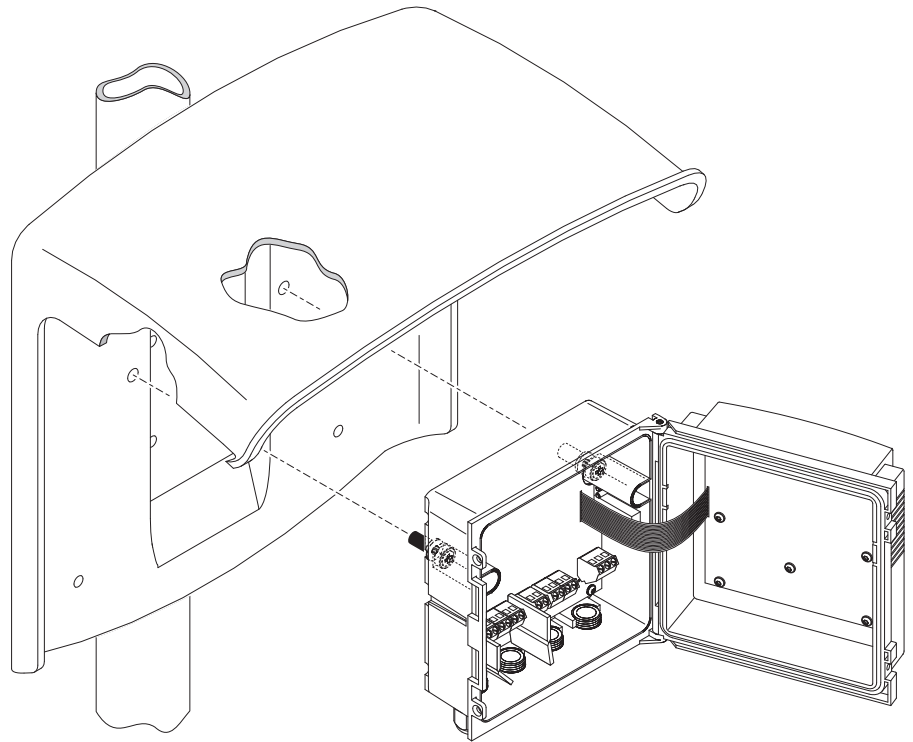


Fig. 3-5 Mounting the DIQ/S 181 on the sun shield SSH/IQ

- 4 Position the universal transmitter on the sun shield and fix it into place with the two screws (pos. 6 in Fig. 3-4).
- 5 Close the lid and fix it with the two countersunk screws (pos. 5 in Fig. 3-4).

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 181 with sun shield

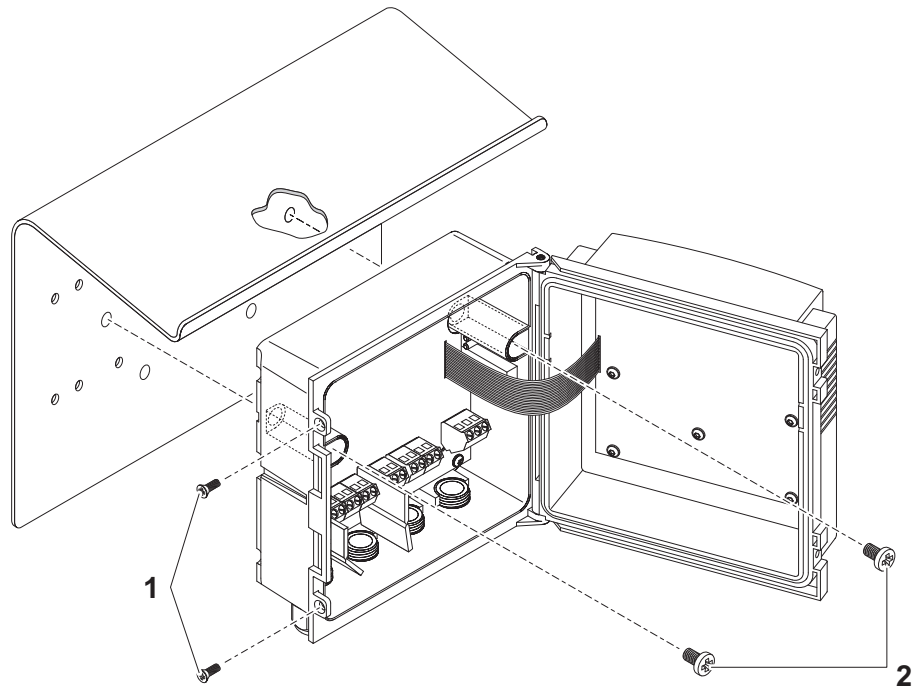


Fig. 3-6 Mounting the DIQ/S 181 with sun shield SD/K 170

1	Remove the two countersunk screws (pos. 1 in Fig. 3-6) 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 Fig. 3-6).
3	Close the lid and fix it with the two countersunk screws (pos. 1 in Fig. 3-6).

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 181 on a top hat rail

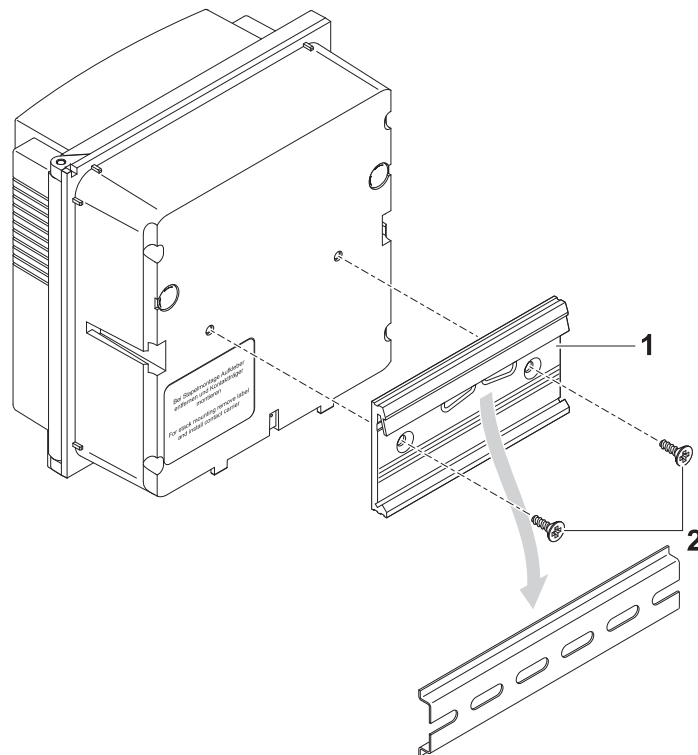


Fig. 3-7 Mounting the DIQ/S 181 on a top hat rail

1	Screw the clamping assembly (pos. 1 in Fig. 3-7) 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

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

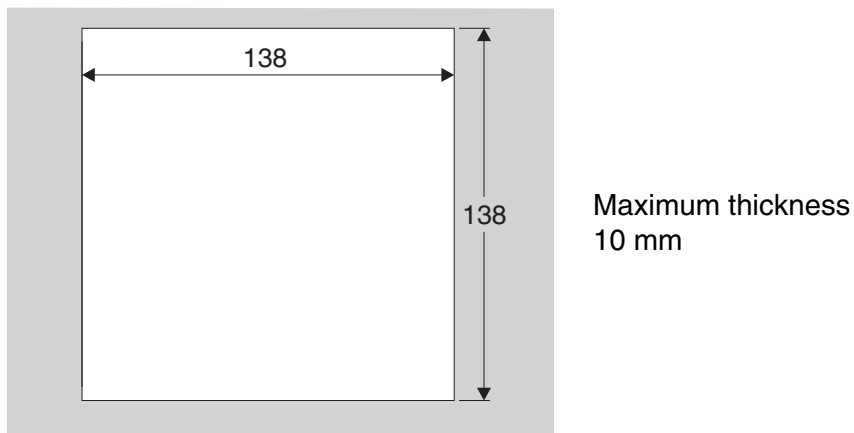


Fig. 3-8 Mounting aperture in the switch panel (dimensions in mm)

Mounting the DIQ/S 181 in a switch panel

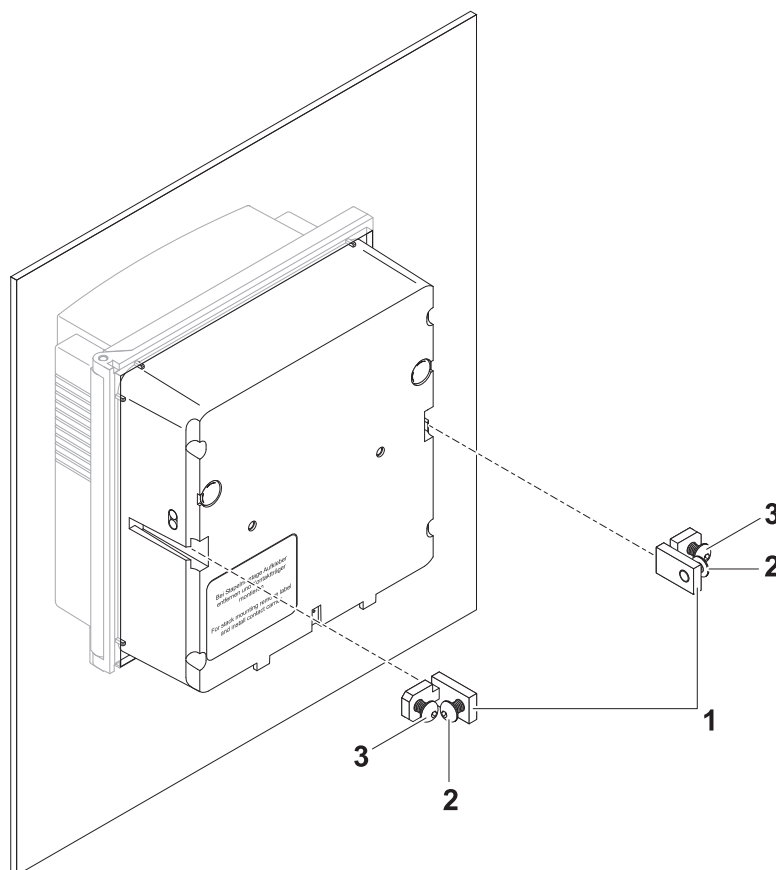


Fig. 3-9 Mounting the DIQ/S 181 in Fig. 3-9

- | | |
|---|--|
| 1 | Insert the universal transmitter in the panel aperture from the front. |
| 2 | Slightly unscrew the screws (pos. 2 and 3) of the two angle brackets (pos. 1 in Fig. 3-9), but do not remove them. |

3	Push in the two angle brackets - as shown in Fig. 3-9 - into the lateral guides of the universal transmitter up to the stop.
4	Tighten the screws (pos. 2).
5	Screw in the screws (pos. 3) until the screws rest snugly against the panel.

3.6.6 Mounting of the DIQ modules (DIQ/JB, DIQ/CHV)

The DIQ module enclosure is designed like a commercial connection socket and can be mounted directly on a wall. For mounting on a WTW mounting stand, WTW offers the MS/DIQ mounting kit. It contains a pipe clip for the mounting stand and provides enough space for two DIQ modules. For assembly use the screws and blind nuts provided with the MS/DIQ as demonstrated in the following figure:

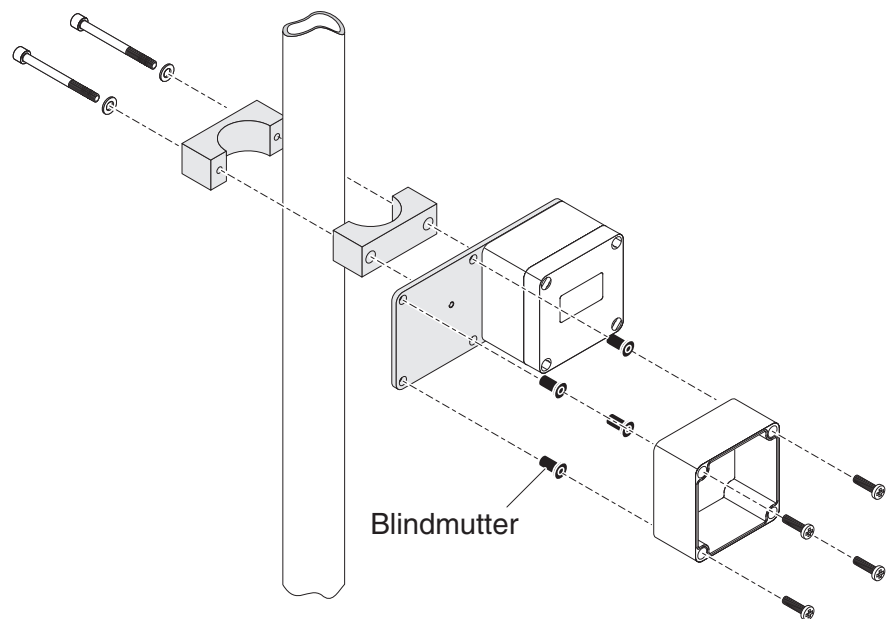


Fig. 3-10 Mounting DIQ modules with the MS/DIQ mounting set.

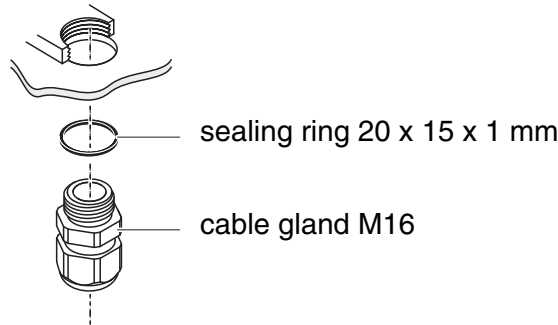
3.7 Electrical connections: General instructions

Cable glands

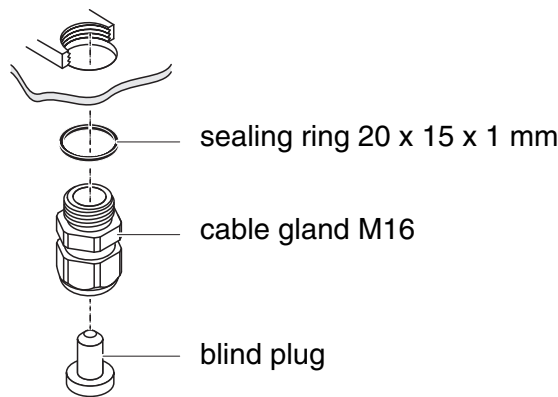
All electric cables are fed from below through openings prepared in the enclosure of the DIQ/S 181 and the DIQ modules. Cable glands with different clamping ranges are included with the DIQ/S 181 to provide sealing between the cable and enclosure as well as for strain relief. Select the suitable cable gland for the relevant cable type and cable

diameter:

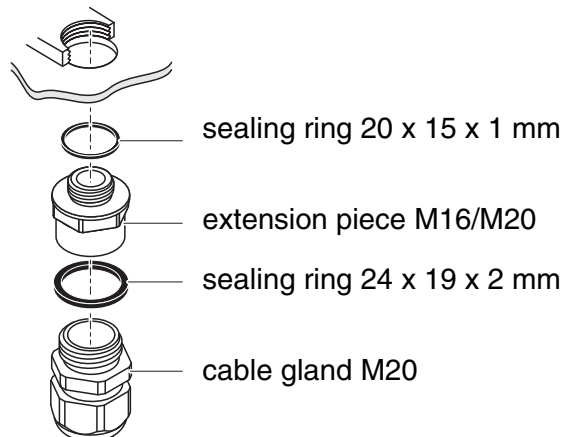
- **Small**, clamping range 2 to 7 mm (no. 029 213).
This cable gland is suitable for the cable of sensors with permanently mounted sensor cable (F sensors).



