Operating Manual

IQ SENSOR NET
System 2020 XT CONNECT



Modular multi-parameter measuring system
Controller MIQ/MC2

ba75970e01 10/2012

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1 Overview

1.1 How to use this system operating manual

Structure of the IQ SENSOR NET operating manual

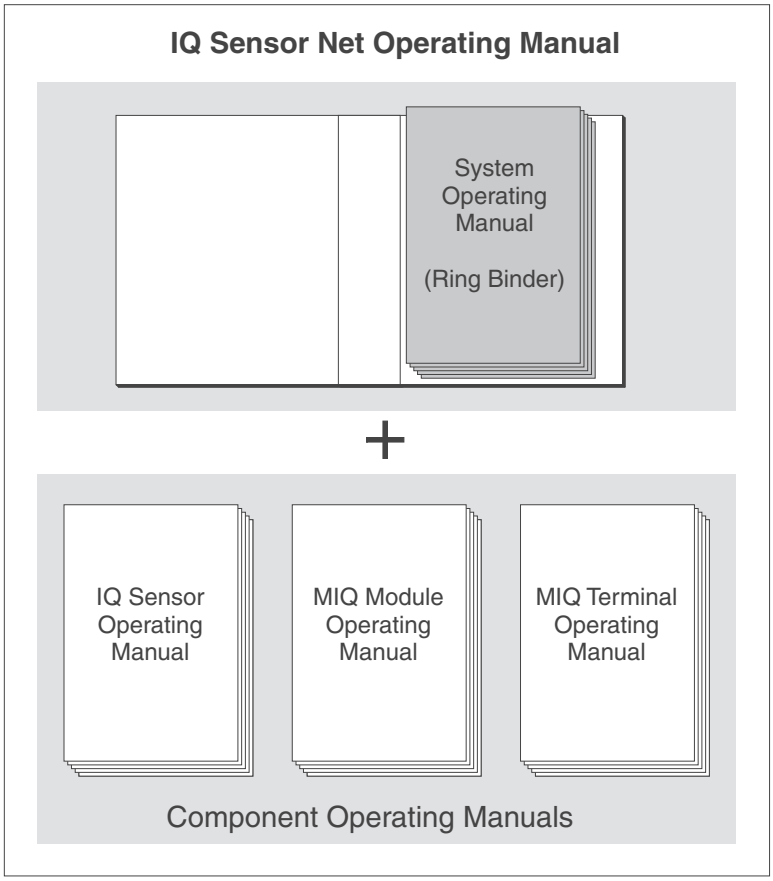


Fig. 1-1 Structure of the IQ SENSOR NET operating manual

The IQ SENSOR NET operating manual has a modular structure like the IQ SENSOR NET system itself. It consists of this system operating manual and the operating manuals of all the components used.

The space in the ring binder behind the system operating manual is intended for filing the component operating manuals. Please file all component operating manuals here so that all information is quickly available in one location.

1.2 The IQ SENSOR NET system2020 XT

1.2.1 Structure of the system

The IQ SENSOR NET is a modular measuring system for online analysis. Modular means that the essential functional units of the measuring system are distributed in components that can be individually compiled for special applications.

The essential functional units of the IQ SENSOR NET System 2020 XT CONNECT include:

- Controller
- Terminal
- IQ sensors
- Inputs (current inputs)
- Outputs (relay contacts, current outputs, valve outputs)
- Additional terminals (mobile terminal, PC Terminal CONNECT)
- Help functions (e.g. power supply unit).

System communication

The functional units are connected with one another via a common line (Fig. 1-2). The line consists of two wires and a shield. It transports digital information between the controller and the other modules. At the same time, the line is used to supply all modules with electrical voltage from a power supply unit. The power supply unit is only required for power supply and is not used in the system communication.

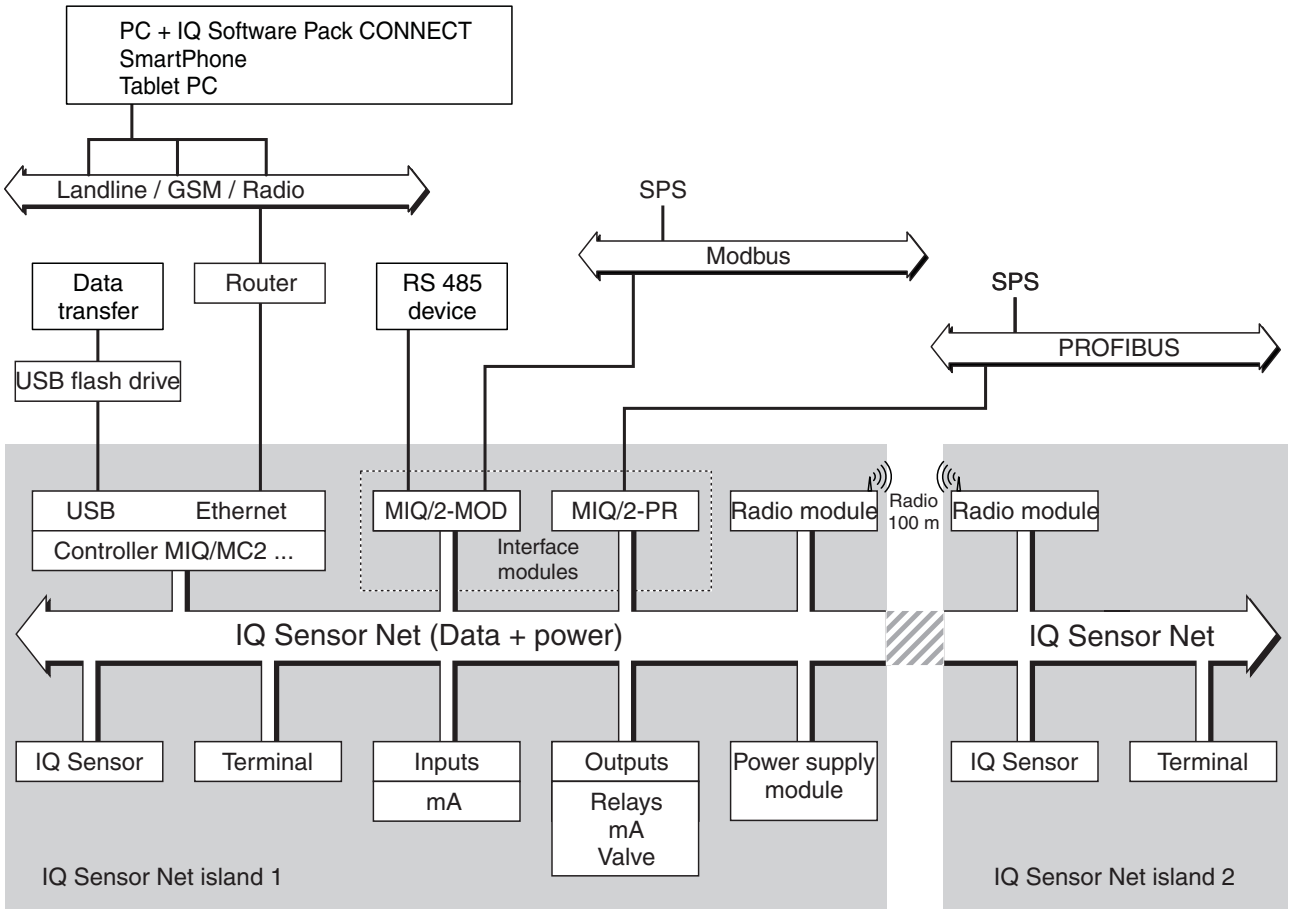


Fig. 1-2 Functional units of the IQ SENSOR NET

1.2.2 Functions in the IQ SENSOR NET

The functions of the IQ SENSOR NET are provided by the system (controller) and the retrofitting components. Details on the functions listed can be found in the relevant system or components operating manuals.

Function	Component
Alarm messages	System
Analog output	Current output module
Data logging	System
Data recording (PC)	IQ Software Pack CONNECT
Data transmission (PC)	IQ Software Pack CONNECT
Data communication (Profibus)	MIQ/MC2PR MIQ/2-PR

Function	Component
Data communication (Modbus)	MIQ/MC2-MOD MIQ/2-MOD
Data logger	IQ Software Pack CONNECT
Web server	MIQ/MC2
Differential sensor	System
Frequency output	Relay output module
Limit monitor	Relay output module
Calibration history	System
List of outputs, list of sensors	System
Log book	System
Log book (messages from components)	IQ sensor Output module
Measured value representation (4 types)	System
Password	System
PID controller	Current output module
Pulse-width output	Relay output module
Sensor cleaning	Relay output module Valve module
Local settings	System
Daily load diagram, weekly load diagram, monthly load diagram	System
Monitoring functions (sensors, system)	Output module

1.2.3 Possible ways to communicate with the IQ SENSOR NET

Digital communication

The IQ SENSOR NET can communicate with humans and machines via different interfaces.

The following page provides an overview:

- who can communicate with the IQ SENSOR NET
- what interfaces and components are required for this
- which functions are available with which interface

Current and relay interfaces

In addition to the digital communication, output modules provide relay and current outputs. These can be used for control, feedback control and monitoring functions.

Available functions / Who communicates with the IQ Sensor Net via which interface/component	Direct actions via the terminal user interface	Viewing/ transmitting current data: •Measured values • Status info •Alarm messages	Viewing/ transmitting logged data: •Measured values •Measured value status	System configuration, • save/ load • view • print	Calibration data, view/transmit
Human					
MIQ/TC 2020 XT, configured as a terminal	X	X	X		X
Human + PC					
MIQ/MC2 + Router + IQ Software Pack CONNECT	X	X	X	X	X
PROFIBUS DP					
MIQ/MC2-PR or MIQ/2-PR cyclical communication		X			
Modbus					
MIQ/MC2-MOD or MIQ/2-MOD Modbus-RTU RS485 bus operation		X			
PC ("data logger")					
MIQ/MC2 + Router + IQ Software Pack CONNECT (+ network)		X			X

1.2.4 Components of the system 2020 XT

Minimum configuration (basic components)

The following basic components are required for a System 2020 XT CONNECT:

- MIQ/MC2 controller
- A terminal/controller MIQ/TC 2020 XT (configured as terminal) or PC Terminal CONNECT
- A power supply module (e.g. MIQ/PS)
- At least one IQ sensor.

IQ sensors, main and secondary measured values

Sensors provide main measured values (e.g. pH, D. O. concentration, turbidity value...) and additionally, depending on the type, secondary measured values (e.g. temperature). In the System 2020 XT, digital WTW single sensors and multiple sensors can be used:

- Single sensors provide a main measured value and normally a secondary measured value (example: TriOxmatic 700 IQ → D. O. + temperature).
- All active 0/4-20 mA inputs of the MIQ/IC2 input module rank among the single sensors. Via a 0/4-20 mA input, any external instruments can be connected to the IQ SENSOR NET via their current output. Each input provides a main measured value.
- Multiple sensors provide several main measured values and normally one secondary measured value (example: VARiON 700 IQ → ammonium + nitrate + temperature).

> Each main measured value occupies a sensor location in the IQ SENSOR NET. A multiple sensor with two active main measured values thus occupies two sensor locations. The available sensor locations can be occupied by any single or multiple sensors.

Extension components

The system can be adapted to fulfill different specifications by adding further components, e.g. by:

- Terminals. They are the operation and communication units for the IQ SENSOR NET. Available are:
  - Mobile terminal/controller MIQ/TC 2020 XT (configured as terminal) for operation of the system from varying locations, for example for calibration of IQ sensors on site.
  - PC Terminal CONNECT. Connection to the PC via the Ethernet interface.
- Output modules with relay, current and valve outputs. Valve outputs enable the time controlled, compressed air operated cleaning of the sensor.

Each current output, relay output and valve output occupies an output channel in the IQ SENSOR NET. The available output channels can be assigned to outputs arbitrarily.

- Power supply modules for power supply
- MIQ/JB and MIQ/JBR branching modules to branch the system and to connect IQ sensors and terminals
- MIQ/Blue PS radio modules for wireless connection within the IQ SENSOR NET.

Maximum configuration

Maximum configuration of the IQ SENSOR NET system 2020 XT:

Component or resource	Maximum number
Controller MIQ/MC2(-...)	1
Sensor locations, can be occupied by: – Single sensors – Multiple sensors – 0/4-20 mA inputs	20
Terminal locations, can be occupied by: – MIQ/TC 2020 XT, configured as a terminal	3
PC Terminal CONNECT	1
Output channels, can be occupied by: – Current outputs – Relay outputs – Valve outputs	48
Power supply modules (e.g. MIQ/PS)	6
MIQ/JB branching modules	25
MIQ/JBR branching modules with integrated signal processing	2
MIQ/Blue PS radio modules	several transmission paths (see operating manual of the MIQ/Blue PS)

Connecting MIQ modules

There are two basic mounting variants for connecting the MIQ modules:

- **Stack mounting** - permanent mechanical and electrical connection. The housings of the MIQ modules are permanently mounted on one another to form a stack. No cabling is necessary.
- **Distributed mounting** - electrical connection via cable. Locally separated MIQ modules or module stacks are connected with one another via the SNCIQ or SNCIQ/UG cable.

The following diagram shows an IQ SENSOR NET system with two mounting variants (Fig. 1-3).

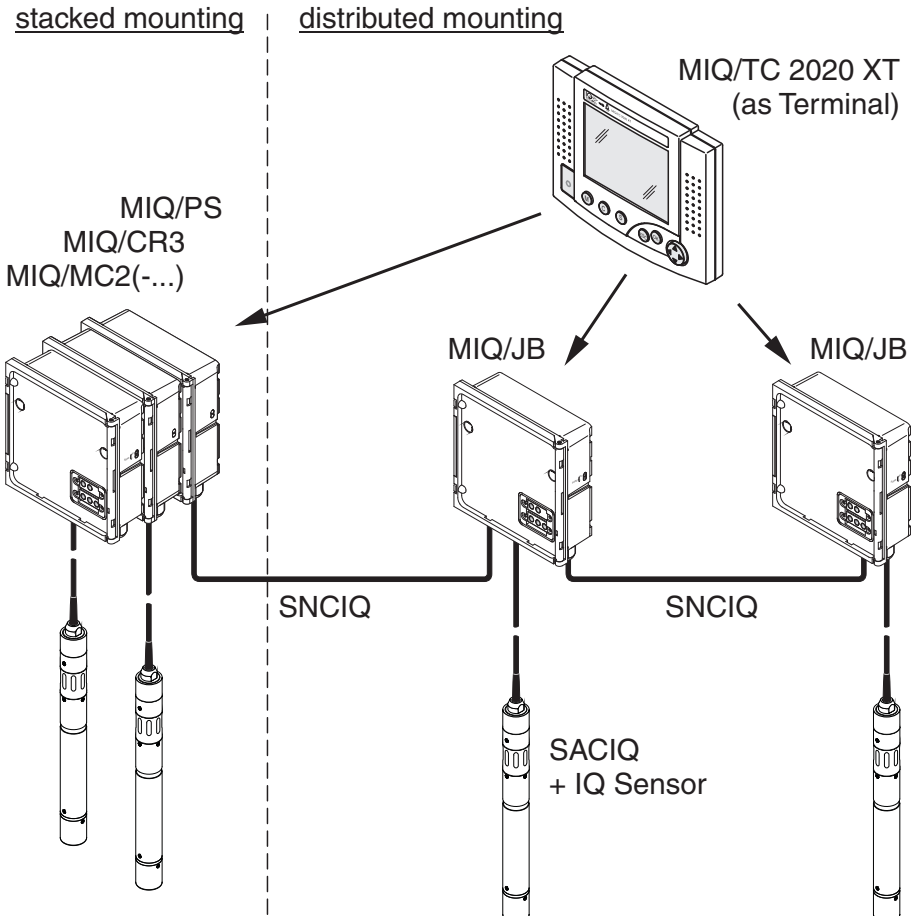


Fig. 1-3 Example of an IQ SENSOR NET system configuration

IQ sensors

Up to 20 IQ sensors of any type can be used in the 2020 XT system. They can be connected to any MIQ module that has a free connection for the IQ SENSOR NET. The connection between the IQ sensor and MIQ module is made via the SACIQ sensor connection cable. The IQ sensor connection cable is connected with the plug head connector of the IQ sensor via a screwable socket to form a watertight connection. As a result, the IQ sensor can be quickly removed for maintenance activities and then connected again.

1.2.5 MIQ modules

Some of the IQ SENSOR NET components are so-called MIQ modules with different functions.

All MIQ modules have a standard housing with the following features (Fig. 1-4):

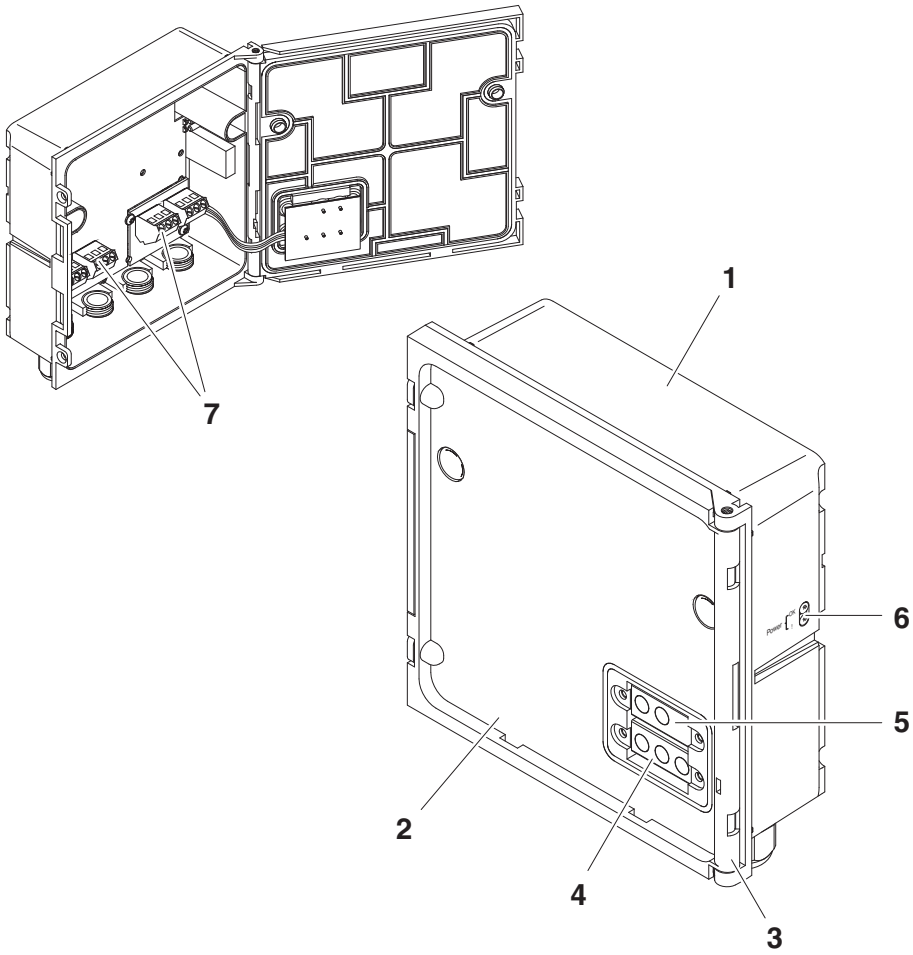


Fig. 1-4 MIQ module

1	Housing
2	Lid
3	Hinge
4	Contacts for voltage and communication
5	Contacts for the local identity function
6	Voltage LEDs
7	Terminal strip (example)

Common characteristics of the MIQ modules

- **Module lid with hinge**
  Due to its wide opening angle, the lid provides a large space for working inside the module (e.g. for connecting lines to the terminal strip).
- **Docking facility**
  MIQ modules can be mechanically docked onto one another. As a result, several MIQ modules can be mounted in the form of a stack to create a single unit (**stack mounting**). At the same time, docking enables the MIQ modules to be electrically connected with one another via the module contacts on the front and back so that no cabling is required. Even when it is part of a stack, each MIQ module can be opened. In addition, a terminal component can be docked onto each free lid front.
- **Terminal strip**
  Further IQ SENSOR NET components can be connected by cable to the terminal strip inside the housing (**distributed mounting**). The terminal strip enables IQ sensors to be connected via the SACIQ sensor connection cable or the IQ SENSOR NET can be further branched and extended here. Certain MIQ modules have a terminal strip with further specific connections (e.g. power connection, relay contacts, current outputs).
- **Local identity function**
  The local identity function is integrated in each MIQ module in the form of a memory chip. This memory chip can store information such as the designation of the measurement location and a specific selection of IQ sensors for the measured value display. This information is output when a terminal is docked and, thus, e.g. enables the rapid finding of local IQ sensors for calibration.
- **Voltage diagnosis via LEDs**
  Two LEDs, yellow and red, on the side of the housing are used to monitor the operational voltage of each MIQ module.

1.2.6 MIQ/MC2 controller

The MIQ/MC2 controller does the following jobs:

- Control and monitoring of all IQ sensors
- Control and monitoring of all current and relay outputs
- Continuous diagnosis of the system, i.e. the information and error messages of all components is recorded and entered in the system log book (example: voltage monitoring)
- Recording of measurement data

Digital interfaces

The MIQ/MC2 controller is has the following digital interfaces:

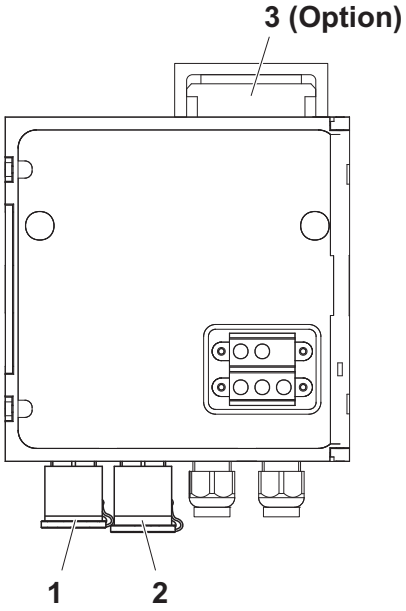


Fig. 1-5 MIQ/MC2

1	USB interface (socket type A) for measurement data download and software updates.
2	Ethernet interface (RJ45 socket or LSA terminal strip on the main PCB)
3	Field bus interface with climate-resistant D-sub plug connection, depending on the instrument type: – MIQ/MC2-PR: Profibus-DP – MIQ/MC2-MOD: Modbus

The present operating manual covers the common basic functions of all variants of the MIQ/MC2 controller.

1.2.7 Terminals

A terminal is required to view measurement data and to configure the IQ SENSOR NET system. The following terminal components are suitable:

- MIQ/TC 2020 XT, configured as a terminal
- PC Terminal CONNECT, connected to a PC via the Ethernet interface.



The system System 2020 XT CONNECT is not compatible with the no longer available terminals MIQ/T2020 and MIQ/T2020 PLUS.

1.2.8 Behavior of the IQ SENSOR NET in case of power failure

- The system configuration (*Settings of sensors and diff. sensors* and *Settings of outputs and links*) is stored permanently
- All stored measured data remain permanently available
- Linked current outputs and relay outputs switch to the non-active condition.
  Current output: 0 mA current
  Relay output: Relays open
  For details, refer to the component operating manual of the current or relay output module.
- When the power supply is available again, the system is automatically restarted, starts working again and switches to the measured value display
- During the restart, an entry informing of the power failure is made in the log book.

1.2.9 Behavior of the IQ SENSOR NET if a components fails

- If the operating voltage is too low, the LEDs on the MIQ modules extinguish.
- If active components (e.g. sensors or output modules) cannot be contacted, an entry is made in the log book. The error symbol flashes on the display.
- The *Edit list of sensors* or *Edit list of outputs* display shows a question mark "?" for the component.

Component	Behavior
IQ sensor	● The configuration for the IQ sensor (*Settings of sensors and diff. sensors*) remains stored. ● Current measured values are not available. ● The measured value display shows *ERROR.*
MIQ modules	● If an active module fails, an entry is made in the log book. The error symbol flashes on the display.
Controller	● No current measured data can be displayed, processed or stored. ● If communication with the controller is disturbed, output modules activate the error behavior after 2 minutes (see component operating manual of the output module).
Output module	● The configuration for the output module (*Settings of outputs and links*) remains stored.
Terminal	● The measured value display is not updated. ● The display does not react to entries. ● The system continues working. ● Stored measured data and the system configuration remain stored.
Power supply module	like power failure (see section 1.2.8)

1.2.10 Availability of the system

The IQ SENSOR NET was optimized to achieve a very high availability. The high availability is achieved through

- The two-wire connection technique that is not interference-prone
- The digital signal transmission resulting from this
- Tools for error diagnosis
  - LEDs on the MIQ modules to check the available voltage
  - Log book messages with instructions to eliminate problems
- Quick replacement of components with minimum configuration requirements (see section 10.4). The system configuration (*Settings of sensors and diff. sensors* and *Settings of outputs and links*) and the measured data are stored in the controller and remain stored when other components are used.

Preventive actions to optimize the availability of the system

If the requirements of the availability are especially high, you can further improve the availability of the system as follows:

- Install identical components in the system.
  If the requirements of the availability are high, components can be installed doubly in the system (exception: controller component).
- Keep substitute components ready.
  The system automatically recognizes substitute components of active components (IQ sensors and the output modules). They are easily integrated in the system by assigning them as substitute components.
- Save the system configuration.
  The system configuration (*Settings of sensors and diff. sensors* and *Settings of outputs and links*) can be saved on a PC. The data are transferred via the Ethernet interface or the USB interface. The stored system configuration can be loaded from the PC to a substitute controller that might be necessary.

1.2.11 Compatibility of the MIQ/MC2 (System 2020 XT CONNECT) with components of an existing IQ SENSOR NET system

The MIQ/MC2 controller uses modern network engineering (Ethernet) for communication with the IQ SENSOR NET system.

If the MIQ/MC2 controller replaces an MIQ/MC controller in an existing IQ SENSOR NET system, your IQ SENSOR NET system may have to be adapted due to the altered communication.

Please replace the following older components by compatible components to ensure the failure-free operation of the IQ SENSOR NET System 2020 XT CONNECT:

Incompatible components	Compatible components
● Terminal T2020 ● Terminal T2020 (Plus)	● Terminal/Controller TC2020XT (configured as a terminal)
● MIQ/IF232 + IQ SoftwarePack	● Ethernet interface (MIQ/MC2) + IQ Software Pack CONNECT

All other components of an existing IQ SENSOR NET system can be used in the System 2020 XT CONNECT without restriction.

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 meter 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 danger level:



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 possibly dangerous 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 IQ SENSOR NET system (power packs, controller, 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 System 2020 XT CONNECT consists of its use as a sensor in the IQ SENSOR NET. Only the operation and running of the product according to the instructions and technical specifications given in this operating manual is authorized (see chapter 8 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 8 TECHNICAL DATA).

2.3 User qualification

Target group

The IQ SENSOR NET 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 MIQ/PS power supply module to the power line (see MIQ/PS module manual).
- Connection of external, line voltage-carrying circuits to relay contacts (see module manual of the relay output module).



WARNING

A circuit (except for the power supply connections), that is connected to an IQ SENSOR NET component, must not feed any voltages or currents that are not allowed. It has to be made sure that the circuit at any time meets all requirements of a *Limited circuit* or *Limited Power* as well as of *SELV* (Safety Extra Low Voltage). These include the following limiting value specifications:

- **AC voltage: max. 30 V effective / 42.4 V peak**
- **DC voltage: max. 60 V**
- **Current limit: max. 8 A**
- **Power output limitation: max. 150 VA**

3 Installation

3.1 Scopes of delivery

MIQ modules standard scope of delivery

- MIQ module MIQ/MC2 with the following interfaces
  - USB
  - Ethernet
  - optional: MODBUS or PROFIBUS
- Accessory set, including:
  - 4 x cable glands (clamping range 4.5-10 mm) with seals and blind plugs
  - 4x ISO blind nuts M4 with suitable cheese-head screws and plain washers
  - 2x countersunk screws M3x8 to close the module lid (+ 2 replacement screws)
  - 1 x contact base with fixing screws
- Operating manual.

3.2 Requirements of the measurement location

The respective measurement location of all IQ SENSOR NET components must meet the environmental conditions specified in section 11.1 GENERAL SYSTEM DATA.

3.3 Basics of the installation

3.3.1 System planning

Overview of planning steps

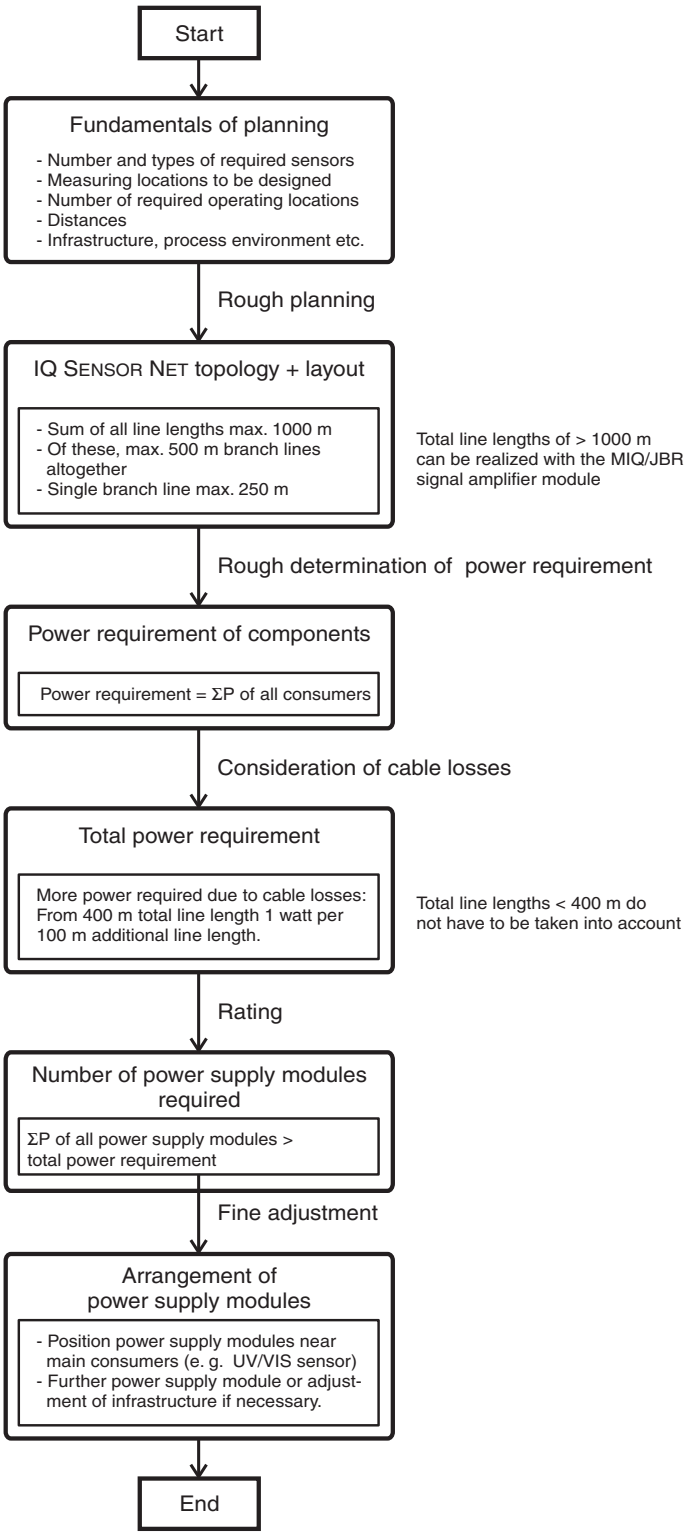


Fig. 3-1 System planning

3.4 Basic requirements for optimum installation

3.4.1 General information

The IQ SENSOR NET supplies all components with low voltage as well as digital communication via a shielded 2-wire line.

Due to this characteristic, the following factors must be taken into account in the planning of an IQ SENSOR NET system:

- Power consumption of all components (power rating). Primarily, this determines the number of power supply modules required (section 3.4.2).
- Distance of the components from one another. Large distances may require a further MIQ/PS power supply module and/or an MIQ/JBR signal amplifier module (section 3.4.3).
- Placement of the MIQ/PS power supply modules in the IQ SENSOR NET (effect on the power supply - section 3.4.3).

Note
Only IQ SENSOR NET products may be used in the IQ SENSOR NET.

3.4.2 Drawing up the power rating

Power rating - why?

All components in the system require a specific level of electrical power for operation. Thus, it is necessary to draw up a power rating after selecting the desired components. At the same time, this can determine whether the entire power requirement of all components (consumers) is covered by the existing MIQ power supply modules. If this is not the case, the power available in the system must be increased by further MIQ power supply modules.



The power rating provides an initial guide value. In specific limiting cases, the power supply may be insufficient despite the positive power rating. Long cable lines, for example, result in additional power losses that may have to be compensated by further MIQ power supply modules. This can be checked for the planned installation by following section 3.4.3.

The total power requirement P of all consumers can be determined from the following table:

Power requirement of IQ SENSOR NET components

Component	Power requirement [W]
IQ sensors	
SensoLyt® 700 IQ (SW)	0.2
TriOxmatic® 700 IQ (SW)	0.2
TriOxmatic® 701 IQ	0.2
TriOxmatic® 702 IQ	0.2
FDO® 70x IQ (SW)	0.7
TetraCon® 700 IQ (SW)	0.2
VisoTurb® 700 IQ	1.5
ViSolid® 700 IQ	1.5
AmmoLyt® *Plus* 700 IQ	0.2
NitraLyt® *Plus* 700 IQ	0.2
VARiON® *Plus* 700 IQ	0.2
Spectral sensors XXXVis® 7YY IQ (e.g. NiCaVis® 705 IQ)	8.0
IFL 700	5.5
IFL 701	3.0
MIQ modules	
MIQ/JB	0
MIQ/JBR	0
MIQ/CR3	3.0
MIQ/C6	3.0
MIQ/R6	1.5
MIQ/IC2	0.2 + 2.2 W per connected WG 20 A2 power supply/isolator
MIQ/CHV	2.0
MIQ/CHV PLUS	1.0
MIQ/Blue PS	0.6
MIQ/2-PR	2.0
MIQ/2-MOD	1,6
Terminal, controller	
MIQ/MC2	1,6
MIQ/MC2PR	2.0
MIQ/MC2-MOD	1,6
MIQ/TC 2020 XT	3.0

Determining the number of MIQ power supply modules

From the value determined for the power requirement, determine the number of the MIQ power supply modules as follows:

Total power requirement P	Number of MIQ power supply modules
P ≤ 18 W	1
18 W < P ≤ 36 W	2
36 W < P ≤ 54 W	3
54 W < P ≤ 72 W	4
72 W < P ≤ 90 W	5
90 W < P ≤ 108 W	6

Sample configuration	Power requirement [W] (component)	Total power requirement P [W] (sum of the components)	Number of power supply modules required
1 MIQ/MC2	1,6	1,6	1
+ 1 MIQ/TC 2020 XT	+ 3.0	4,6	1
+ 1 NiCaVis® 705 IQ	+ 8.0	12,6	1
+ 1 VisoTurb 700 IQ	+ 1.5	14,1	1
+ 1 MIQ/CR3	+ 3.0	17,1	1
+ 1 SensoLyt 700 IQ	+ 0.2	17,3	1
+ 1 MIQ/CR3	+ 3.0	20.2	2
+ 1 MIQ/TC 2020 XT	+ 3.0	23,3	2

The determined number of power supply modules required in the IQ SENSOR NET can increase if the cables are very long (see section 3.4.3).

