



# IQ SENSORNET System 2020 3G

CONTROLLER MIQ/MC3 AND TERMINAL/CONTROLLER MIQ/TC 2020 3G



a xylem brand



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# 1 Overview

## 1.1 How to use this system operating manual

### Structure of the IQ SENSORNET operating manual

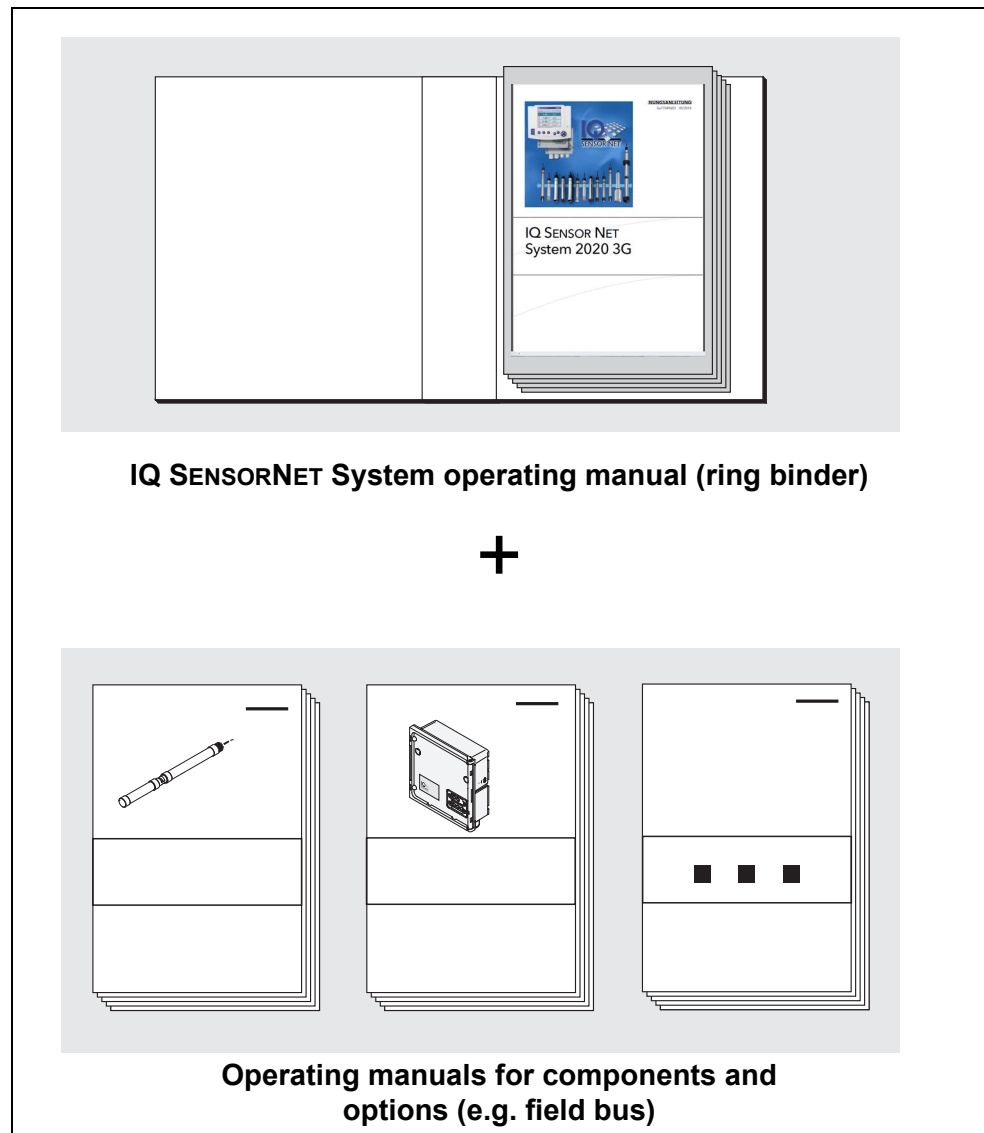


figure 1-1 Structure of the IQ SENSORNET System 2020 3G operating manual

The IQ SENSORNET operating manual has a modular structure like the IQ SENSORNET 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 SENSORNET system 2020 3G

### 1.2.1 Structure of the system

The IQ SENSORNET 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 SENSORNET System 2020 3G include:

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

#### **System communication**

The functional units are connected with one another via a common line (figure 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.