- **Small**, clamping range 4.5 to 10 mm (no. 021 346).
This cable gland is suitable for all cables (earth cable after stripping the outer insulation, see section 3.12) and sensor connection cables.



- **Big**, clamping range 7 to 13 mm (no. 021 339).
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.





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

General installation instructions

Observe the following points when attaching connecting wires to the terminal strip

- 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 must be allowed to project into the enclosure. 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 DIQ/S 181. 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 181 universal transmitter to the voltage supply.

3.8.1 DIQ/S 181 (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 181 universal transmitter may only be connected by a trained electrician.
- The connection of the DIQ/S 181 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 181.
The interrupt facility must be
 - installed in the vicinity of the DIQ/S 181 universal transmitter, easily accessible by the user, and

- labeled as the interrupt facility for the DIQ/S 181 universal transmitter.

- **After the DIQ/S 181 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 181).

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.

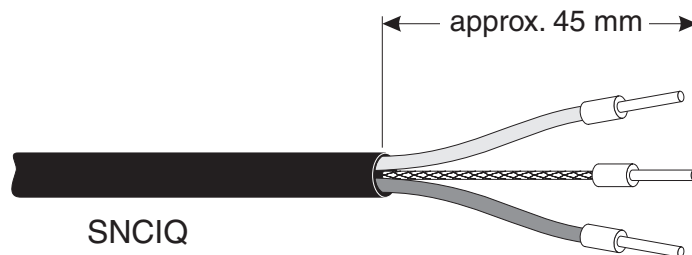


Fig. 3-11 Prepared power cable.

NOTE

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

Connecting the power line

5	On the left-hand side of the DIQ/S 181, remove the two countersunk screws and open the enclosure.
---	---

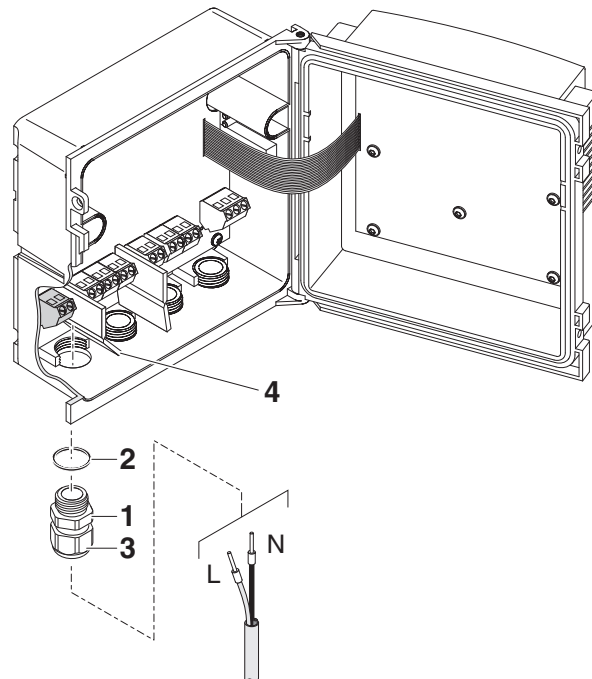


Fig. 3-12 Inserting the supply line.

6	Screw a cable gland (pos. 1 in Fig. 3-12) 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.

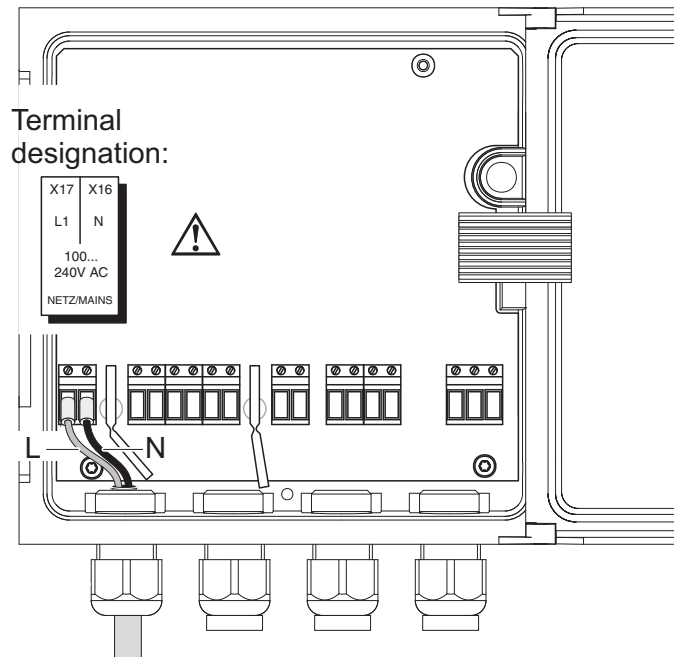


Fig. 3-13 Line power connection.



The complete assignment of the terminal strip is shown in section 3.11.

- 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 Fig. 3-12).



WARNING

No free wires are allowed to project into the enclosure. 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 181.

3.8.2 DIQ/S 181/24V (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 181 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 181 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 181.

The interrupt facility must be

- installed in the vicinity of the DIQ/S 181 universal transmitter, easily accessible by the user, and
- labeled as the interrupt facility for the DIQ/S 181 universal transmitter.



Rechargeable battery systems should have a deep discharge protection. The DIQ/S 181/24V 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 181).

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.

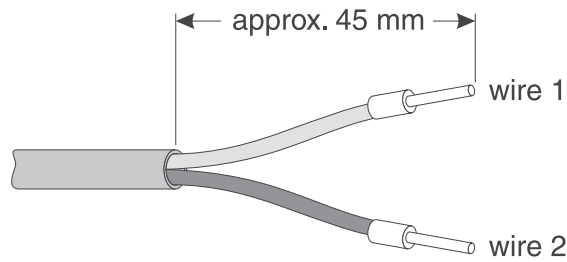


Fig. 3-14 Prepared 24 V AC/DC line.

Connecting the 24 V AC/DC line

- | | |
|---|---|
| 4 | On the left-hand side of the DIQ/S 181, remove the two countersunk screws and open the enclosure. |
|---|---|

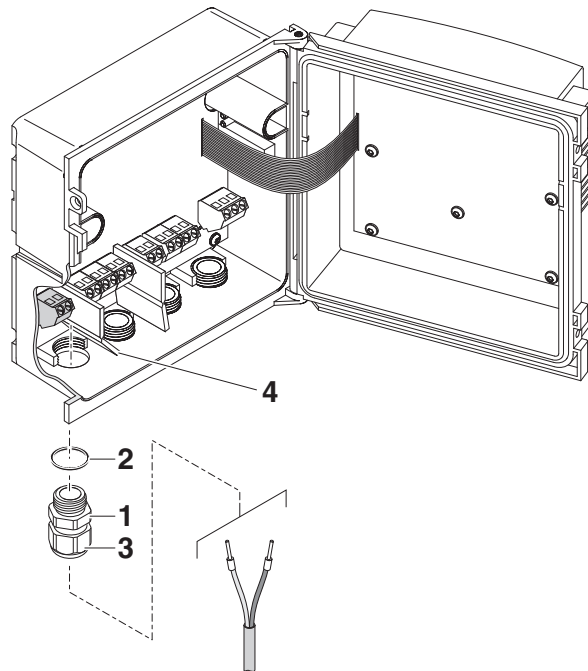


Fig. 3-15 Inserting the 24V AC/DC line

- | | |
|---|---|
| 5 | Screw a cable gland (pos. 1 in Fig. 3-15) 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. |

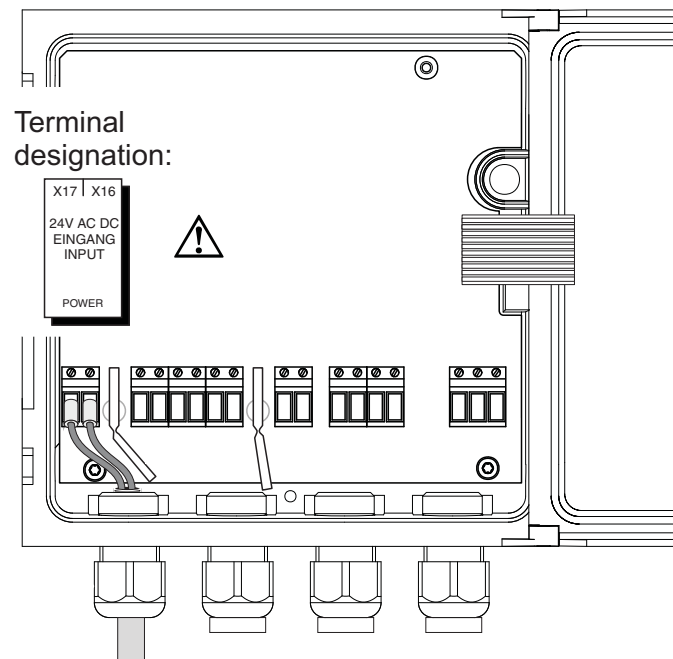


Fig. 3-16 24 V AC/DC connection.



The complete assignment of the terminal strip is shown in section 3.11.

- | | |
|---|--|
| 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 Fig. 3-15). |

NOTE

No free wires are allowed to project into the enclosure. Otherwise there is the danger 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 181. |
|----|---------------------------------------|

3.9 Connections to the relay output and current outputs

3.9.1 General installation instructions



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 must only be connected by a qualified electrician.
- Electrical circuits subject to the danger of physical contact must 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 181 has been installed, it may only be opened if all external voltages have been switched off beforehand.

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 181)

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 181, remove the two countersunk screws and open the enclosure.

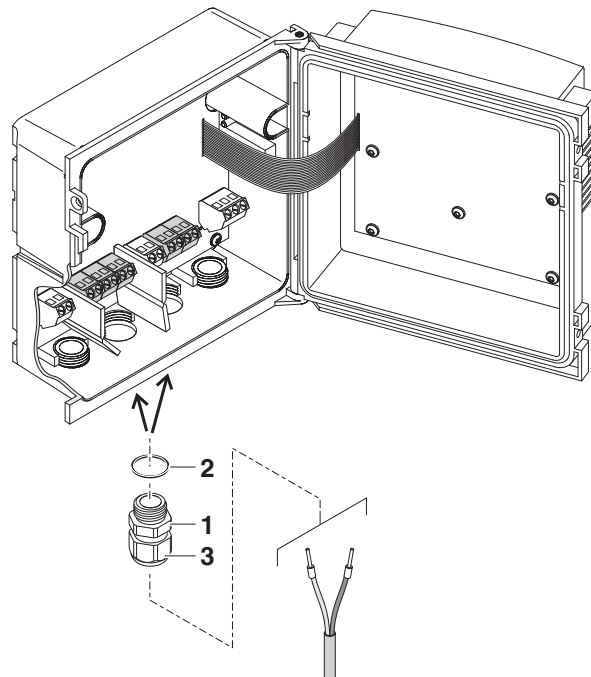


Fig. 3-17 Inserting the lines



The complete assignment of the terminal strip is shown in section 3.11.

2	Screw a cable gland (pos. 1 in Fig. 3-17) 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 enclosure. 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 181. 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 181.

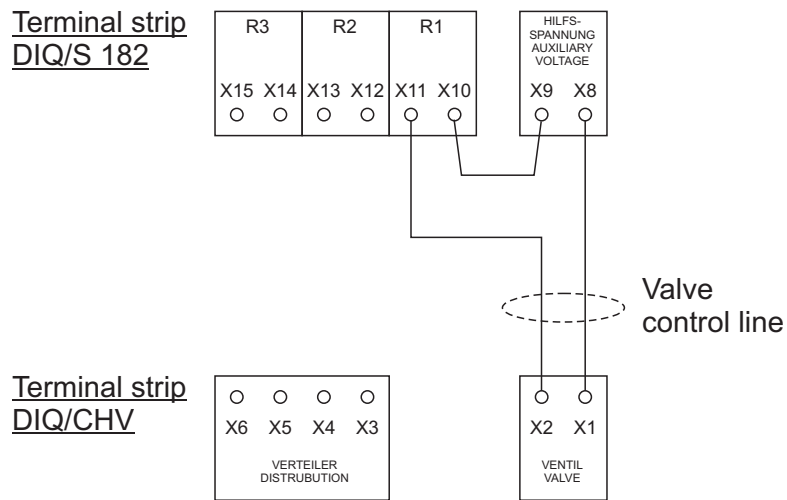
3.9.2 Usage of the auxiliary voltage

The universal transmitter DIQ/S 181 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.

NOTE

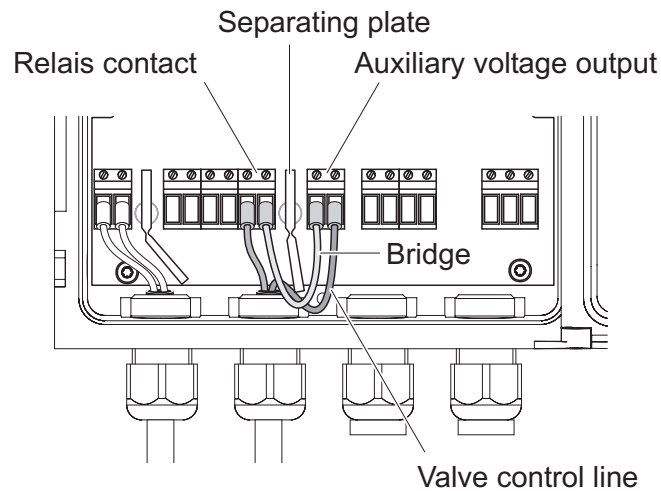
The auxiliary voltage must not be used for other purposes.

Connection scheme for one sensor with compressed air cleaning



NOTE

Run the bridge below the divider so the bridge does not bump against the circuit board in the lid when the enclosure is closed.



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, if necessary, section 3.12)?
- 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 181. 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:



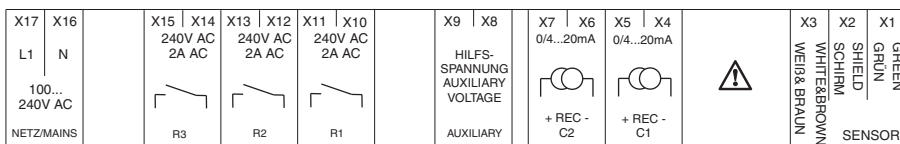
Fig. 3-18 Display during the start phase



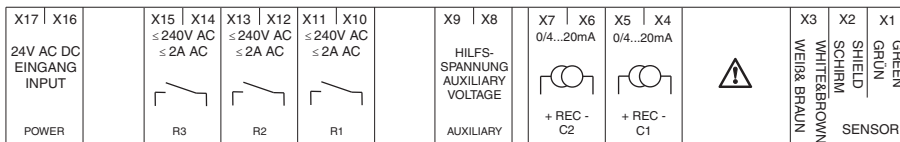
If the system start failed, see chapter 8 WHAT TO DO IF

3.11 Figures of the terminal strips

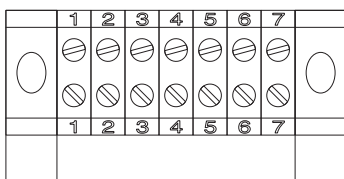
DIQ/S 181



DIQ/S 181/24V

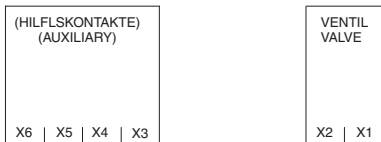


DIQ/JB



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

DIQ/CHV



3.12 Extending the cable length between the sensor and DIQ/S 181

General information

The DIQ/JB module is a passive module and can be used to extend the length of the sensor cable, e.g. to connect a sensor located farther away to the universal transmitter.