Power supply with the aid of the MIQ/Blue PS radio module

The MIQ/Blue PS radio module can provide power for components with a total of up to 7 W power consumption on an IQ SENSOR NET island. Details of this are given in the operating manual of the MIQ/Blue PS.

3.4.3 Effect of the cable length

The length of the cables in the IQ SENSOR NET affects

- the operating voltage available for a component
- the quality of data transmission.

All information applies to SNCIQ cable material only. As regards the copper wire diameter and dielectric, this cable is especially designed for the combined energy and data transmission via great distances and ensures the lightning protection characteristics stated in chapter 11 TECHNICAL DATA.

Voltage drop due to cable lengths

Very long cables in the IQ SENSOR NET cause voltage drops with growing distance from the power supply module. If the voltage is under the limit values, further IQ power supply modules must be used to compensate.

Guideline

If the power supply modules are positioned in the vicinity of the main consumers and the total cable length is no more than 400 m, no additional cable losses have normally to be taken into account. Main consumers are components with a power consumption of 5 W or more.

When determining the number of power supply modules required, the most unfavorable design has to be taken into account for mobile components (MIQ/TC 2020 XT). I. e., take into account

- the maximum number of mobile components and
- their greatest possible installation distance from the power supply unit.

Determining the length of the cable section

A diagram is used to determine whether an additional MIQ power supply module is necessary for the planned installation. To do so, the length of the cable section must be determined.

A cable section is the longest continuous length of cable from an MIQ power supply module to a consumer. Sensor connection cables up to 15 m are not taken into account in this.

Example The following figure shows the length of the cable section L made up of the partial lengths L1, L2 and L3 as the cable section L4 is shorter than L3:

L = L1 + L2 + L3

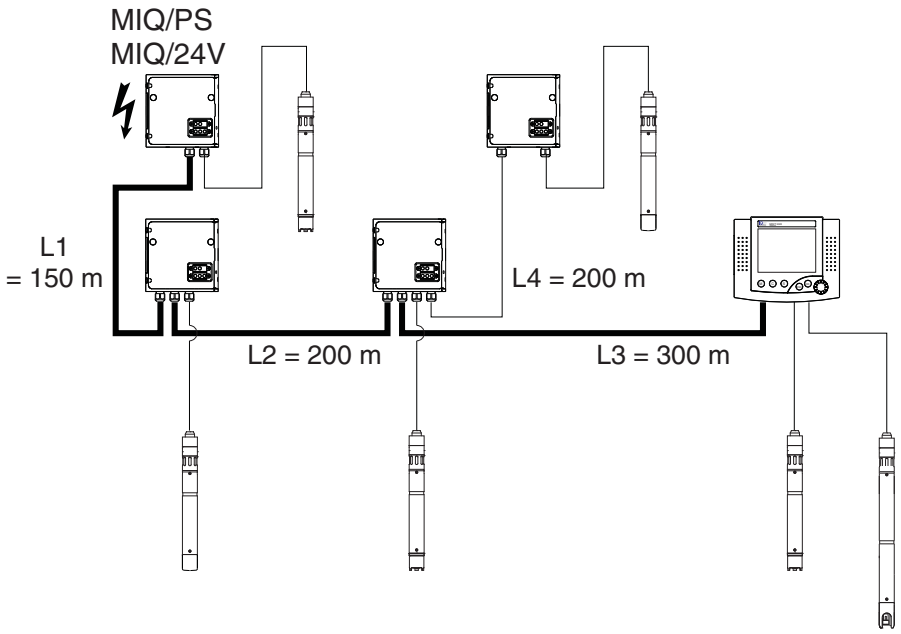


Fig. 3-2 Example of determining the cable section

Checking the power supply

1	Determine the length of the cable section for the planned installation.
2	Determine the sum of the power consumption of all consumers along the cable section (including IQ sensors).
3	Enter both determined values as a point in the following diagram.

To make it easier it is assumed that all consumers are placed at the end of the cable section.

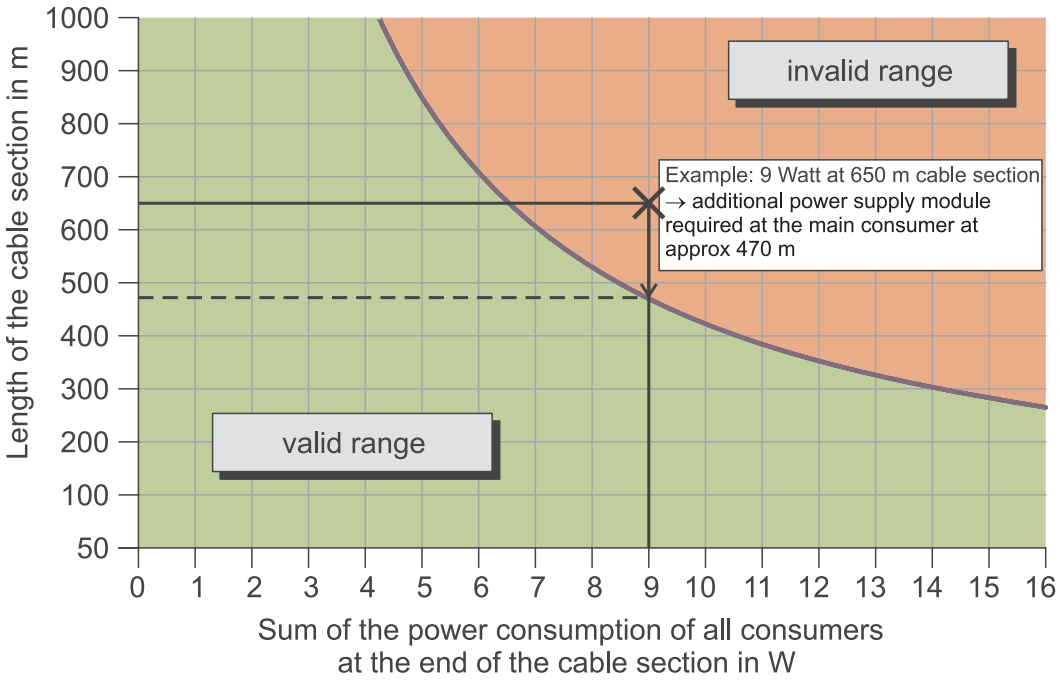


Fig. 3-3 Diagram to check the power supply

4	<u>Evaluation:</u> If the point is in the lower, valid range, no additional power supply module is required. If the point is in the upper, invalid range, an additional power supply module is required. Install this power supply module in the vicinity of the main consumers of this section, or, if not possible, - starting from the primary MIQ power supply module - approx. at that point of the section where the maximum cable length is exceeded (see following example).

Example

Problem:

Consumers with a total power requirement of 9 W are positioned on a cable section of 650 m. Is the power supply with one power supply module sufficient? At which point must a further power supply module be installed if necessary?

Proceeding:

- Enter both values as a point in the diagram (point "x" in Fig. 3-3).
- Result: the point is in the invalid range. I. e. the power supply is not sufficient.
- Draw down a vertical line from the point until the line crosses the limit between the upper and lower range. The intersecting point specifies the maximum cable length for the existing power requirement (at approx. 470 m). This is the place where the additional power supply module is required.
- If any main consumers are near the place, the power supply module should be installed in their vicinity (ideally, directly on them).



After commissioning, you can check the voltage directly on the MIQ modules or on the terminal connections of the IQ sensors (see section 10.2.2). The limits of the voltage levels are given in this operating manual in section 10.2.2 MEASURING THE VOLTAGE.

Quality of data transmission

If the sum of all line lengths (including the SACIQ sensor connection cable) exceeds 1000 m, an MIQ/JBR signal amplifier module must be installed in the system. More details of this are given in the MIQ/JBR component operating manual.

3.4.4 Optimum installation of MIQ power supply modules

Basic rules

- Install the MIQ power supply modules as near as possible to the IQ SENSOR NET components with the highest power consumption. This also applies in the case of several MIQ power supply modules in the system.
- If possible, assemble the IQ SENSOR NET in a star configuration from the MIQ power supply modules.

3.4.5 Installation guidelines for lightning protection

When using the IQ SENSOR NET measuring technique, 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 WTWonline instrumentation as so-called 'lightning protection' (see chapter 11 TECHNICAL DATA).

The exterior protective measures of the installation environment can be carried out observing the following guidelines:

1 All lines of IQ SENSOR NET 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 the SNCIQ or SNCIQ-UG cable material must be used. This cable material, particularly the high line cross section of the cable shielding (1.5 mm²), 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 IQ SENSOR NET components. It is not recommended to use cables from other manufacturers with usually appreciably lower shielding conductor cross sections.

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

which MIQ 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 IQ SENSOR NET cable and via the valuable sensors in the measuring medium.

4 The contacts of the MIQ modules always have to be protected with the respective contact covers when they are not used by terminal components. The contact cover provides improved insulation against the electric fields of a thunderstorm event through the extension of the air and creepage paths.

5 It is recommended to attach a metallic or nonmetallic sun shield to each outside location of the MIQ modules. Sun shields protect the electric field lines in the area of the MIQ module through 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.

6 The mains voltage for supplying the measuring system 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.

7 The IQ SENSOR NET safety and lightning protection concept is partly based on the high-quality protective insulation of the line power supply units and the total system. It does not have or require any protective ground (PG) conductor or earth terminal. Avoid any direct connection of the IQ SENSOR NET connections or the metallic sensor enclosures with the local grounding or potential equalization system and with metallic construction elements (see point 9).

8 Additional external lightning protection measures directly on the IQ SENSOR NET system or its components, 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.

9 For the realization of the internal lightning protection of the system (e.g. wastewater treatment plant control stands) and for the protection of IQ SENSOR NET external resources, cable entry points into buildings or distributions coming from the IQ SENSOR NET 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. Shielding terminals (e.g. of the PROFIBUS system) have to be used 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.
- The PROFIBUS and Modbus cables have to be installed according to the rules of the respective bus system.
- Relay lines should be connected to the local potential equalization in order to provide general and consistent protection via gas overvoltage surge arresters.

3.5 Connecting system components

3.5.1 General information

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

- **Stacked mounting of MIQ modules**
  Up to three MIQ modules can be installed and mechanically connected with one another to form a stack at a single location. The contacts on the front and rear automatically create the electrical connection between the MIQ modules in the stack (section 3.5.2).
- **Distributed mounting of MIQ modules**
  Individual MIQ modules or an assembled module stack are installed at various locations (for example, a central control unit and an MIQ branching module for connecting IQ sensors at the edge of the basin). The spatial distance is bridged with the aid of the SNCIQ or SNCIQ/UG cable (section 3.5.3).
- **Connection of IQ sensors:**
  IQ sensors are connected to an MIQ module with the aid of the SACIQ cable. This cable is available in different lengths. The MIQ module must have a free SENSORNET connection on the terminal strip. On the sensor side, the connection is made via a plug that is standard for all IQ sensors (section 3.5.4).
- **Docking of a terminal unit:**
  A terminal unit is attached to the lid of a free MIQ module with the aid of a quick-release locking mechanism.

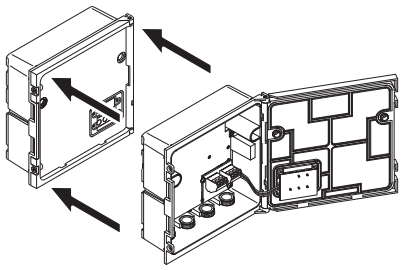
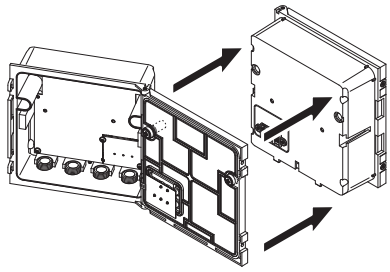
Note
Distributed mounting is only allowed in a star configuration. The system must nowhere be closed to form a ring. Only use the assembly material provided for the installation.

3.5.2 Stacked mounting of MIQ modules:

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

Mounting direction

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

Variant 1 - stack expansion forwards. The back of an MIQ module is attached to the lid of another MIQ module (page 3-15).	
Variant 2: - stack expansion backwards. The lid of an MIQ module is attached to the back of another MIQ module (page 3-18).	

Which variant is suitable for a specific case depends on whether and how an MIQ module is already permanently installed at a location (e.g. on a wall or in a panel), among other factors.

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

Materials required

- 2 x ISO blind nuts M4
- 2 x cheese-head screws M4x16 with plastic washer
- 1 x contact base with two plastic tapping screws.

Tools

- Phillips screw driver.

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

Variant 1: Stack expansion forwards

Preparing the stack mounting

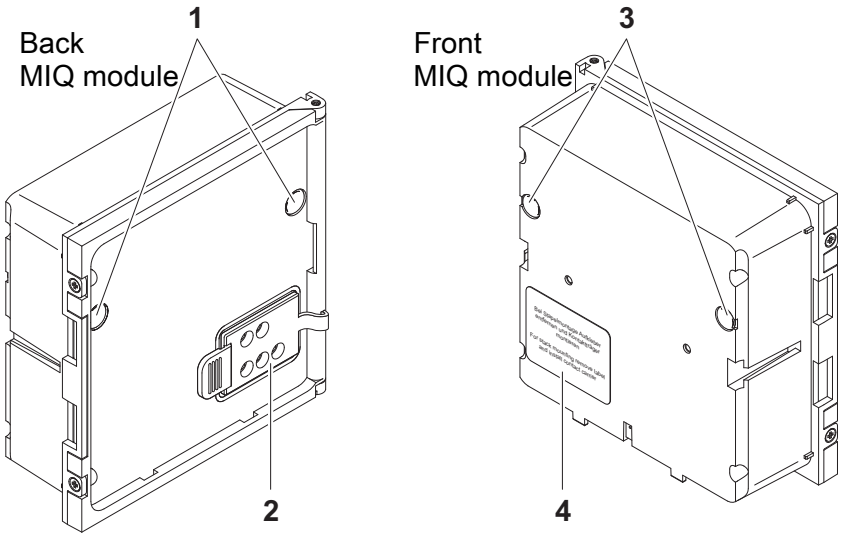


Fig. 3-4 Preparing MIQ modules for stack mounting (variant 1)

1	Remove the covers from the drilled mounting holes (pos. 1 and 3 in Fig. 3-4).
2	Remove the contact cover (pos. 2).
3	Pull off the adhesive label (pos. 4).

Mounting the contact base

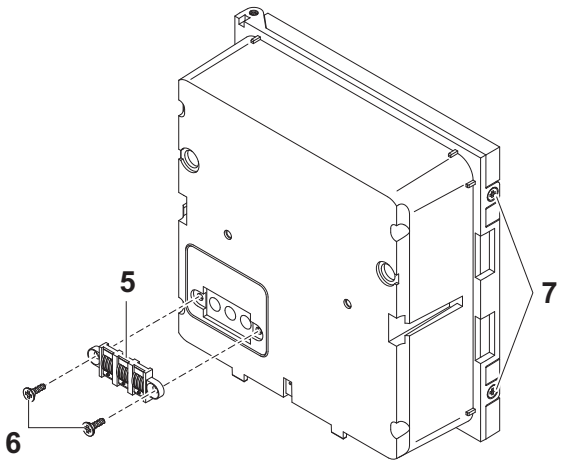


Fig. 3-5 Mounting the contact base (variant 1)

Note

Only IQ SENSOR NET products may be used in the IQ SENSOR NET.

4	Attach the contact base (pos. 5 in Fig. 3-5) on the front MIQ module with the two plastic tapping screws (pos. 6).
5	On the front MIQ module, remove the two countersunk screws (pos. 7 in Fig. 3-5) and swing open the module lid.

Premounting the ISO blind nuts

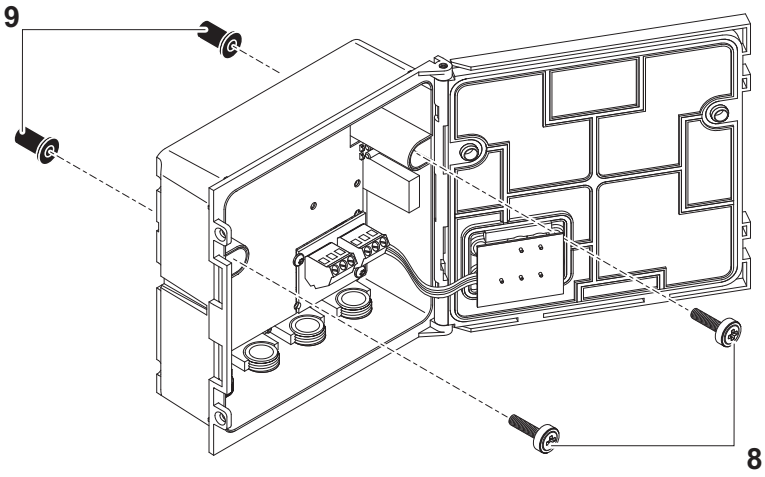


Fig. 3-6 Premounting the ISO blind nuts (variant 1)

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

Stacking the MIQ modules

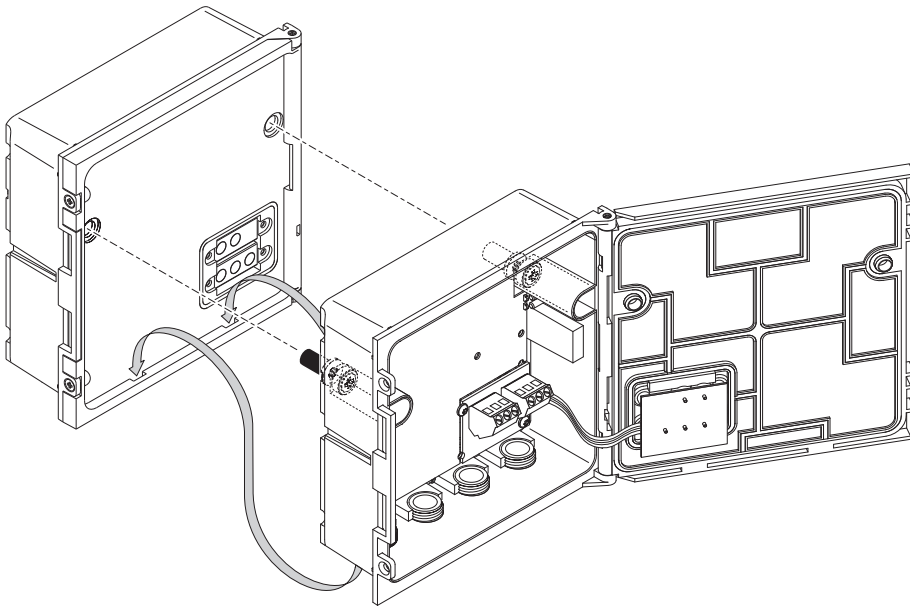


Fig. 3-7 Stacking the *MIQ modules (variant 1)*

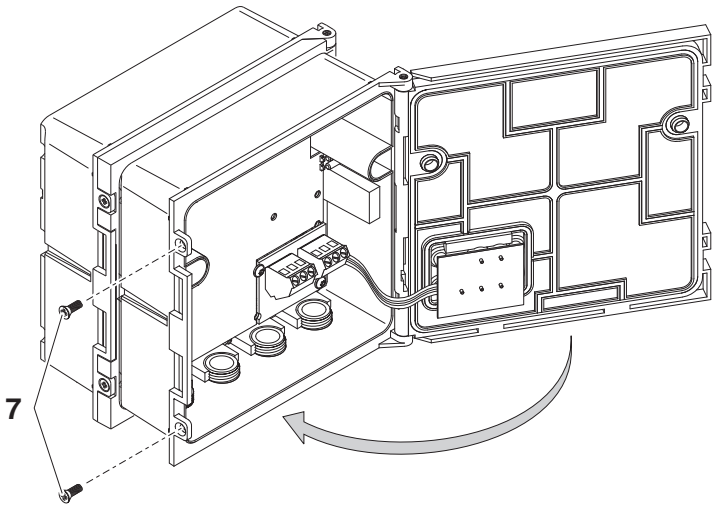


Fig. 3-8 Closing the enclosure (variant 1)

7	Attach the prepared MIQ module to the lid of the back MIQ module. At the same time, ensure that the two clips on the front MIQ module click into place in the lid of the back MIQ module. Subsequently, tighten the two screws (pos. 8 in Fig. 3-6).
8	Check the position of the SN terminator switch and correct it if necessary (see section 3.10.1).

9	Close the lid of the front MIQ module and fix it with the two countersunk screws (pos. 7 in Fig. 3-8).

Variant 2: stack expansion backwards

Preparing the stack mounting

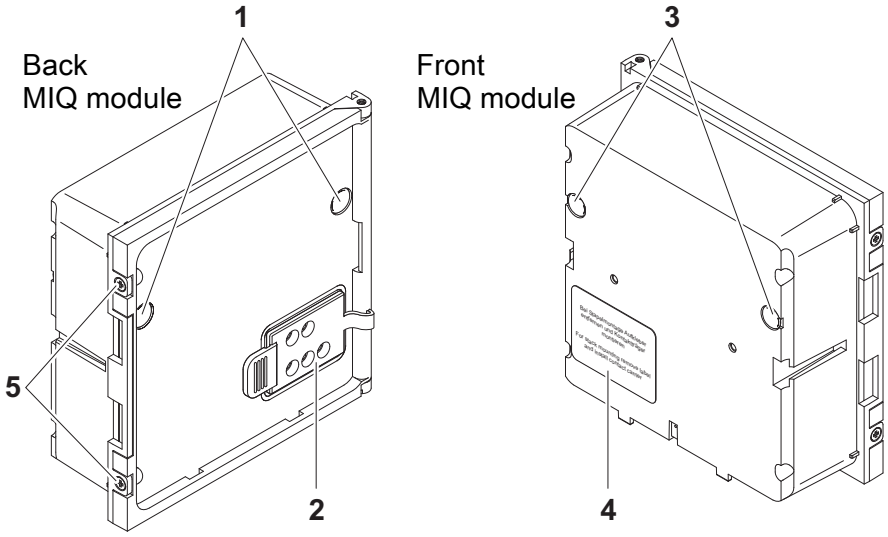


Fig. 3-9 Preparing the MIQ modules for stack mounting (variant 2)

1	Remove the covers from the drilled mounting holes (pos. 1 and 3 in Fig. 3-9).
2	Remove the contact cover (pos. 2).
3	Pull off the adhesive label (pos. 4).
4	On the back MIQ module, remove the two countersunk screws (pos. 5) and swing open the module lid.

Mounting the contact base

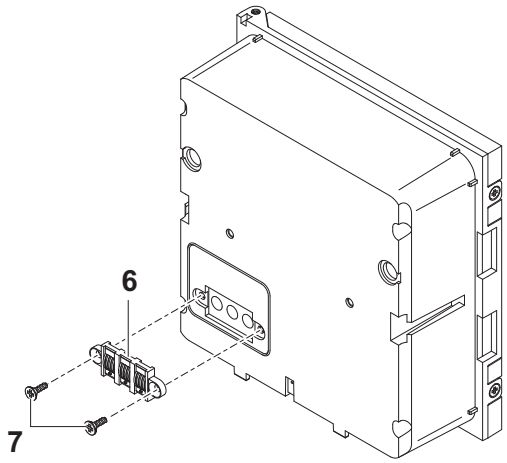


Fig. 3-10 Mounting the contact base (variant 2)

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

5	Attach the contact base (pos. 6 in Fig. 3-10) on the front MIQ module with the two plastic tapping screws (pos. 7).

Premounting the ISO blind nuts

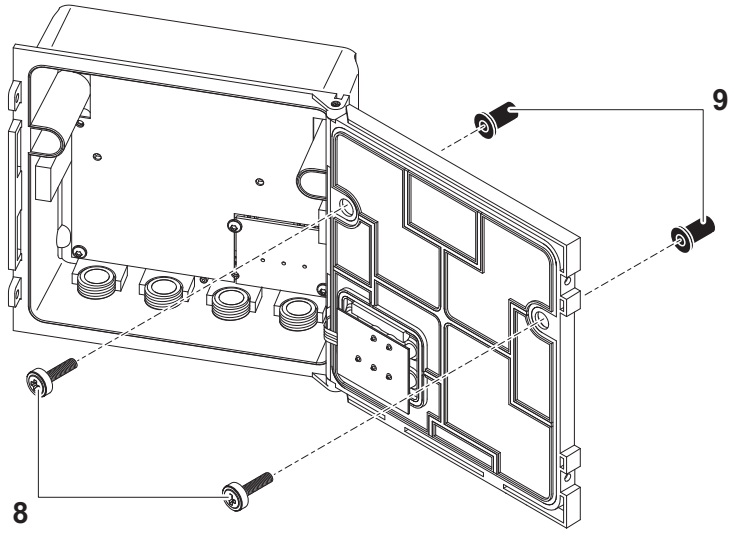


Fig. 3-11 Premounting the ISO blind nuts (variant 2)

6	Insert the cheese-head screws (pos. 8 in Fig. 3-11) with the plastic washers in the drilled mounting holes in the module lid and loosely screw in the ISO blind nuts (pos. 9).

Stacking the MIQ modules

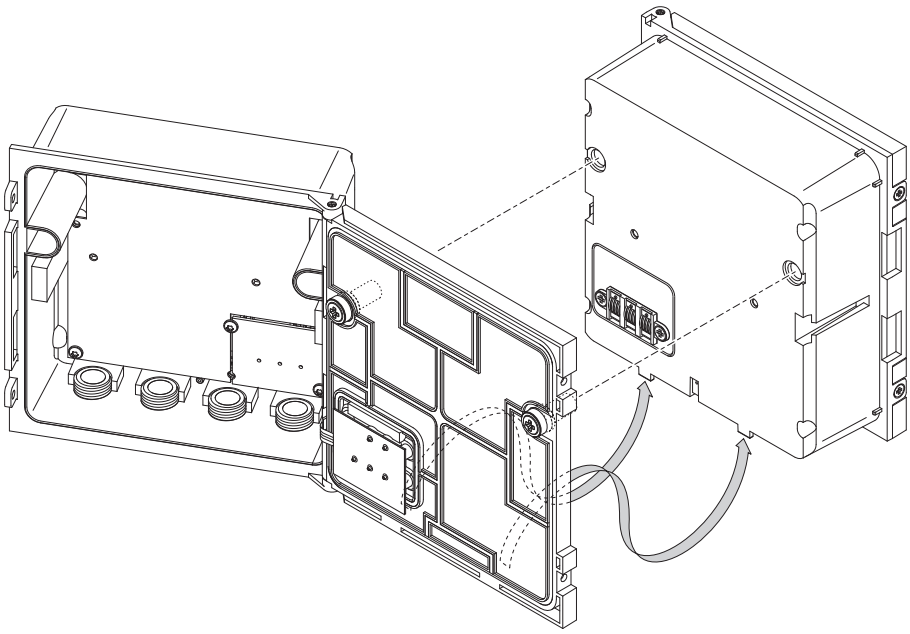


Fig. 3-12 Stacking the *MIQ modules (variant 2)*

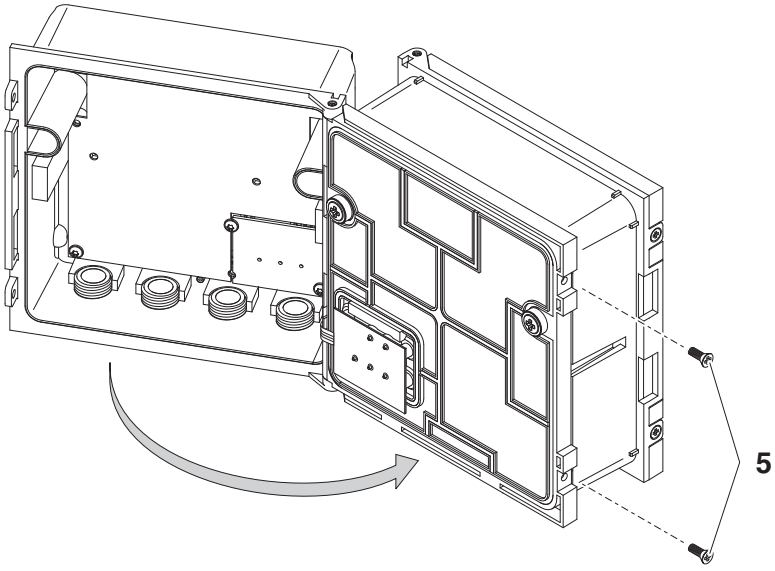


Fig. 3-13 Closing the housing (variant 2)

7	Attach the prepared MIQ module to the back of the front MIQ module. At the same time, ensure that the two clips on the front MIQ module click into place in the lid of the back MIQ module. Subsequently, tighten the two screws (pos. 8 in Fig. 3-11).
8	Check the position of the SN terminator switch and correct it if necessary (see section 3.10.1).

9	Close the back MIQ module and fix it with the two countersunk screws (pos. 5 in Fig. 3-13).

3.5.3 Distributed mounting of MIQ modules

General information

The following IQ SENSOR NET cables can be used for distributed mounting:

- SNCIQ cable
- SNCIQ/UG earth cable - suitable for underground laying according to VDE 01816, Part 2 and DIN/VDE 0891, Part 6.

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

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

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

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

Materials required

- 1 x SNCIQ or SNCIQ/UG connection cable (see chapter 12 ACCESSORIES AND OPTIONS)
- Wire end sleeves for 0.75 mm^2 wire cross-section with matching crimping tool
- 1 x cable gland with seal (scope of delivery of MIQ module).

Tools

- Cable stripping knife
- Wire stripper
- Phillips screw driver
- Small screw driver.

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 and outer insulation).
3	Only for the SNCIQ/UG earth cable: strip the outer insulation for 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.

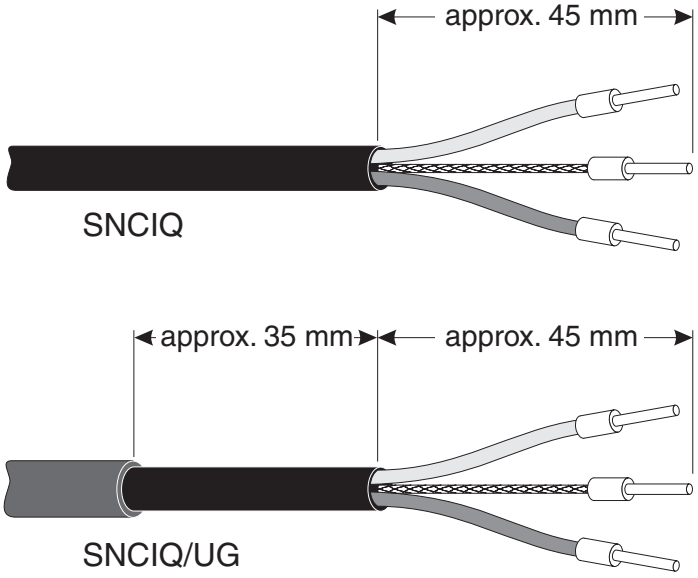


Fig. 3-14 Prepared cable end

Connecting the cables

The SNCIQ and SNCIQ/UG cables are connected to the terminal strip in the same way as the SACIQ sensor connection cable (see section 3.5.4):

1	Open the MIQ module.
2	Select any SENSORNET connection. At the same time, look out for the SENSORNET designation.

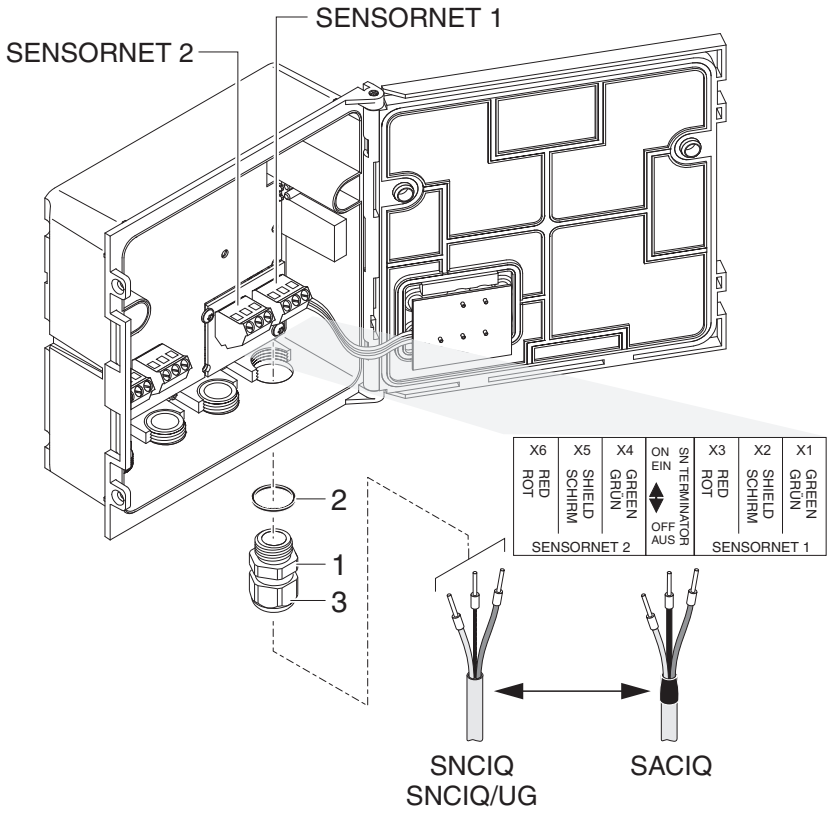


Fig. 3-15 Connecting cables to the MIQ module

3	Screw the cable gland (pos. 1 in Fig. 3-15) with the sealing ring (pos. 2) into the module housing.
4	Loosen the cap nut (pos. 3 in Fig. 3-15).
5	Feed the cable through the cable gland into the module housing.
6	Connect the cable ends to the terminal strip. At the same time, look out for the designations of the terminals (red / shield / green).
7	Tighten the cap nut (pos. 3 in Fig. 3-15).
8	Check the position of the SN terminator switch and correct it if necessary (see section 3.10.1).
9	Close the MIQ module.

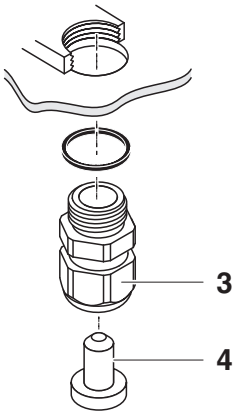


Fig. 3-16 Closing the cable opening

10	Screw the remaining cable glands with the sealing rings into the remaining free openings and close them with the enclosed blind plugs (pos. 4 in Fig. 3-16) and tighten the cap nut (pos. 3) if they are not used.

3.5.4 Connecting IQ sensors

Materials required

- 1 x SACIQ connection cable (see chapter 12 ACCESSORIES AND OPTIONS)
- 1 x cable gland with seal

The module end of the connection cable already has the sheath removed in the factory and all the wires are fitted with wire end sleeves.

Tools

- Phillips screw driver
- Small screw driver.

Differentiating IQ sensors of the same type in the system

For the simpler correlation of measured value and measurement location, the system provides the option of giving each IQ sensor a user-defined name (see section 5.4.1). This name appears on the measured value display.

When the IQ sensor is delivered, the name is identical with the serial number. Therefore, after the initial commissioning, IQ sensors of the same type can only be differentiated by the serial number that appears on the measured value display. In order to prevent confusing the IQ sensors when assigning the name, you can proceed according to one of the two methods:

- Note the serial number of the IQ sensor at the respective measurement location before installation. Then, install all IQ sensors. After the commissioning, open the list of sensors on the controller. Then assign a suitable sensor name using the sensor type and the noted serial number.
- Disconnect the IQ sensors of the same type from the connection cables before commissioning the system. Then, put the system into operation. After the commissioning, connect the IQ sensors individually to the SACIQ connection cable. To do so, proceed step-by-step sensor for sensor. After each newly connected IQ sensor, select the *Edit list of sensors* menu on the terminal and assign a suitable sensor name to the sensor.