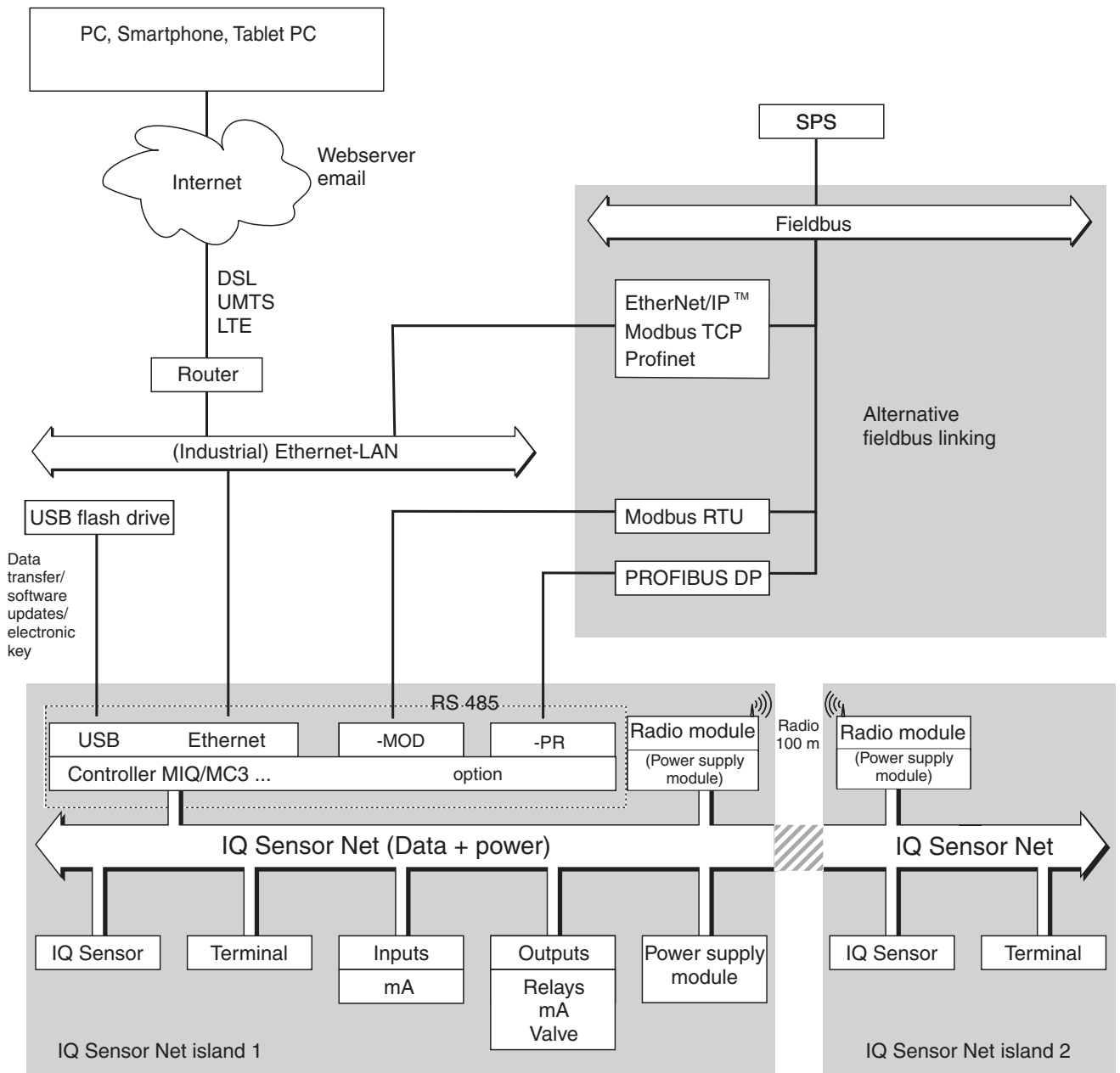


figure 1-2 Functional units of the IQ SENSORNET with MIQ/MC3

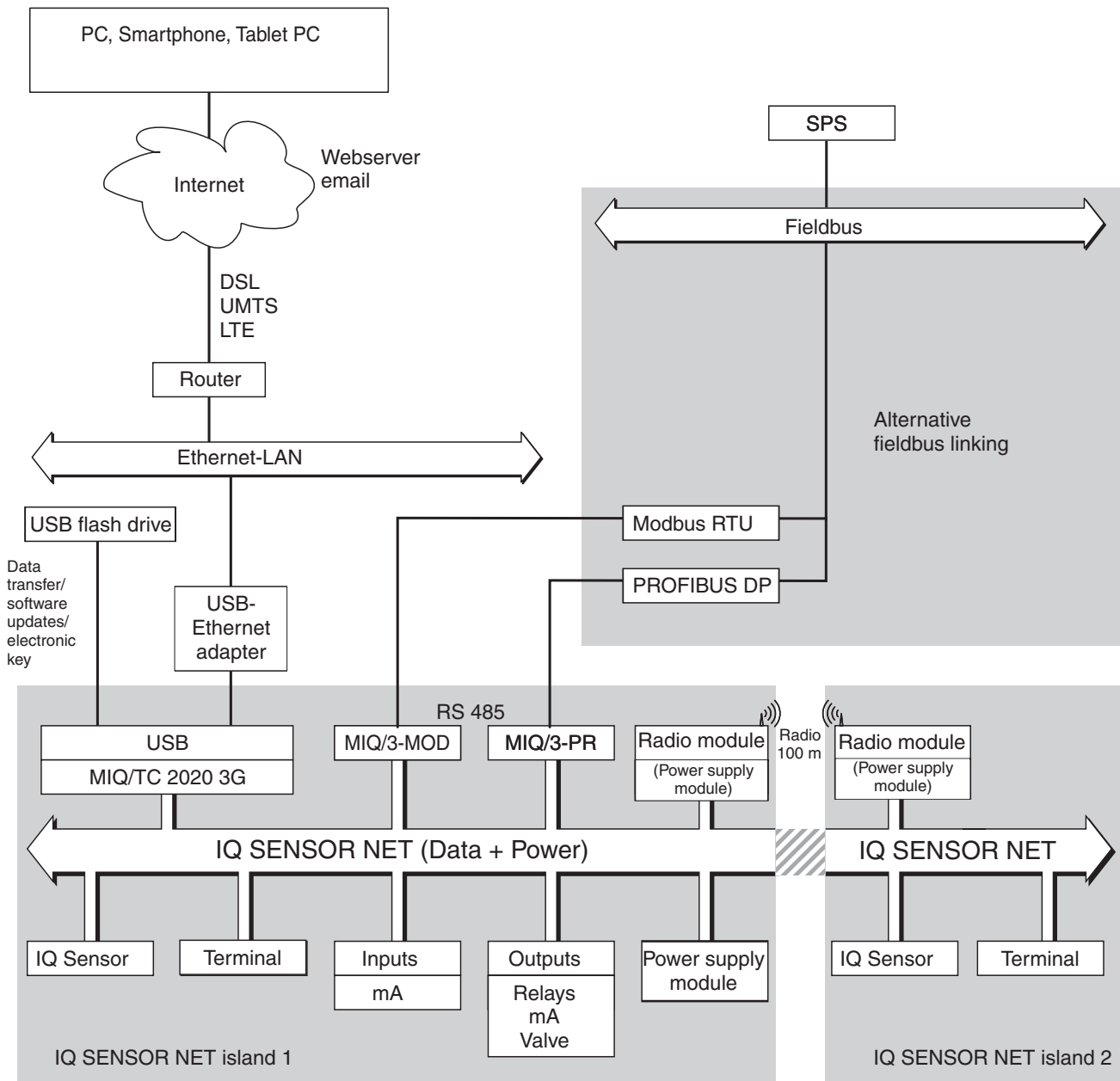


figure 1-3 Functional units of the IQ SENSORNET with MIQ/TC 2020 3G



If the Ethernet connection is established with the aid of a USB Ethernet adapter, (see section 6), please note that the Ethernet connection may be restricted.