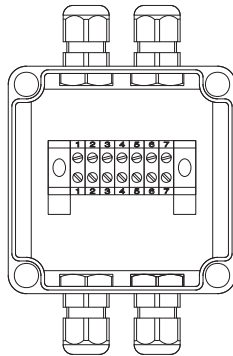


Fig. 3-19 DIQ/JB open.

For the locally separated connection between Universal Transmitter and DIQ modules the following cables can be used:

- 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!).

NOTE

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

General installation instructions

Please note the following points for the connections of components:

- The line length from the sensor to the DIQ/S 181 may be up to 250 m
- lines must always be installed separately at a minimum distance of 20 cm from any other lines carrying a voltage greater than 60 V.

Materials required

- 1 x IQ SENSOR NET cable SNCIQ or SNCIQ/UG (see chapter 10 ACCESSORIES AND OPTIONS)
- Wire end sleeves for 0.75 mm² wire cross-section with matching crimping tool
- 1 x cable gland with seal (scope of delivery of DIQ 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.

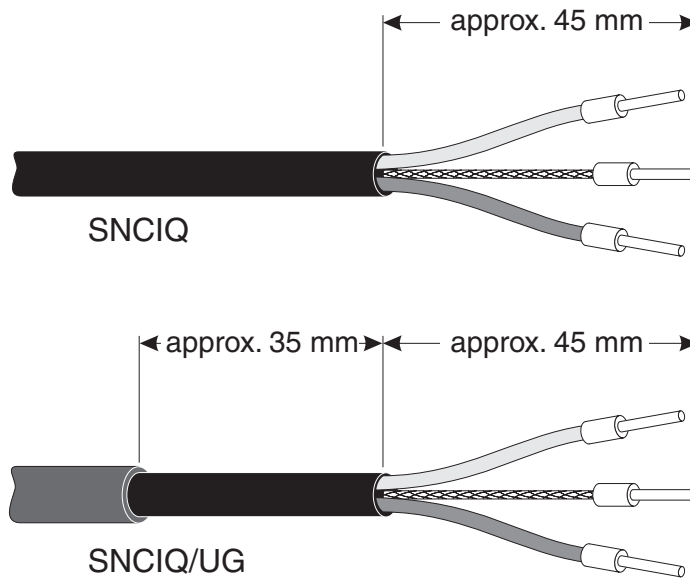


Fig. 3-20 Prepared cable end

Connecting the cables

1	On the left-hand side of the DIQ/S 181 or DIQ module, remove the two countersunk screws and open the enclosure.
---	---

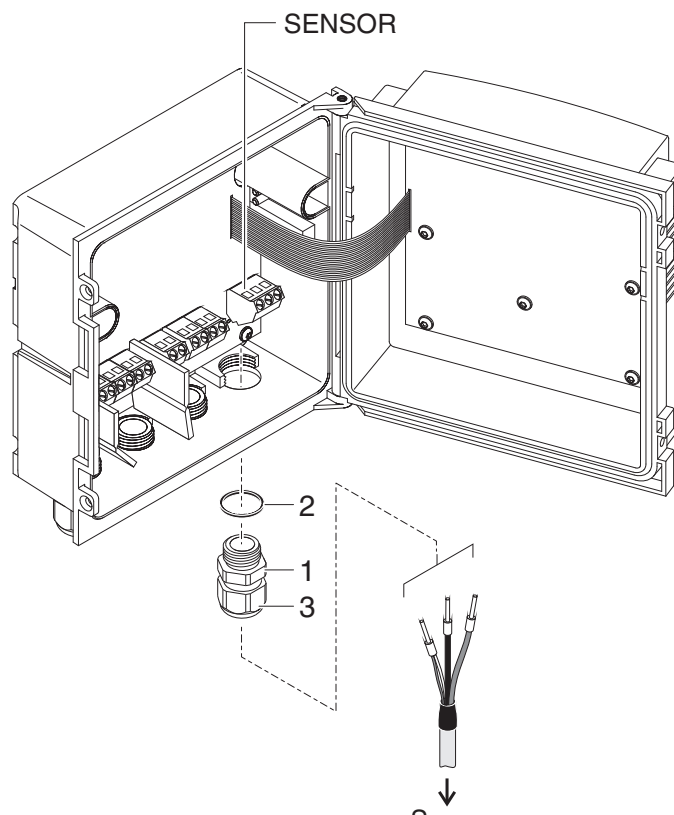


Fig. 3-21 Connect the cable (example DIQ/S 181)

2	Screw a cable gland (pos. 1 in Fig. 3-1) with the sealing (pos. 2) into the enclosure at the mounting position for the SENSOR connection (see label on the bottom of the enclosure)
3	Loosen the cap nut (pos. 3 in Fig. 3-1).
4	Feed the cable through the cable gland into the enclosure.

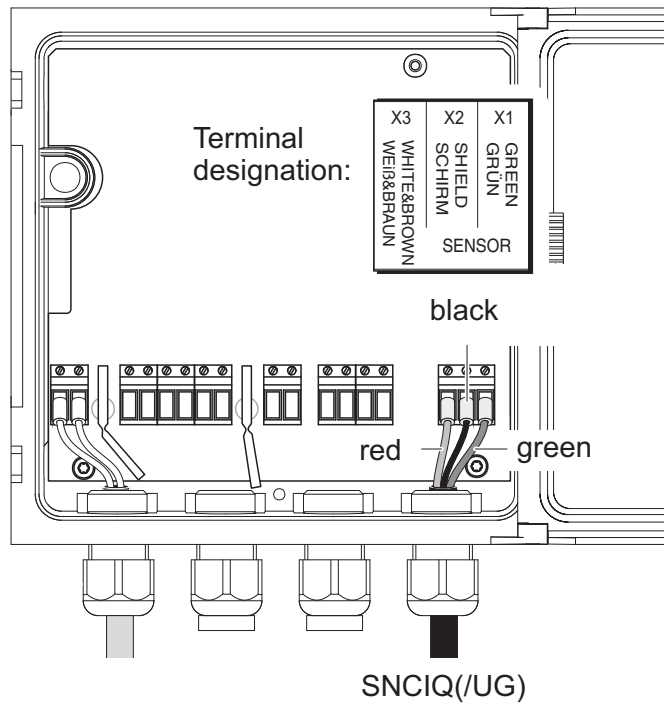


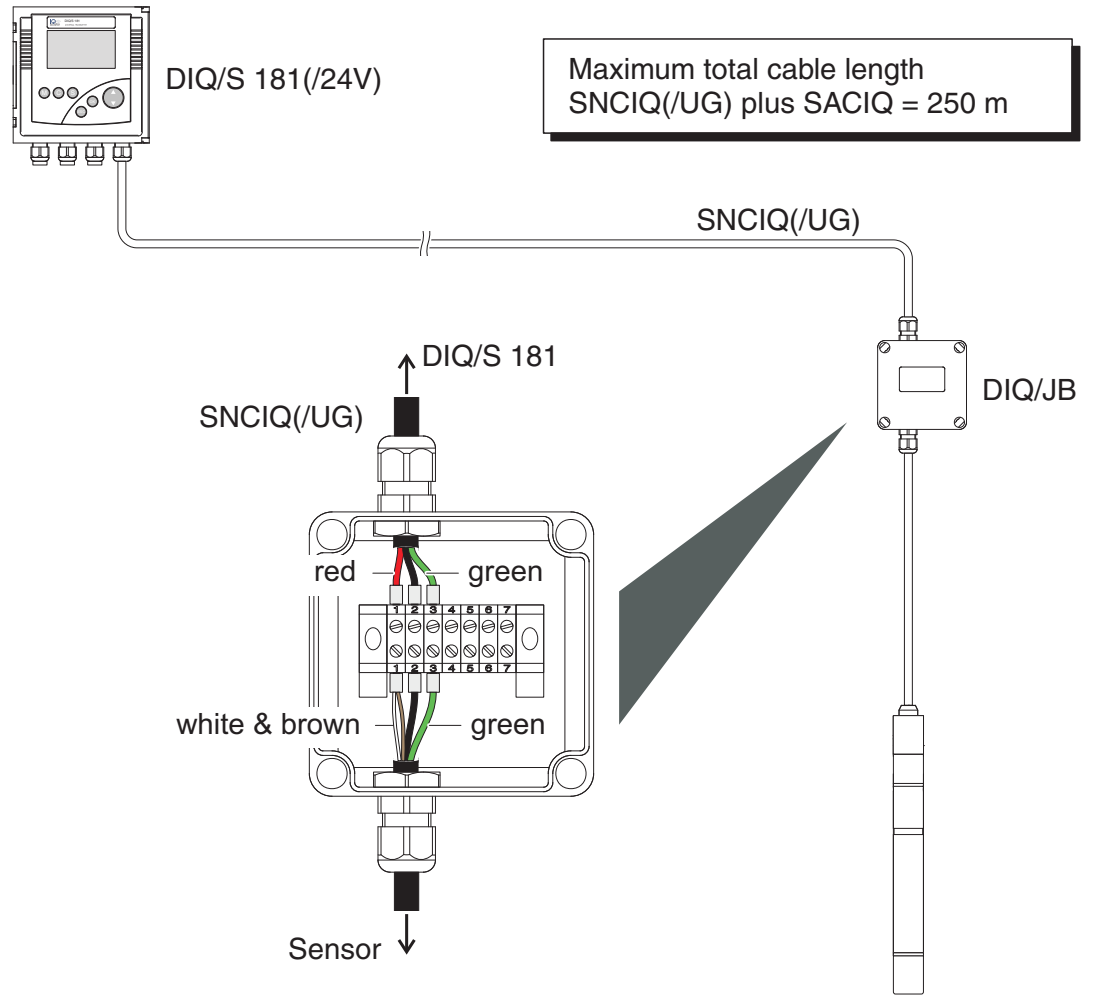
Fig. 3-22 SENSOR connection

- | | |
|---|--|
| 5 | Connect the cable ends to the terminal strip. When doing so, look out for the designations of the terminals (white & brown / shield / green).
Connect the red cable to the terminal with the designation white & brown. |
| 6 | Tighten the cap nut (pos. 3 in Fig. 3-1). |
| 7 | Close the enclosure. |

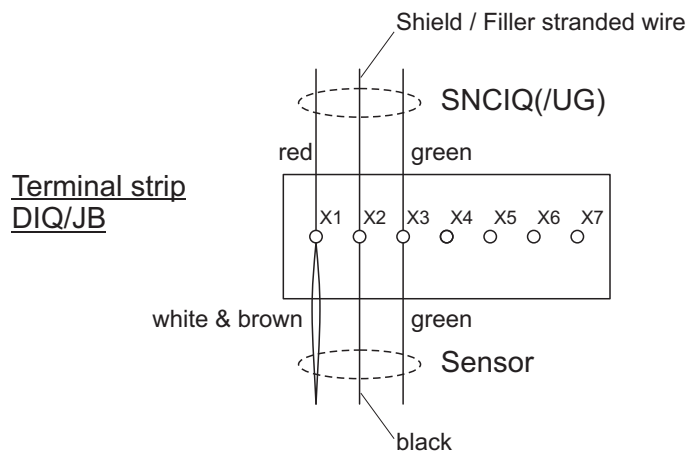


The complete assignment of the terminal strip is shown in section 3.11.

Example



Connection scheme of the DIQ/JB



3.13 Automatic compressed air cleaning (module DIQ/CHV)

The valve module for the automatic relay-driven compressed air cleaning of a sensor (module DIQ/CHV) has four additional potential free terminals for the connection of interface cables.

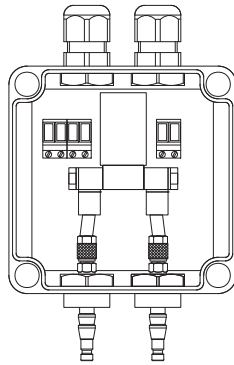
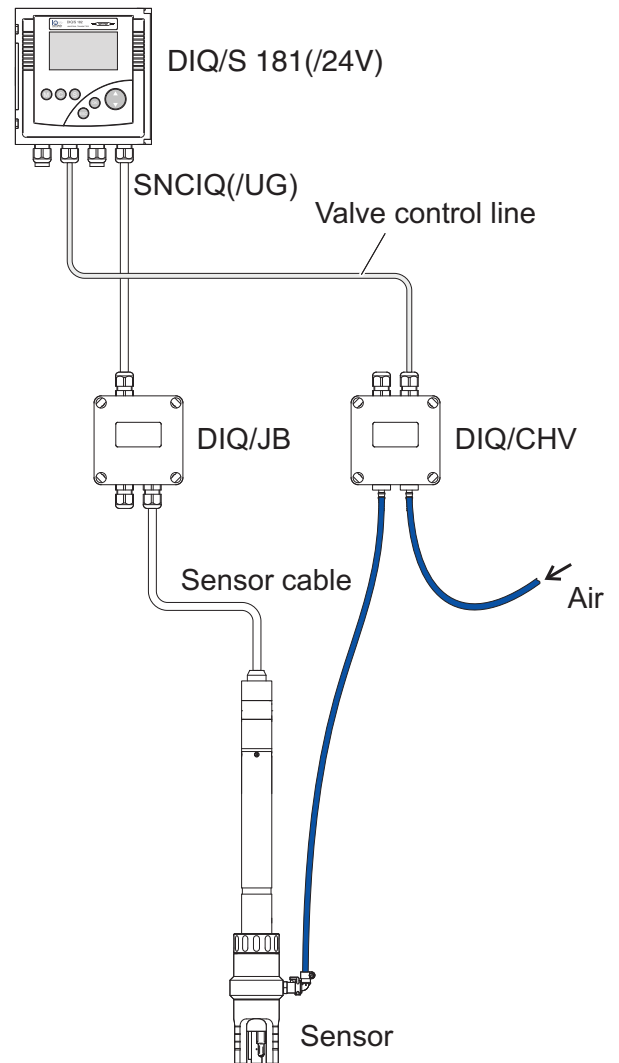


Fig. 3-23 DIQ/CHV open.