The list of sensors and the assignment of sensor names is described in section 5.4.1 on page 5-3.

Connecting the SACIQ cable to the MIQ module

The connection of the SACIQ cable to the terminal strip of an MIQ module is described in section 3.5.3 (see CONNECTING THE CABLES, page 3-22).

Note

The SACIQ sensor connection cable may only be connected to the SENSORNET connections. No wire of the cable may be connected with an external electrical potential. Otherwise, malfunctions could oc-

cur.

Connecting the sensor to the connection cable

1	Remove the protective caps from the plug connections of the IQ sensor and SACIQ sensor connection cable and keep them safe.
2	Plug the socket of the SACIQ sensor connection cable onto the plug head connector of the IQ sensor. At the same time, rotate the socket so that the pin in the plug head connector (1) clicks into one of the two holes in the socket.
3	Then, screw the cap nut (2) of the IQ sensor connection cable on the IQ sensor up to the stop.

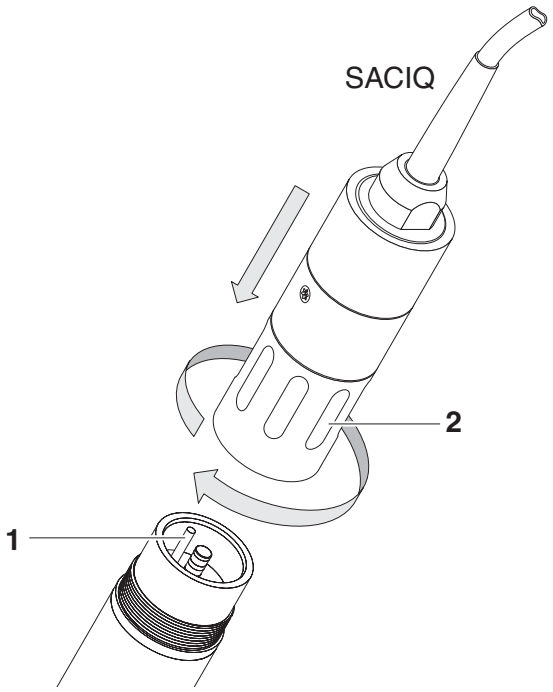


Fig. 3-17 Connecting the SACIQ cable with the IQ sensor

For further instructions on the mounting of IQ sensors at the application location, please see the respective manuals (immersion depths, etc.).

3.6 Installation of the MIQ modules at the installation location

3.6.1 General information

The IQ SENSOR NET system has a comprehensive program of mounting accessories, which can be used to adapt the installation to the most varied requirements.

Note
MIQ modules 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 MIQ modules vertically. Do not under any circumstances install MIQ modules without rain protection with the lid facing upwards (danger of retained humidity and penetration of moisture).

Installation options

The most important types of installation for MIQ modules and module stacks are described in the following chapters:

- **Mounting on a mounting stand with the SSH/IQ sun shield:**
  The SSH/IQ sun shield provides enough space for one unit of up to three stacked MIQ modules and a docked terminal (section 3.6.2).
- **Mounting on the SD/K 170 sun shield**
  The SD/K 170 sun shield provides enough space for a single MIQ module with a docked terminal. The sun shield can be mounted on 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 back MIQ module of a module stack or a single MIQ module is permanently screwed to a wall. For wall mounting, use the WMS/IQ mounting set (see chapter 12 ACCESSORIES AND OPTIONS).
- **Panel mounting:**
  The front MIQ module of a module stack or a single MIQ module is installed in the aperture of a panel. The aperture dimensions are 138 x 138 mm + 1 mm (maximum thickness 15 mm) according to DIN 43700 or IEC 473 (section 3.6.4).
- **Top hat rail mounting:**
  The back MIQ module of a module stack or a single MIQ module is mounted on a 35 mm top hat rail with the aid of a bracket in accordance with
  EN 50022, e.g. in a control cabinet. The connection can be released again with one simple movement (section 3.6.5).



Caution
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.

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

Materials required

- SSH/IQ sun shield (see chapter 12 ACCESSORIES AND OPTIONS).

Tools

- 4 mm set screw wrench
- Phillips screw driver.

Mounting the sun shield on a mounting stand

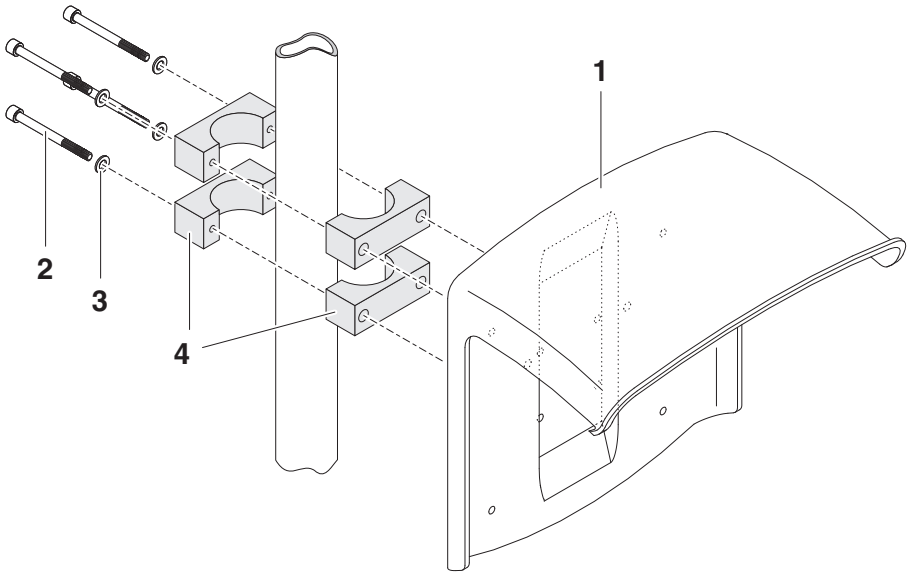


Fig. 3-18 Mounting the SSH/IQ sun shield on a mounting stand

1	Screw the sun shield (pos. 1 in Fig. 3-18) with the four hex-socket 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

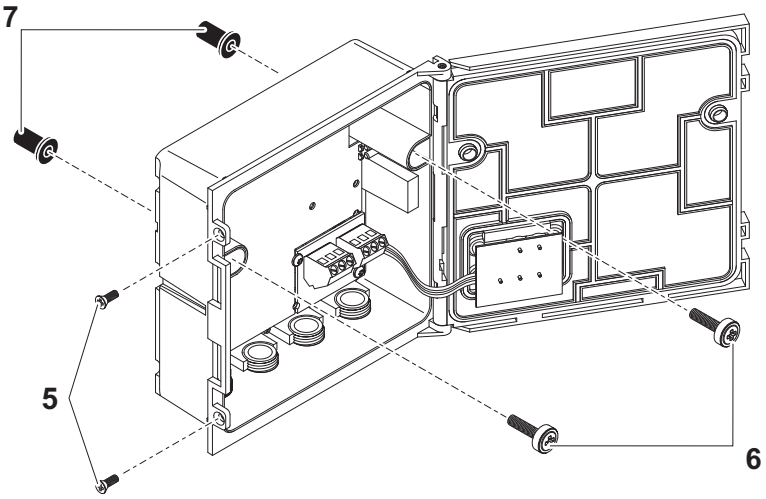


Fig. 3-19 Mounting the sun shield: Premounting the ISO blind nuts

2	Remove the two countersunk screws (pos. 5 in Fig. 3-19) and swing open the module lid.
3	Insert the cheese-head screws (pos. 6 in Fig. 3-19) with the plastic washers in the drilled mounting holes and loosely screw in the ISO blind nuts (pos. 7).

Mounting the MIQ module under the sun shield

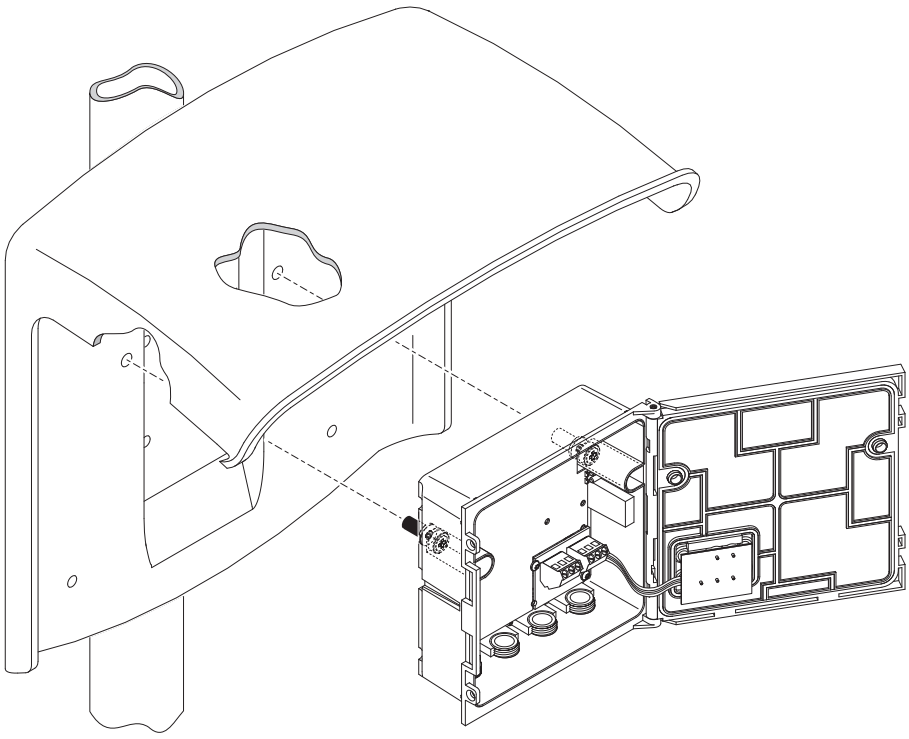


Fig. 3-20 Mounting the MIQ module on the SSH/IQ sun shield

4	Position the MIQ module on the sun shield and fix it into place with the two screws (pos. 6 in Fig. 3-19).
5	Close the module lid and fix it with the two countersunk screws (pos. 5 in Fig. 3-19).

3.6.3 Mounting under the SD/K 170 sun shield

If a single MIQ module is to be installed outside, it must be provided with a sun shield that protects it against the effects of weather. 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 12 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 12 ACCESSORIES AND OPTIONS).

Tools

- Phillips screw driver.

Mounting the MIQ module under the sun shield

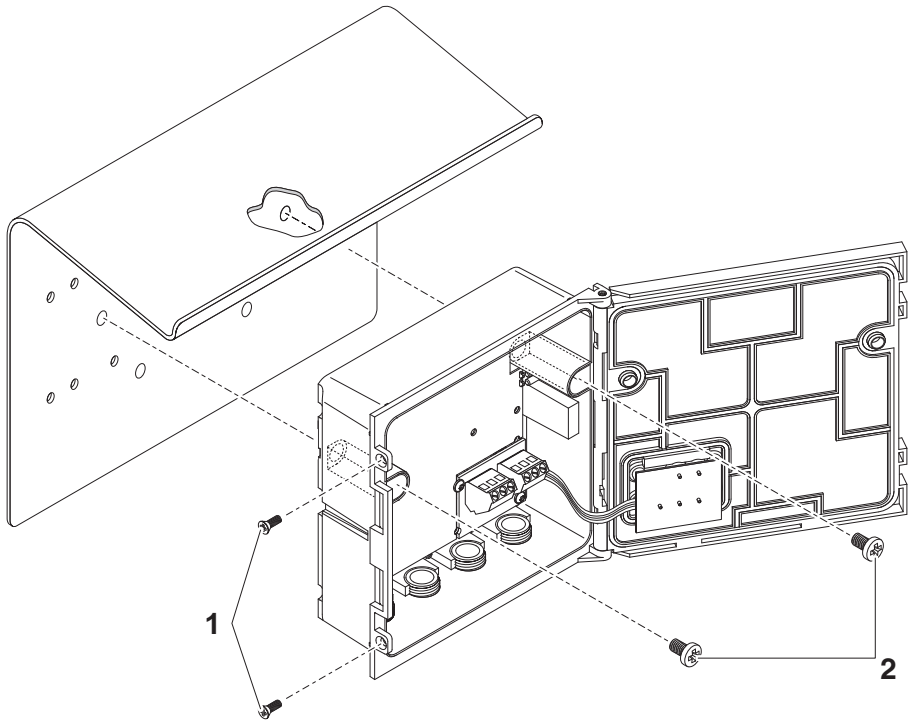


Fig. 3-21 Mounting the MIQ module on the SD/K 170 sun shield

1	Remove the two countersunk screws (pos. 1 in Fig. 3-21) and swing open the module lid.
2	Position the MIQ module on the sun shield and fix it into place with the two screws (pos. 2 in Fig. 3-21).
3	Close the module lid and fix it with the two countersunk screws (pos. 1 in Fig. 3-21).

3.6.4 Panel mounting

The space required on the panel for a module stack is given in the dimension drawings in section 11.3.

The front MIQ module of the preassembled module stack must be removed in order to install the stack. After the installation of the front MIQ module, the remaining part of the stack can be added to the installed MIQ module (see section 3.5.2 STACKED MOUNTING OF MIQ MODULES: - Variant 2).

Materials required

- PMS/IQ kit for panel mounting (see chapter 12 ACCESSORIES AND OPTIONS).

Tools

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

Mounting the MIQ module on a panel

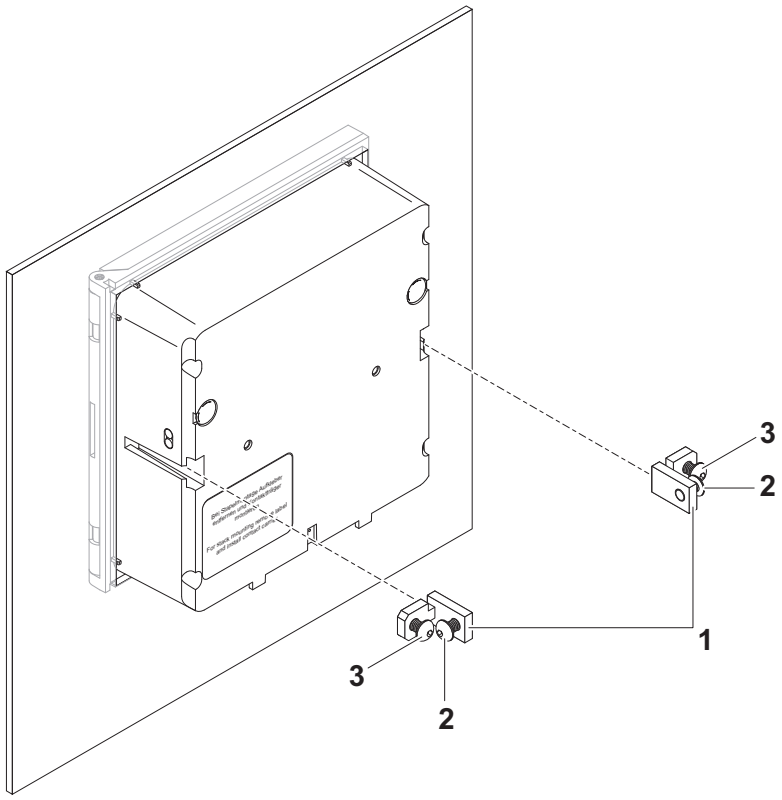


Fig. 3-22 Mounting the MIQ module on a panel

1	Insert the MIQ module 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. 3-22), but do not remove them.
3	Push in the two angle brackets - as shown in Fig. 3-22 - into the lateral guides of the MIQ module 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.

3.6.5 Top hat rail mounting

Materials required

- THS/IQ kit for top hat rail mounting (see chapter 12 ACCESSORIES AND OPTIONS).

Tools

- Phillips screw driver.

Mounting the MIQ module on a top hat rail

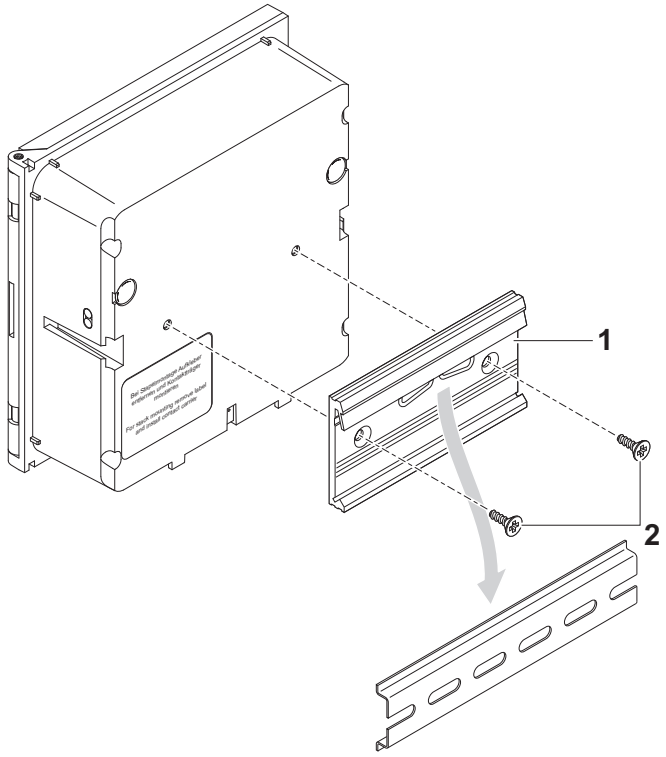


Fig. 3-23 Mounting the MIQ module on a top hat rail

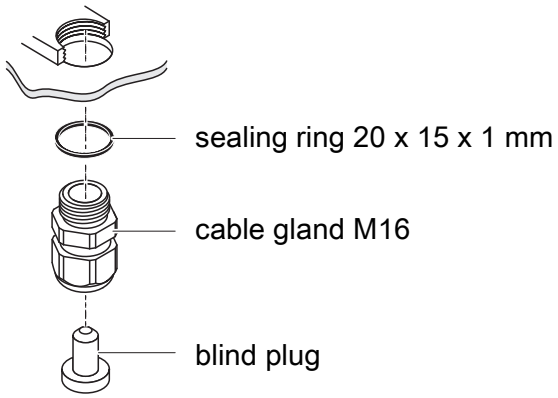
1	Screw the clamping assembly (pos. 1 in Fig. 3-23) onto the back of the MIQ module with the two plastic tapping screws (pos. 2).
2	Attach the MIQ module onto the top hat rail from above using the clamping assembly and press against the rail until the clamping assembly clicks into place. The MIQ module can be moved sideways afterwards.
3	To unhook the MIQ module, press it downwards and pull it forwards at the bottom.

3.7 Electrical connections: General instructions

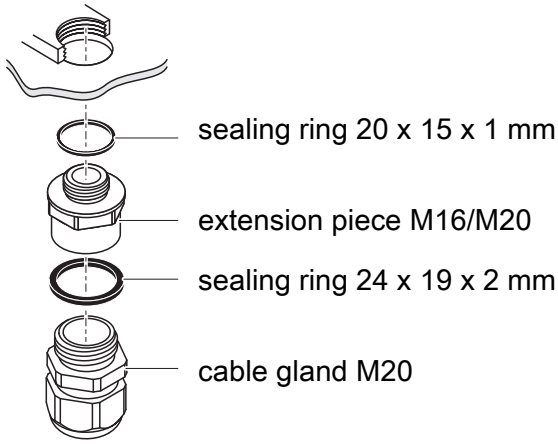
Cable glands

All electric cables are fed from below via prepared openings in the enclosure of the MIQ modules. Cable glands with different clamping ranges are included with most MIQ modules to provide sealing between the cable and enclosure as well as for strain relief. Select the matching cable gland for the respective cable diameter:

- **Small**, clamping range 4.5 to 10 mm. This cable gland is suitable for all IQ SENSOR NET cables (including earth cable after stripping the outer insulation, see section 3.5.3) and IQ SENSOR NET sensor connection cable.



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



If necessary, you can order other sizes of cable gland (see chapter 12 ACCESSORIES AND OPTIONS).

General installation instructions

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

- Shorten all the 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 IQ SENSOR NET. Always cut off any wires that are not in use as closely as possible to the cable gland.

3.8 Connecting the voltage supply



How to connect the voltage supply is comprehensively described in the operating manual of the MIQ power supply module.

3.9 Ethernet connection in case of outdoor installation

When plugged in, the RJ45 socket is not sufficiently protected against moisture. With outdoor installation, the Ethernet cable must therefore be clamped directly on the PCB of the MIQ/MC2 controller to ensure a safe Ethernet communication. For this purpose there is a 4-pole terminal strip and a shielding terminal on the main PCB. An LSA punch down tool is required for the assembly.

Connecting the Ethernet cable with the main PCB

1	Open the MIQ module.
2	Disconnect the flat flexible cable (pos. 1 in Fig. 3-24) from the main PCB.

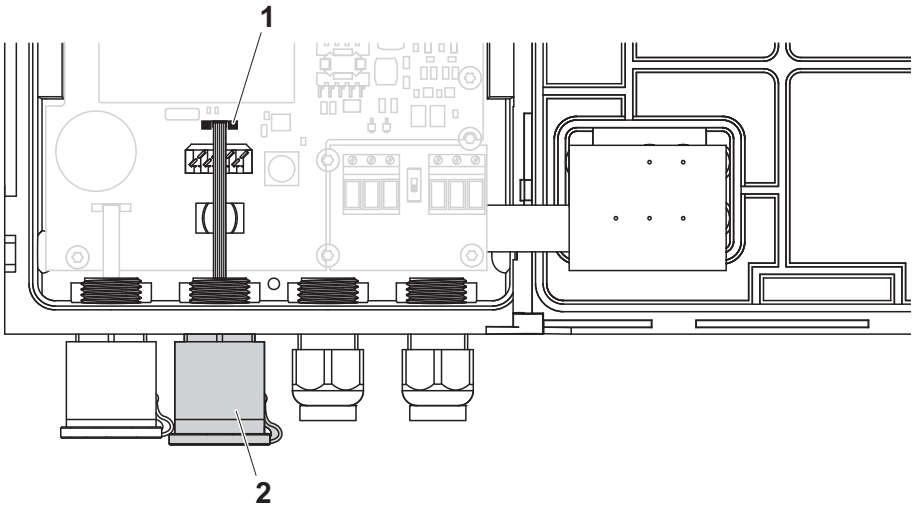


Fig. 3-24 Ethernet connection with RJ45 socket

3	Unscrew the RJ45 socket enclosure (pos. 2 in Fig. 3-24).
4	Screw a cable gland with sealing ring into the free duct. Then loosen the cap nut of the cable gland.

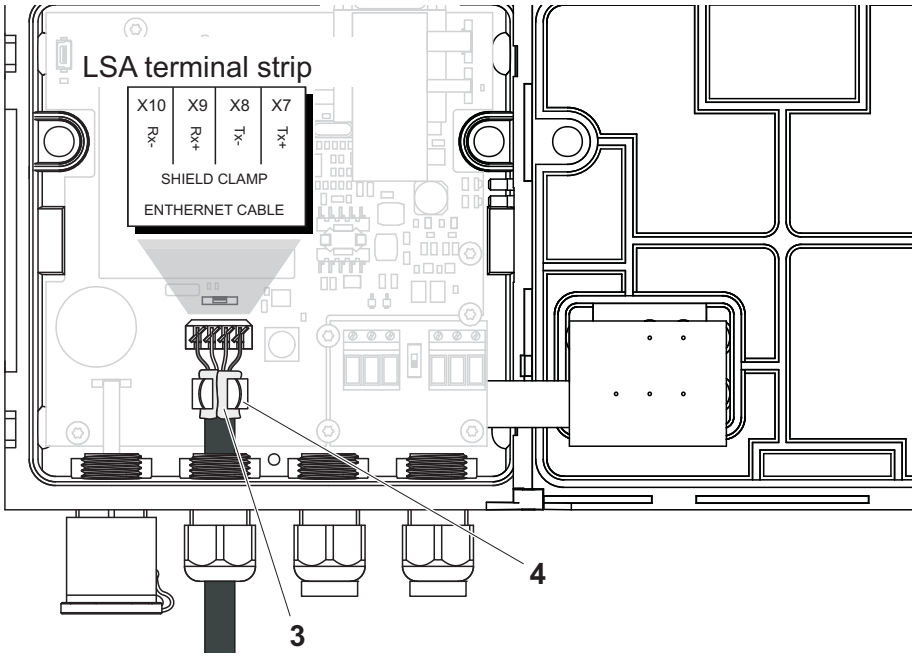


Fig. 3-25 Ethernet connection via terminal strip

5	Strip the Ethernet cable for approx. 2 cm and untwist the Rx+, Rx-, Tx+ and Tx wires.
6	Carefully slash the cable shield (foil + netting) lengthwise and put it backwards over the cable sheath (pos. 3 in Fig. 3-25).
7	Feed the Ethernet cable through the cable gland into the module housing.
8	Where the cable shield was put backwards, press the Ethernet cable into the shielding terminal (pos. 4 in Fig. 3-25). The shielding terminal must contact the cable shield across a wide area.
9	Connect the Rx+, Rx-, Tx+ and Tx- wires to the LSA terminal strip with the aid of an LSA punch down tool. Make sure that the cable assignment agrees with the specification on the terminal label under the terminal strip.
10	Fasten the cap nut of the screwed cable gland.
11	Close the module.

3.10 Commissioning

3.10.1 Topology and terminator switch

For failure-free operation, the terminator switches (terminating resistors) must always be set to ON on two MIQ modules. On which modules this has to be done can be taken from the topology of the IQ SENSOR NET system:

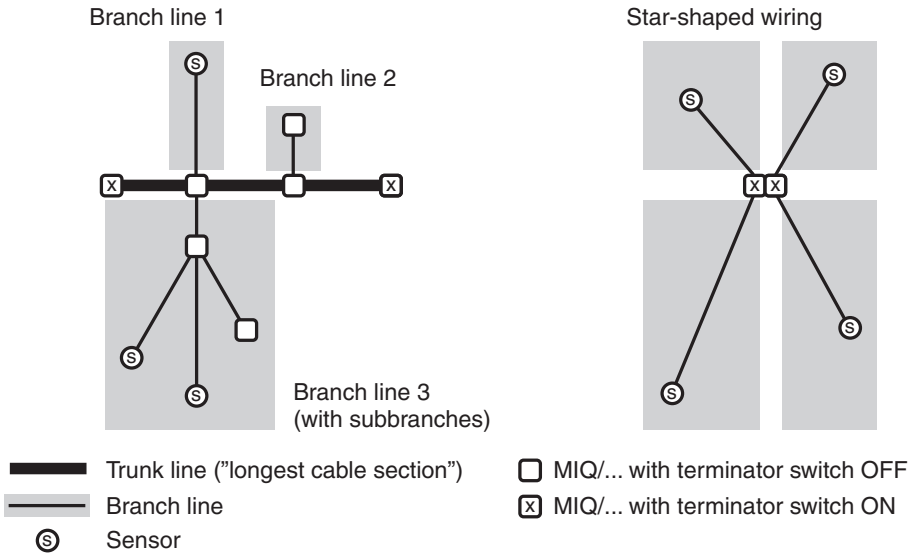


Fig. 3-26 Correct setting of the terminator switches

Main line — Longest cable section with terminator switches at its ends.
The terminator switches on both ends must be set to ON.
If all MIQ modules are at one location, i. e. in a module stack, the length of the main line is zero (star-shaped wiring).

Branch line — All lines that branch from the main line.
Branch lines can be branched further.

Example of determining the main line

The following figure shows the length of the main line L made up of the partial lengths L1, L2 and L3 as the cable section L4 is shorter than L3:

Length of the main line = L1 + L2 + L3

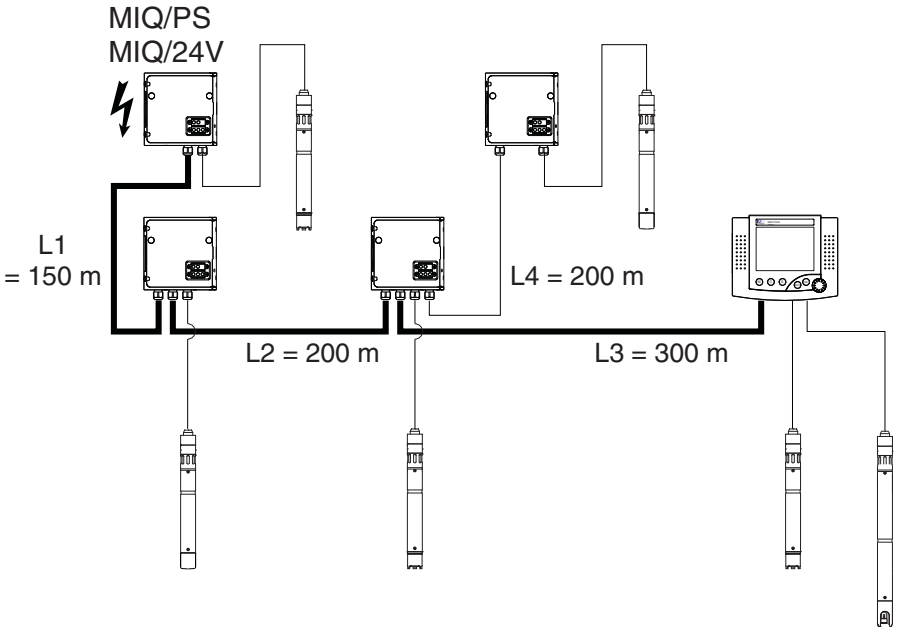


Fig. 3-27 Example of determining the length of the main line

Terminator switch

Terminator switches are located in each MIQ module between the two SENSORNET connections on the right of the terminal strip (designation "SN TERMINATOR"):

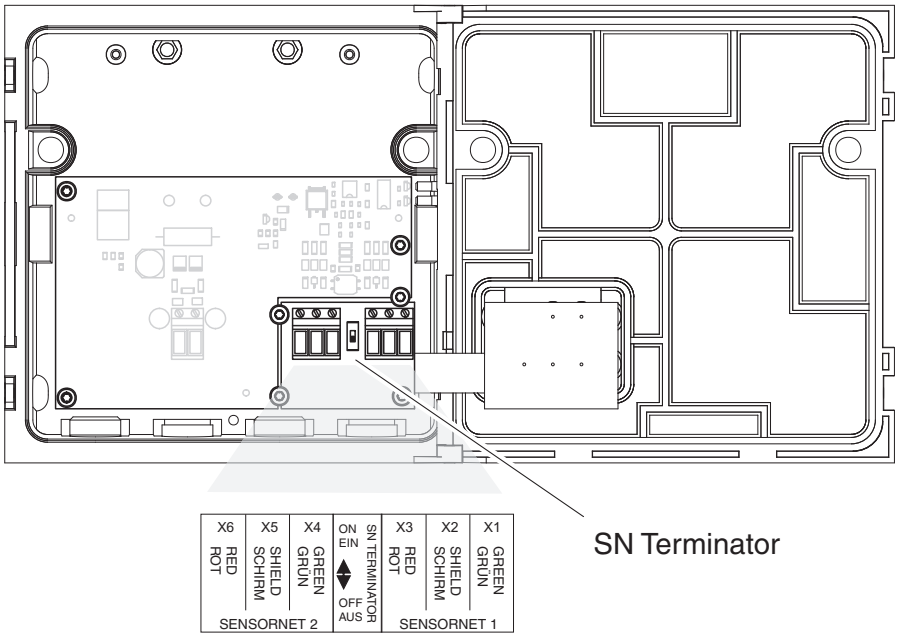


Fig. 3-28 Terminator switch

3.10.2 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 Is the sum of the power consumption of the components smaller than the sum of the power delivery of all power supply modules (see section 3.3.1)?

2 Are all IQ SENSOR NET components correctly connected with one another (see section 3.5)?

3 Are all SN terminator switches correctly set (see section 3.10.1)?

4 Is the MIQ power supply module correctly connected to the voltage supply?

5 Do the line voltage and line frequency agree with the data on the name plate of the MIQ power supply module?

6 Are all IQ sensors ready to measure?

Starting the system

Switch on the voltage supply of the MIQ power supply module(s).

Initial start phase

In the initial start phase, all IQ SENSOR NET components are automatically registered on the MIQ/MC2 controller module and the terminal is initialized. The system then performs a self test. This process can take several seconds. During this period, the following display appears:

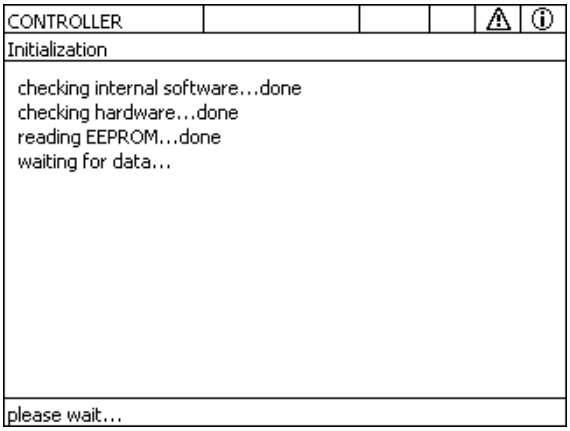


Fig. 3-29 Display during the initialization process

Second start phase

As soon as the terminal is successfully initialized, the measured value display appears (fourfold display). In the case of IQ sensors that are not yet providing measured values, "Init" appears temporarily:

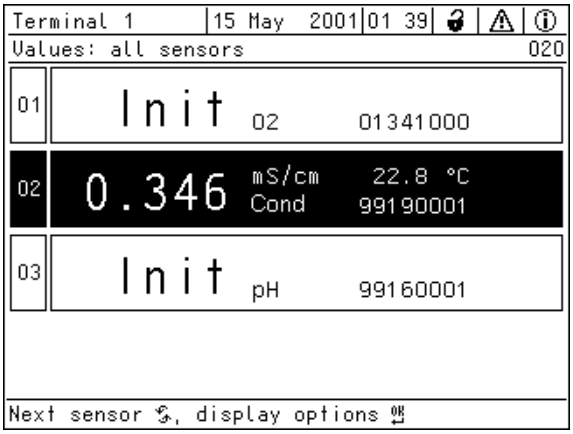


Fig. 3-30 Display after initialization of the terminal

Assign a name to each IQ sensor after putting it into operation for the first time so you can identify it more easily. How to assign a sensor name is described in section 5.4.1 on page 5-3.

If the system start failed, see chapter 10 WHAT TO DO IF....

3.10.3 Checking the voltage supply

This test should always be performed:

- after the initial commissioning
- after any system extension or modification.

This test checks the power supply and the communication of the components after the system has been started.

Test procedure

1	Check the status of the LEDs on the MIQ power supply modules (Fig. 3-31): – Yellow lights upOperational voltage OK. The operational voltage supplied is constant and is max. 24 V. – Red lights upOperational voltage with power limitation. The operational voltage supplied is adjusted to the load conditions. – no LED lights up:Operational voltage too low. The operational voltage supplied is too low or the MIQ power supply module is defective.
2	Dock any existing MIQ/TC 2020 XT mobile terminals on the system as far away as possible from a MIQ power supply module (i.e. test of the power supply in the most unfavorable possible conditions)
3	Check the status of the LEDs on all MIQ modules (except for the MIQ power supply modules, see step 1) (Fig. 3-31): – Yellow lights upOperational voltage OK – Red lights upOperational voltage in warning range. The component is fully functional. However, any further slight drop in voltage can lead to failure – no LED lights up:Operational voltage in error range



The relationship between the supply voltage, the LED status and the log book entries is described in the section 11.1 GENERAL SYSTEM DATA.

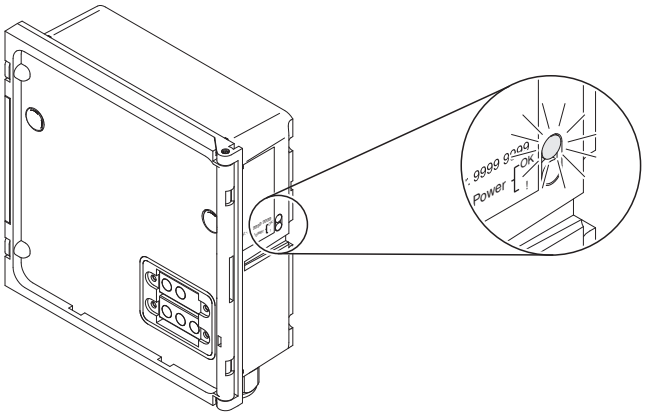


Fig. 3-31 Voltage LED on the MIQ module

You can measure the voltage that is actually available at the MIQ modules or IQ sensors (see section 10.2.2).

4	Wait until the system start is completed and the measured value display appears.
5	If necessary, select another display language (see section 5.1 SELECTING THE LANGUAGE).
6	Check that all the IQ sensors are listed in the measured value display.
7	Check that all the MIQ output modules are listed in the *Edit list of outputs* menu (see section 5.6 EDITING THE LIST OF OUTPUTS).
8	If a component is not listed, carry out troubleshooting according to chapter 10 WHAT TO DO IF....
9	Open the log book and acknowledge the messages. In the case of error messages, follow the instructions for clearing the error. For more details on the log book, see section 4.6.

3.11 System extension and modification

3.11.1 General information

The modular structure of the IQ SENSOR NET system makes it easy to carry out subsequent extensions and modifications. The system automatically identifies new active modules and includes them in the list of modules. Added IQ sensors immediately deliver measured values without the necessity for special settings.



Warning

When the system is switched on, if the MIQ/PS power supply module is opened, there is a danger to life due to possible hazard of electric shock from line voltage. There is also a danger to life inside the relay output modules (e.g. MIQ/ CR3) if voltages are applied to the relay contacts that may present a hazard of electric shock. Before opening the MIQ modules, switch off the system and all external voltages that present a hazard of electric shock and secure the system against being inadvertently switched on again.

Installation instructions

Note the following points in any system extension or modification:

- Before any extension or modification, check that the planned number of MIQ power supply modules is sufficient for the planned installation (see section 3.3.1 SYSTEM PLANNING)
- Before beginning the installation tasks, always switch off the system. Also, switch off all external voltages
- Clean the MIQ module stack to remove the worst of any dirt before taking it apart or opening it (see section 9.2 CLEANING)
- Before mounting the stack, check the contacts on the front and back of any MIQ modules that were already in use somewhere else. Clean any dirty contacts
- After any change to the system, check the setting of the SN terminator switches and adjust it if necessary (see section 3.10.1 TOPOLOGY AND TERMINATOR SWITCH).

Installing new components

Install new components as described in section 3.5 CONNECTING SYSTEM COMPONENTS. Then put the system into operation again (section 3.10 COMMISSIONING). Active modules are automatically recognized by the controller and included in the corresponding module lists.

If a new component is not included, the maximum number of datasets (active and inactive datasets) may be exceeded.

The maximum number of datasets for IQ sensors is 20. For MIQ output modules, the maximum number of datasets (active and inactive datasets) is 48.

When this number of datasets is already stored, no further component can be installed.

If necessary, an inactive dataset has to be erased to make an extension possible (how to erase inactive datasets is described in section 5.4.3 or section 5.6.2).

New modules are first registered on the system when the measured value display is opened.

Replacing components

The replacement of components is described in detail in section 10.4 REPLACING SYSTEM COMPONENTS.

4 Operation

4.1 MIQ/MC2 controller

The MIQ/MC2 controller is the control unit of the IQ SENSOR NET.

4.2 Terminal

The terminal is the operating unit of the IQ SENSOR NET.

You can install the following terminal components:

- Terminal MIQ/TC 2020 XT, configured as a terminal
- PC Terminal CONNECT, connected to the IQ SENSOR NET via the Ethernet interface

The terminal can be used to:

- Display measurement results
- Starting calibration
- Perform system and terminal settings
- Display messages.



To guarantee data safety within the IQ SENSOR NET, access to the following functions is only possible from one terminal at the same time:

- Opening the *Settings* menu
- Starting calibration
- Assigning IQ sensors or MIQ output modules as substitutes.

If one of these functions is already active at another terminal, a note appears on the display.



General key symbols are used for all operating steps in this operating manual.
Details and deviations for usage of the PC Terminal CONNECT (see documentation of the IQ IQ Software Pack CONNECT).

4.2.1 Overview of the operating elements

This section provides basic information on the operation of the IQ SENSOR NET systems using the MIQ/TC 2020 XT (configured as a terminal).

General key symbols are used for all operating steps in this operating manual.
Details and deviations for usage of the PC Terminal CONNECT (see documentation of the IQ IQ Software Pack CONNECT).

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

Use the 5 keys **<M>**, **<C>**, **<S>**, **<ESC>**, **<OK>** and the arrow keys **<▲▼◀▶>** to operate the IQ SENSOR NET system.

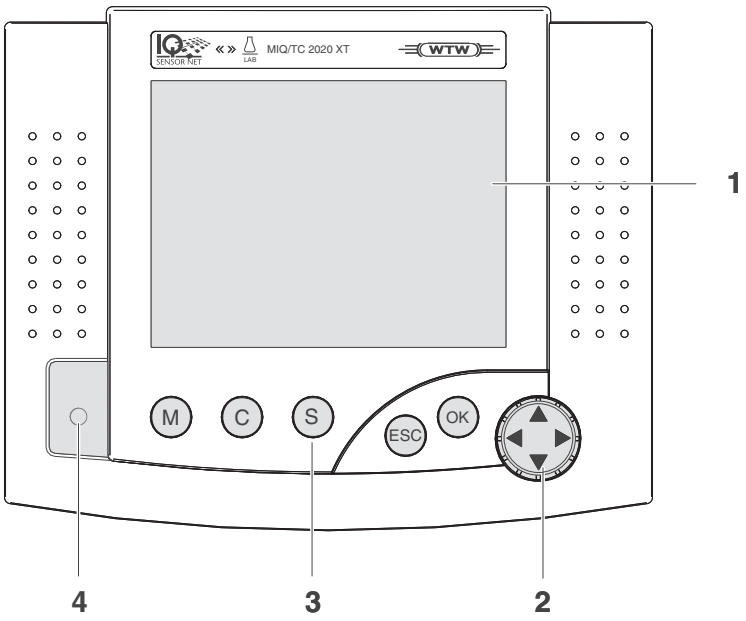


Fig. 4-1 View of the MIQ/TC 2020 XT

1	Display (see section 4.2.2 DISPLAY)
2	Arrow keys (see section 4.2.4 ARROW KEYS)
3	5 keys **<M>**, **<C>**, **<S>**, **<ESC>**, **<OK>** (see section 4.2.3 KEYS)

4.2.2 Display

The display contains the following information:

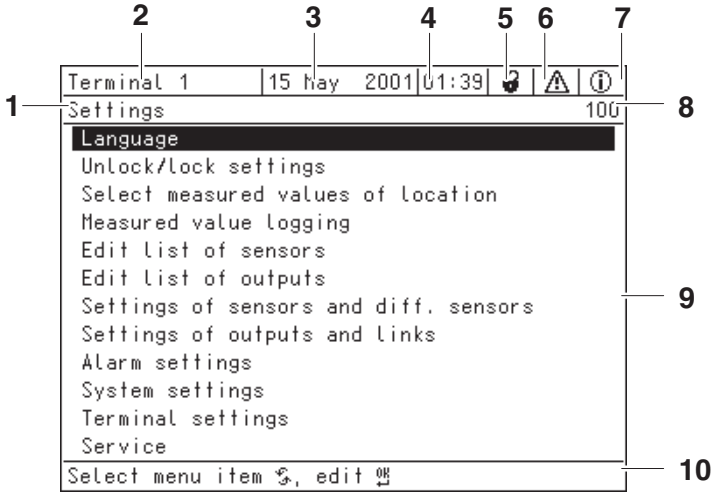


Fig. 4-2 View of the display

1	Name of the display
2	Name of the terminal alternating with the controller function (CONTROLLER or BACKUP CONTROLLER)
3	Date
4	Time
5	User authorization:
	Simple access control Lock open: Settings are unlocked – System settings can be changed Lock closed: Settings are locked – All system settings can only be read
	Extended access control: Crown: Administrator authorization Configuration and running operation of the system Tool: Maintenance authorization Running operation of the system and maintenance activities Eye: Observer authorization Only read permission, no operation of the system

6	Error symbol ⚠: If the error symbol flashes, a new or unacknowledged error message is present in the log book that requires immediate action (see section 4.6.3).
7	Info symbol ⓘ: If the info symbol flashes, new or unacknowledged information is present in the log book (see section 4.6.3).
8	Number of the display
9	Display range for measured values, menus, lists, etc.
10	Help line with operating instructions

Measured value display

The measured value display contains the following information for each IQ sensor/differential sensor:

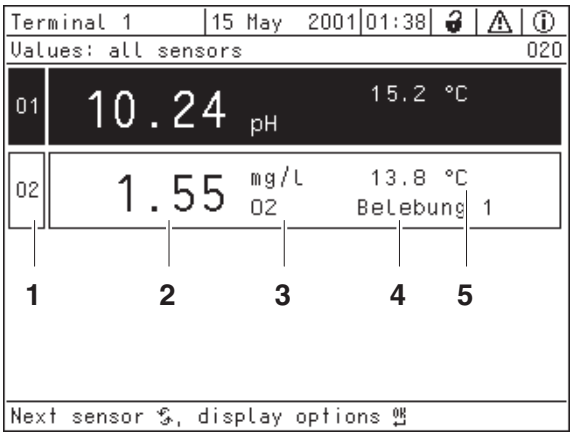


Fig. 4-3 Display - measured value display

1	Consecutive numbering of the measured values
2	Main measured value
3	Unit and parameter of the main measured value
4	Name of the sensor (to enter name: see section 5.4.1
5	Adjoining measured value with unit

Special displays

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

4.2.3 Keys

Key	Function
<M>	Display measured values
<C>	Start calibration of the IQ sensor selected in the measured value display
<S>	Open the *Settings* menu
<ESC>	Change to the higher menu levels or abort entries without storing them
<OK>	Confirm selection

4.2.4 Arrow keys

Arrow keys	Function
<▲▼◀▶>	Highlight and select: ● Menu items ● Entries ● Columns or fields ● Letters or numerals



The selection highlighted with the arrow keys is displayed as white text on a black background (reverse video).

4.3 General operating principles

The operation of the IQ SENSOR NET is standardized and user-friendly.

- Select an item with the arrow keys <▲▼◀▶>
  - Highlight individual elements in menus, lists and tables, e.g. menu entries, list elements, columns or fields
  - Select a setting in selection fields
  - Select a character in text entry fields
- Confirm a selection with the **<OK>** key.
- Break off an action and change to the next higher level with the **<ESC>** key.
- Start a calibration procedure with the **<C>** key.
- Switch to the settings with the **<S>** key.
- Change to the measured value display and break off current actions with the **<M>** key.



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

Examples of the operating principles are given below:

- Navigation in menus, lists and tables (see chapter 4.3.1)
- Entering text and numerical values (see chapter 4.3.2)



General key symbols are used for all operating steps in this operating manual.
Details and deviations for usage of the PC Terminal CONNECT (see documentation of the IQ Software Pack CONNECT).



If two or more terminals are used in an IQ SENSOR NET, access to the functions **<C>** and **<S>** is blocked when the functions are already being used on another terminal.

4.3.1 Navigating in menus, lists and tables

1	Using **<S>**, open the *Settings* menu. Menus appear in the form of a list on the display, e.g. the *Settings* menu shown here.

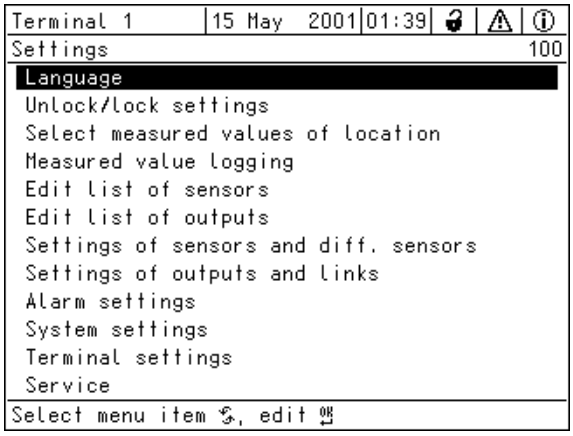


Fig. 4-4 Settings

2	Select a menu item (e.g. *System settings*) with **<▲▼◀▶>**. Move the highlighting (reverse video display, black background) in the list of menu items with the arrow keys **<▲▼◀▶>**.
3	Confirm the menu item (e.g. *System settings*) with **<OK>**. The display (e.g. *System settings*) opens. Confirm the selection and move to a new display by pressing the **<OK>** key.
4	Return to a higher level with **<ESC>**. or: Switch to the measured value display with **<M>**.

4.3.2 Entering texts or numerals

You can assign names to IQ sensors, MIQ output modules, terminals and locations. Example: Entering a sensor name:

1	Using **<S>**, open the *Settings* menu.
2	Select the *Edit list of sensors* menu item with **<▲▼◀▶>**.
3	Confirm the *Edit list of sensors* menu item with **<OK>**. The *Edit list of sensors* display opens. A column is highlighted.
4	Select the *Sensor name* column with **<▲▼◀▶>**.
5	Confirm the *Sensor name* column with **<OK>**. A sensor name is highlighted.
6	Select a sensor name with **<▲▼◀▶>**.

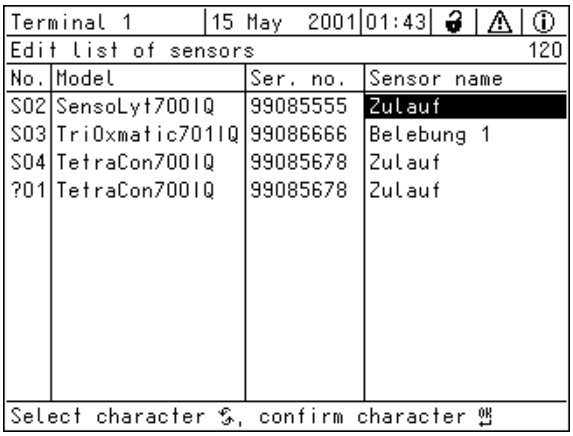


Fig. 4-5 Edit list of sensors

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

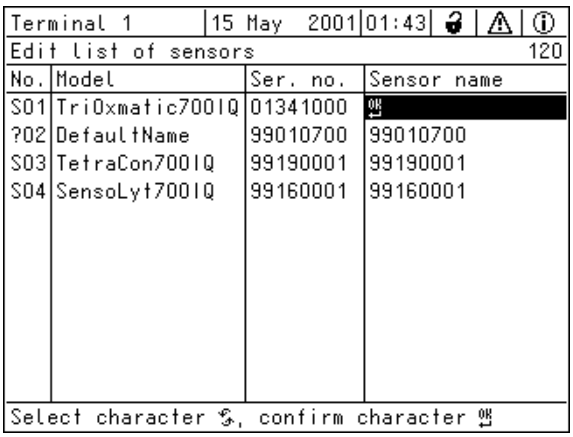


Fig. 4-6 Edit list of sensors

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

8	Select a letter or numeral with **<▲▼◀▶>**.
9	Confirm the letter with **<OK>**. The character OK appears behind the last letter.

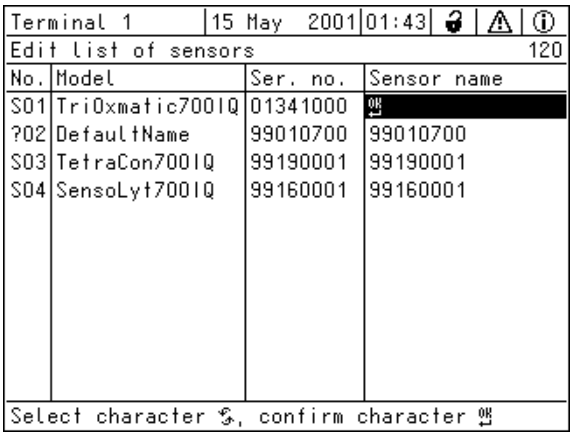


Fig. 4-7 Edit list of sensors

10	● Add a new character Select the character to be added with **<▲▼◀▶>** and confirm with **<OK>**. or ● Delete the last character Select the character with **<▲▼◀▶>** and confirm with **<OK>**. or ● Adopt the name Select the character with **<▲▼◀▶>** and confirm with **<OK>**.
11	Repeat steps 8 to 10 until the whole name has been entered.



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

4.4 Access to the IQ SENSOR NET with active access control



Access control is switched off in the delivery condition.
No login to the IQ SENSOR NET is required.

As soon as an access control of any type is enabled, access to the IQ SENSOR NET is protected completely or partly. Access is granted only after a password was entered.

Access to the system (entry of a password) is different for the various types of access control.

- Simple access control
  the lock symbol (open, closed) is visible
  (see section 4.4.1)
- Extended access control
  one of the following symbols is visible: crown, tool, eye (see section 4.4.2)
- Extended access control with instrument block
  only the IQ SENSOR NET logo is visible (see section 4.4.3)

4.4.1 Simple access control

A lock symbol is displayed if the simple access control is enabled and the system settings are locked. If a closed lock symbol is displayed, a message appears on the display of the IQ SENSOR NET before a changed system setting is taken over, stating that this setting is not possible in the protected mode.

Unlocking the system settings

You have the following options to unlock the system settings:

- Enter the password for the simple access control with the arrow keys in the menu *Settings* / *Unlock/lock settings* / *Unlock settings*. The system settings are unlocked.
- Connect the electronic key to the USB interface (if the administrator has enabled this function)

Locking the system settings

You have the following options to lock the system settings:

- Enter the password for the simple access control with the arrow keys in the menu *Settings* / *Unlock/lock settings* / *Lock settings*. The system settings are locked.
- Disconnect the electronic key from the USB interface
- The system settings are automatically locked after 10 minutes without keystroke.

4.4.2 Extended access control

If the extended access control is enabled (without instrument block), a symbol is displayed for the currently enabled access authorization.

Crown: Administrator logged in, all functions allowed

Tool: User with authorization for maintenance activities logged in (e.g. calibration)

Eye: Observer without authorization

The relevant symbol is displayed depending on the currently active user authorization. Functions that are not allowed are not displayed in the menu.

Access as user or administrator

If user authorization is required for a job, login with the password is required. This can be done as follows:

- Open the *Display/Options* / *Change user rights* menu.
  The password prompt appears.
  Enter the password with the arrow keys and confirm with OK.
  The relevant user authorization is enabled.
- Connect the electronic key to the USB interface of the MIQ/ TC 2020 XT terminal (if the administrator has enabled this function)
  The relevant user authorization is enabled.

Protecting the system

You have the following options of protecting the system:

- Select the *Display/Options* / *Viewing only* menu.
  The system is protected.
- Disconnect the electronic key from the USB interface of the MIQ/ TC 2020 XT terminal.
- After 10 minutes without keystroke, the user or administrator is automatically logged off from the system and the system safety is automatically activated.

4.4.3 Extended access control with instrument block

If the extended access control with instrument block is enabled, only the IQ SENSOR NET logo is displayed on the terminal where the instrument block was activated.

As soon as a password was entered, a symbol for the currently enabled access authorization is displayed.

Crown: Administrator logged in, all functions allowed

Tool: User with authorization for maintenance activities logged in (e.g. calibration)

Eye: Observer without authorization

The relevant symbol is displayed depending on the currently active user authorization. Functions that are not allowed are not displayed in the menu.

Access as observer, user or administrator

User authorization is required for all jobs, even for viewing the measured values. You have to log in with a password. This can be done as follows:

- Press the any button.
  The password prompt appears.
  Enter the password with the arrow keys and confirm with OK.
  The relevant user authorization is enabled.
- Connect the electronic key to the USB interface of the MIQ/ TC 2020 XT terminal
  (if the administrator has enabled this function)
  The relevant user authorization is enabled.

Logging off Protecting the system and terminal

There are the following ways to protect the system and to lock the terminal:

- Select the *Display/Options* / *Lock Device* menu.
  The system is protected. The instrument is blocked.
- Disconnect the electronic key from the USB interface of the MIQ/ TC 2020 XT terminal.
- After 10 minutes without keystroke, the user or administrator is automatically logged off from the system and the system safety is automatically activated.

4.5 Display of current measured values

Several options can be selected for displaying the measured values:

- *Measured values (1 sensor)*
  The measured value is shown numerically and as a bar graph on the *Measured values (1 sensor)* display (see section 4.5.1)
- *Measured values (4 sensors)*
  The *Measured values (4 sensors)* display provides an overview of a maximum of four IQ sensors or differential sensors (see section 4.5.2)
- *Measured values (8 sensors)*
  The *Measured values (8 sensors)* display provides an overview of a maximum of eight IQ sensors or differential sensors (see section 4.5.3)
- *Display local values or all values*
  Here you can switch between the display of the IQ sensors selected for the measurement location and the display of all the IQ sensors (see section 4.5.4).

Switch between the different types of display as follows:

1	Call up the measured value display with **<M>**.
2	Using **<OK>**, open the *Display/Options* menu.

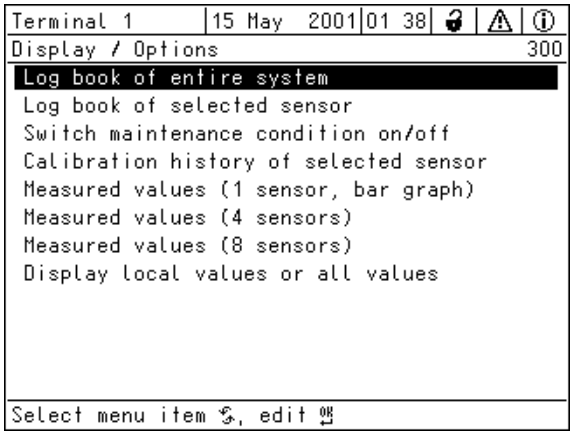


Fig. 4-8 Display/Options

3	Select and confirm a display type with **<▲▼◀▶>** and **<OK>**.The selected display is activated.

4.5.1 Displaying a single measured value

The measured value is shown numerically and as a bar graph on the *Measured values (1 sensor)* display.

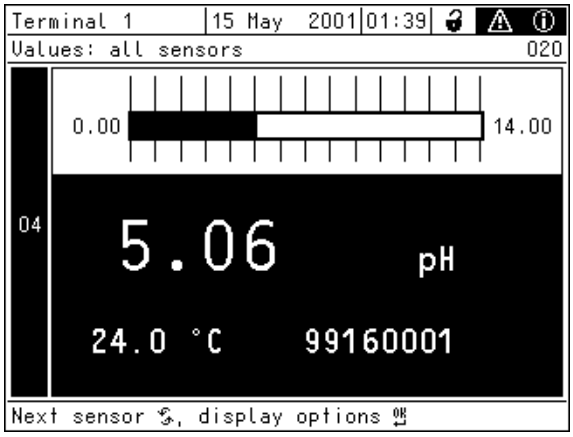


Fig. 4-9 010 - Values: location -> Measured values (1 sensor)

4.5.2 Displaying four measured values

Up to four measured values of IQ sensors or differential sensors are shown on the display at the same time.

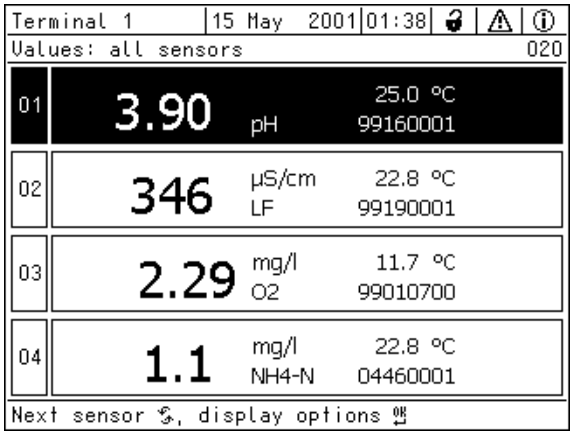


Fig. 4-10 010 - Values: location -> Measured values (4 sensors)

4.5.3 Displaying eight measured values

Up to eight measured values of IQ sensors or differential sensors are shown on the display at the same time.

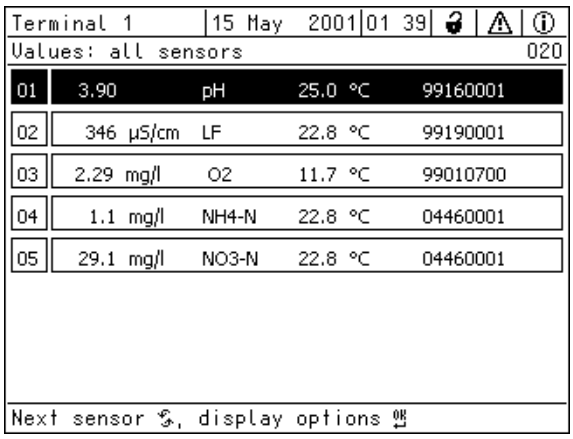


Fig. 4-11 010 - Values: location -> Measured values (8 sensors)

4.5.4 Displaying recorded measured values

If the measured value recording has been activated for an IQ sensor (see section 5.10), the temporal course of the recorded measured values can be displayed numerically and graphically.

The following display options are possible:

- *Monthly load of selected sensor* (graphic display)
- *Weekly load of selected sensor* (graphic display)
- *Daily load of selected sensor* (graphic display)
- *Measured value list of selected sensor* (numerical display)

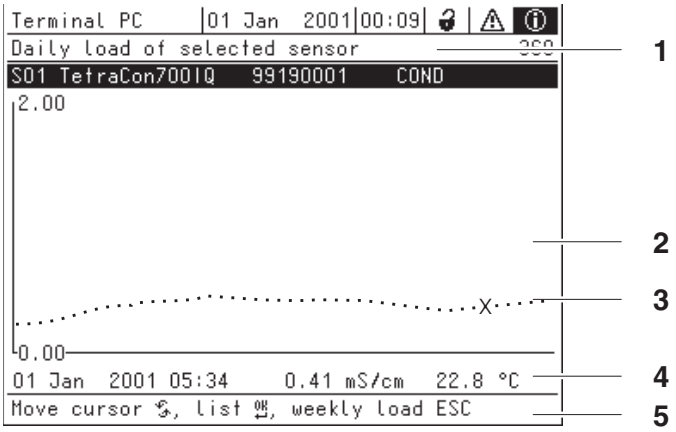


Fig. 4-12 Daily load of selected sensor (example)

1	Display
2	Range of the graphical display ● The time range (x axis) corresponds to the selected display option (1 day, 1 week, 1 month). ● The value range of the y-axis is automatically adjusted to min and max values
3	Position of the cursor (X)
4	Data about the position of the cursor (X) (Date, time, main measured value and adjoining measured value)
5	Navigation instructions

Displaying recorded measured values

1	Switch to the measured value display with **<M>**.
2	Select an IQ sensor with **<▲▼◀▶>**.
3	Using **<OK>**, open the *Display/Options* menu.
4	Select one of the display types with **<▲▼◀▶>** ● *Monthly load of selected sensor* ● *Weekly load of selected sensor* ● *Daily load of selected sensor* ● *Measured value list of selected sensor* and confirm with **<OK>**. The selected option is displayed.

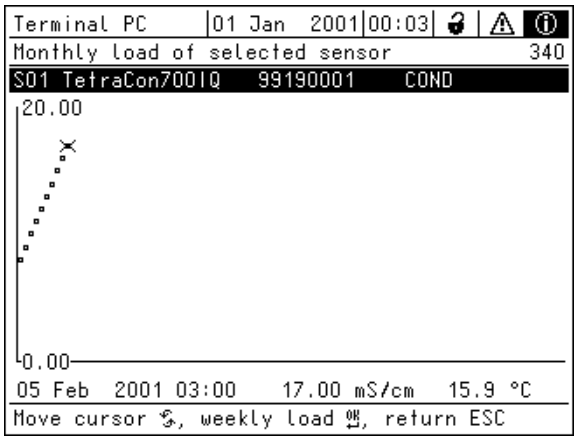


Fig. 4-13 Monthly load of selected sensor (example)

5	Move the cursor (X) along the measured value curve with **<▲▼◀▶>**. The cursor (X) marks the selected measured value.
6	Switch to the next display option with a shorter display period with **<OK>**. or Switch to the next display option with a longer display period with **<ESC>**.

4.5.5 Transmitting recorded measuring data to a PC

Recorded measured values can be transmitted to a PC via the Ethernet interface. For details on data transmission, see section 6.

4.5.6 Display of the measured values of a measurement location or of all IQ sensors in the system

As soon as a terminal is docked onto a measurement location, the local measured value display becomes active. The IQ sensors selected for the measurement location appear on the measured value display (see section 5.7).

Switch between the measured values for the measurement location and all IQ sensors as follows:

1	Switch to the measured value display with **<M>**.
2	Using **<OK>**, open the *Display/Options* menu.
3	Using **<▲▼◀▶>**, select the menu item, *Display local values or all values* and confirm with **<OK>**. The measured value display switches between the display of the sensors at the measurement location and all sensors.

4.6 Messages and log book

The IQ SENSOR NET continuously monitors the status of the entire system. If the IQ SENSOR NET identifies system changes, a message appears. New messages can be recognized by the flashing information symbol or error symbol on the display.

All messages are recorded in the log book.

4.6.1 Message types

The system differentiates two types of messages:

- **Errors** ⚠
  Indicates a critical status in the system or an individual system component that requires immediate action.
  In the case of new error messages, the error symbol flashes on the display.
- **Information** ⓘ
  Information that does not require immediate action.
  In the case of new information, the info symbol flashes on the display.



In the case of errors, immediately open the detailed message text in the log book and perform the recommended actions. If the actions have been performed, mark the message as read (see section 4.6.3).

4.6.2 Log book

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

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

The flashing of the info or error symbol only stops after all detailed message texts in the log book have been opened and marked with a tick (✔) (see section 4.6.3).

Structure of the log book

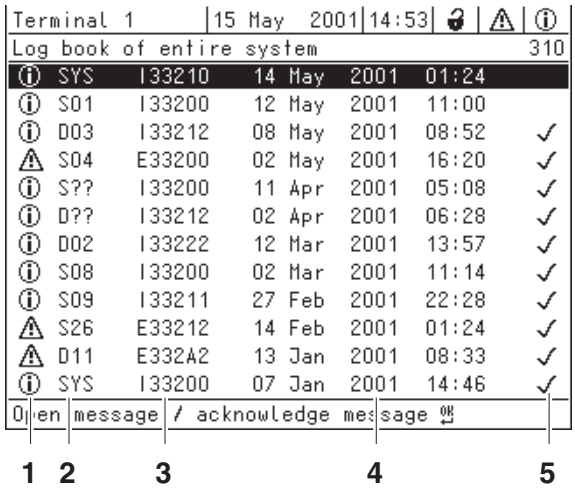


Fig. 4-14 310 - Log book of entire system

1	Message category (error or info symbol)
2	Module that triggered the message. *SYS* system (controller) *S01* IQ sensor (number 01) *S??* IQ sensor (inactive, dataset deleted) *D01* MIQ output module (number 01) *D??* MIQ output module (inactive, dataset deleted)
3	Message code
4	Date and time of the message
5	Status field of the message ✔ message is acknowledged No tick message is not acknowledged

The system provides the following log books:

- *310 - Log book of entire system*:
  List of all messages from all modules
- *Log book of selected sensor*:
  List of all messages from a single IQ sensor.

There is a detailed message text for each message of a module that is ready for operation. The detailed message text on each message is given in the log book (see section 4.6.3) and in the operating manual of the registering module.

Structure of the message code

The message code consists of 6 characters and can contain numerals and letters, e.g.: II2121.



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

Example: Message code II2121

The component "121" (MIQ/MC2 controller) sends a message with the short form message "II2".
This is an info message (I) of the type Installation (I) with the type number (2). The detailed message text of the short form message (II2) can be found in the log book and in the operating manual of the component that sent it.

The detailed message text in the log book contains a precise description of the message code and, if required, any further actions.

The detailed message texts can also be found in the component operating manuals of the individual components.

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

4.6.3 Viewing detailed message texts

1	Switch to the measured value display with **<M>**.
2	Using **<OK>**, open the *Display/Options* menu.
3	Using **<▲▼◀▶>** and **<OK>**, select and open the *Log book of entire system*. A list of log book entries appears.
4	Using **<▲▼◀▶>** and **<OK>** select and confirm a new log book entry (unchecked). The message text with further information on the selected log book entry appears.

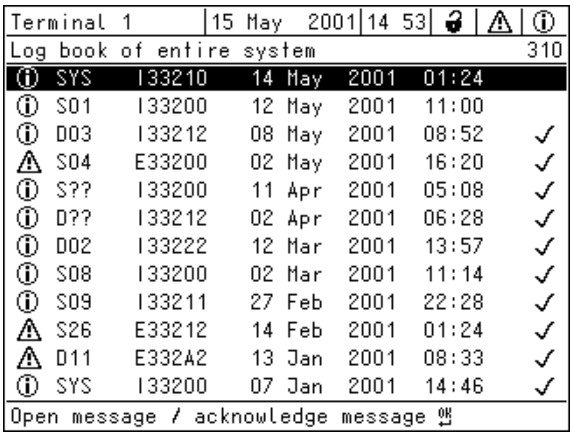


Fig. 4-15 310 - Log book of entire system

5	Acknowledge the message with **<OK>**. A tick appears in the log book entry.
6	Exit the message text with **<ESC>**.

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

With the *Acknowledge all messages* function you can acknowledge all messages at the same time (see section 4.6.4).

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

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

- Messages of the system are given in this operating manual (see section 13.2).
- Messages of a module are given in the respective component operating manual of the module.

4.6.4 *Acknowledge all messages*

1	Switch to the measured value display with **<M>**.
2	Using **<S>**, open the *Settings* menu.
3	Using **<▲▼◀▶>**, select the menu item, *Service* and confirm with **<OK>**.
4	Using **<▲▼◀▶>**, select the menu item, *Acknowledge all messages* and confirm with **<OK>**. A security prompt opens.
5	Press **<▲▼◀▶>** to select *Acknowledge* and confirm with **<OK>**. All messages are acknowledged. Error symbol and info symbol do no longer flash.

4.7 Calibration data

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

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

- Calibration date
- Calibration successful or not successful.

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

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

4.7.1 Calibration entries in the log book

The date and time of a calibration are entered in the log book. The respective message text contains an indication as to whether a calibration was successful or not. The values determined with calibration can be viewed in the calibration history (see section 4.7.2).

1	Call up the measured value display with **<M>**.
2	Using **<▲▼◀▶>**, highlight a sensor and confirm with **<OK>**. The *Display/Options* menu opens.
3	Using **<▲▼◀▶>**, highlight the menu item, *Log book of selected sensor*, and confirm with **<OK>**. Calibration entries in the log book are held in message code (ICxxxx and ECxxxx).
4	Select and open a calibration entry (ECxxxx or ICxxxx) with **<▲▼◀▶>** and **<OK>**.
5	Leave the *Calibration history of selected sensor* with **<▲▼◀▶>**.