Example

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

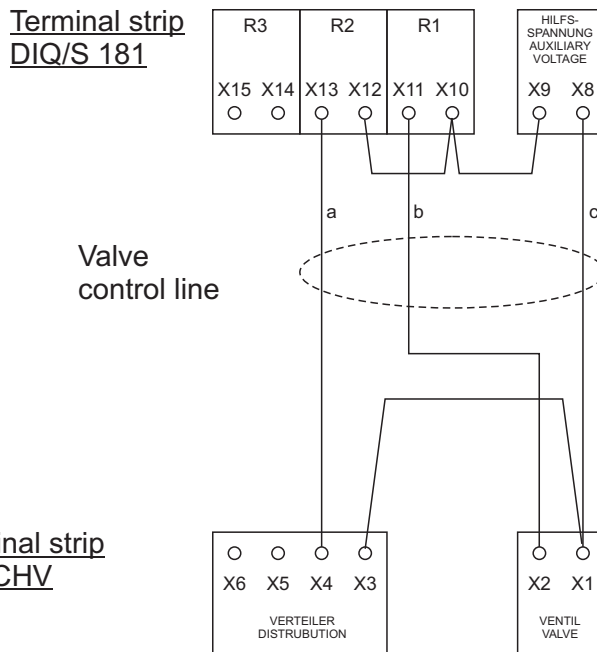


**Connection scheme of
valve control**

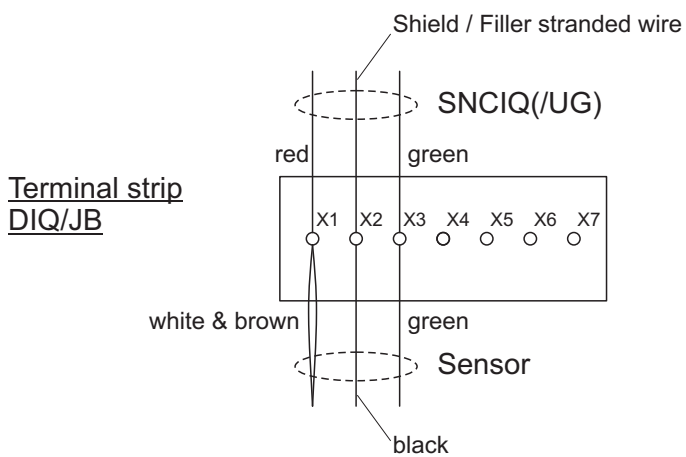


WARNING

No free wires are allowed to project into the enclosure. 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.



Connection scheme of the DIQ/JB



4 Operation

4.1 Operating elements

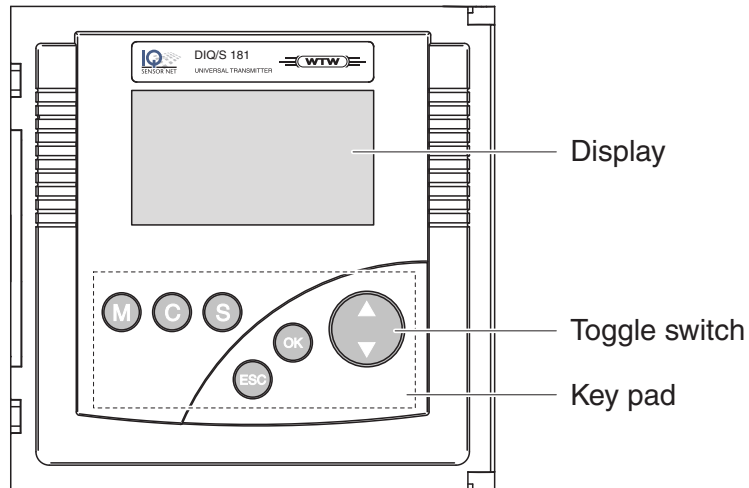


Fig. 4-1 Operating elements of the DIQ/S 181

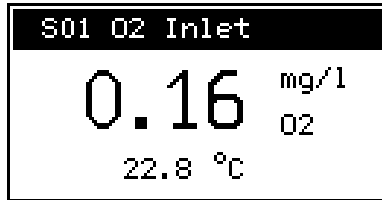
Functions	Key	Function
	<M>	Switches directly to the measured value display from all operating situations
	<C>	Starts calibrating the connected sensor
	<S>	Opens the <i>SETTINGS</i> menu in the measured value and status display
	<ESC>	<ul style="list-style-type: none"> ● Switches to the higher menu level ● Cancels entries without storing them
	<OK>	<ul style="list-style-type: none"> ● Opens the <i>PROPERTIES</i> menu in the measured value and status display ● Confirms an entry
	<▲▼> (Toggle switch)	<ul style="list-style-type: none"> ● Selects: <ul style="list-style-type: none"> – Menu items – List entries – Letters or numerals ● Scrolls through longer menus or texts

4.2 Measured value and status display

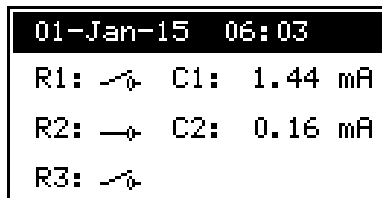
With the <M> key, you can change from any operating situation to the measured value display or status display last selected. Entries that are not completed are ignored while doing so.

Pressing <M> once again cyclically switches between the further display options.

**Example:
Display options**



Display of measured values. Main and secondary measured parameter.



Display of the outputs. The current states of the relays and current outputs and the date and time are displayed.

Operating notes:

- With <C> you can start a calibration procedure for the sensor. Starting calibration from the display of outputs is not possible.
- Using <OK>, call up the menu *PROPERTIES*. This menu can be used to put the sensor in the maintenance condition and prompt for important data (calibration data, error messages, operating states, software versions etc.).
- Using <S>, open the *SETTINGS* menu.

**Special
sensor conditions**

The following displays inform you of special states of the sensor:

<i>Init</i>	Sensor is being initialized <ul style="list-style-type: none"> ● during commissioning or ● if a new sensor is recognized that is not yet giving measured values
----	Sensor inactive or inadmissible operating conditions
<i>Cal</i>	Sensor is being calibrated
<i>Clean</i>	Cleaning procedure active
<i>Error</i>	No communication with the sensor due to defective connection
<i>OFL</i>	Measuring range undercut or exceeded (overflow)
Display flashes	Sensor in maintenance condition

Error symbol

If the error symbol Δ appears in the header, error messages from the sensor or error conditions of the DIQ/S 181 system have occurred. Error messages from the sensor are entered in the log book. The log book is described in detail in section 4.4.3. Error conditions of the DIQ/S 181 can e.g. be an insufficient operational voltage or malfunctions of the communication and are displayed in the *PROPERTIES / SYSTEM STATUS* menu (see section 4.4.1).

4.3 Working with the *SETTINGS* menu



All settings in the *SETTINGS* menu can be protected by a password against unauthorized changing. For more detailed information on password protection, see section 4.6.

4.3.1 Selection menus

Pressing <S> switches from the measured value display to the *SETTINGS* menu (main menu).

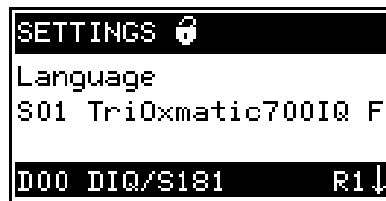


Fig. 4-2 *SETTINGS* menu (main menu)

Operating notes:

- In the main menu, the lock symbol shows the current safety level for the settings:
 - 🔒 Settings not protected by password
 - 🔒 Settings protected by password (reading possible only)

For more detailed information on password protection, see section 4.6.
- The arrows ↑/↓ appear automatically if further display contents are above or below the visible display range.
- The toggle switch <▲▼> is used to highlight a menu item (displayed in reverse video) and move the visible display range up or down..
- To open a menu item, highlight it and press <OK>. The display switches to a further submenu or to a setting table.
- To return to the measured value display, press <M> or <ESC>.

4.3.2 Setting tables

The actual settings are made in the setting tables. Each setting is represented by two lines together. The name of the setting appears in the upper line on the left side of the display. The corresponding value is in the line below on the right side.

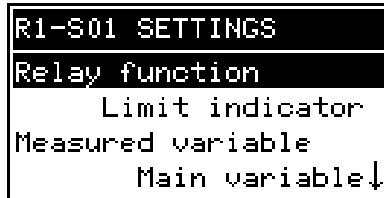


Fig. 4-3 Example of a setting table

Operating notes:

- The arrows ↑/↓ appear if further display setting options are above or below the visible display range.
- The toggle switch <▲▼> is used to highlight a setting (displayed in reverse video) and move the visible display range up or down.
- To edit a setting, highlight it and press <OK>. The line below is highlighted and switches to the entry mode. Depending on the operating situation, a new submenu or a table with further relevant settings can open up.
- Break off an action and change to the next higher level with the <ESC> key.
- Move directly to the measured value display with <M>.



To accept all settings, highlight the *Save and quit* menu item at the lower end of the setting table and press <OK>. If you exit the setting table via <M>, <ESC>/ or the *Quit* menu item, all changes are ignored.

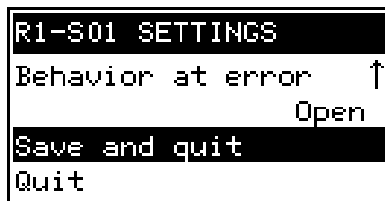


Fig. 4-4 Save and quit

4.3.3 Entry mode

In the entry mode you can change individual values or enter a character string. Depending on the value type, change a value as follows:

- **Fixed values of a selection list** (e.g. sensor measuring ranges):
This is the most frequent form of an entry. Select the required option with the toggle switch <▲▼> and confirm the selection with <OK>. The display switches back to the setting table.

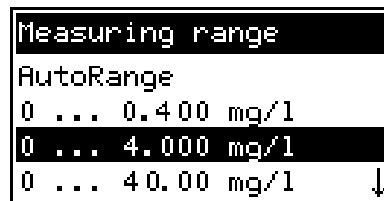


Fig. 4-5 Example of a selection list

- **Character strings** (text and numerals):

The following letters, numerals and special characters can be entered: AaBb . . Zz 0 . . 9µ%&/ () + - = > < ! ? _ °.

Entries are made character after character. Select the first character with the toggle switch <▲▼> and press <OK>. The entry mark moves to the next position and indicates ↵. Select the next character with the toggle switch <▲▼>. When you have selected the required sequence of characters select ↵ as the following character and press <OK>. This completes the entry and the display switches back to the setting table.

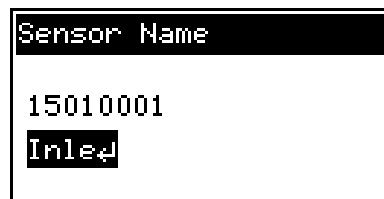


Fig. 4-6 Example of text entry

If you want to correct a previously selected character while entering, select the thin arrow to the left ← and press <OK>. This moves the entry mark by one digit to the left. Thus you can go back to the required character. All characters on its right side, however, have to be entered once again.

If you want to restart entering the characters, select the thick arrow to the left ← and press <OK>.

- **Numerals:**
Entering numerals is made in the same way as entering characters.
The following numerals can be entered: 0 . . 9 - .
Entering " - " or ". " is only allowed where it makes sense, e.g. "- " at

the first position only.

Save and quit

On principle, all settings made in the entry mode are only taken over after you selected the *Save and quit* item in the relevant setting table and pressed <OK>. If you exit the setting table with <M>, <ESC> or the *Quit* menu item, all changes are ignored.
Exceptions: Date/time, air pressure and password.

4.4 PROPERTIES menu

4.4.1 Overview

Pressing <OK> switches from the measured value display to the *PROPERTIES* menu.

In the *PROPERTIES* menu, you can prompt calibration data and various information on system components. Moreover, you can switch the maintenance condition of a sensor on and off.

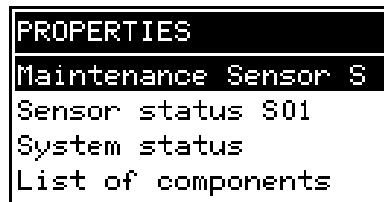


Fig. 4-7 PROPERTIES menu

Submenus/functions

- *Maintenance S01*
With this function, you switch on and off the maintenance condition of a sensor (see section 4.4.2)
- *Sensor status S01*
Here you can query the following data of the sensor (see section 4.4.3):
 - Type, series number and software version
 - Data of the last calibration
 - Error and info messages
- *System status*
Here you can query the following data of the DIQ/S 181 system:
 - Series number and software version of the DIQ/S 181
 - Status of the operational voltage (☺ = OK / ☹ = faulty)
 - Status of communication (☺ = OK / ☹ = faulty)

If the operational voltage or communication are faulty, the flashing error symbol ⚠ appears in the header of the measured value display. The error symbol ⚠ automatically disappears when the malfunction has been eliminated.

- *List of components*
Here you find the connected sensor.

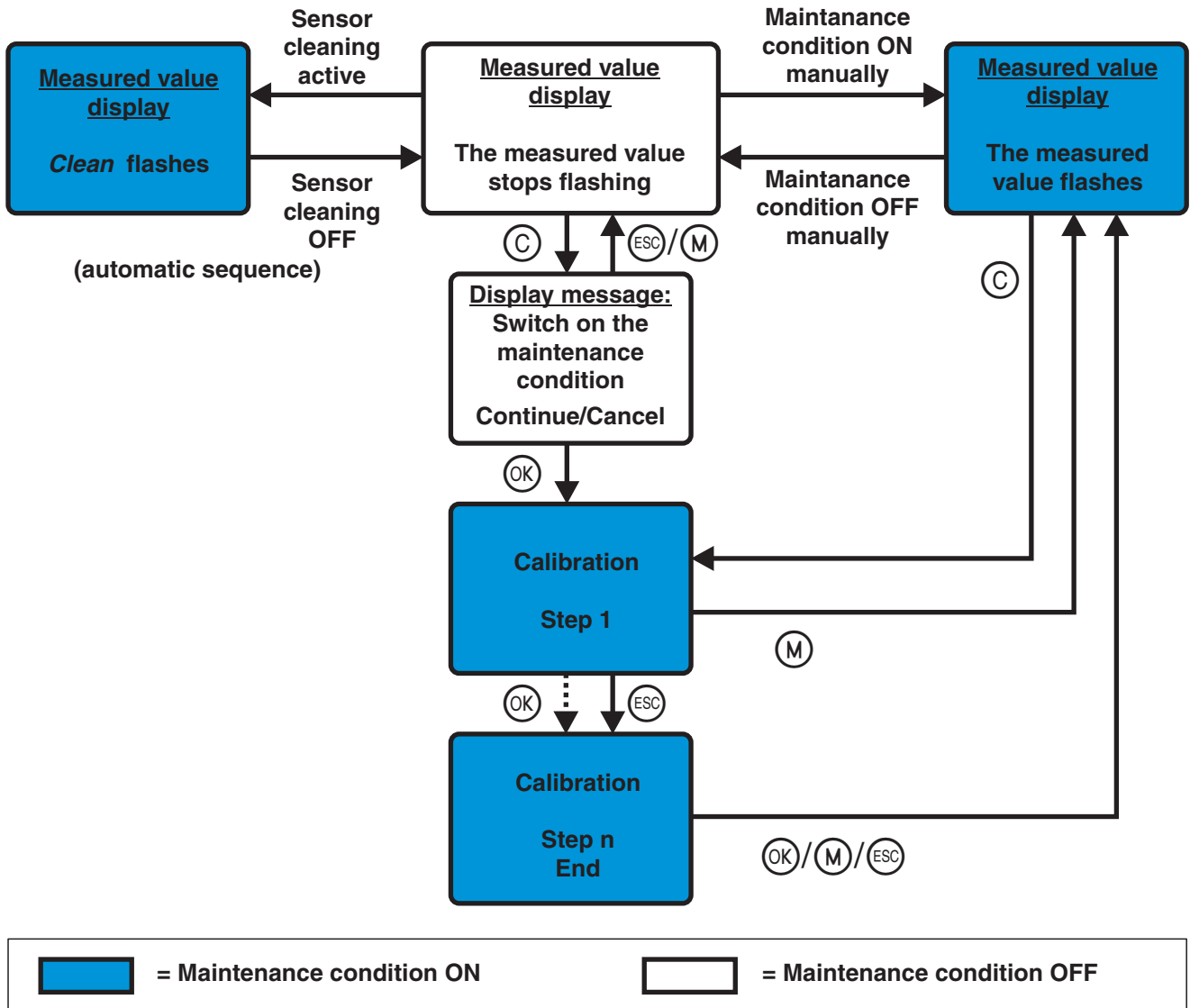
4.4.2 Maintenance condition

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

In the maintenance condition:

- except for the display, the DIQ/S 181 does not react to the current measured value or the condition of the selected sensor
- sensor errors do not cause any changes of the condition of the linked output.

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



Recommended proceeding for cleaning, maintenance and repair

1	Switch on the maintenance condition for the sensor. The measured value display flashes.
2	Pull the sensor out of the sample.
3	Carry out the cleaning, maintenance or repair (removal and replacement) of the sensor.
4	Submerge the sensor in the sample again.
5	Wait until the measured value no longer changes.
6	Switch off the maintenance condition for the sensor. The display of the sensor in the measured value display no longer flashes.

Automatic switch-on of the maintenance condition

The maintenance condition is automatically activated

- during calibration. After calibration the sensor remains in the maintenance condition until the maintenance condition is switched off manually (see section 4.5)
- during a compressed air cleaning cycle. After the cleaning cycle is finished the maintenance condition is automatically switched off again.

4.4.3 Log book / Sensor status S01

In the menu *SENSOR STATUS S01* you can query the following information on the connected sensor:

- Type and series number
- Software status
- Error and info messages ("log book")
- Data of the last calibration (only for a sensor that can be calibrated)

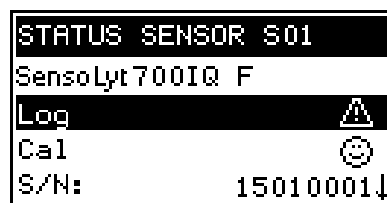


Fig. 4-8 *SENSOR STATUS S01*

Log book

The log book is a list of messages related to the connected sensor. If there is a new message the error symbol in the header of the measured value display flashes:



Flashes if a new or unacknowledged error message is present in the log book that requires immediate action.

The flashing of the error symbol only stops after all detailed message texts in the log book have been opened and marked with a checkmark (✓). The operating sequence to do this is described on Seite 55.



The error symbol also flashes if the operational voltage or communication are faulty. You can check this in the *PROPERTIES / SYSTEM STATUS* menu (see section 4.4.1).

Calibration data

You can view the data of the last calibration of the sensor under the *Cal* menu item. With a sensor that was not yet calibrated, this menu item is missing. The symbol in the *Cal* line quotes the validity state:

Log book messages

- ☺ = valid
- ☹ = invalid

The contents and form of the calibration data depend on the sensor type. Each log book message in the log book consists of one line. The latest message is on the first position. It is not yet marked with a checkmark, i.e. acknowledged.

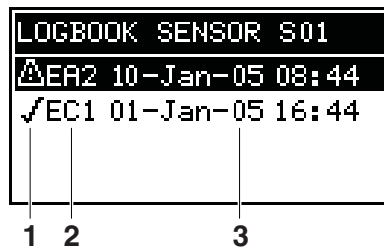


Fig. 4-9 Log book

1	Message type (error symbol) of an unacknowledged message, or checkmark (✓) with an acknowledged message
2	Message code
3	Date and time of the message



The log book shows the current status at the point of time it was opened. If new messages arrive while the log book is open, these do not appear in the log book. The new messages are only included when you switch to the measured value and status display.

Structure of the message code

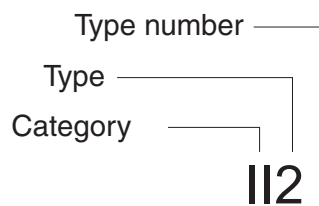


Fig. 4-10 Message code

Position	Information	Explanation
1	Category	<ul style="list-style-type: none"> ● Info message (I) ● Error message (E)

Position	Information	Explanation
2	Type	<ul style="list-style-type: none"> ● Calibration (C) ● Installation and commissioning (I) ● Instructions for service and repair (S) ● Application instructions (A)
3	Type number	Each type contains subtypes (0..9A..Z)



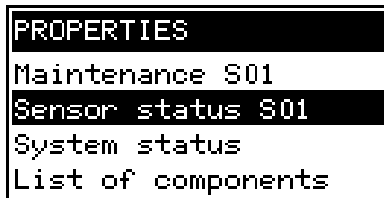
Only the last message of each message code is ever displayed. If a new message arrives with a message code that already exists in the log book, the older message is overwritten.

Detailed message text

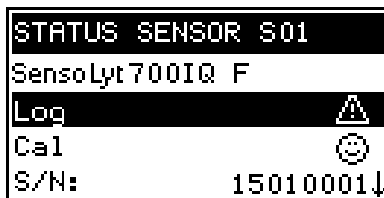
You can view the detailed message text when you acknowledge the message. It contains a precise description of the message codes and, if required, instructions for any further actions. The detailed message texts can also be found in the respective sensor operating manual.

**Proceeding:
Open log book,
acknowledge messages
and view detailed
messages**

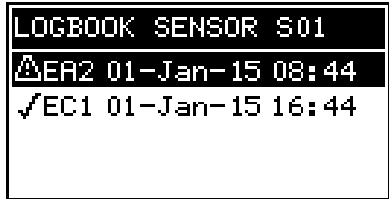
- 1 | Open the *PROPERTIES* menu.
To do so, press <OK> in the measured value display.



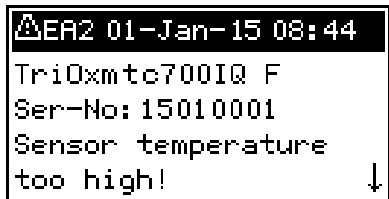
- 2 | Select *Sensor status S01* and press <OK>.



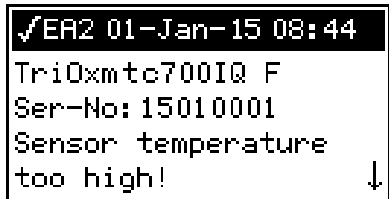
- 3 | Select the *Log...* menu item and press <OK>.
The log book is displayed.



4 Highlight the message to be acknowledged and press <OK>. The detailed message text is displayed. Scroll through the text with the toggle switch <▲▼>.



5 Press <OK>. Thus you acknowledge the message (✓).



6 Once again, press <OK>. This returns you to the log book where you can view and acknowledge further messages as necessary.

7 To exit the log book press <ESC>. Return directly to the measured value and status display with <M>.

4.5 Calibrating the sensor



The sensor can be protected by a password against unauthorized calibration. For more detailed information on password protection, see section 4.6.

General proceeding

1 If necessary, switch to the measured value display with <M>.

- 2 Call up calibration with **<C>**.
The message, *During the calibration procedure, the linked outputs are frozen*, appears. The maintenance condition is switched on the next time the **<OK>** key is pressed. To return to the measured value display without switching on the maintenance condition, press **<M>** or **<ESC>**.

```
S01 CALIBRATE
15010001
TriQxmtc700IQ F
Linked outputs are
frozen during ↓
```



By activating the maintenance condition, linked outputs remain in their present state. The measured value or status display of the sensor flashes in the measured value display.

- 3 Confirm with **<OK>**. The maintenance condition is active.

The following proceeding is sensor type specific.
The display guides you through all steps.
Follow the instructions exactly.
A message of the success of the calibration and the determined calibration data appear at the end.



Up to this point you can cancel the calibration procedure with the **<ESC>** key at any time. The DIQ/S 181 system will then continue to work with the old calibration data. The maintenance condition, however, has to be switched off again in any case.

- 4 Confirm the calibration data with **<OK>**. Calibration is completed with this. The following display message describes the further steps to put the sensor into operation again.

```
S01 CALIBRATE
After calibration:
* Submersion sensor
in sample
* When meas val. is ↓
```

Putting the sensor into operation after calibrating

5	Confirm with <OK>. The display returns to the measured value display (the measured value flashes as the sensor is still in the maintenance condition).
6	If calibration was successful, immerse the sensor in the test sample.
7	Wait for a stable measured value.
8	Switch off the maintenance condition (press <OK> three times). The measured value has stopped flashing.



If calibration was not successful, this is indicated by "----" on the display and a corresponding message with remedial actions appears in the log book. Follow the instructions and repeat calibration.

4.6 Passwords

You can assign and activate two passwords for the DIQ/S 181.

- **Settings password**
protects all settings in the *SETTINGS* menu.
If the password is active, all settings can be viewed but not changed. The password prompt appears on leaving a setting table with the *Save and quit* command. Resetting the system configuration to default is also protected.
- **Calibration password**
protects against unauthorized calibration.
If this password is active, the password query appears on calling up calibration with <C>. If no valid password is entered, calibration is blocked.

Configuring passwords

Activating/deactivating and changing passwords is carried out in the *SETTINGS -> System* menu.

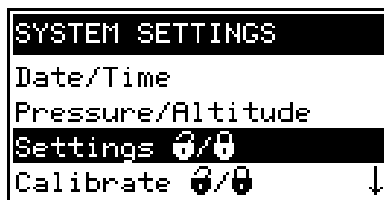




Fig. 4-11 SYSTEM SETTINGS menu

Operating notes:

- The settings password is configured with the *Settings* 0 / 0 menu

item.





- The calibration password is configured with the *Calibrate*  /  menu item.
- Any activating, deactivating or changing action requires the entry of the relevant current password.

4.6.1 Default passwords

In the default condition of the DIQ/S 181 both passwords are set to 1000.

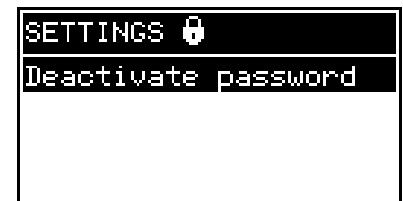
4.6.2 Forgotten the password?

Procedure: Prompt for the password

1	Open the <i>SETTINGS</i> menu with <S>.
2	Depending on the password to be prompted, use <▲▼> and <OK> to select and confirm the menu item <i>Settings</i>  /  or <i>Calibrate</i>  /  . The following display appears:



or



3	Press <C> and then <S>. The current password is displayed.
---	--



4	Quit the display of the password with <OK>.
---	---

5 The *SETTINGS* menu

5.1 Overview of the *SETTINGS* menu

Pressing <S> switches from the measured value display to the *SETTINGS* menu (main menu).

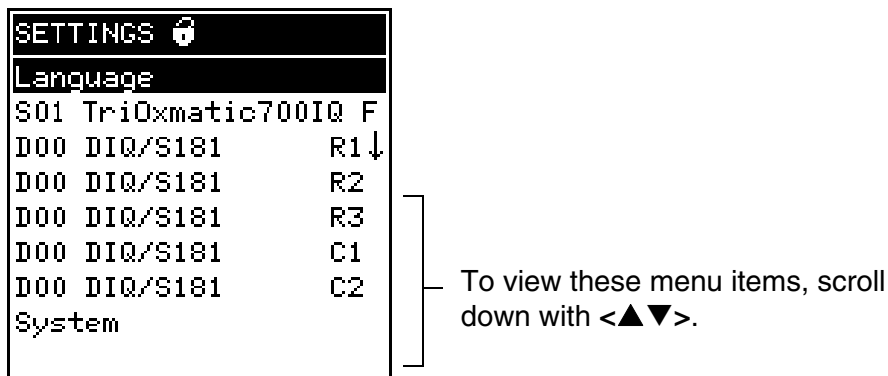


Fig. 5-1 Submenus in the *SETTINGS* menu

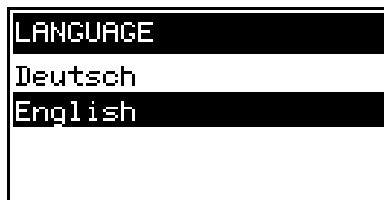
The individual submenus are described in the following paragraphs.

5.2 Language

In this menu, you can set the system language.

Proceeding: selecting the language

- | | |
|---|--|
| 1 | Open the <i>SETTINGS</i> menu with <S>. |
| 2 | Using <▲▼> and <OK>, select and confirm the menu item, <i>Language</i> .
The <i>LANGUAGE</i> display opens. |



- | | |
|---|---|
| 3 | Select the selected language from the list with <▲▼> and confirm with <OK>. The selection is taken over immediately. The display switches to the higher menu level. |
| 4 | Switch to the measured value display with <M>. |



If the selected system language is not available in a sensor, all displays of this sensor appear in the standard language, English. To activate the selected system language for this component, a software update of the component is required. Please contact WTW.

5.3 Sensor S01

In this menu, you can assign a name of your choice to the sensor and adjust the sensor so it optimally meets the requirements of your application (measured parameter, measuring range, etc.).

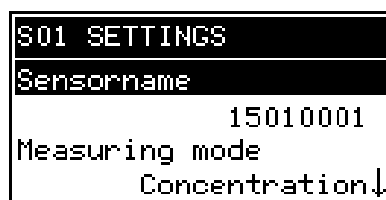
All settings are specific for the respective sensor type. They can only be modified if the sensor is connected and communicates properly with the DIQ/S 181. Otherwise, the dataset is inactive. How to deal with inactive datasets is described below.



General steps for editing sensor settings are given below. The *Sensor name* menu item is always on the first position of the setting table. Details of further sensor settings can be found in the chapter, COMMISSIONING of the sensor operating manual.

**Procedure:
Carrying out settings**

5	Open the <i>SETTINGS</i> menu with <S> .
6	Press <▲▼> and <OK> to select and confirm the menu item, <i>Sensor S01</i> . The following note appears: <i>If the measuring mode or measuring range is changed, the links of the sensor are erased.</i>
7	If you want to continue, press <OK> . The setting table of the sensor is displayed.



8	Edit the setting table as described in section 4.3.2.
---	---



To accept all settings, highlight the *Save and quit* menu item at the lower end of the setting table and press <OK>. If you exit the setting table via <M>, <ESC>/ or the *Quit* menu item, all changes are ignored.

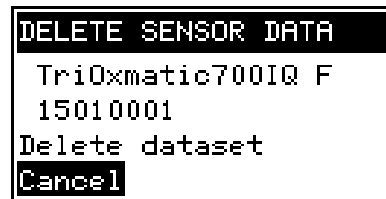
Inactive dataset of the sensor

An inactive dataset for a sensor exists if the DIQ/S 181 receives no signals from a sensor that is already registered. The *Error* display appears on the measured value display instead of a measured value.

An inactive dataset can be reactivated by connecting a sensor of the same type. All settings are retained. If these data are no longer required, they can be erased. All the settings belonging to this sensor as well as any links with outputs are deleted with this action.

Proceeding: Erasing an inactive dataset

- | | |
|---|--|
| 1 | Open the <i>SETTINGS</i> menu with <S>. |
| 2 | Press <▲▼> and <OK> to select and confirm the menu item, <i>Sensor S01</i> .
If the dataset is inactive, the following display appears: |







- | | |
|---|--|
| 3 | Using <▲▼>, select <i>Delete dataset</i> and confirm with <OK>. The dialog window for the security prompt appears. |
| 4 | Using <▲▼>, select <i>Delete dataset</i> and confirm with <OK>. The inactive dataset is erased. |

5.4 Relay output R1/R2/R3, mA output C1/C2

These two menus can be used to link the sensor with the relay outputs and current outputs of the DIQ/S 181 and to set the outputs. The various setting options are described in detail in the chapter 6 OUTPUTS menu.