4.7.2 Calibration history

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

1	Call up the measured value display with **<M>**.
2	Using **<▲▼◀▶>**, highlight a sensor and confirm with **<OK>**. The *Display/Options* menu opens.
3	Using **<▲▼◀▶>**, highlight the menu item, *Calibration history of selected sensor*, and confirm with **<OK>**. The calibration history with the results of the last calibration procedures opens.
4	Exit the *Calibration history of selected sensor* overview with **<M>**.

4.8 Status info of sensors and outputs

The display of the instrument status provides a simple overview of the current modes of sensors (sensor info) and outputs in the IQ SENSOR NET.

The status display can be reached in the *Settings*| *Service*| *List of all components* menu (see section 4.11.1).

1	Call up the *List of all components* (see section 4.11.1).
2	Highlight the required component with **<▲▼◀▶>** and confirm with **<OK>**. ● Output module: The *Status of output channels* window opens up (for details, refer to the operating manual of the output module). ● Sensor: The sensor info opens up (for details, refer to the operating manual of the selected sensor).

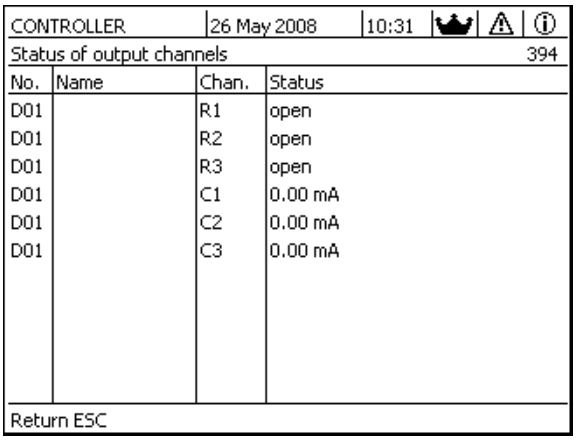


Fig. 4-16 393 - List of all components with sensor info

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

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

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

In the maintenance condition

- the system does not react to the current measured value or the condition of the selected IQ sensor
- linked outputs are frozen
- IQ sensor errors do not prompt changes in the conditions of linked outputs.

The maintenance condition for IQ sensors is automatically activated

- during calibration. After calibration the IQ sensor remains in the maintenance condition until the maintenance condition is switched off manually (see section 4.9.3)
- during a compressed-air cleaning cycle.

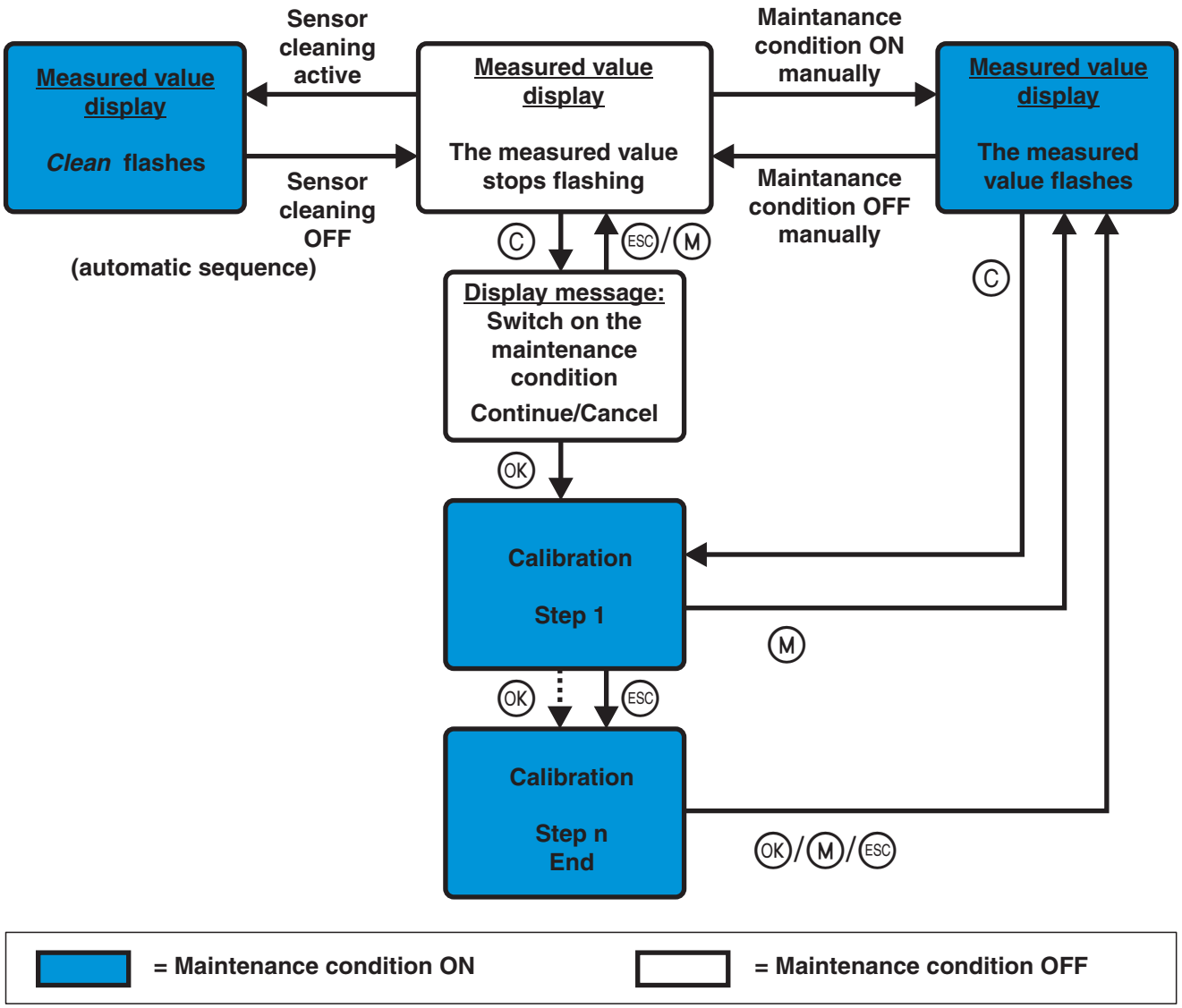
Therefore, keep to the following course when you calibrate, clean, service or repair an IQ sensor.

Steps

1	Switch on the maintenance condition for the IQ sensor (see section 4.9.2). The display of the sensor in the measured value display flashes.
2	Pull the sensor out of the sample.
3	Perform the calibration in the laboratory, cleaning, maintenance or repair (removing and replacing) of the sensor (about these topics, see the component operating manual of the corresponding sensor).
4	Submerse the sensor in the sample again.
5	Wait until the measured value does no longer change.
6	Switch off the maintenance condition for the sensor (see section 4.9.3). The display of the sensor in the measured value display does no longer flash.

4.9.1 Maintenance condition of IQ sensors

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



4.9.2 Switching on the maintenance condition

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

1	Call up the measured value display with **<M>**.
2	Select the sensor you want to switch on the maintenance condition for with **<▲▼◀▶>**. The display of the sensor in the measured value display does not flash.
3	Using **<OK>**, open the *Display/Options* menu.
4	Using **<▲▼◀▶>**, highlight the menu item, *Switch maintenance condition on/off*, and confirm with **<OK>**. A window that informs you about the maintenance condition opens up.
5	Confirm with **<OK>** *Continue*. The selected sensor is in the maintenance condition. Linked outputs are frozen.
6	Call up the measured value display with **<M>**. The display of the sensor in the measured value display flashes.

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

When you have finished calibrating, cleaning, servicing or repairing the sensor, switch off the maintenance condition manually (see section 4.9.3).

4.9.3 Switching off the maintenance condition

1	Call up the measured value display with **<M>**.
2	Select the sensor you want to switch off the maintenance condition for with **<▲▼◀▶>**. The display of the sensor in the measured value display flashes.
3	Using **<OK>**, open the *Display/Options* menu.
4	Using **<▲▼◀▶>**, highlight the menu item, *Switch maintenance condition on/off*, and confirm with **<OK>**. A window that informs you about the maintenance condition opens up.
5	Confirm with **<OK>** *Continue*. The maintenance condition of the selected sensor is switched off. Linked outputs are released.
6	Call up the measured value display with **<M>**. The display of the sensor in the measured value display does not flash.



If a power failure occurs, the outputs automatically are in the non-operative condition (relays: open, current output: 0 A; see component operating manual of the output module). After the end of the power failure the outputs work as defined by the user again.

If a power failure occurs while an IQ sensor that is linked with an output is in the maintenance condition, the current and relay outputs work as defined by the user after the maintenance condition has been switched off only (see section 4.9.3).

4.10 USB interface

The USB interface on the MIQ/MC2 can be used for the following actions:

- Save data of the IQ SENSOR NET to a USB memory device (see section 4.10.1)
- Transmit data to a PC with the aid of a USB memory device (see section 4.10.2)
- Transmit configuration data to the controller (see section 4.10.3)
- Carry out a software update (see section 4.11)

4.10.1 Saving IQ SENSOR NET data to a USB memory device

You can save the following data types:

- Configuration data (see section 4.10.3)
- Measurement data (see section 4.10.2)
- Log book
- Calibration history

The configuration data can be transferred from the USB memory device back to the IQ SENSOR NET. Thus, you can very easily create systems that are configured identically.

Data backup

1	Switch to the measured value display with **<M>**.
2	Using **<S>**, open the *Settings* menu.
3	Use **<▲▼◀▶>** and **<OK>** to open the *Data transfer to USB memory* menu.

4	Select the data to be saved with <▲▼◀▶>. ● *Save configuration* ● *Measured data storage* ● *Log book* ● *Calibration history* and confirm with <OK>. When saving the measured value memory only:

4-1	A list of those sensors is displayed for which measurement data are stored .
4-2	Using <▲▼◀▶>, select the *Selec.* column. Confirm with <OK>. Using <▲▼◀▶>, select the sensor and check it off with <OK>. The measurement data of the sensor are included in the backup. If necessary, add further sensors to the list of measurement data to be saved.
4-3	Terminate the selection of sensors with <ESC>.
4-4	Using <▲▼◀▶>, select the menu item, *Transfer data for selected sensors*, and confirm with <OK>. A dialog box pops up for the selection of the decimal separator for the exported *.csv file.
4-5	Using <▲▼◀▶>, select the decimal separator (comma or point) for the measurement data and confirm with <OK>. A query for the restart of the measured value recording pops up.
4-5	Using <▲▼◀▶>, select *Yes* or *No* and confirm with <OK>. If the restart of the measured value recording is selected, the measurement data stored in the IQ SENSOR NET are deleted after the save process. The measured value recording is restarted.

5	The data are prepared for the transfer.



You can cancel the data saving process by highlighting and confirming the Cancel menu item with <▲▼◀▶> and <OK>. In this case the data will not be stored to the USB memory device.

6	Press <▲▼◀▶> to highlight the *Save* menu item and confirm with **<OK>**. The selected data will be stored to the USB memory device.

4.10.2 Transmitting recorded measurement data to a PC

In the IQ SENSOR NET, you can log measured values of IQ sensors or differential sensors (see system operating manual, *Measured value logging*). The logged measured values can be transferred to a PC via the USB interface or the Ethernet interface.

The data is transferred in two steps:

1	Transfer of logged measurement data from a sensor to a USB memory device.
2	Transfer of temporarily stored measurement data from a USB memory device to the PC.

4.10.3 Saving the system configuration manually

During normal terminal operation, you can at any time save the system configuration data of the main controller to a USB memory device, in addition to the automatic backup.

4.11 Software-Update for IQ SENSOR NET

With a Software-Update, you maintain the latest state of the instrument software for your IQ SENSOR NET system 2020 XT and all active components.

The update packet with the current instrument software for active IQ SENSOR NET components is available on the Internet under www.WTW.com.



A Software-Update does not change the measurement settings, measurement data and calibration data. The instrument languages included in the language packet are automatically installed. Previously installed languages are deleted, with the exception of German and English.

The new software version is transferred to the System 2020 XT CONNECT with the aid of a USB memory device.



More detailed information on the Software-Update is given in the documentation of the software update.

4.11.1 Info on software versions

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

1	Call up the measured value display with **<M>**.
2	Using **<S>**, open the *Settings* menu.
3	Using **<▲▼◀▶>**, highlight the menu item, *Service*, and confirm with **<OK>**. The *Service* dialog window opens.
4	Using **<▲▼◀▶>**, highlight the menu item, *List of all components*, and confirm with **<OK>**. The *List of all components* dialog window opens.

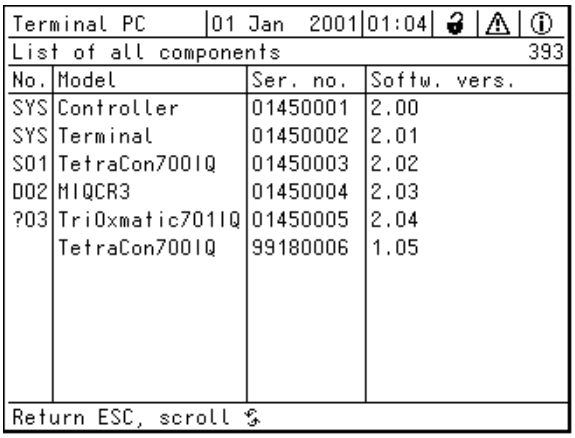


Fig. 4-17 393 - List of all components

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

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

5 Settings/setup

5.1 Selecting the language

A list shows all the available system languages.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item *Language*. The *Language* display opens.

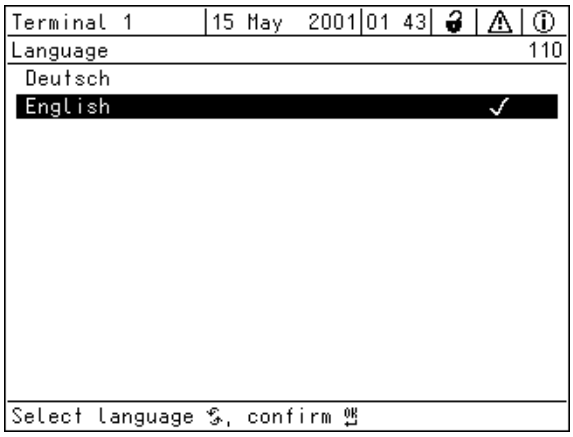


Fig. 5-1 110 - Language

3	Select a language from the list with **<▲▼◀▶>** and confirm with **<OK>**. The active language is marked with a tick.
4	Switch to the higher menu level with **<ESC>**. or: Switch to the measured value display with **<M>**.

If the selected system language is not available in a component, all indications of this component (e.g. sensor, controller, terminal, output module) appear in the standard language, German. To activate the selected system language for this component, a software update of the component is required. Please contact WTW.

5.2 Terminal settings

The available terminal settings depend on the terminal installed. The following terminals can be used:

- MIQ/TC 2020 XT, configured as a terminal
- PC Terminal CONNECT (see documentation on the IQ IQ Software Pack CONNECT)

5.3 Releasing or locking settings

Password protection can be switched on or off with the *Unlock/lock settings* function. The current setting is displayed in the safety field. The lock symbol is open or closed. Before any change of the release setting, a password query appears.

If the closed lock symbol can be seen on the display, all system settings are locked.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Unlock/lock settings*. The *Unlock/lock settings* dialog window opens.

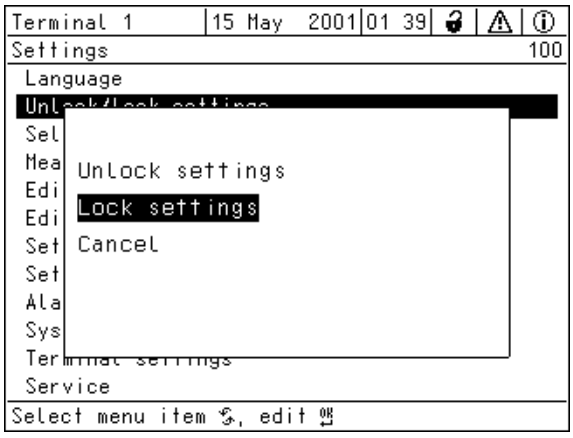


Fig. 5-2 Settings -> Unlock/lock settings

3	Press **<▲▼◀▶>** and **<OK>** to select a function and **<OK>** to confirm. The dialog window for entering the password opens.

4	Press **<▲▼◀▶>** and **<OK>** to enter the valid password and press **<OK>** to confirm. The setting is changed.



Forgotten the password? You can display the valid password on the screen (see section 14.1).

5.4 Editing the list of sensors

The *Edit list of sensors* display provides an overview of all IQ sensors, differential sensors and inactive datasets (see section 10.4.2).

In the *Edit list of sensors* display, you can:

- assign sensor names (see section 5.4.1)
- delete inactive datasets (see section 5.4.1)
- change the order of the display of measured values on the measured value display (see section 5.4.2).

5.4.1 Entering / editing a name for an IQ sensor

For the easier identification of the IQ sensors and differential sensors, you can assign an individual name to each IQ sensor.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Edit list of sensors*. The *Edit list of sensors* display opens.
3	Using **<▲▼◀▶>**, highlight the *Sensor name* column. Confirm with **<OK>**.
4	Using, **<▲▼◀▶>** highlight the name of a sensor and confirm with **<OK>**.

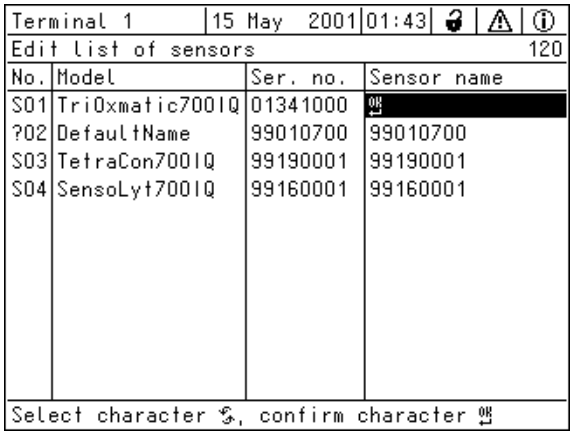


Fig. 5-3 Edit list of sensors

5	Enter the name with **<▲▼◀▶>** and **<OK>** and confirm with **<OK>** (see section 5.4.1).

5.4.2 Changing the display position

The numbering of the sensors is generated by the system. The order of the sensors in the measured value display and in the *Edit list of sensors* overview can be individually determined.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Edit list of sensors*. The *Edit list of sensors* display opens.
3	Using **<▲▼◀▶>**, highlight the *Model* column. Confirm with **<OK>**.
4	Press **<▲▼◀▶>** to highlight a *Model* and confirm with **<OK>**. A dialog window opens.

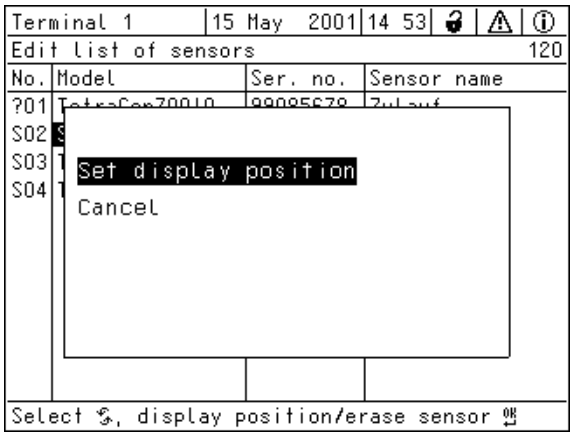


Fig. 5-4 Edit list of sensors -> Set display position

5	Using **<▲▼◀▶>**, select the menu item, *Set display position* and confirm with **<OK>**. A dialog window opens.
6	Press **<▲▼◀▶>** to select the required number for the display position and confirm with **<OK>**. The sensor is displayed at the new position in the list of sensors. The other sensors are moved accordingly.

5.4.3 Erasing inactive sensor datasets

An inactive dataset for an IQ sensor arises if the controller receives no signals from a registered IQ sensor. The *Error* display appears on the measured value display instead of a measured value. Inactive datasets can be recognized by a question mark, e.g. "?01" in the *Edit list of sensors* overview.

An inactive dataset can be reactivated by assigning it, e.g. to an IQ sensor of the same type (see section 10.4.2). All settings are retained. If you no longer require these data, you can erase them. All the data and settings belonging to this IQ sensor, as well as differential sensors and the link with an output, are erased by this action.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Edit list of sensors*. The *Edit list of sensors* display opens.
3	Using **<▲▼◀▶>**, highlight the *Model* column. Confirm with **<OK>**.
4	Press **<▲▼◀▶>** to highlight a *Model* and confirm with **<OK>**.

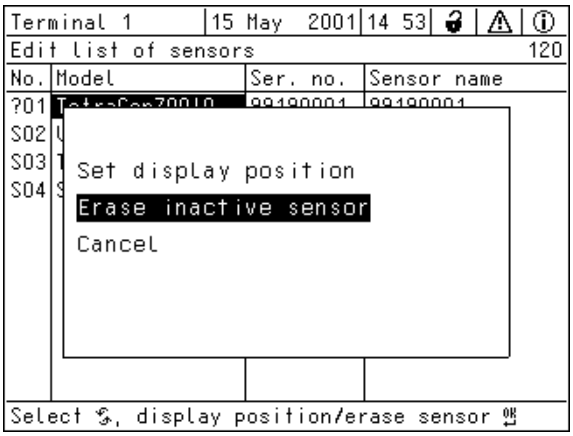


Fig. 5-5 Edit list of sensors -> Erase inactive sensor

5	Press **<▲▼◀▶>** to select *Erase inactive sensor* and confirm with **<OK>**. The dialog window for the security prompt appears.
6	Press **<▲▼◀▶>** to select *Erase inactive sensor* and confirm with **<OK>**. The inactive sensor is erased.

5.5 Setting up IQ sensors/differential sensors

5.5.1 Creating a differential sensor

A differential sensor is a virtual sensor. It shows the differential value of two IQ sensors that measure the same parameter and have the same settings. This is used to display the difference, e.g. before and after a water treatment.

Differential IQ sensors can be recognized in the *Edit list of sensors* overview in the *Ser. no.* field by the specification of the two sensors involved.

A link with another IQ sensor in the *Settings of sensors and diff. sensors* menu can be recognized in the *&* field by the sensor number of the linked sensor.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Settings of sensors and diff. sensors*. The *Settings of sensors and diff. sensors* display opens.
3	Using **<▲▼◀▶>**, select a sensor and confirm with **<OK>**. The display for the selection of the second sensor opens.

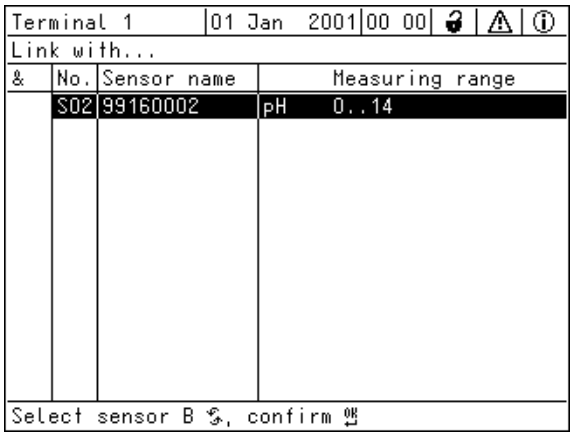


Fig. 5-6 140 - Settings of sensors and diff. sensors -> Link with...

4	Using **<▲▼◀▶>**, select a sensor and confirm with **<OK>**. The sensors are linked. The link in both sensors is entered in the *Edit list of sensors* overview. The linked sensor is created as a new sensor and also appears in the measured value display.

5.5.2 Erasing a differential sensor

If a differential sensor is no longer required, it can be erased from the list of sensors.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Settings of sensors and diff. sensors*. The *Settings of sensors and diff. sensors* display opens.
3	Press **<▲▼◀▶>** to highlight the *&* column and confirm with **<OK>**.
4	Press **<▲▼◀▶>** to highlight a differential sensor and confirm with **<OK>**.

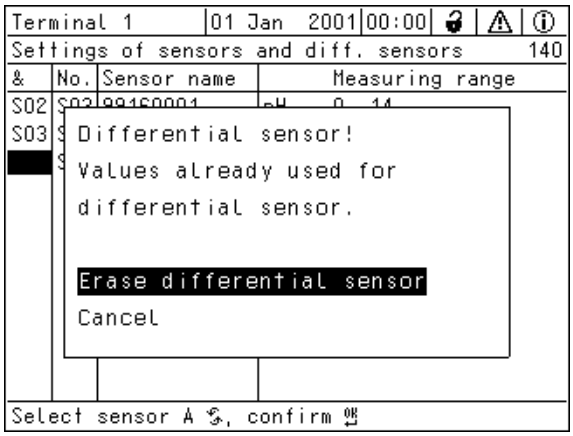


Fig. 5-7 140 - Settings of sensors and diff. sensors -> Erase differential sensor

5	Press **<▲▼◀▶>** to select *Erase differential sensor* and confirm with **<OK>**. The differential sensor is erased.

5.5.3 Adjusting the settings for sensors/differential sensors

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

General steps for the selection of sensor settings are given below. Details on sensor settings are given in the operating manual for the IQ sensor.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Settings of sensors and diff. sensors*. The *Settings of sensors and diff. sensors* display opens.
3	Using **<▲▼◀▶>**, highlight the *Measuring range* column. Confirm with **<OK>**. An information window opens up.

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

4	Confirm the information with **<OK>**. The *Link with...* display opens.

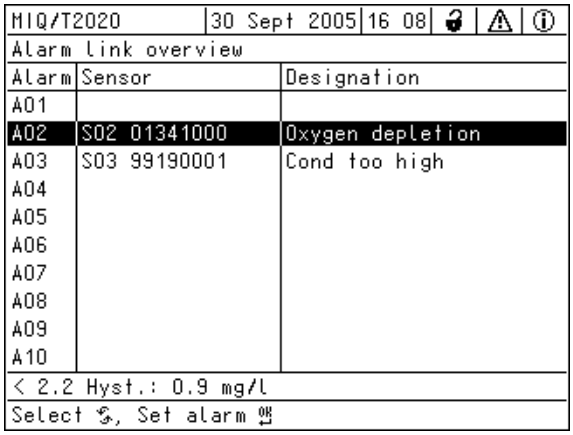


Fig. 5-8 140 - Settings of sensors and diff. sensors

5	Using **<▲▼◀▶>**, select a sensor and confirm with **<OK>**. The current settings are displayed.

5.6 Editing the list of outputs

The *Edit list of outputs* display provides an overview of all outputs, links and inactive datasets (see section 10.4.3).

In the *Edit list of outputs* display, you can:

- assign output names (see section 5.4.1) and
- erase inactive datasets (see section 5.4.2).

5.6.1 Entering / editing the name of an output

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

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Edit list of outputs*. The *Edit list of outputs* overview opens.
3	Press **<▲▼◀▶>** to highlight a name in the *Name* column and confirm with **<OK>**.

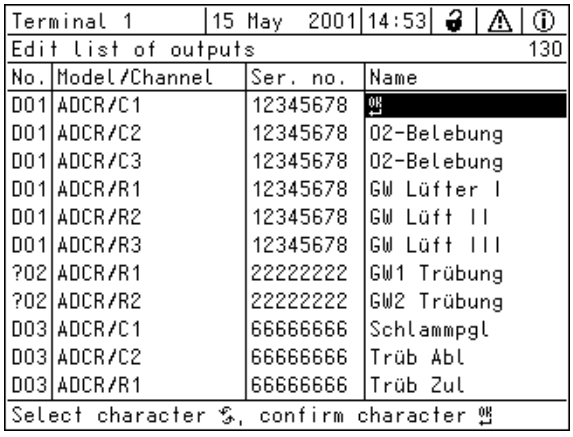


Fig. 5-9 130 - Edit list of outputs -> enter a name

4	Enter the name with **<▲▼◀▶>** and **<OK>** and confirm with **<OK>** (see also section 4.3.2).

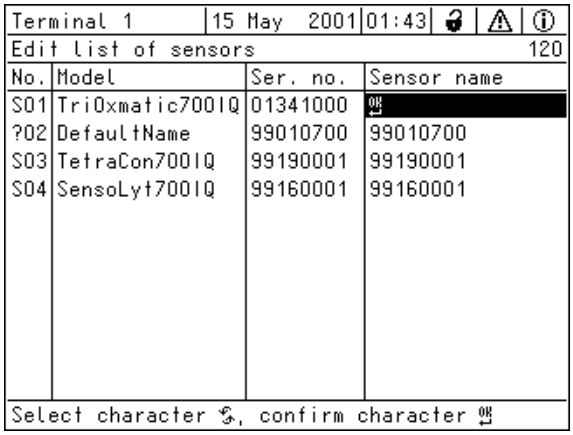


Fig. 5-10 Edit list of sensors

5.6.2 Erasing an inactive dataset for an MIQ output module

An inactive dataset for an MIQ output module arises if the system receives no signals from a registered MIQ output module. Inactive datasets can be recognized by a question mark, e.g. "?01" in the *Edit list of outputs* overview.

An inactive dataset can be reactivated by assigning it, e.g. to an MIQ output module of the same type (see section 10.4.3). All settings are retained. If you no longer require the stored data, you can erase them.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Edit list of outputs*. The *Edit list of outputs* display opens.
3	Using **<▲▼◀▶>**and **<OK>**, highlight the *Model/Channel* column. Confirm with . This column can only be highlighted if an inactive dataset (?xx) is present.
4	Press **<▲▼◀▶>** to highlight a *Model/Channel* and confirm with **<OK>**.

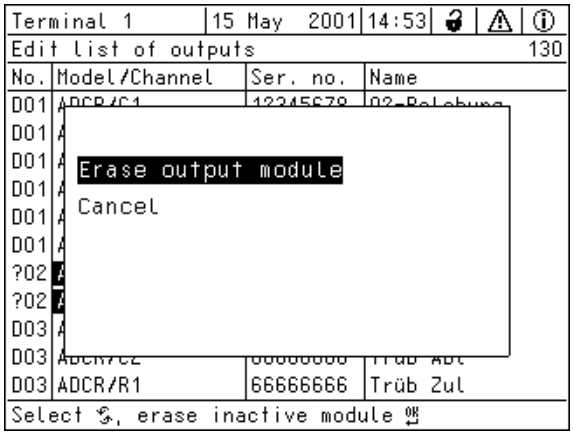


Fig. 5-11 130 - Edit list of outputs -> Erase output module

5	Press **<▲▼◀▶>** to select *Erase output module* and confirm with **<OK>**. The dialog window for the security prompt appears.
6	Press **<▲▼◀▶>** to select *Erase output module* and confirm with **<OK>**. The output is deleted.

5.6.3 Output links/settings

The procedure and possible settings for linking outputs with sensors are given in the operating manual of the respective output module.

5.7 Settings for a measurement location

Primarily, the settings for a measurement location simplify the calibration of IQ sensors if several IQ sensors of the same type are operated on the system. The option of hiding IQ sensors on the measured value display that are not operated at the measurement location helps to find IQ sensors at the measurement location quickly.

Measurement location-related settings become effective as soon as a terminal is docked on an MIQ module. Measurement location-related settings include:

- the location name (module name)
- the selection of the sensors for the measured value display.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Location display*. The *170 - Location display* display opens.

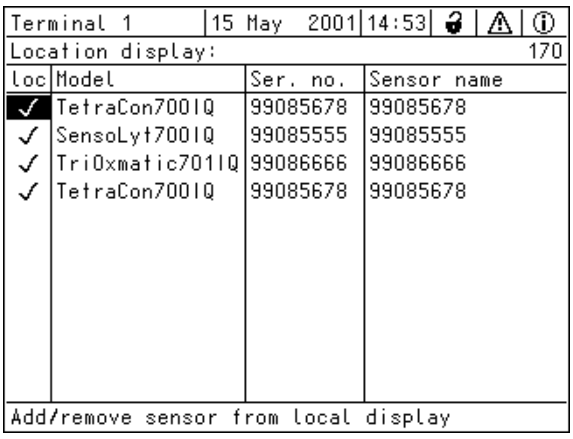


Fig. 5-12 170 - Location display

Entering the name of a measuring location

The name of the measurement location is displayed in the line with the name of the display. 15 characters are available for the name of the measurement location.

3	Press **<▲▼◀▶>** to select the name of the display, *Location display* and confirm with **<OK>**.
4	Press **<▲▼◀▶>** and **<OK>** to enter the location name and finally confirm with **<OK>** (see also section 4.3.2).

Selecting sensors for the measured value display on the measurement location

The measured value display provides the option of displaying either all sensors or a selection of sensors (see section 4.5.4).

As soon as a terminal is docked on any MIQ module, the selected sensors at the measurement location are displayed. All sensors for the display at the measurement location are activated in the delivery state.

The sensors are selected in the *Location display* menu. This selection is stored in the MIQ module on which the terminal is docked.

5	Select and confirm sensors for the local measured value display with **<▲▼◀▶>** and **<OK>**. This sets or removes a tick (✔) for the individual sensors. Sensors selected for the display are marked with a tick (✔).

5.8 Alarm settings

5.8.1 General information

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

An alarm event is when a certain measured value (limiting value) of a sensor is exceeded or undercut. You can configure up to 20 alarm events.

Alarm events can be relayed as follows:

- as a message on the display
- as a relay action (with corresponding output module)



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

5.8.2 Setting up / editing alarms

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *Alarm settings ->* . The *Alarm link overview* dialog window opens. Alarms that have already been set up have entries in the *Sensor* column.

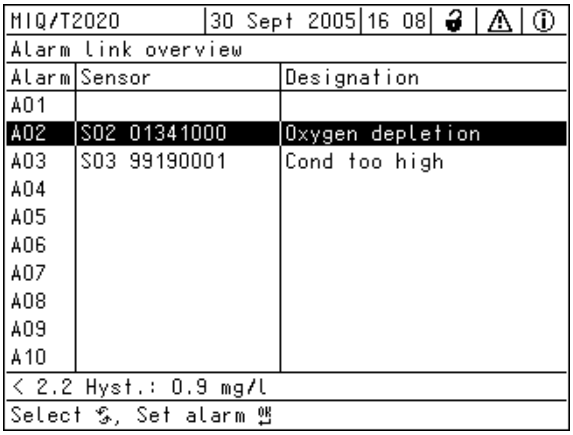


Fig. 5-13 Alarm settings -> Alarm link overview

In the *Sensor* column, the sensor number (corresponding to the list of sensors) and series number is named.

3	Select an alarm *A01* to *A20* to be edited with **<▲▼◀▶>**. To set up a new alarm without entry select in the *Sensor* column. Then confirm with **<OK>**. When a new alarm is set up a list with all sensors appears first. Alarm links that are already available can be erased or edited (for editing continue with step 5).