5.5 System

The settings in the *SYSTEM* menu comprise:

- *Date/Time*
- *Pressure/Altitude*
This setting is important if you want to carry out D.O. measurements with the universal transmitter DIQ/S 181.
(adjustable range: 500 ... 1100 mbar or 0 ... 5955 m altitude).
- *Settings*  / 
Here you can configure the password for the settings.
For details on the passwords, refer to section 4.6.
- *Calibrate*  / 
Here you can configure the password for calibration.
For details on the passwords, refer to section 4.6.
- *Display contrast*
Here you can set the display contrast for optimum readability.
- *Delivery state*
Here you can reset all settings to the default values. Only the date, time and contrast setting for the display will remain stored. If the settings password is active, a password prompt appears before the reset. In any case a security prompt appears to prevent an inadvertent reset.

Default settings

Settings	Default values
<i>Language</i>	German
<i>Pressure/Altitude</i>	1013 mbar / 0 m
Settings password	1000 / inactive
Calibration password	1000 / inactive
Sensor settings	Sensor dependent (see settings tables in the respective sensor operating manual). <u>Note:</u> Calibration of the sensor is stored in the sensor and is retained when the system configuration is reset.
Relay outputs	No function, all links are erased
Current outputs	No function, all links are erased

6 Outputs

6.1 Outputs of the DIQ/S 181

The DIQ/S 181 universal transmitter has three relays outputs and two current outputs.

Functions for relay outputs

- *System monitoring*
- *Sensor monitoring*
- *Limit indicator*
- *Frequency controller*
- *Pulse-width output*
- *Cleaning*
- *Manual control*

Relay outputs can be configured as openers or closers.

Functions for current outputs

- *Recorder*
- *Fixed current value*



You can view the current states of the relay and current outputs in the measured value and status display (see section 4.2).

6.2 Linking and adjusting: general proceedings

6.2.1 Linking the outputs

Linking options

The following options of linking the outputs are available:

- *Sensor S01*
The output is linked with sensor 01
- *System*
Select this option if you want to use the output for system monitoring (details, see section 6.4.2).

Proceeding: linking outputs

Proceed as follows to link an output. If you want to change a link you have to erase the existing link first.

- 1 | Open the *SETTINGS* menu with **<S>**.

- 2 Using <▲▼> and <OK>, select and confirm the *Relay output Rx* menu item (corresponding to relay 1, 2 or 3) or *mA output Cy* menu item (corresponding to current output 1 or 2). A list with all linking options is displayed.

```
R1 LINK WITH
Sensor S01
System
```

- 3 Select the required option with <▲▼> and confirm with <OK>. The output is linked. The link is displayed in the header when the setting of the output is edited.

6.2.2 Deleting a link with an output

If you no longer need a link you can erase the link.

Proceeding: Erasing a link

- 1 Open the *SETTINGS* menu with <S>.
- 2 Using <▲▼> and <OK>, select and confirm the *Relay output Rx* menu item (corresponding to relay 1, 2 or 3) or *mA output Cy* menu item (corresponding to current output 1 or 2).

```
R1-S01
Delete link
Set output
  Limit indicator
```

- 3 Using <▲▼>, select *Delete link* and confirm with <OK>. A safety query appears.
- 4 Using <▲▼>, select *Delete link* and confirm with <OK>. The link is deleted.

6.2.3 Setting outputs

Proceeding: setting an output

- 1 | Open the *SETTINGS* menu with **<S>**.
- 2 | Using **<▲▼>** and **<OK>**, select and confirm the *Relay output Rx* menu item (corresponding to relay 1, 2 or 3) or *mA output Cy* menu item (corresponding to current output 1 or 2).

```
R1-S01
Delete link
Set output
    Limit indicator
```

- 3 | Confirm the selection of *Set output* with **<OK>**. The setting table of the output is displayed.

```
R1-S01 SETTINGS
Relay function
    Limit indicator
Measured variable
    Main variable↓
```

- 4 | Edit the setting table as described in section 4.3.2.



To accept all settings, highlight the *Save and quit* menu item at the lower end of the setting table and press **<OK>**. If you exit the setting table via **<M>**, **<ESC>**/*Quit* or the *Quit* menu item, all changes are ignored.

6.3 Basic information on relay functions

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

- Monitoring (see section 6.3.1)
- Limit indicator (see section 6.3.2)
- Proportional output (see section 6.3.3)

6.3.1 Monitoring

When using a relay for monitoring, a relay action (*Open*, *Close*) occurs when certain states occur. This function is suitable, e.g. for the monitoring of errors in the DIQ/S 181.



For monitoring functions, use the relay preferably as an opener. In the case of an error, the relay opens. As a result, the monitoring function operates even if, for instance, the supply voltage fails.

6.3.2 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 68).
- 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 68).



If the simple monitoring function (*Open*, *Close*) with one or two relays is not sufficient, use proportional output (see section 6.3.3).

Monitoring limiting values using one or two relays

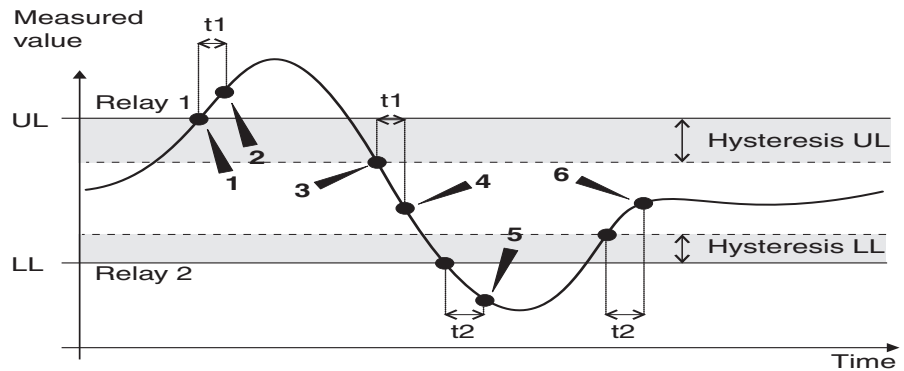


Fig. 6-1 Switching points for relays with the function of a limit indicator

1	Upper limit value (relay 1) exceeded
2	Selected switching delay t1 for relay 1 expired Relay 1 switches
3	Hysteresis for upper limiting value (relay 1) undercut
4	Selected switching delay t1 for relay 1 expired Relay 1 switches back
5	Lower limit value (relay 2) undercut Selected switching delay t2 for relay 2 expired Relay 2 switches
6	Hysteresis for lower limiting value (relay 2) exceeded Selected switching delay t2 for relay 2 expired Relay 2 switches back

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.

6.3.3 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 70) or

- switching frequency (frequency output, see page 71).

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 69).
- 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 69).

Output with one relay

Switching frequency f or
Pulse width v

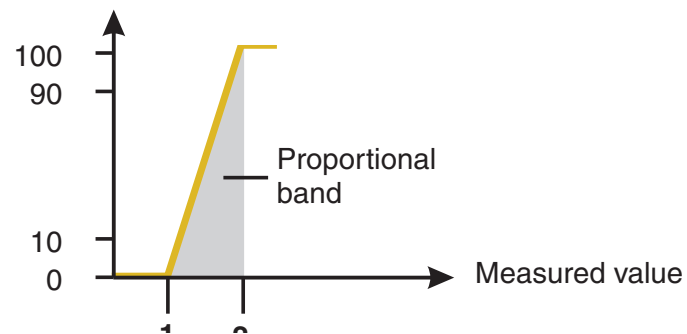


Fig. 6-2 Output with one relay

Output with two relays

Switching frequency f or
Pulse width v

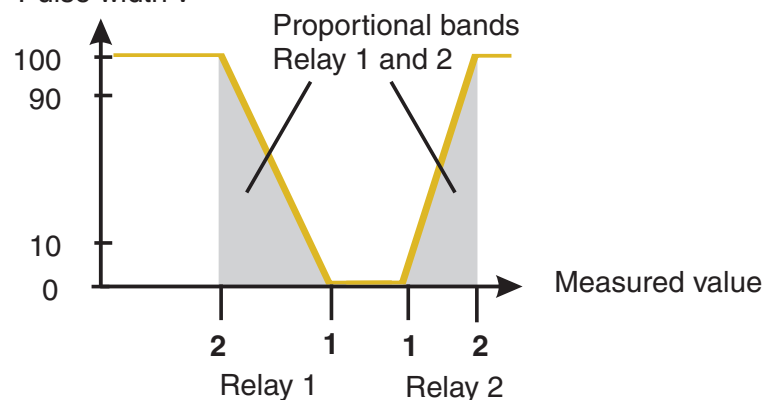


Fig. 6-3 Output with two relays

1	<p><i>Start value</i> Measured value with a minimum pulse width or switching frequency</p>
2	<p><i>End value</i> Measured value with a maximum pulse width or switching frequency</p>

Pulse width output

The output via 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.

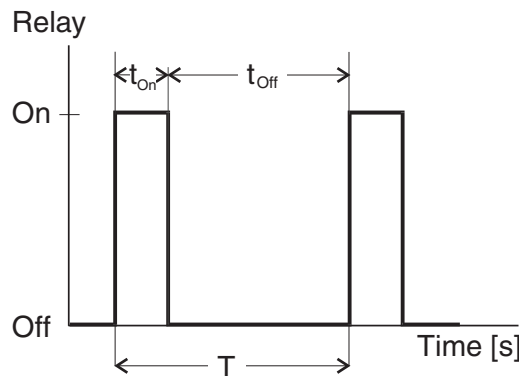


Fig. 6-4 Relay output of the pulse-width output

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.

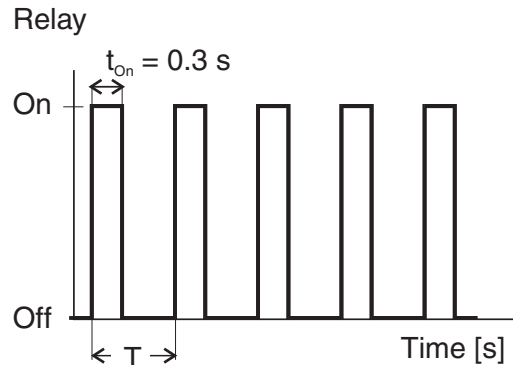


Fig. 6-5 Relay output of the frequency output

While the selected switching duration ($t_{on} = 0.3 \text{ s}$) always remains constant, 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 curves

Through the selection of the *Start value* and *End value*, the proportional output 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 72).
- 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 73).

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.

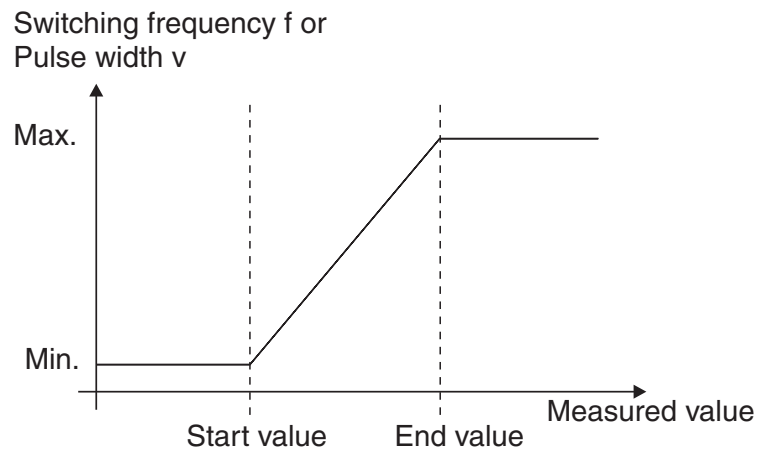


Fig. 6-6 Positive characteristic curve

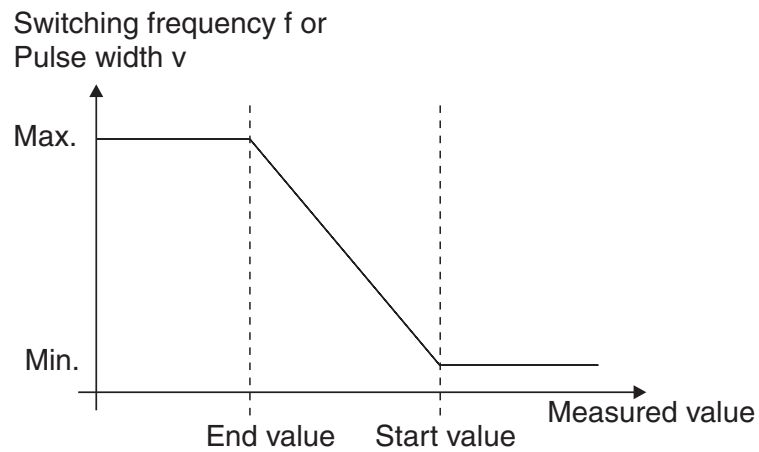


Fig. 6-7 Negative characteristic curve

Positive characteristic curve

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

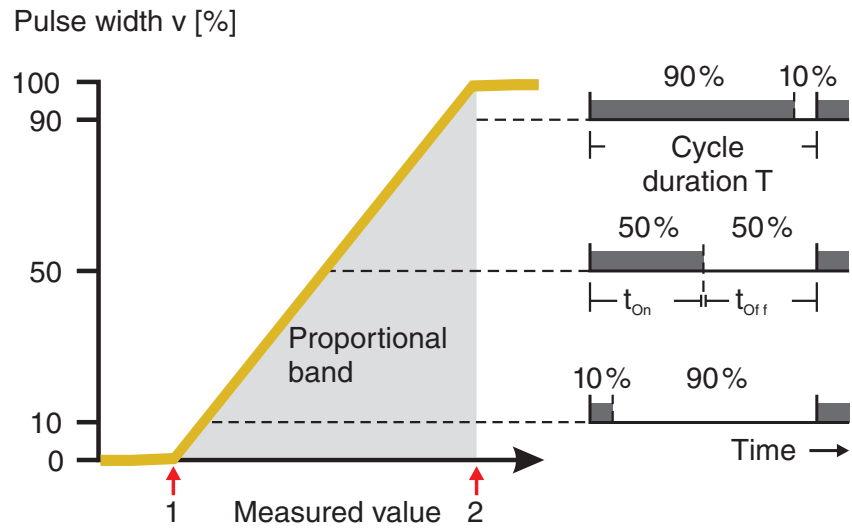


Fig. 6-8 Pulse width output

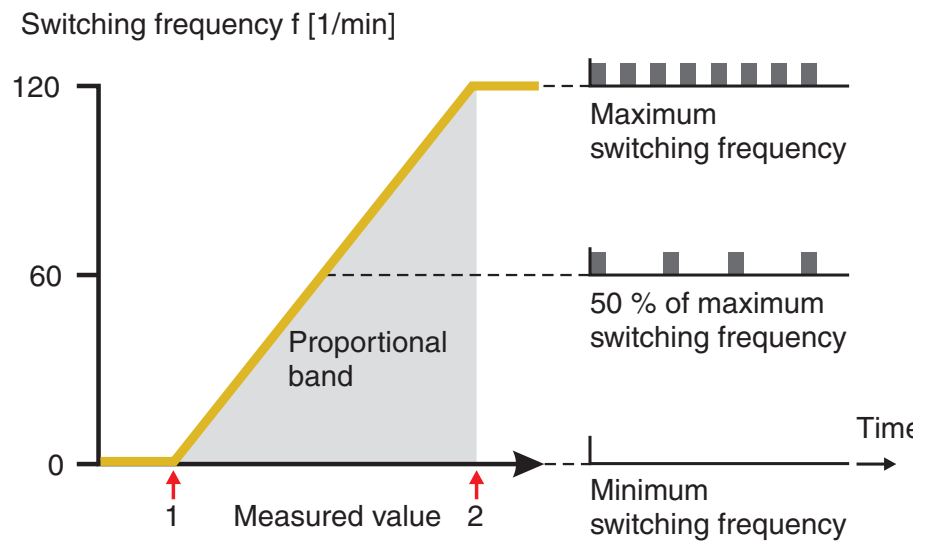


Fig. 6-9 Frequency output

1	<i>Start value</i> Measured value with a minimum pulse width or switching frequency
2	<i>End value</i> Measured value with a maximum pulse width or switching frequency