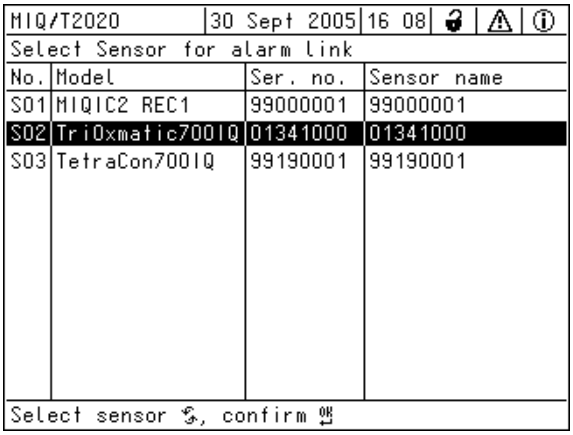


Fig. 5-14 Select sensor for alarm link

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

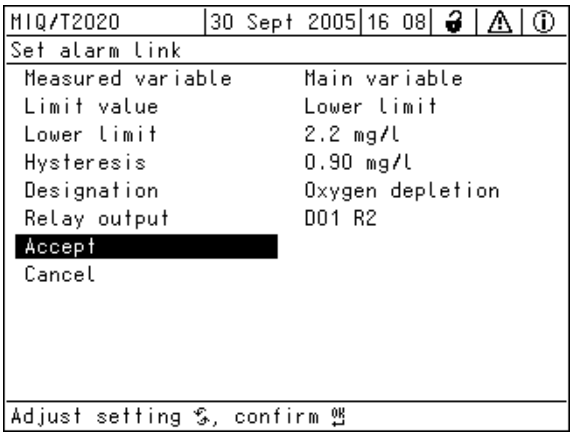


Fig. 5-15 Set alarm link

5	Edit the setting table. The required operating steps are described in detail in section 4.3 GENERAL OPERATING PRINCIPLES.

Alarm links setting table

Menu item	Selection/Values	Explanations
Measured variable	● *Main variable* ● *Adjoining variable*	*Main variable* designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). *Adjoining variable* designates an additional measured parameter (e.g. temperature).
Limit value	● *Lower limit* ● *Upper limit*	Type of the alarm event. *Lower limit*: An alarm is triggered if the defined limit value is undercut. *Upper limit*: An alarm is triggered if the defined limit value is exceeded.
Lower limit / *Upper limit*	*within the measuring range (sensor-dependent)*	Limit value for the alarm event
Hysteresis	*0 - 10 % of the measuring range*	Hysteresis for the limit value
Designation	(max. 20 characters)	User-defined designation for easier identification in the alarm message.
Relay output	Dxx / .../Ry *...* *...* *...* *No relay output*	Opens a list with all relay outputs where the *Alarm contact* is set. Dxx: number of the output module .../Ry: relay output channel Here you can select a relay output. When the alarm event occurs, it carries out the specified action (Open or Close). Details see section 5.8.3 ALARM OUTPUT TO DISPLAY.
Accept		The settings are taken over in the setting table by pressing <▲▼◀▶>. The display switches to the next higher level.
Cancel		The display switches to the next higher level without storing the new settings.

5.8.3 Alarm output to display

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

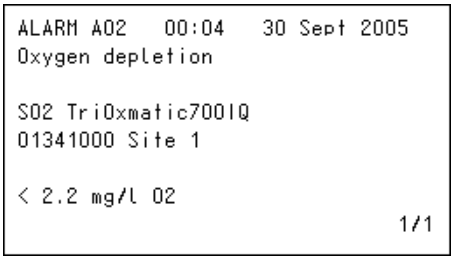


Fig. 5-16 Example of an alarm message on the display

The alarm message contains the following information:

- Line 1: Alarm no. Axx and date and time of the alarm event
- Line 2: User-defined designation
- Line 3: Sensor number and model name of the sensor that triggered the alarm event
- Line 4: Series number and name of the sensor that triggered the alarm event
- Line 5: Description of the event with specification of the limiting value:
  "<" = undercut
  ">" = exceeded

Operating instructions

If there are several alarm messages indicated on the display, you can scroll through the messages with **<▲▼◀▶>**. This can be recognized from the page number in the right lower corner. The latest message is always on the first position.

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

5.8.4 Alarm output as relay action

The relay outputs of the IQ SENSOR NET can be configured so a relay action is triggered when an alarm event occurs (Open or Close). For this the *Alarm contact* function must be set for the relay output in the *150 - Settings of outputs and links*.

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

5.9 System settings

System settings include:

- *Change password* (see section 5.9.1).
- *Language* (see section 5.1)
- *Date/Time*(see section 5.9.2)
- *Loc. altitude:*(see section 5.10)

5.9.1 Changing the password

A password protects the system settings against inadvertent changes. The password must always be entered in order to change the release of the settings.

The password is set to 1000 in the delivery state.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Change password*. The *Change password* dialog window opens.

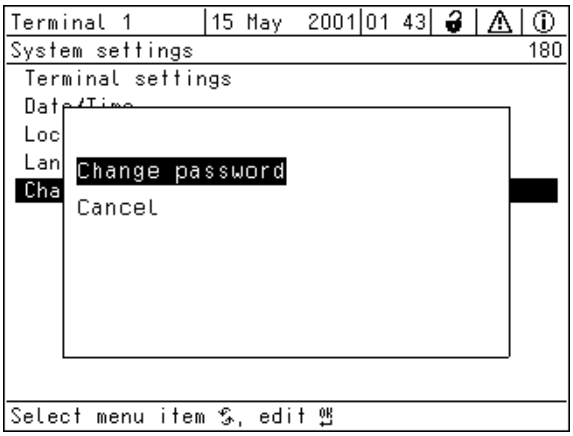


Fig. 5-17 180 - System settings -> Change password

3	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *Change password ->* . The dialog window for entering the password opens.
4	Press **<▲▼◀▶>** and **<OK>** to enter the new password and press **<OK>** to confirm. The setting is changed.

Forgotten the password? You can display the valid password on the screen (see section 14.1).

5.9.2 Setting the date and time

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

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Date/Time*. The *Date/Time* display opens.
3	Press **<▲▼◀▶>** to select *Set date* or *Set time*.
4	Confirm the selection with **<OK>**. A field is highlighted, e.g. *Year*.

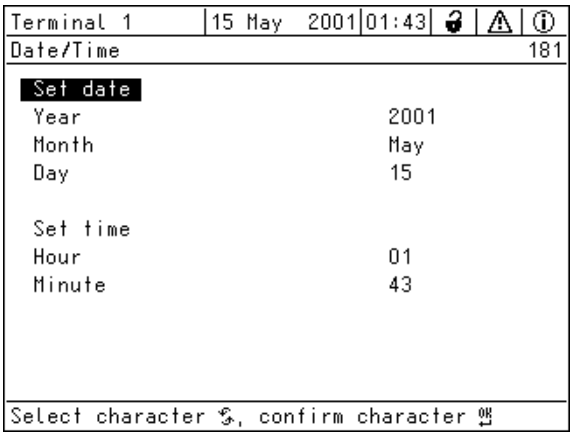


Fig. 5-18 181 - Date/Time

5	Press **<▲▼◀▶>** and **<OK>** to select and confirm a number. The next field is highlighted, e.g. *Month*.
6	Complete the entries on the display *Date/Time*.

The clock in the MIQ/MC2 bridges periods of power failure of up to 24 hours. After a longer power failure, the clock starts precisely at the time of the failure. A message and an entry in the log book provide information on the power failure and the necessity for resetting the clock.

5.10 *Measured value logging*

With the *Measured value logging* setting you can record and store measured values of IQ sensors or differential sensors.

You can display the stored measured values

- as a list or
- display the temporal course of the stored measured values graphically (see section 4.5.4).
- display the stored measured values to a PC.

The system allocates memory blocks to an IQ sensor for the *Measured value logging*. With a recording interval of 1 measurement dataset per minute, a recording duration of 1 day per memory block is possible. 360 memory blocks are available and can be distributed to the sensors.

The recording duration directly depends on the recording interval. If a recording duration of 0 d is set for a sensor, there is no memory block allocated to the IQ sensor. The *Dur.* setting also contains the number of the allocated memory blocks (see table).

Recording interval	Possible recording duration with the given recording interval					
1 min	0 d	1 d	2 d	3 d	...	360 d
5 min	0 d	5 d	10 d	15 d	...	1800 d
10 min	0 d	10 d	20 d	30 d	...	3600 d
15 min	0 d	15 d	30 d	45 d	...	5400 d
30 min	0 d	30 d	60 d	90 d	...	10800 d
60 min	0 d	60 d	120 d	180 d	...	21600 d

5.10.1 Setting the recording interval (*dt*) and recording duration (*Dur.*)

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *Measured value logging ->* . The *160 - Measured value logging* display opens. It contains a list of all sensors and inactive sensors.

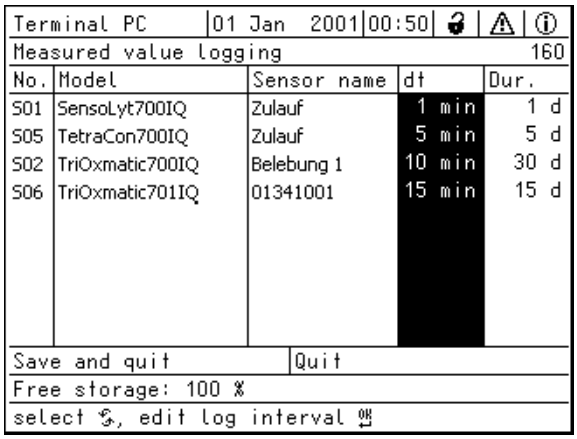


Fig. 5-19 160 - Measured value logging

3	Press **<▲▼◀▶>** and **<OK>** to select and confirm the *dt* column.
4	Press **<▲▼◀▶>** and **<OK>** to select and confirm a sensor.
5	Determine the recording interval with **<▲▼◀▶>** and **<OK>**. When the recording interval is changed, the recording duration changes at the same time (*Dur.*), because the recording duration results from the recording interval due to a fixed number of memory blocks.
6	Switch to the selection of columns with **<ESC>**.
7	Press **<▲▼◀▶>** and **<OK>** to select and confirm the *Dur.* column.
8	Press **<▲▼◀▶>** and **<OK>** to select and confirm a sensor.
9	Select the recording duration with **<▲▼◀▶>** and **<OK>**. The recording duration is always increased or decreased in the same steps.

The percentage of the memory blocks not yet allocated is shown on the display. If all memory blocks have already been allocated (*Free storage:*: 0%), the number of memory blocks allocated to another IQ sensor may have to be reduced.

When the number of memory blocks for a sensor is reduced, the memory block with the oldest data is erased. All other data is retained.

For inactive IQ sensors, the *Dur.* setting can only be reduced.

10	Switch to the selection of columns with **<ESC>**.
11	Press **<▲▼◀▶>** and **<OK>** to select and confirm the *Save and quit* column. The changes are stored. The *Settings* display opens.

If the changes made for recording duration or recording interval should not be stored, press **<▲▼◀▶>** and **<OK>** to select and confirm the *Quit* field.

6 Network connection

The network connection of the IQ SENSOR NET system extends and simplifies communication with the IQ SENSOR NET.

- The Ethernet interface allows the MIQ/MC2 to be integrated into a local network and connection to other networks (e.g. Internet) using commercially available network technology.
- The web server of the MIQ/MC2 provides the measurement data of the IQ SENSOR NET as a web page.
- Communication with the IQ SENSOR NET is possible via a large number of network-capable terminals.
  - Internet-capable devices with web browser (e.g. PC, Smartphone, Tablet PC) can display the measurement data of the IQ SENSOR NET .
  - The programs of the IQ Software Pack CONNECT can be used to manage the IQ SENSOR NET on a PC as usual.
- Extraction of the data provided by the web server is possible using commercially available or self-created programs (DataLogger).

6.1 Configuring the Ethernet network

The following overview helps in the planning, project planning and installation of a network connection of the IQ SENSOR NET.

A basic understanding of network technology is useful for setting up a local network and especially the connection to the Internet.

Various settings are to be made on the individual network subscribers according to the configuration of the network .

Insofar as the settings affect network subscribers of third-party vendors (e.g. the router), only a general reference is made here to the setting . For details, of the menus in which the settings are made, please refer to the respective to the respective operating manual for your device. If you have no knowledge of networks, please contact your network administrator.

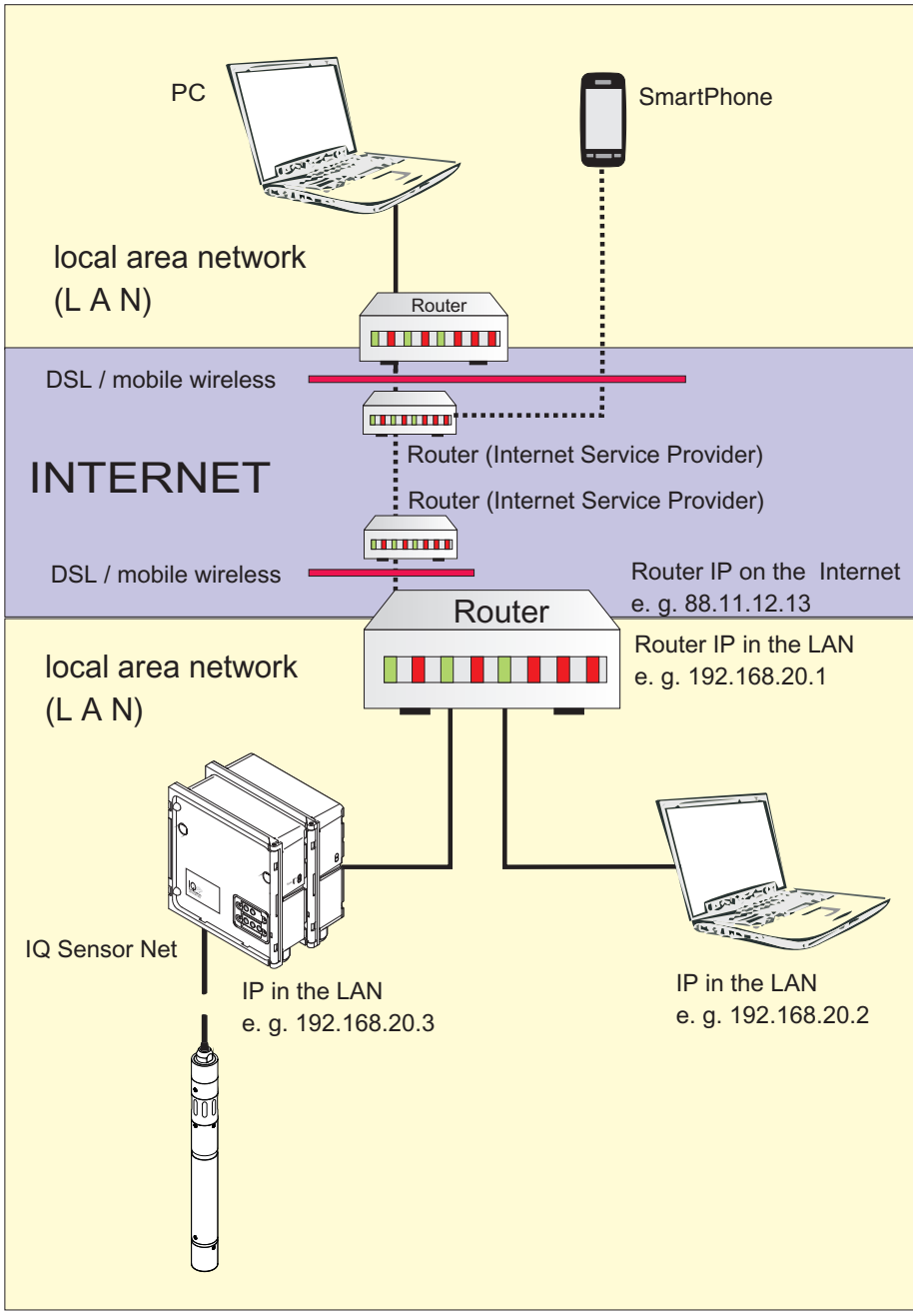


Fig. 6-1 IQ SENSOR NET in the local network and on the Internet

6.1.1 Communication in a local network (LAN)

	Prerequisites	Details / Examples / Designations
Hardware	System 2020 XT CONNECT	Controller MIQ/MC2
	Router	with DHCP and DNS servers (for network access in the LAN via the name of the MIQ/MC2)
	Ethernet cable	RJ45 cable (for connection of IQ SENSOR NET and router)
	Terminal equipment (a network subscriber that sets up the communication), e.g.:	● PC ● Tablet PC ● Smartphone
Software	Communication software on the terminal equipment, e.g.:	● web browser ● programs of the IQ Software Pack CONNECT (for PC only)
	Network services (on the PC)	● WINS server
Network address of the MIQ/MC2 in the LAN	● device name_serial number of the MIQ/MC2 (see imprint on the MIQ/MC2, example: MIQMC2_12250001) or ● fixed local IP address of the MIQ/MC2 (defined in the settings of the MIQ/MC2) (see Abschnitt 6.1.2).	

6.1.2 Communication on the Internet

	Prerequisite	Details / Examples / Designations
Hardware	System 2020 XT CONNECT	Controller MIQ/MC2
	Router, e.g.	● DSL router ● Mobile wireless router
	Ethernet cable	RJ45 cable (for connection of IQ SENSOR NET and router)
	Terminal equipment (network subscriber that sets up the communication), e.g.:	● PC ● Tablet PC ● Smartphone
Software	Communication software on the terminal equipment, e.g.:	● web browser ● programs of the IQ Software Pack CONNECT (for PC only)
Network address of the MIQ/MC2 on the Internet	The network address of the router on the Internet is configured via an Internet service (see below).	
Internet services	Internet access with data flat rate, e.g.:	● DSL connection ● Mobile wireless connection (SIM card)
	Internet service which makes the router publicly addressable on the Internet, e.g.:	● A public IP address (e.g. available at an Internet service provider) ● A service (e.g. DynDNS), which assigns a fixed name to the changing IP address of an Internet subscriber so that the subscriber is always accessible under the same name

	Prerequisite	Details / Examples / Designations
Special settings of the network subscriber	IQ SENSOR NET	Menu: *System settings* / *TCP/IP settings*: ● *DHCP*: *No* ● *IP address*: Enter a fixed IP address (the IP address must lie outside the address range of the DHCP server (the DHCP server is often a network service of the router) ● *Subnet mask*: The IP address depends on the local network (in home networks, e.g. 255.255.255.0) ● *DNS server*: Local IP address of the router (e.g. 129.168.179.1) ● *Standard gateway*: Local IP address of the router (e.g. 129.168.179.1)
	Router (see operating manual for your router)	● Data for Internet access (from Internet service provider) ● Port forwarding of ports 21371 to 21373 on the fixed IP address of the MIQ/MC2 ● Port forwarding of port 8080 to port 80 of the fixed IP address of the MIQ/MC2
	Firewall on the router and terminal equipment	● Port release of ports 21371 to 21373 for incoming and outgoing connections

6.2 Setting up a connection with the IQ SENSOR NET

6.2.1 General information

Prerequisites

- All network components (MIQ/MC2, router, PC) are connected
- The network services are active

Procedure

- On the PC:
  in the start routine of the programs of the
  IQ Software Pack CONNECT in the *IP address* input box, enter the IP address of the System 2020 XT CONNECT.
- On any terminal equipment:
  Enter the network address of the MIQ/MC2 in the address line in the web browser



The name set in the menu *Settings->TCP/IP settings->Host name* is used as the name.
When delivered, the combination of "device name-serial number" is entered as the name
(e.g. "MIQ-MC2-12250001").

The serial number is found on the housing of the MIQ/MC2.

6.2.2 Communication with the web server of the MIQ/MC2

The web server of the MIQ/MC2 constantly provides current measurement data. Within a network the data can be displayed on any terminal equipment via any web browser (e.g. from a PC, Tablet PC or Smartphone). The recording of this data can be automated (DataLogger). The data output from the web server are provided with unique identifiers in the source code of the web site and thus easily read by machine.

1	MIQ/MC2 The network address of the controller is entered in the address line of the web browser or in the address line of a program of the IQ Software Pack CONNECT . ● In the LAN, e.g. device name_serial number of the controller MIQ/MC2 ● On the Internet, e.g. fixed IP address of the router or DynDNS name The network connection to the IQ SENSOR NET System 2020 XT CONNECT is set up.

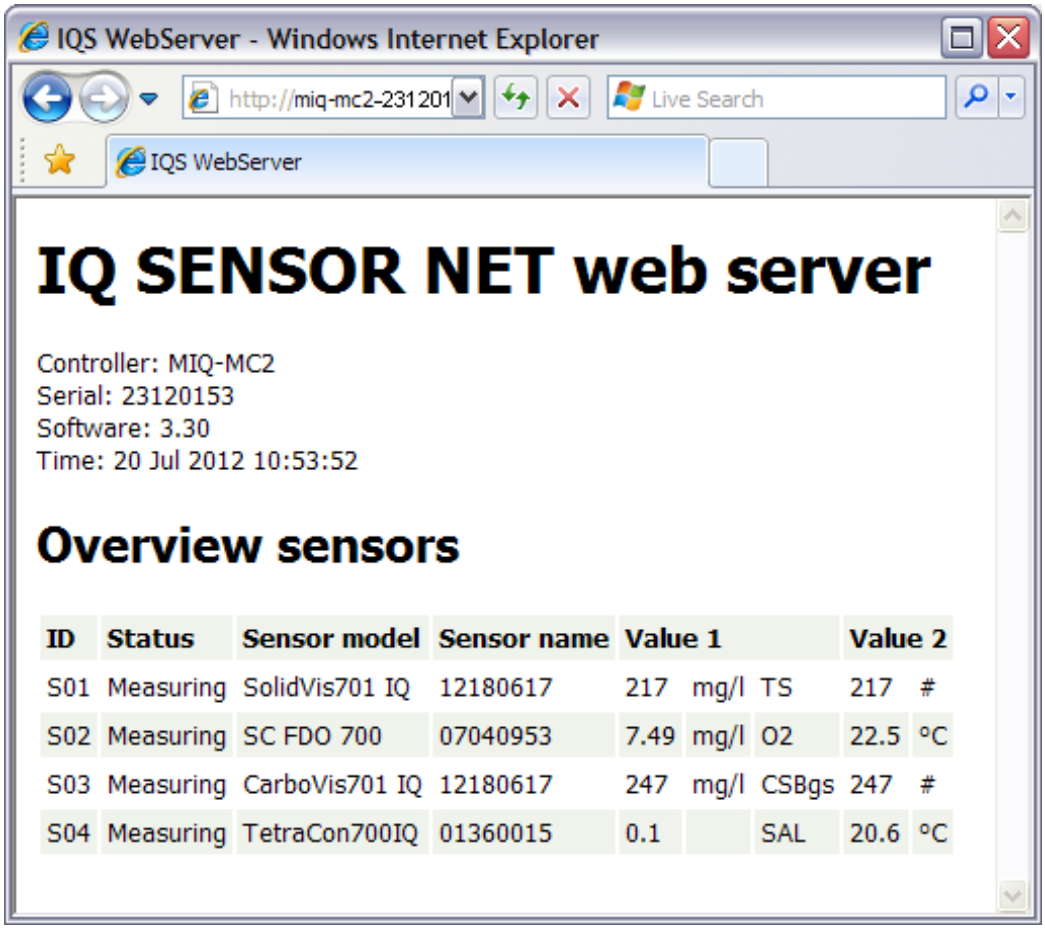


Fig. 6-2 Display of the IQ SENSOR NET web server in the web browser

The transfered data of all IQ SENSOR NET sensors can be found in the WTW document "IQ SENSOR NET Sensors: Coded data for fieldbus communication" (ba75560de). It is constantly updated with the appearance of new sensors and changes to the sensor software (insofar as they affect the transferred sensor data). The latest version can be found in the download area for operating manuals on the Internet. Use the search function and search for "ba75560de" for the download.

Before further processing check the sent data for agreement of the requested and sent sensor number (Sxx).

6.3 Communication via a PC

Communication via a PC is carried out via the programs of the IQ Software Pack CONNECT.
The IQ Software Pack CONNECT is a software collection for (remote) operation of the IQ SENSOR NET system on a PC. Among other things, it also includes the following programs:

- DatalogTransfer CONNECT
- ConfigSaveLoad CONNECT
- PC Terminal CONNECT

In addition, the IQ Software Pack CONNECT contains an example of a DataLogger which records the data of the web server.

The programs of the software collection can be used if the IQ SENSOR NET system has an interface to a PC.

The current version can be found on the Internet at www.WTW.com.

The following functions can be carried out from a (remote) PC:

(Remote) Operation / Monitoring of the IQ SENSOR NET

The PC Terminal can perform all functions of a terminal (e.g. MIQ/TC 2020 XT). It has the same operating interface. Thus, it is not necessary to "get used to" the terminal when changing between the various terminal types (for details, see the documentation of the IQ IQ Software Pack CONNECT).

(Remote) Data transmission of current measurement data

For this purpose, the controller has a web server function which can be used to query the most important information from the IQ SENSOR NET system (for details, see the documentation of the IQ IQ Software Pack CONNECT).

(Remote) Data transmission of stored measurement data

The (remote) data transmission can be carried out directly or indirectly (for details, see the documentation of the IQ IQ Software Pack CONNECT).

- In the case of direct (remote) data transmission, the data are transmitted directly from the IQ SENSOR NET to a PC with, for example, the aid of the PC Terminal.
- In the case of indirect data transmission, the data are temporarily stored on a mobile memory device and then read out on the PC.

(Remote) Backup/Loading of the system configuration

The system configuration can be backed up on a PC from the IQ SENSOR NET and loaded from the PC onto theIQ SENSOR NET system (for details, see the documentation of the IQ IQ Software Pack CONNECT).

6.3.1 Installation of the IQ Software Pack CONNECT

PC software requirements

- Windows XP or higher
- Example of a DataLogger which automatically records the data of the web server:
  - Microsoft Excel 2003 or higher
- With Windows XP operating system or higher:
  Administrator rights for the PC for program installation

Installation under Windows

Installation on the hard disk:

- Download IQ Software Pack CONNECT from www.WTW.com
- Execute the downloaded file.
- Follow the instructions of the setup program.

6.3.2 Starting the programs of the IQ Software Pack CONNECT

The programs of the IQ Software Pack CONNECT are in the Windows start menu under *IQS Software Pack*. CONNECT

The programs of the IQ Software Pack CONNECT require a network connection to the IQ SENSOR NET.
The connection dialog window appears in all programs of the IQ Software Pack CONNECT that communicate during the start routine. The connection is made by entering the network address of the IQ SENSOR NET.



The IP address and the other network settings for the MIQ/MC2 controller are configured in the *System settings -> TCP/IP settings* menu.

Details on programming the IQ Software Pack CONNECT can be found in the documentation accompanying the IQ Software Pack CONNECT.

6.4 Troubleshooting

The IQ SENSOR NET uses the MIQ/MC2 to provide an Ethernet interface for connecting the IQ SENSOR NET to private networks, company networks and public networks.

To establish accessibilty of the IQ SENSOR NET in a public network (e.g. Internet), external services (e.g. Internet access, fixed public IP address etc.) are required.

A detailed error analysis for connection errors is not possible within the scope of the IQ SENSOR NET operating manual because of the multitude of service providers, network architectures and connection options involved.

Here is a selection of possible causes for network/connection problems. If there are other connection problems, contact your network administrator or a network specialist.

No network connection

Cause	Remedy
– Ethernet hardware defective, e. g. – Ethernet cable defective – Ethernet connection to MIQ/MC2 or router defective	– Open the MIQ/MC2 and check the red Ethernet LED. – The red Ethernet LED is not illuminated (hardware defective): Use other hardware, e. g.: Ethernet cable, Ethernet socket on the router, router – The red Ethernet LED is illuminated (hardware OK): check for other errors (see below)
– Incorrect network address entered in the LAN (name)	– Enter the correct name: "device name-serial number", replace special characters (/, empty spaces etc.) with "-", e.g. MIQ-MC2-12250001 – Ascertain or define the correct IP address of the controller in the local network (e.g. IQ SENSOR NET setting + router setting) and enter

Cause	Remedy
– Incorrect network address on the Internet (IP address of the router)	– Ascertain or define the correct Internet IP address of the router (e.g. FixedPublicIP) and enter
– A network connection from a PC to the controller already exists (PC Terminal CONNECT)	– Exit 2nd PC Terminal CONNECT
– Incorrect setting in the router (e.g. Internet access data, port forwarding)	– Correct settings
– Incorrect setting in the IQ SENSOR NET (System menu/ *TCP/IP settings*)	– Correct settings
– Ports which are used by the IQ SENSOR NET are already assigned to other devices in the network (e.g. another IQ SENSOR NET system)	– Have your network administrator assign you free ports – Specify the port (1-65535) manually in the address line of the browser/PC Terminal CONNECT (example: http://10.11.12.13:65535) – Forward this port (65535) in the router to the IP address of the controller.
– Blocking by firewall	– Contact your network administrator or a network specialist

6.5 Technical network terms

DHCP (Dynamic Host Configuration Protocol)

DHCP is a network service which automatically assigns an IP address to a network subscriber.
In local networks, this function is mostly carried out by the router.

DNS (Domain Name System)

DNS is a network service which manages the name of a subscriber on the Internet (e.g. www.google.com) and the associated IP address e.g. "http://74.125.224.72/".
In local networks, this function is mostly carried out by the router.

DynDNS (Dynamic DNS)

DynDNS is an Internet service which makes a subscriber with changing (dynamically issued) IP address accessible under a fixed name on the Internet.
Prerequisite: The router in the local network must support DynDNS and must always send its current dynamic public IP address to the Internet service.

Firewall

A firewall protects a device or a local network against attacks from the Internet.
A firewall blocks communication interfaces (ports) which are not used for standard communication (web browser, e-mail etc.).

IP address

A network address identifies a subscriber in a network.

Private IP addresses are IP addresses specially reserved for home networks (range 192.168.0.0 to 192.168.255.255). In most cases, they are automatically assigned by the router which manages the local network. They are used to uniquely identify the individual subscribers within a local network.
Routers provide the possibility to manually assign a fixed local IP address for individual devices.

Public IP addresses are automatically assigned to the router in the local network (LAN) by the Internet Service Provider (ISP) (LAN). They are used to uniquely identify an Internet subscriber (a home network or even an individual device) to the Internet. They are mostly only valid for the duration of an Internet session (dynamic IP address) and are released again upon ending the Internet connection.
An Internet user can also be assigned a fixed public IP address via (chargeable) Internet services.

ISP (Internet Service Provider)

An ISP is an Internet service provider which provides Internet access.

Port

A port is the communication interface of an application (possible port numbers: 0-65535).
Some ports (port numbers) are reserved for special applications, e.g.:

- 21: FTP (File Transfer Protocol)
- 25: SMTP (Simple Mail Transfer Protocol)
- 80: HTTP (Hypertext Transfer Protocol)
  (used by the web browser for communication with web servers)

Port release

To allow communication with a device behind a firewall, ports must be released for specific applications. The firewall then forwards incoming or outgoing data to this port.
In local networks, this function is often assumed by the router.

The IQ SENSOR NET controller MIQ/MC2 uses ports 21371 - 21373 and 80.

Port forwarding

If a router receives a communication request on a port for which forwarding is configured, communication is forwarded to the port of a network subscriber which is defined in the forwarding rule.
In local networks, this function is mostly assumed by the router.

Router

A router fulfills the following tasks as an interface between two networks:

- It connects the local network to the Internet.
- It controls the communication of network devices within a local network and manages the local IP addresses of the subscriber. In the local network, it is also possible to manage names for individual IP addresses (DHCP) in most cases.

Routers often assume other services in a network, e. g.:

- DNS (assigning of names to IP addresses)
- Firewall (protects the network subscriber against attacks from the Internet)
- Port forwarding

TCP/IP (Transmission Control Protocol / Internet Protocol)

The Internet Protocol is the common language (protocol) of the network subscriber.

7 Modbus connection (option)

The IQ SENSOR NET system can be connected to a Modbus system in the following ways:

- with an MIQ/MC2 controller with the Modbus option
- with an MIQ/2-MOD Modbus module

The present section only describes the connection with the MIQ/MC2-MOD controller.



Further instructions for the installation and operation of a Modbus network are given on the Internet under www.modbus.org. Especially recommendable is the "Aufbaurichtlinie PROFIBUS/FMS" (installation guideline) issued by the PNO PROFIBUS user organization, (PNO order number 2.111) with many practical installation tips that apply to Modbus systems as well.

7.1 Modbus checklist

The following checklist supports you when planning, projecting and installing a Modbus plant with the IQ SENSOR NET. For smooth operation, you should be able to answer all questions with "Yes".

- Is the [bus system] (bus segment) installed without branch lines?
- Was the correct Modbus cable used (cord type A according to EN 50170)?
- Are the poles of the signal lines A line and B line correctly connected at all bus connections?
- Is it guaranteed that there is no short-circuit between A line, B line and cable shielding?
- Is the shielding installed free of interruptions?
- Are the guidelines for shielding and grounding being observed, and doesn't any unallowed potential equalization current flow via the shielding?
- Is the maximum cable length (per bus segment) observed for the corresponding baud rate?
- Do all devices support the required baud rate?
- Are exactly two terminators switched on at the ends of the [bus system] (bus segment)?
- Are the terminators supplied with voltage so the following applies: $U_{B\ line} - U_{A\ line} > + 500$ mV?
- Do all devices have individual bus addresses?

- After changing the bus address, have the devices been restarted (switched off and on again)? Note: The IQ SENSOR NET does not have to be restarted.
- Do the addresses projected in the master correspond to the actual addresses?
- After commissioning:
  Do all devices signal error-free behavior?
- Is it guaranteed that the Modbus master has consistent access to the 16 byte sensor data structure?

7.2 Connecting the Modbus cable

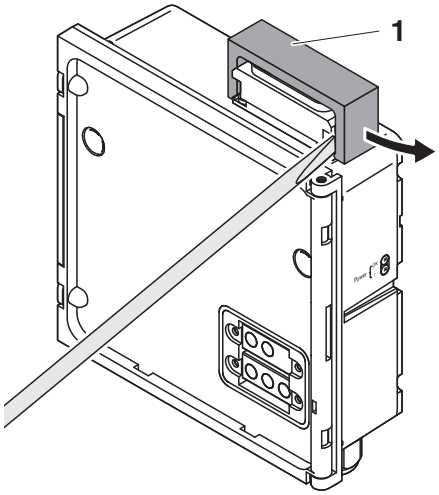
The Modbus cable is connected to the IQ SENSOR NET using a 9-pin D-SUB connector on the top of the housing. As connector on the cable side, we exclusively recommend one of the following two connectors.

Manufacturer: Phoenix Contact GmbH & Co. KG
Flachsmarkt 8
32825 Blomberg
Germany
http://www.phoenixcontact.com

Types: VS-09-PROFB-SC
(Phoenix article no. 1654549, with screwed contacts, available from WTW under the order no. 902 888)

or: VS-09-PROFB-SP
(Phoenix article no. 1654345, with spring contacts)

To remove the blind plug, lift the safety bracket with a suitable screw driver at both clamps on the left and right side (see Fig. 7-1).



1 Safety bracket

Fig. 7-1 Removing the safety bracket

Note

To prevent the enclosure of the IQ SENSOR NET from being penetrated by water the following must be observed:

- *Use connectors recommended by WTW only.*
- *When the connector is removed, the connection socket of the IQ SENSOR NET must be closed with the blind plug and secured with the safety bracket.*

All cables with electrical characteristics according to EN 50170 are suitable as a Modbus cable (e.g. all Profibus cables).