Negative characteristic curve

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

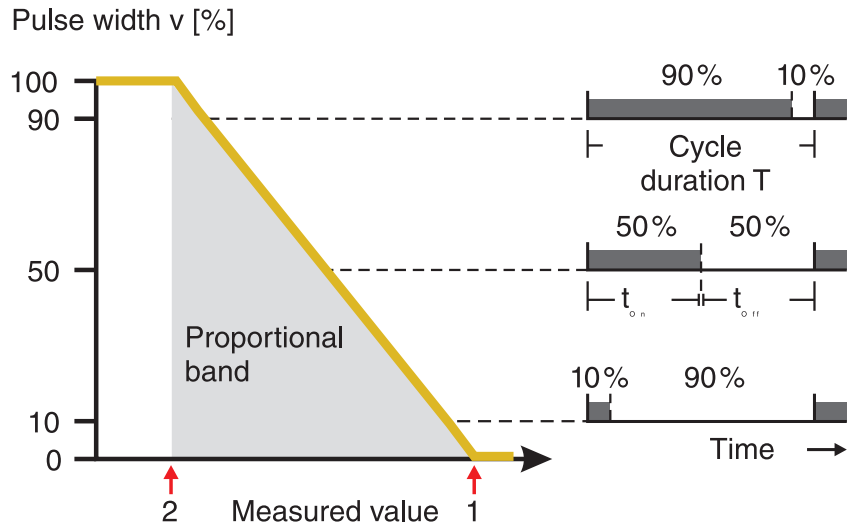


Fig. 6-10 Pulse width output

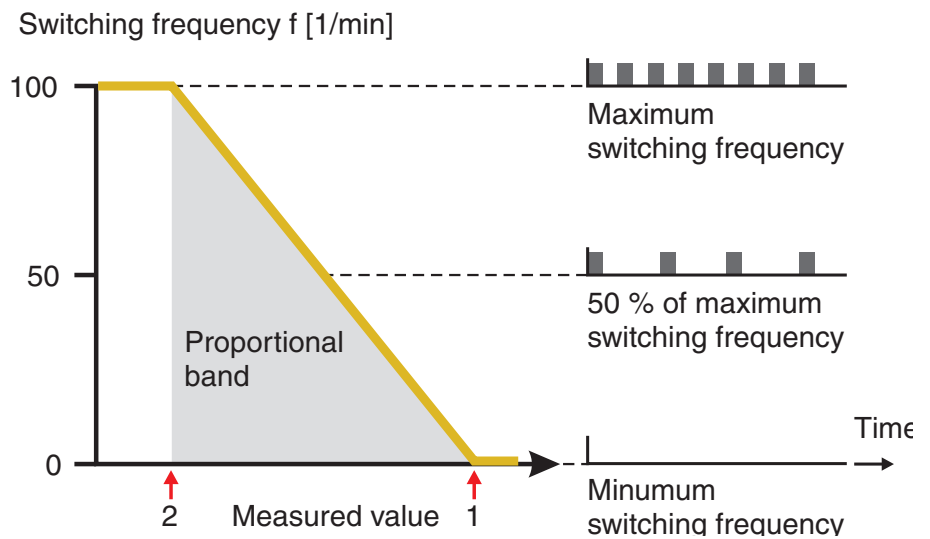


Fig. 6-11 Frequency output

- | | |
|----------|--|
| 1 | <i>Start value</i>
Measured value with a minimum pulse width or switching frequency |
| 2 | <i>End value</i>
Measured value with a maximum pulse width or switching frequency |

6.4 Setting table for relays

6.4.1 Functions and settings

To set a relay, its function has to be selected first. Then the relevant setting table is displayed:

Relay function and relevant setting tables

Function	Setting table
<i>No function</i>	The relay output is not used.
<i>System monitoring</i>	see section 6.4.2
<i>Sensor monitoring</i>	see section 6.4.3
<i>Limit indicator</i>	see section 6.4.4
<i>Frequency controller</i>	see section 6.4.5
<i>Pulse-width output</i>	see section 6.4.6
<i>Cleaning</i>	see section 6.4.7
<i>Manual control</i>	see section 6.4.8

6.4.2 System monitoring

Function The *System monitoring* enables the monitoring of system errors.

To set up the *System monitoring* function for a relay output, you have to select the *System* option when linking the relay output (see section 6.2.1).

It can be used to monitor the following system errors:

Settings	Setting	Selection	Explanation
	<i>Power failure</i>	<i>On</i> <i>Off</i>	The <i>Power failure On</i> function monitors the supply voltage. If the voltage falls below a critical value, the relay switches.
	<i>Collective error</i>	<i>On</i> <i>Off</i>	The <i>Collective error On</i> function simultaneously monitors the proper function of the sensor. (for details, see below this table)
	<i>Action</i>	<i>Open</i>	For all functions of the <i>System monitoring</i> , the relay action is set to <i>Open</i> .

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 181, does not provide a valid main measured value
- The sensor, which is properly registered to the DIQ/S 181, does not provide a valid secondary measured value

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 not 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 (compressed air operated cleaning system).

6.4.3 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 6.2.1).

Settings

Setting	Selection	Explanation
<i>Errors</i>	<i>All</i>	All sensor errors (special ones and general ones) are monitored and can prompt a relay action.
	<i>Special</i>	Special sensor errors are monitored and can prompt a relay action.
	<i>Off</i>	Sensor errors are not monitored.
<i>Mainten. Condition</i>	<i>On</i>	Switching on and off the maintenance condition is monitored and can prompt a relay action.
	<i>Off</i>	
<i>Action</i>	<i>Open</i>	Relay action
	<i>Close</i>	



For monitoring functions, preferably set up the relay output as an opener.

Sensor messages include errors and information 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

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

6.4.4 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 6.3.2).

In order to set up the *Limit indicator* function for a relay output, the relay output must be linked with the sensor (see section 6.2.1).

Settings

Setting	Selection/Values	Explanation
<i>Limit values</i>	<i>UL main variable</i> <i>LL main variable</i> <i>UL adjoining var.</i> <i>LL adjoining var.</i>	<i>Main variable</i> designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). <i>Adjoining variable</i> designates an additional measured parameter (e.g. temperature).
<i>Limit value UL</i>	<i>within the measuring range (sensor-dependent)</i>	Any upper or lower limiting value
<i>Limit value LL</i>		
<i>Hysteresis UL</i>	<i>0 - 10 % of the measuring range</i>	Hysteresis for upper or lower limiting value
<i>Hysteresis LL</i>		

Setting	Selection/Values	Explanation
<i>Behavior at error</i>	<i>Open</i> <i>Close</i> <i>Unchanged</i>	The relay opens, closes or remains unchanged in the case of system errors or sensor errors (see page 87).
<i>Action</i>	<i>Open</i> <i>Close</i>	Relay action
<i>Switching delay</i>	<i>0 ... 3600 s</i>	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.

6.4.5 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 6.3.3).

In order to set up the *Frequency controller* function for a relay output, the relay output must be linked with the sensor (see section 6.2.1).

Settings

Setting	Selection/Values	Explanation
<i>Measured variable</i>	<i>Main variable</i> <i>Adjoining variable</i>	<i>Main variable</i> designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). <i>Adjoining variable</i> designates an additional measured parameter (e.g. temperature).

Setting	Selection/Values	Explanation
<i>Start value</i>	<i>within the measuring range (sensor-dependent)</i>	Minimum spacing: 5 % of the measuring range
<i>End value</i>		
<i>Frequency (f) min.</i>	0 to 120 1/min	Minimum spacing: 10 1/min
<i>Frequency (f) max.</i>		
<i>Frequency with error</i>	0 to 120 1/min	In case of system errors or sensor errors (see page 87), the relay switches with the frequency specified.
<i>Action</i>	<i>Open</i> <i>Close</i>	Relay action

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*.

6.4.6 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 6.3.3).

In order to set up the *Pulse-width output* function for a relay output, the relay output must be linked with the sensor (see section 6.2.1).

Settings

Setting	Selection/Values	Explanation
<i>Measured variable</i>	<i>Main variable</i> <i>Adjoining variable</i>	<i>Main variable</i> designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). <i>Adjoining variable</i> designates an additional measured parameter (e.g. temperature).

Setting	Selection/Values	Explanation
<i>Start value</i>	<i>within the measuring range (sensor-dependent)</i>	Minimum spacing: 5 % of the measuring range
<i>End value</i>		
<i>Pulse width (v) min.</i>	0 ... 100 %	Minimum spacing: 10 % of the <i>Cycle duration (T)</i>
<i>Pulse width (v) max.</i>		
<i>Cycle duration (T)</i>	5 ... 100 s	Length of the switching period T $T = (t_{on} + t_{off})$
<i>Error pulse width</i>	0 ... 100 %	In case of system errors or sensor errors (see page 87), the relay switches with the pulse-width specified.
<i>Action</i>	<i>Open</i> <i>Close</i>	Relay action

Characteristic curve

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

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*.

6.4.7 Cleaning

Function

The *Cleaning* function enables the time controlled automatic start of the sensor cleaning function with the aid of a relay of the DIQ/S 181. 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 the sensor (see section 6.2.1).

The assigned relay 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 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

The operativeness of the cleaning system can be tested as follows: manually open or close the relay with the *Manual control* function (see section 6.4.8) and, while doing so, check the behavior of the cleaning system.

Alternatively, the operativeness of the cleaning system can be tested by checking the performance of the function at the programmed start time (reference time \pm 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
	<i>Reference time (h)</i>	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.
	<i>Reference time (min)</i>	0 ... 60 min	
	<i>Interval unit</i>	1 .. 7 d 1 .. 24 h 5 .. 60 min	Selection of range and unit for the <i>Cleaning interval</i> .
	<i>Cleaning interval</i>	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*.
	<i>Cleaning duration</i>	0 ... 300 s	Duration of the cleaning
	<i>Adjustment time</i>	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:

<i>Cleaning interval</i>	<i>Cleaning duration</i>	<i>Adjustment time</i>
≤ 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* is changed.



The reference time and all further cleaning times relate to the date and time of the system clock. The setting of the system clock can be found in section 5.5.

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	

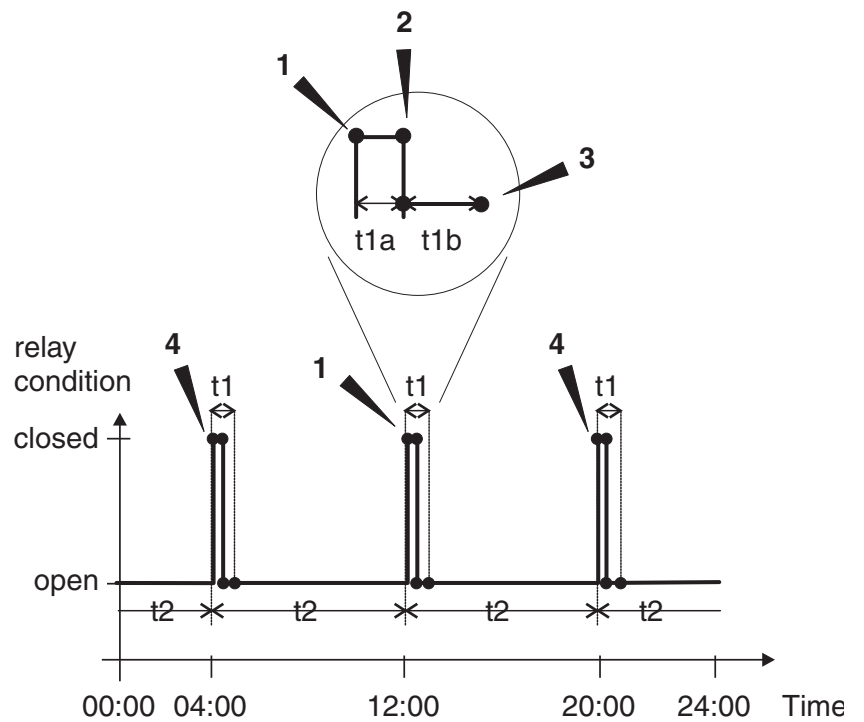


Fig. 6-12 Cleaning cycle

1	Reference time Start of a cleaning cycle (t1) Start of the specified <i>Cleaning duration</i> (t1a)
2	End of the specified <i>Cleaning duration</i> (t1a) Start of the specified <i>Adjustment time</i> (t1b)
3	End of the specified <i>Adjustment time</i> (t1b) End of the cleaning cycle (t1)
4	Reference time ± <i>Cleaning interval</i> (t2) Start of a cleaning cycle
t1	Cleaning cycle = <i>Cleaning duration</i> (t1a) <i>Adjustment time</i> (t1b) Linked outputs are frozen.
t2	<i>Cleaning interval</i>

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 6.6.2). As soon as the power is available, the outputs are released again. The next cleaning cycle will be performed at the time set up.

6.4.8 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
<i>Relay function</i>	<i>Manual control</i>	The selected relay action is carried out with <i>Save and quit</i> .
<i>Action</i>	<i>Open</i> <i>Close</i>	Relay action



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.

6.5 Setting tables for current outputs

6.5.1 Functions and settings

To set a current output, its function has to be selected first. Then the relevant setting table is displayed:

Function of current outputs and relevant setting tables

Function	Setting table
<i>No function</i>	The current output is not used.
<i>Recorder</i>	see section 6.5.2
<i>Fixed current value</i>	see section 6.5.3

6.5.2 Recorder

Function

The measured values of the linked sensor at the current output are set up as current 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
<i>Recorder type</i>	<i>0 to 20 mA or 4 to 20 mA</i>	
<i>Start value</i>	<i>(sensor dependent)</i>	Minimum spacing: ≤ 5 % of the measuring range (sensor-dependent)
<i>End value</i>		
<i>Measured variable</i>	<i>Main variable Adjoining variable</i>	<i>Main variable</i> designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). <i>Adjoining variable</i> designates an additional measured parameter (e.g. temperature).
<i>Attenuation</i>	<i>0 ... 40 mA/s</i>	Speed of change of the output current (mA/s) in the case of erratic changes of the input signal.

<i>I -> UFL/OFL</i>	<i>Error</i>	Current values outside the range between <i>Start value</i> and <i>End value</i> are regarded as an error. The current output reacts as specified under <i>Behavior at error</i> (see below).
	<i>Limitation</i>	The current at the output is limited to the <i>Start value</i> or <i>End value</i> .
<i>Behavior at error</i>	<i>Fixed current value</i>	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.
	<i>Unchanged</i>	The current at the output remains unchanged.