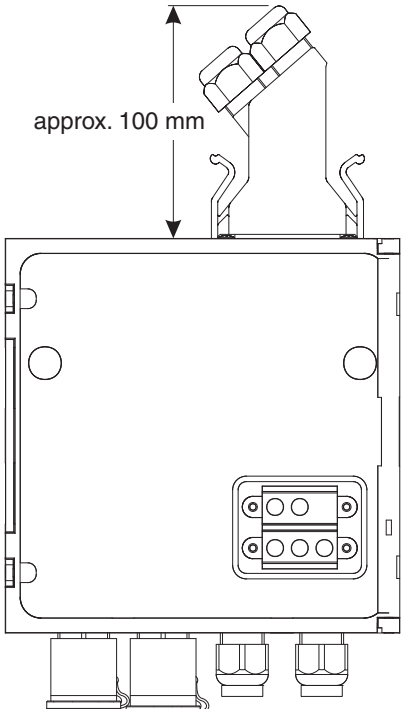


Fig. 7-2 IQ SENSOR NET with Phoenix connector

Pin assignment of the connector

Pin	Color*	Name	Function
1			-
2			-
3	Red	B line	Positive RxD/TxD according to RS 485 specification
4		RTS	Request To Send
5		GND BUS	Reference potential for data lines and terminating resistors

Pin	Color*	Name	Function
6		+5 V BUS	Supply voltage for terminating resistors
7			-
8	Green	A line	Negative RxD/TxD according to RS 485 specification
9			-

* Wire colors when using a standard PROFIBUS cable.



Please observe the operating manual of the connector.

7.3 Setting the Modbus interface parameters

The setting of the Modbus interface parameters (RS 485 interface) is done in the menu, *MODBUS Konfiguration*.

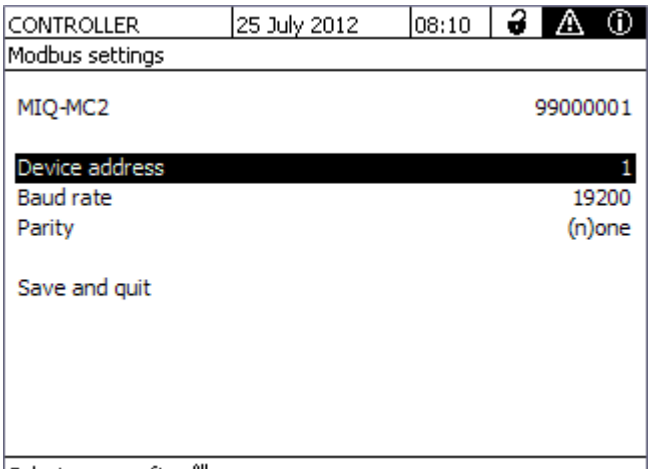
Settings

Setting	Selection/Values	Description
Device Address	*1 ... 247*	Device address of the IQ SENSOR NET
Baud rate	*1200* *2400* *4800* *9600* *19200* *38400* *57600*	Baud rate
Parity	*None* *Even* *Odd*	Parity *None* (2 stop bits) *Even* (1 stop bit) *Odd* (1 stop bit)

Proceeding: setting the interface parameters

1	Using **<S>**, open the *Settings* menu.
2	Press **<▲▼◀▶>** and **<OK>** to select and confirm the menu item, *Settings interface devices*.

3	Press **<▲▼◀▶>** and **<OK>** to select and confirm the bus interface.



4	Edit the setting table as described in section 4.3.

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

7.4 Transmitted sensor data

7.4.1 Overview

Data transmission is carried out via the RS 485 interface with the Modbus RTU protocol.

Transmitted sensor data

The following data for a sensor is transmitted to the Modbus master as a consistent data block:

- Sensor number (Sxx)
- Sensor status
- Sensor model
- Status info of sensors
- Measuring mode
- Measured value status (main and secondary measured value)
- Main measured value
- Secondary measured value

The transmitted data of all IQ SENSOR NET sensors is given in the WTW document, "IQ SENSOR NET sensors: encoded data for field bus communication" (ba75560de). It is permanently updated when new sensors are available and when the sensor software is modified (if the modifications are relevant for the transmitted sensor data). The latest version is available on the Internet, in the download area for operating manuals. Use the search function for the download and search for "ba75560de".

Check the transmitted data for agreement of the requested and transmitted sensor number (Sxx) before any further processing.

Sensor data block

The datasets of the sensors are made available to the Modbus master in a sensor datablock in the IQ SENSOR NET.

Query and response telegram

Data transmission takes place via query and response telegrams. The form of the telegrams is determined by the Modbus RTU protocol. The Modbus master transmits a query telegram with a Modbus command to the Modbus slave (here, the IQ SENSOR NET). The Modbus slave transmits a response telegram with the requested data from the sensor data block or an error message.

Supported Modbus commands

The IQ SENSOR NET provides the data block for read access only. Writing Modbus commands are not carried out.

Modbus commands	Command code
Read Input Register	04h
Read Discrete Inputs	02h
Read Holding Register	03h
Read Coils	01h

7.4.2 Sensor administration under Modbus

Preparation of the IQ SENSOR NET for communication with the Modbus may require, e.g. the following:

- Creating an IQ SENSOR NET system with specific assignment of sensor numbers to sensors
- Creating several IQ SENSOR NET systems with the identical assignment of sensor numbers to sensors
- Changing the order of the sensors in an already installed system

Creating the assignment of sensor numbers

You want to install an IQ SENSOR NET system and, at the same time, to create a specific sequence of sensor number assignments to the sensors.

1	Carry out a system start without any sensors (see section 3.10.2).
2	Connect the sensors to the system in the required order. With each sensor wait until the system has recognized the sensor.

Changing the assignment of sensor numbers

You want to change the assignment of sensor numbers to the sensors in an already running IQ SENSOR NET system.

1	Unplug all sensors from the IQ SENSOR NET.



When the inactive datasets are deleted, all settings for the sensors are deleted as well.

2	Delete all inactive datasets in the list of sensors (see System operating manual, chapter *Deleting inactive datasets of sensors*).
3	Connect the sensors to the system in the required order. For each sensor, wait until the sensor is recognized by the system (see System operating manual, chapter Installation).

Creating the identical assignment of sensor numbers in several systems

You want to install several identical IQ SENSOR NET systems and, at the same time, to create the same sequence of sensor number assignments to the sensors in all systems.

1	Carry out a system start without any sensors (see System operating manual, chapter Installation).
2	Connect the sensors to the system in the required order. For each sensor, wait until the sensor is recognized by the system (see System operating manual, chapter Installation).
3	Repeat steps 1 and 2 for all other systems and, while doing so, keep to exactly the same order when connecting the sensors.

7.4.3 Sensor data block

The data block contains the data of the sensors in the order of their registering on the IQ SENSOR NET (Sxx number).

The data of a sensor are stored in 8 registers each.
Thus, the sensor data block consists of altogether 16 registers. Each register contains 2 bytes. The bytes 0 and 1 form register 0001, the bytes 2 and 3 form register 0002, etc.

	Modbus		Information	Data format	
	Register	Bit		Data type	Bit
Sensor S01	0001	1-8	1 [= sensor number (S01)]	(Int 8)	7-0
	0001	9-16	Sensor status	(Int 8)	7-0
	0002	1-16	Sensor model	(Int 16)	15-0
	0003	1-16	Status info	(Int 16)	15-0
	0004	1-8	Measuring mode	(Int 8)	7-0
	0004	9-16	Measured value status	(Int 8)	7-0
	0005	1-16	Main measured value (IEEE-754 floating point, 32-bit)	(Float 32)	31-16
	0006	1-16	Main measured value (IEEE-754 floating point, 32-bit)	(Float 32)	15-0
	0007	1-16	Secondary measured value (IEEE-754 floating point, 32-bit)	(Float 32)	31-16
	0008	1-16	Secondary measured value (IEEE-754 floating point, 32-bit)	(Float 32)	15-0

	Modbus		Information	Data format	
	Register	Bit		Data type	Bit
Sensor S02	0009	1-8	2 [= sensor number (S02)]	(Int 8)	7-0
	0009	9-16	Sensor status	(Int 8)	7-0
	0010	1-16	Sensor model	(Int 16)	15-0
	0011	1-16	Status info	(Int 16)	15-0
	0012	1-8	Measuring mode	(Int 8)	7-0
	0012	9-16	Measured value status	(Int 8)	7-0
	0013	1-16	Main measured value (IEEE-754 floating point, 32-bit)	(Float 32)	31-16
	0014	1-16	Main measured value (IEEE-754 floating point, 32-bit)	(Float 32)	15-0
	0015	1-16	Secondary measured value (IEEE-754 floating point, 32-bit)	(Float 32)	31-16
	0016	1-16	Secondary measured value (IEEE-754 floating point, 32-bit)	(Float 32)	15-0

The counting method of the Modbus registers and Modbus bits and the allocation of MSB and LSB is different from the usual method of most programming languages.

	Modbus	Usually
Counting start of the register	1	0
MSB* allocation of the register	Bit 1	Bit 15
LSB* allocation of the register	Bit 16	Bit 0

* MSB = Most significant bit, LSB = Least significant bit

7.4.4 Data formats

The sensor data in the sensor data block (see section 7.4.3) are available in the Float 32, INT16 and INT8 data formats.

Float 32 The data for the main and secondary measured values are transmitted in the IEE-754 standard 32-bit floating point format.

Bit representation	Byte	Bit	
MSB* LSB*			
S E E E E E E E	4	31 - 24	S = sign (bit 31) E = Exponent (Bit 30-23) M = mantissa (bits 22-0)
E M M M M M M M	3	23 - 16	
M M M M M M M M	2	15 - 08	
M M M M M M M M	1	07 - 00	

* MSB = Most significant bit, LSB = Least significant bit

If not all of the bits of the exponent are 0, the value is calculated according to:

$$V = -1^{S} \cdot 2^{E-127} \cdot (1 + M_{b22} \cdot 2^{-1} + M_{b21} \cdot 2^{-2} + M_{b20} \cdot 2^{-3} + ... + M_{b0} \cdot 2^{-23})$$

If all of the bits of the exponent are 0, the value is calculated according to:

$$V = -1^{S} \cdot 2^{-126} \cdot (M_{b22} \cdot 2^{-1} + M_{b21} \cdot 2^{-2} + M_{b20} \cdot 2^{-3} + ... + M_{b0} \cdot 2^{-23})$$

A value is 0 if all the bits of both the exponent as well as the mantissa are 0.

If the measured value is equal to 0, check the measured value status. If the measured value status is not equal to 1, an error has occurred and the measured value is invalid.

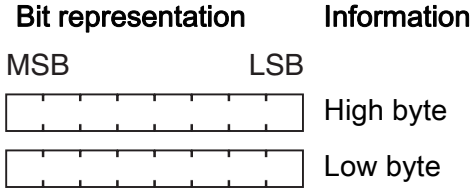
The Modbus protocol does not define how the bytes of 32-Bit-IEEE-754 floating point numbers should be ordered.

Apart from the byte order described in the bit representation, another order of the bytes is also possible.
Opposite to the order described, the two lower bytes have been exchanged with the two upper bytes in this order (b4 b3 b2 b1 - b2 b1 b4 b3).

For Modbus applications that can independently interpret floating point numbers (or allow to select a data format for certain registers), the byte order the data interpretation is based on should be checked.

INT16

In the INT16 format, the data for the sensor model and status info is transmitted. The data consists of two bytes. The assignment is carried out in Motorola format ("big-endian", the higher value byte first).



INT8

All other data are transmitted in the INT8 format. This data consists of one byte.

The data for the measured value status of the main and secondary measured values are encoded jointly into a single byte. Bits 7-4 encode the status of the main measured value, bits 3-0 encode the status of the secondary measured value.

7.5 Modbus query

With each query of sensor data via the Modbus protocol, a block of consecutive registers is read (up to all of the 32 registers).
For a query of sensor data, determine the first register and the number of registers to be read (1 ... 32).

Determining the first register to be read

The first register to be read depends on the sensor number (Sxx) [1 to 4] and the number of the sensor register (R) [1 ... 8]:

(Sxx - 1)] * 8 + R.

Example: Determine the first register with data for the sensor S02:
[(2 - 1) * 8] + 1 = 9

Determining the number of registers to be read

The maximum number of registers to be read is 32.

Example: Read all data of X sensors

Number of sensors (X)	Number of registers
1	8
2	16
3	24
4	32

Example of a Modbus query and Modbus response

Query of all sensor information of the sensor S02:

Modbus query			
Byte	**Value**	**Information**	**Meaning of the value**
1	01h	Modbus address of the IQ SENSOR NET	01h --> **1**
2	04h	Function	04h --> 4 **Read Input Register** (see section 7.4.1)
3	00h	Start address HI	0008h --> 8 **Start with register 9** (Modbus counting method)
4	08h	Start address LO	
5	00h	Number of HI registers	0008h --> 8 **8 registers**
6	08h	Number of LO registers	
7	70h	CRC (HI)	Checksum (CRC)
8	0Eh	CRC (LO)	

Response with all sensor information of the sensor S02:

Modbus response			
Byte	**Value**	**Information**	**Meaning of the value**
1	01h	Modbus address of the IQ SENSOR NET	01h --> **1**
2	04h	Function	04h --> 4 **Read Input Register**
3	10h	Number of bytes	10h --> **16** 16 Byte (8 registers)
4	02h	Contents of register 9 (HI) = sensor number	02h (Int 8) --> 2 Sensor number **S02**
5	02h	Contents of register 9 (LO) = sensor status	02h (Int 8) --> **MEASURE**
6	04h	Contents of register 10 (HI) = sensor model	0401h (Int 16) --> **VisoTurb 700 IQ**
7	01h	Contents of register 10 (LO) = sensor model	

Modbus response			
Byte	Value	Information	Meaning of the value
8	00h	Contents of register 11 (HI) = status info	0000h (Int 16) --> **no errors**
9	00h	Contents of register 11 (LO) = status info	
10	00h	Contents of register 12 (HI) = measuring mode	00h (Int 8) --> **FNU** *Trüb*
11	14h	Contents of register 12 (LO) = measured value status	14h (Int 8) Main measured value (bits 7-4): 1h --> **VALID** Secondary measured value (bits 3-0): 4h --> **MISSING**
12	42h	Contents of register 13 (HI) = main measured value	429E46C2h (Float 32) --> **79,1382** Measured parameter and unit, see byte 10 (measuring mode)
13	9Eh	Contents of register 13 (LO) = main measured value	
14	46h	Contents of register 14 (HI) = main measured value	
15	C2h	Contents of register 14 (LO) = main measured value	
16	00h	Contents of register 15 (HI) = secondary measured value	00000000h (Float 32) --> **0** but measured value invalid (MISSING), see Byte 11 (measured value status)
17	00h	Contents of register 15 (LO) = secondary measured value	
18	00h	Contents of register 16 (HI) = secondary measured value	
19	00h	Contents of register 16 (LO) = secondary measured value	
20	23h	CRC (HI)	Checksum (CRC)
21	5Eh	CRC (LO)	

7.6 Modbus error elimination



Here you will find causes and actions to take of errors concerning the
Modbus communication only. General errors of the
IQ SENSOR NET system are dealt with in chapter 10 WHAT TO DO IF....

Data transmission between the Modbus master and IQ SENSOR NET is faulty

Cause	Remedy
– Incorrect wiring of the Modbus cable on the connector	– Check/change the connections (see section 7.2) – Use checklist according to section 7.1
– Incorrect setting of address, baud rate, parity	– Check/change the settings (see section 7.3)
– Incorrect protocol	– Adapt the protocol
– MIQ/MC2-MOD defective	– Send MIQ/MC2-MOD to WTW

The PLC does not receive any plausible input data

Cause	Remedy
– The data interpretation is not correct	– Heed the data formats of the MIQ/MC2-MOD (see also section 7.4.4).

8 PROFIBUS connection (option)

The IQ SENSOR NET system can be connected to a PROFIBUS system in the following ways:

- with an MIQ/MC2 controller with the PROFIBUS option
- with an MIQ/2-PR PROFIBUS module

The present section only describes the connection with the MIQ/MC2-PR controller.



The PROFIBUS user organization e.V. (PNO) provides detailed information on the subject of PROFIBUS on the Internet under www.profibus.com. Especially recommendable is the
"Aufbaurichtlinie (setup directive) PROFIBUS-DP/FMS" (PNO order
number 2.111) with many practical installation tips.

8.1 PROFIBUS checklist

The following checklist supports you when planning, projecting and installing a PROFIBUS plant with the IQ SENSOR NET. For smooth operation, you should be able to answer all questions with "Yes".

- Is the [bus system] (bus segment) installed without branch lines?
- Was the correct PROFIBUS cable used (cord type A according to EN 50170)?
- Are the poles of the signal lines A line and B line correctly connected at all bus connections?
- Is it guaranteed that there is no short-circuit between A line, B line and cable shielding?
- Is the shielding installed free of interruptions?
- Are the guidelines for shielding and grounding being observed, and doesn't any unallowed potential equalization current flow via the shielding?
- Is the maximum cable length (per bus segment) observed for the corresponding baud rate?
- Do all devices support the required baud rate?
- With 12 Mbit/s transmission rate only: Are the bus plugs suitable for this baud rate?
- Are exactly two terminators switched on at the ends of the [bus system] (bus segment)?
- Are the terminators supplied with voltage so the following applies:

$U_{B\ line}$ - $U_{A\ line}$ > + 500 mV?

- Do all devices have individual bus addresses?
- After changing the bus address, have the devices been restarted (switched off and on again)?
  Note: The IQ SENSOR NET does not have to be restarted.
- Do the addresses projected in the master correspond to the actual addresses? Are all addresses less than or equal to the parameter HSA and less than 126 (HSA = Highest Station Address)?
- Is the currently valid GSD being used? If you are in doubt, download it from the Internet.
- Have admissible bus parameters been set only? If you are in doubt set them to default values.
- Is it guaranteed that the PROFIBUS master has consistent access to the 16 byte sensor data structure?

  Note for Siemens PLC with programming language STEP7:
  The following commands have to be used for consistent access:
  - SFC15 (for writing)
  - SFC14 (for reading)
- After commissioning:
  Do all devices signal error-free behavior?
  (IQ SENSOR NET: status "Online" in the measured value and status display).

8.2 Connecting the PROFIBUS cable

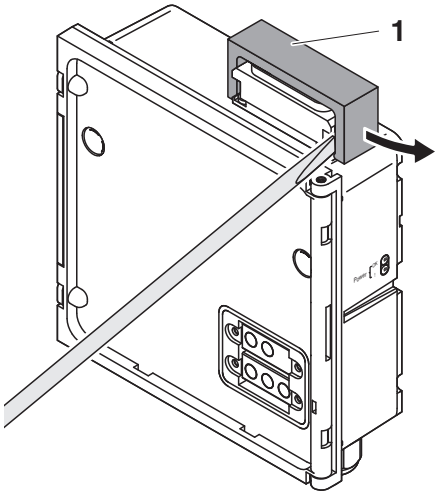
The PROFIBUS cable is connected to the IQ SENSOR NET using a 9-pin D-SUB connector on the top of the housing. As connector on the cable side, we exclusively recommend one of the following two connectors.

Manufacturer: Phoenix Contact GmbH & Co. KG
Flachsmarkt 8
32825 Blomberg
Germany
http://www.phoenixcontact.com

Types: VS-09-PROFB-SC
(Phoenix article no. 1654549, with screwed contacts, available from WTW under the order no. 902 888)

or: VS-09-PROFB-SP
(Phoenix article no. 1654345, with spring contacts)

To remove the blind plug, lift the safety bracket with a suitable screw driver at both clamps on the left and right side (see Fig. 8-1).



1 Safety bracket

Fig. 8-1 Removing the safety bracket

Note

To prevent the enclosure of the IQ SENSOR NET from being penetrated by water the following must be observed:

- *Use connectors recommended by WTW only.*
- *When the connector is removed, the connection socket of the IQ SENSOR NET must be closed with the blind plug and secured with the safety bracket.*

Use PROFIBUS cables according to EN 50170, cort type A.

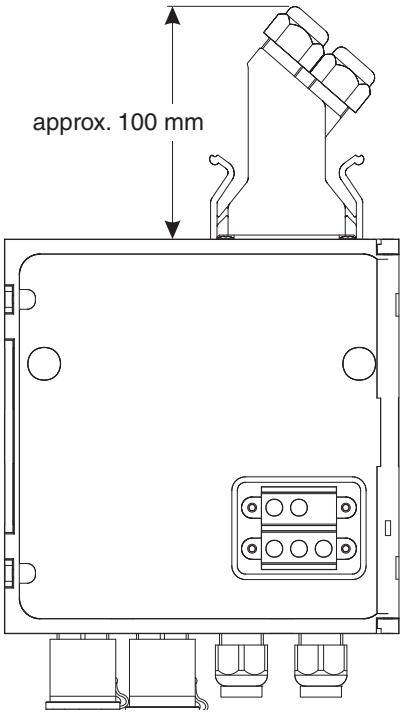


Fig. 8-2 IQ SENSOR NET with Phoenix connector

Pin assignment of the connector

Pin	Color*	Name	Function
1			-
2			-
3	Red	B line	Positive RxD/TxD according to RS 485 specification
4		RTS	Request To Send
5		GND BUS	Reference potential for data lines and terminating resistors
6		+5 V BUS	Supply voltage for terminating resistors
7			-
8	Green	A line	Negative RxD/TxD according to RS 485 specification
9			-

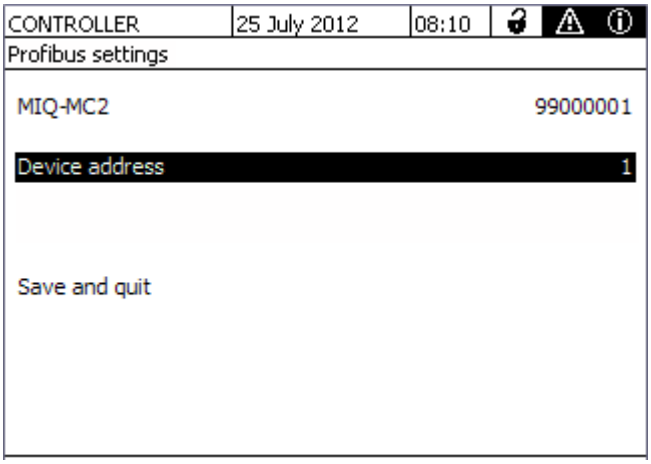
* Wire colors when using a standard PROFIBUS cable.

Please observe the operating manual of the connector.

8.3 Setting the PROFIBUS address

Proceeding: Setting the PROFIBUS address on the IQ SENSOR NET

1	Using **<S>**, open the *Settings* menu.
2	Press **<▲▼◀▶>** and **<OK>** to select and confirm the menu item, *Settings interface devices*.
3	Press **<▲▼◀▶>** and **<OK>** to select and confirm the bus interface.



4	Edit the setting table as described in section 4.3.

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

8.4 GSD file

The GSD file contains all necessary information on the Profibus module and is required by the configuration program of the Profibus master.

The current GSD file is provided on the Internet under www.WTW.com.

8.5 Transmitted sensor data

8.5.1 Overview

Course of the data transmission

The basis for data transmission between the PROFIBUS master and IQ SENSOR NET is formed by the unique assignment of a sensor to its sensor number (Sxx) in the IQ SENSOR NET system. The sensor numbers are assigned by the system in the order in which the sensors are recognized by the system.

The sensor number (Sxx) is the identification for a sensor. The sensor number is always transmitted in the first byte of the output and input data. Thus the PROFIBUS master can clearly query data of individual sensors.

The data is transmitted in two steps:

- The Profibus master transmits the request to the IQ SENSOR NET to supply data for the sensor with a certain sensor number.
- TheIQ SENSOR NET checks whether the requested sensor number is present and returns the data for the sensor with the respective sensor number to the PROFIBUS master.

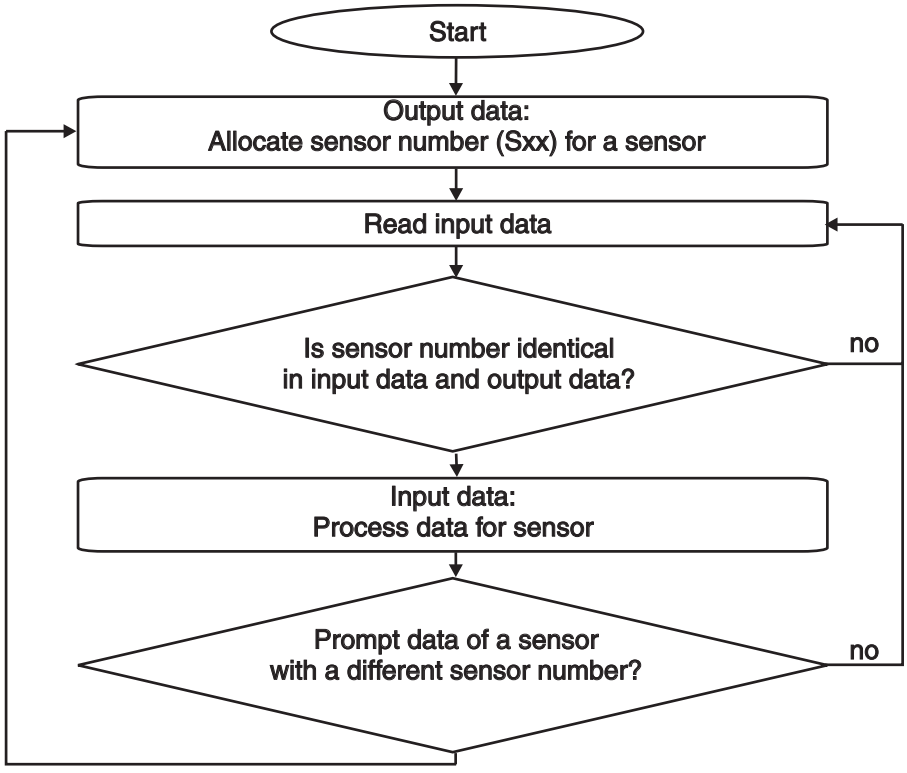


Fig. 8-3 Course of the data transmission in the PROFIBUS master

Transmitted sensor data

The following data for a sensor is transmitted to the PROFIBUS master as a consistent data block:

- Sensor number (Sxx)
- Sensor status
- Sensor model
- Status info of sensors
- Measuring mode
- Measured value status (main and secondary measured value)
- Main measured value
- Secondary measured value

The transmitted data of all IQ SENSOR NET sensors is given in the WTW document, "IQ SENSOR NET sensors: encoded data for field bus communication" (ba75560de). It is permanently updated when new sensors are available and when the sensor software is modified (if the modifications are relevant for the transmitted sensor data). The latest version is available on the Internet, in the download area for operating manuals. Use the search function for the download and search for "ba75560de".

Check the transmitted data for agreement of the requested and transmitted sensor number (Sxx) before any further processing.

8.5.2 Sensor administration under PROFIBUS

Preparation of the IQ SENSOR NET for communication with the PROFIBUS may require, e.g. the following:

- Creating an IQ SENSOR NET system with specific assignment of sensor numbers to sensors
- Creating several IQ SENSOR NET systems with the identical assignment of sensor numbers to sensors
- Changing the order of the sensors in an already installed system

Creating the assignment of sensor numbers

You want to install an IQ SENSOR NET system and, at the same time, to create a specific sequence of sensor number assignments to the sensors.

1	Carry out a system start without any sensors (see section 3.10.2).
2	Connect the sensors to the system in the required order. With each sensor wait until the system has recognized the sensor.

Changing the assignment of sensor numbers

You want to change the assignment of sensor numbers to the sensors in an already running IQ SENSOR NET system.

1	Unplug all sensors from the IQ SENSOR NET.



When the inactive datasets are deleted, all settings for the sensors are deleted as well.

2	Delete all inactive datasets in the list of sensors (see System operating manual, chapter *Deleting inactive datasets of sensors*).
3	Connect the sensors to the system in the required order. For each sensor, wait until the sensor is recognized by the system (see System operating manual, chapter Installation).

Creating the identical assignment of sensor numbers in several systems

You want to install several identical IQ SENSOR NET systems and, at the same time, to create the same sequence of sensor number assignments to the sensors in all systems.

1	Carry out a system start without any sensors (see System operating manual, chapter Installation).
2	Connect the sensors to the system in the required order. For each sensor, wait until the sensor is recognized by the system (see System operating manual, chapter Installation).
3	Repeat steps 1 and 2 for all other systems and, while doing so, keep to exactly the same order when connecting the sensors.

8.5.3 Output data

(1 byte - from the PROFIBUS master to the IQ SENSOR NET)

Address	Information	Bit
Offset 0h	Sensor number (Sxx) in the IQ SENSOR NET (Int8)	Bit 7-0

8.5.4 Input data

(16 bytes - from the IQ SENSOR NET to the PROFIBUS master)

Address	Information	Bit
Offset 0h	Sensor number (Sxx) (Int 8)	Bit 7-0
Offset 1h	Sensor status (Int8)	Bit 7-0
Offset 2h	Sensor model (Int16)	Bits 15-8
Offset 3h		Bit 7-0
Offset 4h	Status info (Int16)	Bits 15-8
Offset 5h		Bit 7-0
Offset 6h	Measuring mode (Int8)	Bit 7-0
Offset 7h	Measured value status (Int8) Main measured value bits 7-4 Secondary measured value bits 3-0	Bit 7-0
Offset 8h	Main measured value (IEEE-754 floating point, 32-bit)	Bits 31-24
Offset 9h		Bits 23-16
Offset Ah		Bits 15-8
Offset Bh		Bit 7-0
Offset Ch	Secondary measured value (IEEE-754 floating point, 32-bit)	Bits 31-24
Offset Dh		Bits 23-16
Offset Eh		Bits 15-8
Offset Fh		Bit 7-0

8.5.5 Data formats

Measured values

The data for the main and secondary measured values are transmitted in the IEE-754 standard 32-bit floating point format.

Address	Bit representation	
	MSB* LSB*	
Offset 0h bits 31-24	S E E E E E E E	S = sign (bit 31)
Offset 1h bits 23-16	E M M M M M M M	E = exponent (bits 30-23)
Offset 2h bits 15-8	M M M M M M M M	M = mantissa (bits 22-0)
Offset 3h bits 7-0	M M M M M M M M	

* MSB = Most significant bit, LSB = Least significant bit

If not all of the bits of the exponent are 0, the value is calculated according to:

$$V = -1^{S} \cdot 2^{E-127} \cdot (1 + M_{b22} \cdot 2^{-1} + M_{b21} \cdot 2^{-2} + M_{b20} \cdot 2^{-3} + ... + M_{b0} \cdot 2^{-23})$$

If all of the bits of the exponent are 0, the value is calculated according to:

$$V = -1^{S} \cdot 2^{-126} \cdot (M_{b22} \cdot 2^{-1} + M_{b21} \cdot 2^{-2} + M_{b20} \cdot 2^{-3} + ... + M_{b0} \cdot 2^{-23})$$

A value is 0 if all the bits of both the exponent as well as the mantissa are 0.

If the measured value is equal to 0, check the measured value status. If the measured value status is not equal to 1, an error has occurred and the measured value is invalid.

Sensor model Status info

The data for the sensor model and status info is transmitted as INT16, i.e. consists of 2 bytes. The assignment is carried out in Motorola format (the higher value byte first).

Address	Bit representation	Information
	MSB LSB	
Offset 0h bits 15-8		High byte
Offset 1h bits 7-0		Low byte

Measured value status

The data for measured value status of the main and secondary mea-

sured values are encoded jointly into a single byte. Bits 7-4 encode the status of the main measured value, bits 3-0 encode the status of the secondary measured value.

Other data

All other data always consist of only a single byte (Int8).

8.6 PROFIBUS error elimination



Here you will find causes and actions to take of errors concerning the
PROFIBUS communication only. General errors of the IQ SENSOR NET system are dealt with in chapter 10 WHAT TO DO IF....

Data transmission between the Profibus master and IQ SENSOR NET is faulty

Cause	Remedy
– Incorrect wiring of the PROFIBUS cable on the connector	– Check/change the connections (see section 8.2) – Use checklist according to section 8.1
– Incorrect setting of the address	– Check/change the setting of the address (see section 8.3)
– Incorrect protocol	– Check the version of the GSD file – Adapt the protocol
– IQ SENSOR NET defective	– Send IQ SENSOR NET to WTW

The PLC does not receive any plausible input data

Cause	Remedy
– Input data and output data are not consistent	– When programming the PLC, define input data and output data as consistent over the entire data length
– The data interpretation of the PLC is not correct	– Observe the data alignment of the PLC data representation. If necessary, exchange the high-order and low-order bytes word by word

9 Maintenance and cleaning

9.1 Maintenance

Maintenance activities

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

9.2 Cleaning

MIQ modules and control units

Clean components mounted in the open of gross contamination as necessary. We recommend to clean the worst of the dirt on the MIQ module and the area around it each time before opening in order to prevent gross 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
The enclosure and the window of the display are made of plastic. Therefore, avoid any contact with acetone or similar cleaning agents. Any splashes must be wiped off immediately.

Note
Never use high-pressure cleaners to clean components of the IQ SENSOR NET.

IQ sensors

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

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

10 What to do if...

10.1 Information on errors

Log book

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

With the aid of the log book, you can call up instructions on how to clear the error directly on the terminal. The log book is described in detail in section 4.6 MESSAGES AND LOG BOOK.



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

10.2 Diagnosing faults in the voltage supply

10.2.1 Options for checking the voltage

The following options are available for checking the correct voltage supply of the individual components:

- **Checking the log book entries**
  Log book entries can only be generated by components with a processor (e.g. IQ sensors and MIQ output modules). The log book entries contain information on how to clear errors. For more details on the log book, see section 4.6.
- **Checking the LED status on the MIQ module housing**
  This check is described within the framework of the commissioning in section 3.10.3 CHECKING THE VOLTAGE SUPPLY.
- **Measuring the voltage on the MIQ modules**
  (see section 10.2.2 MEASURING THE VOLTAGE).



The relationship between the supply voltage, the LED status and the log book entries is described in the section 11.1 GENERAL SYSTEM DATA.

10.2.2 Measuring the voltage

If an MIQ module shows an error condition (both LEDs off), this can be due to the following causes:

- The voltage supply has been interrupted
- The available voltage is not sufficient; the voltage is below the warning range.

These two cases can be differentiated with a voltmeter.

Measuring points of MIQ modules

The supply voltage is tapped at the following points (Fig. 10-1 on page 10-3):

- Outside on the free contacts on the front of the SENSORNET module
- Inside on the SENSORNET connections of the terminal strip (see section 10.2.2 MEASURING THE VOLTAGE).

Measuring points for IQ sensors

The supply voltage is measured on the MIQ module to which the IQ sensor is connected via the SACIQ sensor connection cable.

Systematic voltage measurement

Dock all mobile components (terminals) on the modules with greatest distance to the next power supply module. Begin measuring the voltage at the MIQ modules that are directly connected with an MIQ power supply module. Continue to measure the voltage systematically to the end of each cable section, i. e. along the voltage drop. Thus, in combination with the log book entries, you can narrow down the error location.



WARNING

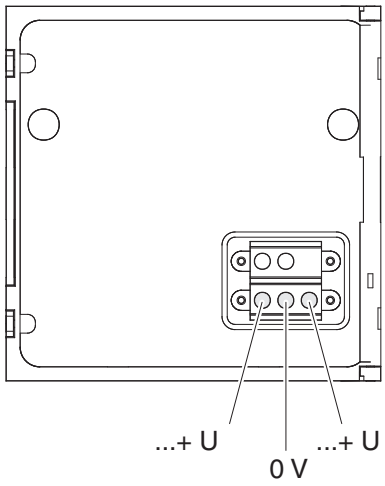
If the MIQ/PS power supply module is opened during operation, there is a danger to life due to possible hazard of electric shock. There is also a danger to life from voltages that may present a hazard of electric shock on the relay contacts of open MIQ output modules (e.g. MIQ/CR3). Note the following points in the case of voltage measurement during operation:

- **The voltage measurement may not be performed on the open MIQ/PS power supply module. The MIQ/PS may only be opened when the line voltage is switched off.**
- **The voltage measurement at an open MIQ output module with relays may only be performed if all external voltages have been previously switched off.**
- **Secure all voltages that have been switched off against being switched on again for the duration of the work.**

Safe voltage measurement is possible on the module contacts on the outside of MIQ/PS and relay output modules (see Fig. 10-1).

Tapping points for measuring the voltage

Front:



SENSORNET connections on the terminal strip (example):

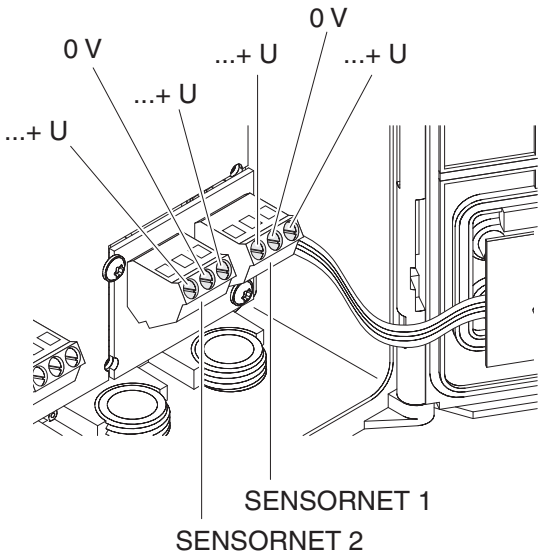


Fig. 10-1 Tapping points for measuring the voltage

The supply voltage (...+ U) must be measurable at both SENSORNET wires, i. e. left and right of the shielding. Otherwise, the functioning of the component is not ensured. Admissible values for the internal voltage supply (+U) are given in section 11.1.

10.2.3 Tips for clearing errors in the voltage supply



Admissible values for the internal voltage supply (+U) are given in section 11.1.

Supply voltage not present or in the warning or error range

Cause	Remedy
– Number of power MIQ power supply modules is not sufficient	– Check power rating. If necessary, install another MIQ power supply module (for details of how to do this, see section 3.4.2 DRAWING UP THE POWER RATING).
– Cable section is too long	– Check length of the cable section. If necessary, install another MIQ power supply module (for details of how to do this, see section 3.4.3 EFFECT OF THE CABLE LENGTH).
– Electrical connection between MIQ power supply module and component is defective (distributed mounting)	– Check cable connection step-by-step starting with the MIQ power supply module, and replace defective cable sections. – Check contacts on the MIQ modules (stack mounting). Clean any dirty contacts. Carefully bend back contact springs that have been pressed flat or bent (pay attention to sufficient spring tension). – Tighten on screws on the terminals.

Malfunctions despite adequate supply voltage on both +U V wires

Cause	Remedy
– Signal transmission faulty	– For terminal components, check/correct their seating on the MIQ module. – Check the log book for error messages (for details on the log book, see section 4.6). – Check/correct the position of the SN terminator switches (for the correct settings, see section 3.10.1). – Check the total line length within the IQ SENSOR NET. For a total line length of more than 1000 m, an MIQ/JBR signal amplifier module is required.
– Component is defective	– Check the log book for error messages (for details on the log book, see section 4.6). – If no log book entry exists, send the component back.

Component is not registered on the system despite sufficient supply voltage on both +U V wires (with no error message)

Cause	Remedy
IQ sensors	
– IQ sensor connection cable is not correctly connected or defective	– Check IQ sensor cable connection on the terminal strip. – Check IQ sensor cable and, if necessary, replace it. Another IQ sensor can be used for the test.
– IQ sensor is defective	– Test IQ sensor at another measurement location. – If IQ sensor still does not work , contact WTW.
Other components	
– Component is defective	– If possible, test component at another measurement location. – If IQ component still does not work, contact WTW.

10.3 Other errors

The system does no longer react on entries

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

"Error" in the measured value display

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

Local settings cannot be displayed

Cause	Remedy
– The contacts of two MIQ modules are not correctly connected to each other	– Clean the contacts

"no sensor" in the measured value display though an IQ sensor is connected

Cause	Remedy
– Local display has been set up and the IQ sensor is not included in the local display	– Add the sensor to the local display (see section 5.7) – Switch to the *All sensors* display with *Display local values or all values* (see section 4.5.6)

The selected system language was not activated for all components

Cause	Remedy
– A system language was selected that is not available in at least one component (sensor, controller, terminal, output module). The standard language, German, was activated instead of the selected system language.	– Contact WTW, a software update is required for the respective components

10.4 Replacing system components

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

10.4.1 Replacing passive components

Passive components include all components that the controller cannot recognize.
These include:

- MIQ power supply modules
- MIQ branching module
- Cables (SNCIQ, SACIQ).



WARNING

If the MIQ/PS power supply module is opened during operation, there is a danger to life due to possible hazard of electric shock. The MIQ/PS may only be opened when the line voltage is switched off. Secure the line voltage against being switched on again.

Only ever replace components when the IQ SENSOR NET system is switched off. Defective components are removed in the reverse order to the installation (see chapter 3 INSTALLATION).

10.4.2 Adding and replacing IQ sensors

Inactive datasets of IQ sensors

If an IQ sensor is removed from the system, its settings remain stored in the IQ SENSOR NET controller. A "?" appears in the left column of the *Edit list of sensors* menu. This indicates an "inactive dataset". A dataset contains the following information:

- Serial number of the IQ sensor (and, with it, the type of sensor)
- Display position
- All sensor settings including differential sensor
- All characteristics of the link with an output.

If no suitable inactive dataset is available, a newly connected IQ sensor is automatically recognized as a new module and added to the list of sensors (see section 3.11 SYSTEM EXTENSION AND MODIFICATION).



The maximum number of data sets (active and inactive datasets) for IQ sensors is limited to 20 in the IQ SENSOR NET system 2020 XT. When this number is reached, no further IQ sensor can be installed. If necessary, an inactive dataset has to be erased to make an extension possible.



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



To erase inactive datasets, see section 5.4.3.

If an IQ sensor is connected to the system when an inactive dataset is present, the following cases are possible:

Case 1:

The serial number of the IQ sensor is identical with the serial number of an inactive dataset.	The connected IQ sensor is automatically assigned to the inactive dataset and starts to operate again. Example: Maintenance or repair. This mechanism ensures that all IQ sensors retain their settings and links if an IQ sensor was removed for maintenance, or if the system was temporarily switched off.

Case 2:

The type of sensor is identical with the type of sensor in an inactive dataset (or several inactive datasets), but the serial numbers differ.	Operator intervention is required here. The connected IQ sensor can: – be assigned to the inactive dataset (or one of the inactive datasets). Example: Replacing an IQ sensor. Make sure that the substitute sensor has at least the software status of the active IQ sensor. – be included as a new module in the list of the sensors. The operating sequence to do this is described below.

Operating sequence in case 2

1	Connect a new IQ sensor.
2	Switch to the measured value display with **<M>**. The component database is updated. The following display appears (example):

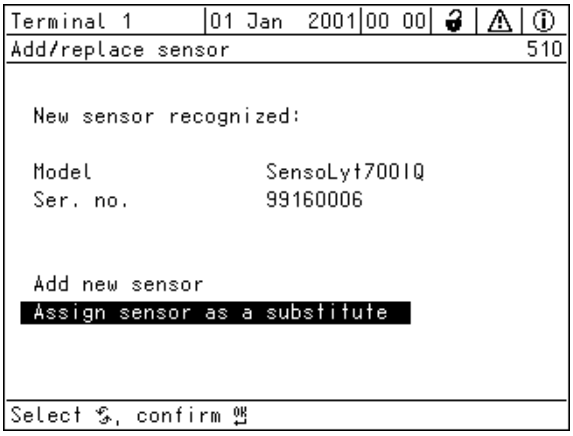


Fig. 10-2 510 - Add/replace sensor

3	Select the required option with **<▲▼◀▶>** and confirm with **<OK>**. – If *Add new sensor* was selected, the system changes directly to the measured value display. As soon as the IQ sensor is ready for operation, it delivers a measured value. – If *Assign sensor as a substitute* was selected, a list of matching inactive datasets appears:

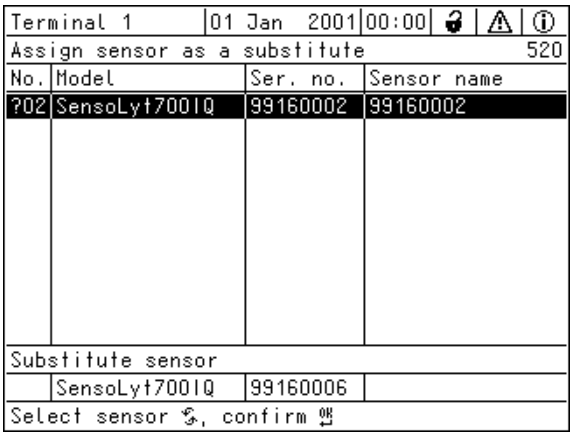


Fig. 10-3 520 - Assign sensor as a substitute

4	Select the required inactive dataset with <▲▼◀▶> and confirm with <OK>. The system changes to the measured value display. The IQ sensor takes over all settings of the inactive dataset. As soon as the IQ sensor is ready for operation, it delivers a measured value.

10.4.3 Adding and replacing MIQ output modules



WARNING

There is also a danger to life from voltages that may present a hazard of electric shock on the relay contacts of open MIQ output modules (e.g. MIQ/CR3). MIQ output modules with relays may only be opened if all external voltages have previously been switched off. Secure all external voltages against being switched on again for the duration of the work.



When replacing MIQ modules make sure that the substitute module has at least the software status of the active module.

Only replace MIQ output modules (all MIQ modules with relay contacts and/or electrical signal outputs) when the IQ SENSOR NET system is switched off. Defective MIQ output modules are removed in the reverse order to the installation. The installation is described in the INSTALLATION chapter of the respective component operating manual.

Inactive datasets in MIQ output modules

If an MIQ output module is removed from the system, its settings remain stored in the IQ SENSOR NET controller. A "?" appears in the left column (= inactive dataset) of the *Edit list of outputs* menu. The dataset contains the following information:

- All settings of the relays
- All settings of the current outputs.

If no inactive dataset is available, a newly connected MIQ output module is automatically recognized as a new module and added to the list of outputs (see section 3.11 SYSTEM EXTENSION AND MODIFICATION).



The maximum number of data sets (active and inactive datasets) for MIQ output modules is limited to 8 in the IQ SENSOR NET system 2020 XT. When this number is reached, no further MIQ output module can be installed. If necessary, an inactive dataset has to be erased to make an extension possible.



To erase inactive datasets, see section 5.6.2.

If an MIQ output module is connected to the system when an inactive dataset is present, the following cases are possible:

Case 1:

The serial number of the MIQ output module is identical with the serial number in an inactive dataset.	The connected MIQ output module is automatically assigned to the inactive dataset and starts to operate again. Example: In the case of repair.

Case 2:

The type of the MIQ output module is identical with the type in an inactive dataset (or several inactive datasets), but the serial numbers differ.	Operator intervention is required here. The connected MIQ output module can: – be assigned to the inactive dataset (or one of the inactive datasets). Example: Replacing an MIQ output module. – included as a new module in the list of outputs. The operating sequence to do this is described below.

Operating sequence in case 2

1	Remove the (defective) MIQ output module. The output module is removed in the reverse order to the installation. The installation is described in the INSTALLATION chapter of the respective component operating manual.
2	Install the new MIQ output module (INSTALLATION chapter of the respective component operating manual).
3	Switch to the measured value display with **<M>**. The component database is updated. The following display appears (example):

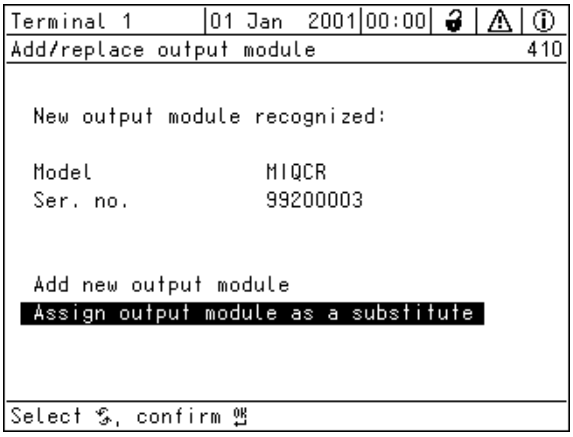


Fig. 10-4 410 - Add/replace output module

4	Select the required option with **<▲▼◀▶>** and confirm with **<OK>**. – If *Add new output module* was selected, the system changes directly to the measured value display. – If *Assign output module as a substitute* was selected, a list of the matching inactive datasets appears:

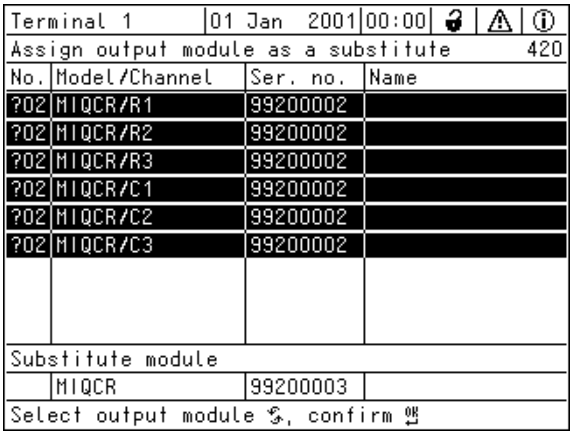


Fig. 10-5 420 - Assign output module as a substitute

5	Select the required inactive dataset with **<▲▼◀▶>** and confirm with **<OK>**. The system changes to the measured value display. The MIQ output module takes over all settings of the inactive dataset.

11 Technical data

11.1 General system data

Test marks

cETLus, CE

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

Nominal voltage of the power supply	See operating manual of the MIQ power supply modules used
Protective class	II
Overvoltage category	II
Maximum power consumption	Depending on the number of MIQ power supply modules
Number of MIQ power supply modules in an IQ SENSOR NET system	Up to 6, depending on the total power requirement of the system (see section 3.3 BASICS OF THE INSTALLATION)
Voltage monitoring	– Optically via 2 LEDs on each MIQ module – Additional monitoring of all components by the controller software



WARNING

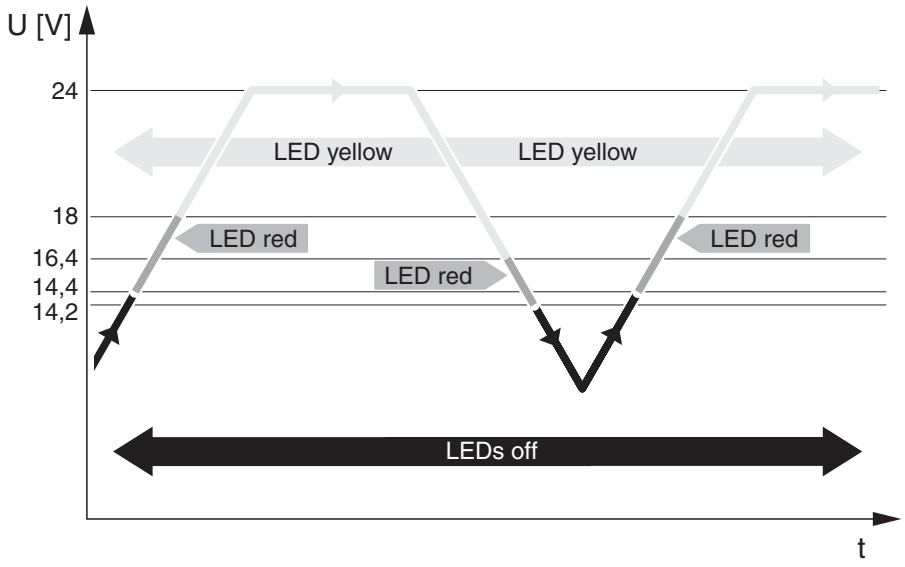
A circuit (except for the power supply connections), that is connected to an IQ SENSOR NET component, must not feed any voltages or currents that are not allowed. It has to be made sure that the circuit at any time meets all requirements of a *Limited circuit* or *Limited Power* as

well as of *SELV* (Safety Extra Low Voltage). These include the following limiting value specifications:

- AC voltage: max. 30 V effective / 42.4 V peak
- DC voltage: max. 60 V
- Current limit: max. 8 A
- Power output limitation: max. 150 VA

Internal voltage supply

Relationship between the supply voltage U, the LED status on the MIQ module and the log book entries (Fig. 11-1):



LED state	Log book
LED yellow	No entry (= OK)
LED red	1st error message
Both LEDs off	2nd error message (or switch-off)

Fig. 11-1 Relationship of supply voltage - LED states - log book

Instructions of how to measure the actual supply voltage on individual IQ SENSOR NET components are given in this operating manual in section 10.2 DIAGNOSING FAULTS IN THE VOLTAGE SUPPLY.

Instrument safety	Applicable norms	– EN 61010-1 – UL 61010-1 – CAN/CSA C22.2#61010-1
EMC product and system characteristics	EN 61326	EMC requirements for electrical resources for control technology and laboratory use – Interference immunity according to EN 61326/A1 table A.1 – Resources for industrial areas, intended for indispensable operation – Interference emission limits for resources of class B
	System lightning protection	Noticeably extended qualitative and quantitative protective characteristics as opposed to EN 61326/A1 table A.1
	FCC, class A	



Any combination of IQ SENSOR NET products in a user-specific system fulfills these listed EMC characteristics.

11.2 General data of MIQ modules

Technical data on special MIQ modules are given in the respective operating manuals.

Dimensions

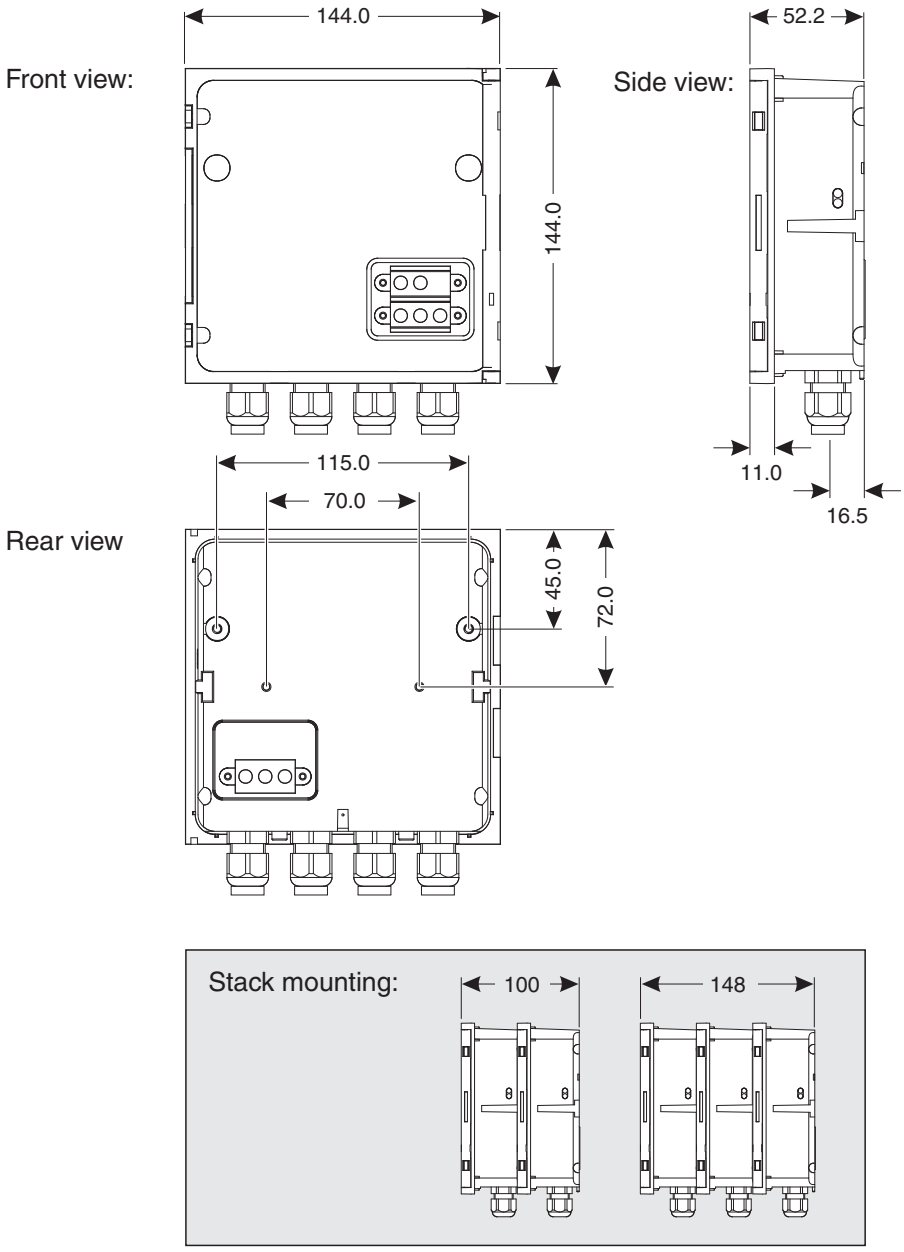


Fig. 11-2 Dimension drawing of MIQ module (dimensions in mm)

Mechanical construction	Maximum number of MIQ modules in a module stack	3 plus terminal component
	Enclosure material	Polycarbonate with 20 % glass fiber
	Weight	Approx. 0.5 kg
	Type of protection	– IP 66 – In accordance with NEMA 4X MIQ modules are not suitable for conduit connection – NEMA 3S
Electrical data	Nominal voltage	Max. 24 VDC via the IQ SENSOR NET (for details, see section 11.1 GENERAL SYSTEM DATA)
	Power consumption	Module-dependent (see section 3.4.2 DRAWING UP THE POWER RATING)
Terminal connections	IQ SENSOR NET connections	At least two in each MIQ module. Additional connectable SENSORNET terminator (terminating resistor)
	Further connections	Module-dependent
	Terminal type	Screw-type terminal strip, accessible by opening the lid
	Terminal ranges	Solid wires: 0.2 ... 4.0 mm^2 AWG 24 ... 12 Flexible wires: 0.2 ... 2.5 mm^2
	Cable feeds	4 cable glands M16 x 1.5 on the underside of the module

11.3 MIQ/MC2

Dimensions

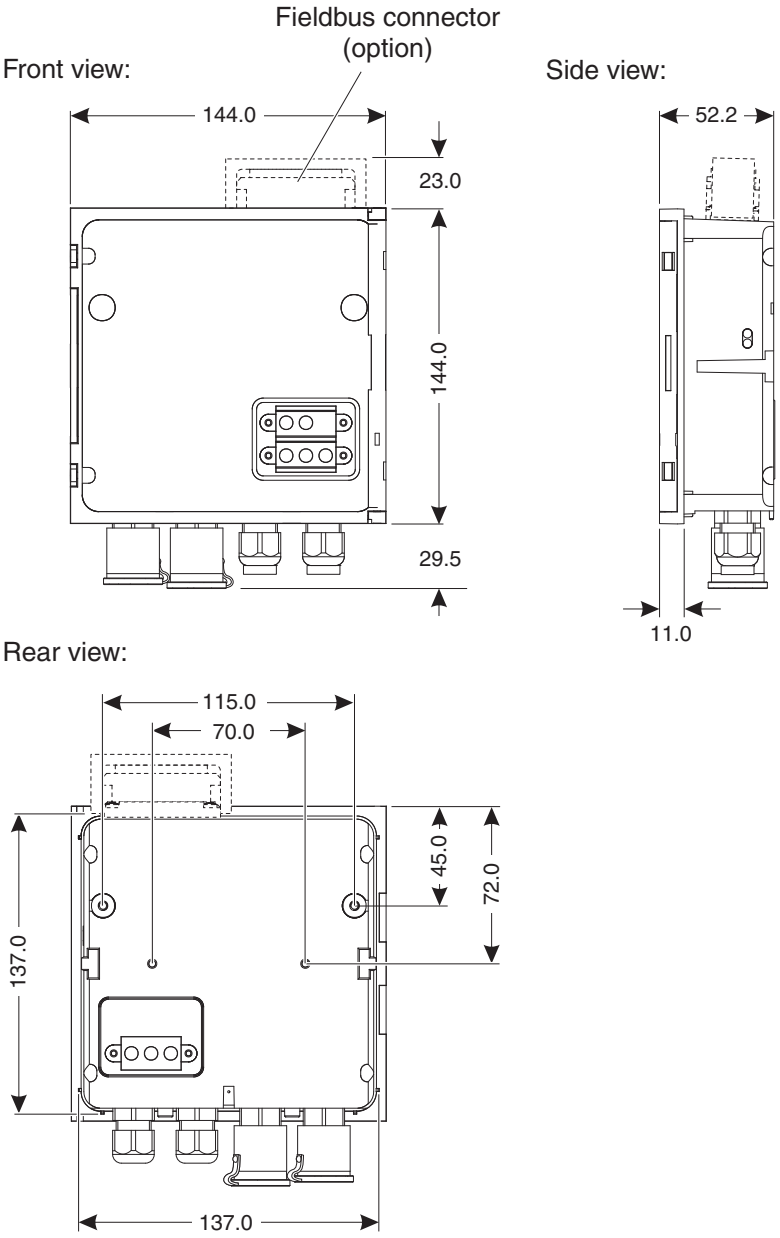


Fig. 11-3 Dimension drawing of the MIQ/MC2 (dimensions in mm)

Terminal strip

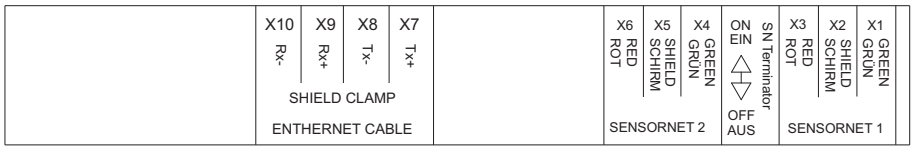


Fig. 11-4 Terminal strip inside the enclosure:

Electrical data

Supply voltage	Max. 24 VDC via the IQ SENSOR NET (for details, see section 11.1 GENERAL SYSTEM DATA)
Power consumption	MIQ/MC2 1,6 W MIQ/MC2-PR 2.0 W MIQ/MC2-MOD 1.6 W

USB connection

USB-A socket for measurement data download and software updates

Ethernet connection

- Equipped with RJ45 socket
- For a permanent and climate-resistant connection at an open air location, it can be retrofitted to be permanently wired to the main PCB via the LSA terminal strip.

Field bus connection

MIQ/MC2	-
MIQ/MC2PR	Profibus-DP
MIQ/MC2-MOD	Modbus RTU/RS 485

Connection via 9-pin D-SUB socket on the top of the enclosure, compatible with Phoenix connector (IP67).

Air pressure measurement

For automatic air pressure compensation when measuring with galvanic D.O. sensors.

Measuring range	500 mbar ... 1100 mbar

11.4 Space required by mounted components

Wall mounting and top hat rail mounting

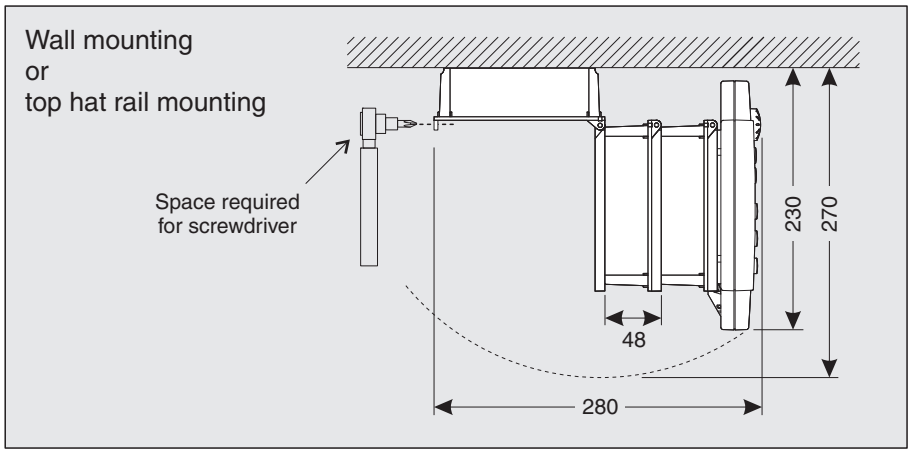


Fig. 11-5 Space required for wall and top hat rail mounting: (dimensions in mm)

Panel mounting

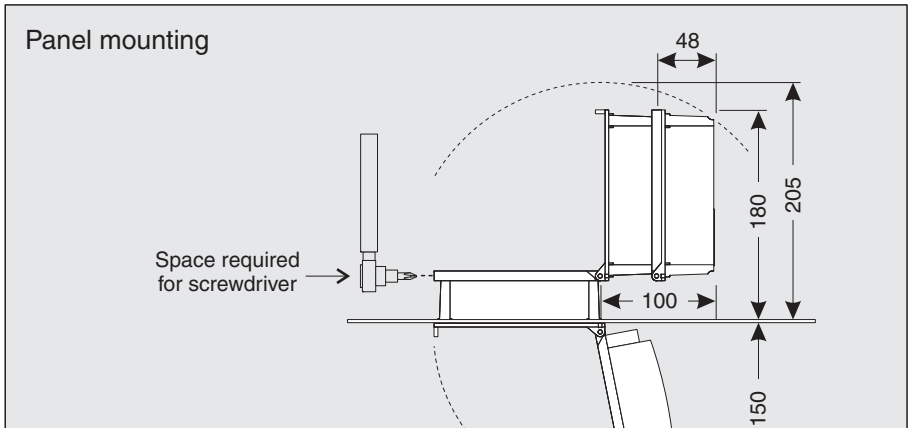


Fig. 11-6 Space required for panel mounting (dimensions in mm)

12 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
IQ sensor connection cable		
– 1.5 m	SACIQ-1.5	480 040
– 7.0 m	SACIQ-7.0	480 042
– 15.0 m	SACIQ-15.0	480 044
– Special length up to max. 100 m	SACIQ-SO	480 041V
– 20 m (seawater version)	SACIQ-20.0 SW	480 045
– 25 m (seawater version)	SACIQ-25.0 SW	480 066
– 50 m (seawater version)	SACIQ-50.0 SW	480 060
– 75 m (seawater version)	SACIQ-75.0 SW	480 067
– 100 m (seawater version)	SACIQ-SO SW	480 062
– Special length (seawater version)	SACIQ-SO SW	480 064V
Sun shield for a unit of up to three stacked MIQ modules plus docked terminal	SSH/IQ	109 295
Sun shield for a single MIQ module plus docked terminal	SD/K 170	109 284
Mounting kit for fixing the SD/K 170 sun shield on horizontal or vertical pipes	MR/SD 170	109 286
Kit for wall mounting of a MIQ module	WMS/IQ	480 052
Set for panel mounting of MIQ modules; switch panel aperture 138 x 138 mm according to DIN 43700 or IEC 473 (max. thickness 15 mm)	PMS/IQ	480 048
Kit for mounting of MIQ modules on a 35 mm top hat rail in accordance with EN 50022	THS/IQ	480 050

Other accessories for the IQ SENSOR NET are given in the WTW catalog or on the Internet.

13 Indexes

On the following pages, you will find the following indexes:

- Index of all displays (see section 13.1)
- Explanation of the message codes (see section 13.2)

13.1 Index of all displays

This index contains a selection of displays showing important indications or settings.

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010 - Values: location -> Measured values (4 sensors) 4-17
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13.2 Explanation of the message codes

The log book contains a list with all the messages from all modules. Each message consists of message code, date and time. You can obtain more detailed information by opening the full message text (see section 4.6).

The full message text comes from the component that has triggered the message. Therefore, these texts are only available from components which are connected to the system and ready for operation.

If a message text is not available, because the component is not connected to the system, you can look up the texts of the messages in the operating manual of the respective component.

The following lists contain the message codes and the related message texts that are shown on the display. Error messages and info messages are listed separately.

General explanations on the subjects of messages, message codes and log book are given in section 4.6 of this system operating manual.

13.2.1 Error messages

Message code	Message text
EI4121	*Max. components of this component type exceeded* *Danger of system overload* ** Check and adapt the components for this type*
EI5121	*Component cannot be reached or not present* ** Component has been removed from the system, insert component again* ** Connex. to component cut.,* *Check sys. installation acc. to op. manual*
EI6121	*Incompatible terminal software* ** Contact service*
EI7121	*Incompatible controller software* ** Contact service*
EI8121	*Connection to the component instable* ** Check installation and cable lengths,* *Follow installation instructions* ** Set SN terminator switch acc. to operating manual* ** Check environmental effects* ** Component defective, contact service*
EI9121	*Power failure occurred* ** Check date and time and, if necessary, adjust them*

Message code	Message text
EA8121	*Error at automatic air pressure measurement* *An air pressure value of 1013 mbar is used for air pressure compensation* ** Contact service*

13.2.2 Info messages

Message code	Message text
II1121	*Language not available,* *Default language German* ** Contact service*
II2121	*New IQ Sensor Net component identified*
II3121	*New IQ Sensor Net component recorded* ** See component lists*
II4121	*IQ Sensor Net component recorded as replacement component* ** See component lists*
II5121	*Link sensor - output has been erased* ** if necessary, link sensor again*
II9121	*Date and time have been set*

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14 Appendix (store separately if required)

14.1 Forgotten the password?

Proceed as follows to show the currently valid password on the display:

1	Using **<S>**, open the *Settings* menu.
2	Using ⟲ and **<OK>**, select and confirm the menu item, *System settings -> Change password*. The *Change password* dialog window opens.

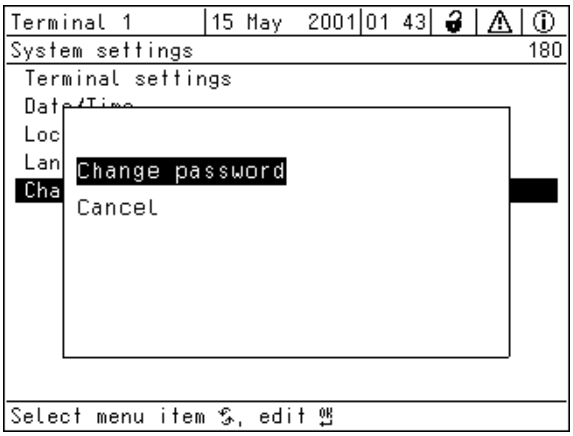


Fig. 14-1 180 - System settings -> Change password

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

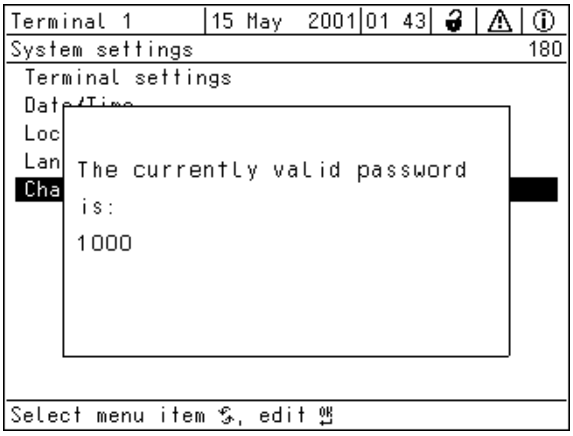


Fig. 14-2 180 - System settings -> Display password

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

14.2 Default password

The password of the controller is set to 1000 in the delivery state.

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