6.5.3 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
<i>Current output</i>	<i>Fixed current value</i>	Using <i>Save and quit</i> , the nominal amperage that was input as <i>Inom</i> is output.
<i>Inom</i>	<i>0 ... 20 mA</i>	The nominal amperage that is output.



The settings for other functions in the *Current output* menu such as *Recorder*, are retained while the *Fixed current value* is being carried out.

6.6 Behavior of linked outputs

6.6.1 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
<i>Limit indicator</i>	<i>Behavior at error</i> (see section 6.4.4)
<i>Frequency controller</i>	<i>Frequency with error</i> (see section 6.4.5)
<i>Pulse-width output</i>	<i>Error pulse width</i> (see section 6.4.6)
<i>Recorder</i>	<i>Current with error</i> (see section 6.5.2)

The specified behavior occurs with the following errors.

- The display shows *Init*, *---*, *Error* or *OFL*.
The meaning of these displays is given in section 4.2 of this operating manual.
- The supply voltage is too low.

6.6.2 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 the link with the sensor
- Changing the *Measuring mode* sensor setting for a linked sensor
- Changing the *Measuring range* sensor setting for a linked sensor
- Changing the *Temperature mode* 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 *Measuring mode* or *Measuring range* 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
sensor	Depending on the type of sensor (see the operating manual of the sensor)
DIQ/S 181, DIQ modules	No maintenance required

7.2 Cleaning

DIQ/S 181, 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.

NOTE

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 enclosure.

Sensor

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

8 What to do if ...

8.1 Information on errors

Log book

The universal transmitter DIQ/S 181 performs a comprehensive cyclical self test during operation. When doing so, the DIQ/S 181 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 terminal. The log book is described in detail in section 4.4.3 LOG BOOK / SENSOR STATUS S01.



Information on possible errors of the sensor is given in chapter WHAT TO DO IF... of the sensor operating manual.

8.2 Error causes and remedies

The DIQ/S 181 no longer reacts to entries

Cause	Remedy
– System error	Reset the DIQ/S 181: – Switch off the power supply and switch it on again after 10 s

"Error" in the measured value display

Cause	Remedy
– Communication with the sensor interrupted	– Check the cable connection
– Error in the sensor	– Switch off the power supply and switch it on again after 10 s

The selected system language was not activated for a sensor

Cause	Remedy
– A system language was selected that is not available in the sensor. The English language was activated instead of the selected system language.	– Contact WTW, a software update is required for the respective components

8.3 Replacing system components

8.3.1 Replacing passive components

Passive components include all components that the universal transmitter cannot recognize.

These include:

- DIQ/JB
- DIQ/CHV
- Cable (SNCIQ).



WARNING

If the universal transmitter DIQ/S 181 is opened during operation, there is a danger to life due to possible hazard of electric shock. Before opening the universal transmitter, switch off the system and, if necessary, all external relay circuits that present a hazard of electric shock and secure the system against being switched on again.

Only ever replace components while the DIQ/S 181 is switched off. Defective components are removed in the reverse order to the installation (see chapter 3 INSTALLATION).

8.3.2 Replacing the sensor

Inactive dataset of the sensor

If the sensor is removed from the DIQ/S 181, its settings remains stored in the universal transmitter as an inactive dataset. A dataset contains the following information:

- Series number and sensor type of the sensor
- All sensor settings
- All characteristics of the link with an output.



The current calibration data of the sensor are always stored in the sensor. If a sensor is connected that is ready for operation and calibrated, this can be used immediately without the need for recalibration.

If a sensor is connected to the DIQ/S 181 when an inactive dataset is present, the following cases are possible:

Case 1:

The type of sensor is identical with the type of sensor in the inactive dataset

The connected sensor is automatically assigned to the inactive dataset and starts to operate again.

Example: Maintenance, repairs, replacement.

This mechanism ensures that all sensors retain their settings and links if a sensor was removed for maintenance, or if the DIQ/S 181 was temporarily switched off.

Case 2:

The type of sensor is not identical with the type of sensor in the inactive dataset

To display the new sensor type on the DIQ/S 181:

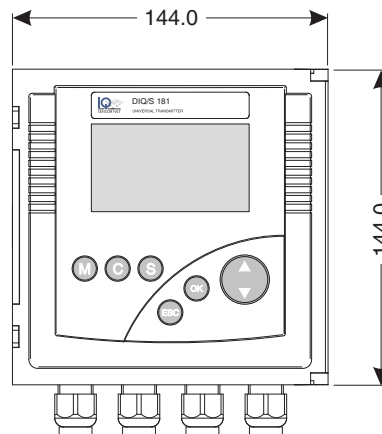
- Erase the inactive dataset (see Seite 62)
- Connect a new sensor (see Seite 14)

9 Technical data

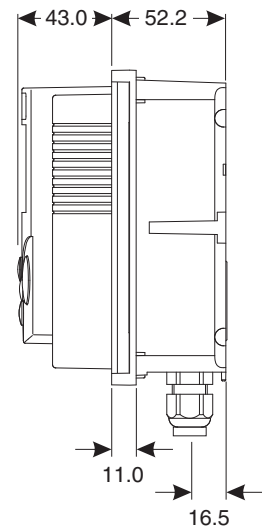
9.1 DIQ/S 181

Dimensions

Front view:



Side view:



Rear view:

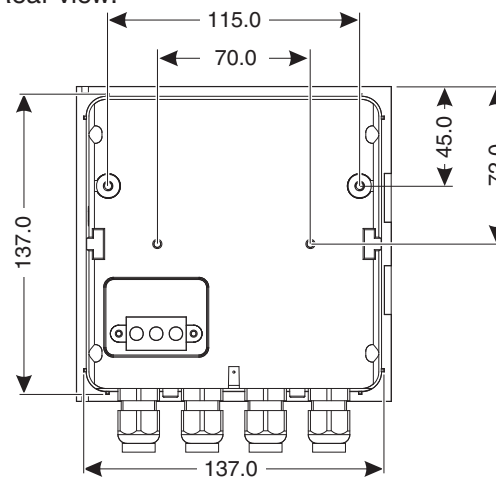


Fig. 9-1 Dimension drawing of the DIQ/S 181 (dimensions in mm)

Test certificates

cETLus, CE

Mechanical structure

Enclosure material	Polycarbonate with 20 % glass fiber
Weight	Approx. 0.7 kg

Type of protection	<ul style="list-style-type: none"> – IP 66 – Corresponds to NEMA 4X <p>The universal transmitter DIQ/S 181 is not suitable for direct conduit connection. Conduits have to be connected with the flexible CC-Box adapters (see chapter 10 ACCESSORIES AND OPTIONS)</p>
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Ambient conditions**Temperature**

Operation	- 20 °C ... + 55 °C (- 4 ... 131 °F)
Storage	- 25 °C ... + 65 °C (- 13 ... 149 °F)

Relative humidity

Yearly average	≤ 90 %
Dew formation	Possible

Site altitude	Max. 2000 m above sea level
----------------------	-----------------------------

**Electrical data
DIQ/S 181
(line power version)**

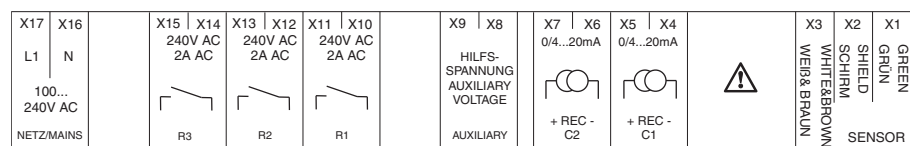
Power supply	Nominal voltage: 100 ... 240 VAC ± 10 %
	Frequency: 50/60 Hz according to DIN IEC 60038
	Line power connection: 2 pin, N and L
	Line cross-section of mains connection: Europe: 1.5 ... 4.0 mm ² USA: AWG 14 ... 12
	Fuse rating on the operator side: max. 16 A
Protective class	II
Overvoltage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

**Electrical data
DIQ/S 181/24V
(24 V AD/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
Power consumption	max. approx. 12 W

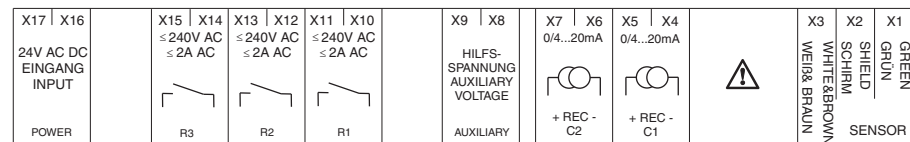
**Electrical connections
DIQ/S 181
(line power version)**

Terminal strip inside the enclosure:



**Electrical connections
DIQ/S 181/24V
(24 V AC/DC version)**

Terminal strip inside the enclosure:



**Relay
(3 x)**

Output	Galvanically separated
Max. switching voltage	240 VAC or 24 VDC
Max. switching current	2 A (AC and DC)
Installation requirements	Fuse rating on the operator side: max. 2 A
Relay functions	Programmable as: <ul style="list-style-type: none"> – Opener or closer – Limit monitor – Monitoring of the warning and error signals – Proportional frequency output – Proportional pulse width output

Current outputs (2 x)	Output	Galvanically separated from the sensor
	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 voltage	24 V, in the case of missing or incorrect burden
	Accuracy	0.3 % of current value \pm 50 μ A, load max. 500 Ω
	Functions	Programmable: <ul style="list-style-type: none"> – 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
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 <ul style="list-style-type: none"> – Resources for industrial areas, intended for indispensable operation – Interference emission limits for resources of class B
	System lightning protection	Extended protective characteristics as opposed to EN 61326
	FCC, class A	



Any combination of the DIQ/S 181 with accessory products in a user-specific system has the EMC characteristics listed.

Meter safety

Applicable norms

- EN 61010-1
- UL 3111-1
- CAN/CSA C22.2 No. 1010.1

9.2 DIQ/JB

Dimensions

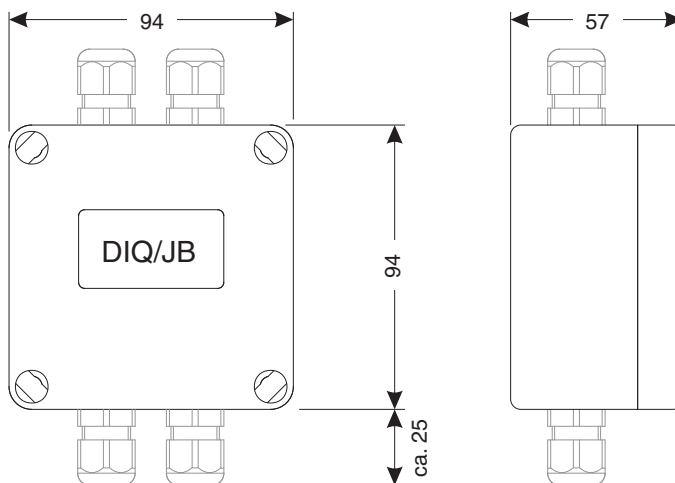
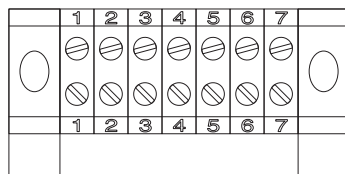


Fig. 9-2 Dimension drawing of DIQ/JB (dimensions in mm)

Mechanical structure

Enclosure material	Polystyrene
Weight	Approx. 0.2 kg
Type of protection	IP 66

Electrical connections



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

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 both on the upper and underside

9.3 DIQ/CHV

Dimensions

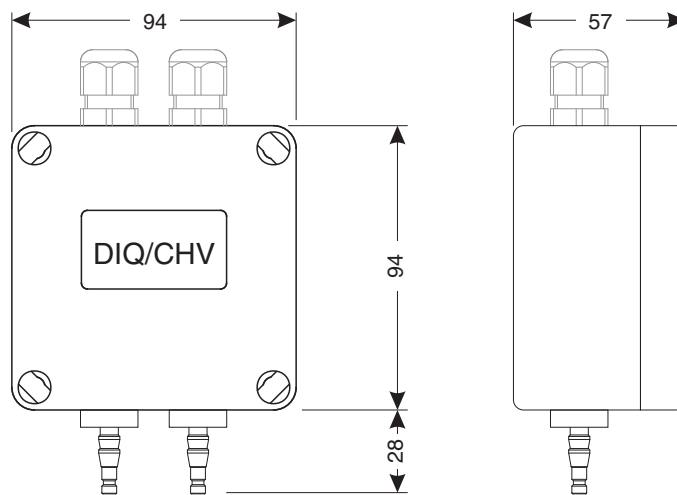


Fig. 9-3 Dimension drawing of DIQ/CHV (dimensions in mm)

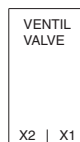
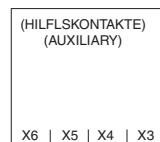
Mechanical structure

Enclosure material	Polystyrene
Weight	Approx. 0.3 kg
Type of protection	IP 66

Electrical connections

- 1 x valve switching contact
- 4 x potential-free terminals to connect interface lines

Terminal strip inside the enclosure:



Connecting terminals

Terminal type	Screw-type terminal strip						
Terminal ranges	<table> <tr> <td>Solid wires:</td> <td>0.2 ... 4.0 mm²</td> </tr> <tr> <td></td> <td>AWG 24 ... 12</td> </tr> <tr> <td>Flexible wires:</td> <td>0.2 ... 2.5 mm²</td> </tr> </table>	Solid wires:	0.2 ... 4.0 mm ²		AWG 24 ... 12	Flexible wires:	0.2 ... 2.5 mm ²
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 181 universal transmitter.

Compressed air

Required air quality	Dry, free of dust and oil
Operating pressure	Max. 7×10^5 Pa (7 bar) absolute
Connections on the DIQ/CHV	6 mm hose nozzles

10 Accessories and options

Description	Model	Order no.
IQ SENSOR NET cable - please specify required length in m when ordering	SNCIQ	480 046
	SNCIQ/UG	480 047
Set with four cable glands for cable sheath diameter of 7 to 13 mm	EW/1	480 051
Branching module	DIQ/JB	472 005
Valve module	DIQ/CHV	472 007
Kit for the mounting of one or two DIQ modules to a WTW mounting stand	MS/DIQ	472 009
Sun shield for the DIQ/S 181	SSH//IQ	109 295
Sun shield for the DIQ/S 181	SD/K 170	109 284
Mounting kit for the pipe installation of sun shields	MR/SD 170	109 286
Kit for wall mounting of the DIQ/S 181	WMS/IQ	480 052
Kit for switch panel mounting of the DIQ/S 181 Switch panel aperture 138 x 138 mm according to DIN 43700 or IEC 473 (max. thickness 10 mm)	PMS/IQ	480 048
Kit for mounting the DIQ/S 181 on a 35 mm top hat rail according to EN 50022	THS/IQ	480 050
Flexible conduit adapter for DIQ/S 181 components	CC-Box	900 120



Other accessories for the DIQ/S 181 are listed in the WTW catalog or on the Internet.

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Service address:

Xylem Analytics Germany
Sales GmbH & Co. KG
WTW
Dr.-Karl-Slevogt-Str. 1
82362 Weilheim
Germany

Tel.: +49 881 183-325
Fax: +49 881 183-414
E-Mail wtw.rma@xyleminc.com
Internet: www.WTW.com



Xylem Analytics Germany GmbH
Dr.-Karl-Slevogt-Str. 1
82362 Weilheim
Germany