If the Ethernet connection is established via the Ethernet interface of the controller MIQ/MC3, its functionality is unrestricted.

### 1.2.2 Functions in the IQ SENSORNET

The functions of the IQ SENSORNET 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	Operating manual
Alarm messages	System
Analog output	System
Data logging	System
Data recording (PC)	System
Data transmission (PC)	System
Data communication (Profibus DP)	Fieldbus linking
Data communication (Modbus RTU)	Fieldbus linking
Data communication Ethernet	Fieldbus linking
Data communication Ethernet fieldbuses (e.g. Profinet, Modbus TCP, Ethernet/IP)	Fieldbus linking
Data logger	System
Web server	System
Email server	System
Frequency output	System
Transmission path	MIQ/WL PS
Limit monitor	System
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	System
Pulse-width output	System
Sensor cleaning	System
Local settings	System

Function	Operating manual
Daily load diagram, weekly load diagram, monthly load diagram	System
Monitoring functions (sensors, system)	System Fieldbus interface

**1.2.3 Possible ways to communicate with the IQ SENSORNET**

**Digital communication** The IQ SENSORNET can communicate with humans and machines via different interfaces.

The following page provides an overview:

- who can communicate with the IQ SENSORNET
- 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  Communication path	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, – backup / load – view – print	Viewing/transmitting calibration data
<b>Direct operation</b>					
Terminal/controller MIQ/TC 2020 3G	X	X	X	X	X
<b>Fieldbuses</b>					
For details, see the "IQ SENSORNET fieldbus linking" operating manual		X			
<b>Ethernet-LAN, Internet</b>					
MIQ/MC3(-...) + Router + LAN/Internet +IQ WEB CONNECT	X	X (via web server and Email service of the MIQ/MC3)	X	X	X

Available functions  Communication path	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, – backup / load – view – print	Viewing/transmitting calibration data
MIQ/TC 2020 3G + USB Ethernet adapter + Router + LAN/Internet +IQ WEB CONNECT	X	X (via web server and Email service of the MIQ/TC 2020 3G)	X	X	X

#### 1.2.4 Components of the system 2020 3G

##### Minimum configuration (basic components)

The following basic components are required for a System 2020 3G:

- A controller, e.g.
  - MIQ/MC3
- A terminal, to be able to view measurement data and to configure the IQ SENSORNET system, e.g.
  - Terminal/controller MIQ/TC 2020 3G (configured as terminal)
  - IQ WEB CONNECT, connected to a PC via the Ethernet interface.
- 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 3G, digital YSI 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 SENSORNET 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 SENSORNET. 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.:

- Terminals. They are the operation and communication units for the IQ SENSORNET. Options available:
  - Mobile terminal/controller MIQ/TC 2020 3G (configured as terminal) for operation of the system from varying locations, for example for calibration of IQ sensors on site.
  - IQ WEB 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 SENSORNET. 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/WL PS radio modules for wireless connection within the IQ SENSORNET.

**Maximum configuration**

Maximum equipment of the IQ SENSORNET system 2020 3G:

Component or resource	Maximum number
Controller MIQ/MC3(-...)	1
Sensor locations, can be occupied by: <ul style="list-style-type: none"> <li>– Single sensors</li> <li>– Multiple sensors</li> <li>– 0/4-20 mA inputs</li> </ul>	20
Terminal locations, can be occupied by: <ul style="list-style-type: none"> <li>– MIQ/TC 2020 3G</li> </ul>	3
IQ WEB CONNECT Terminal	2 (MIQ/MC3) 1 (MIQ/TC 2020 3G)



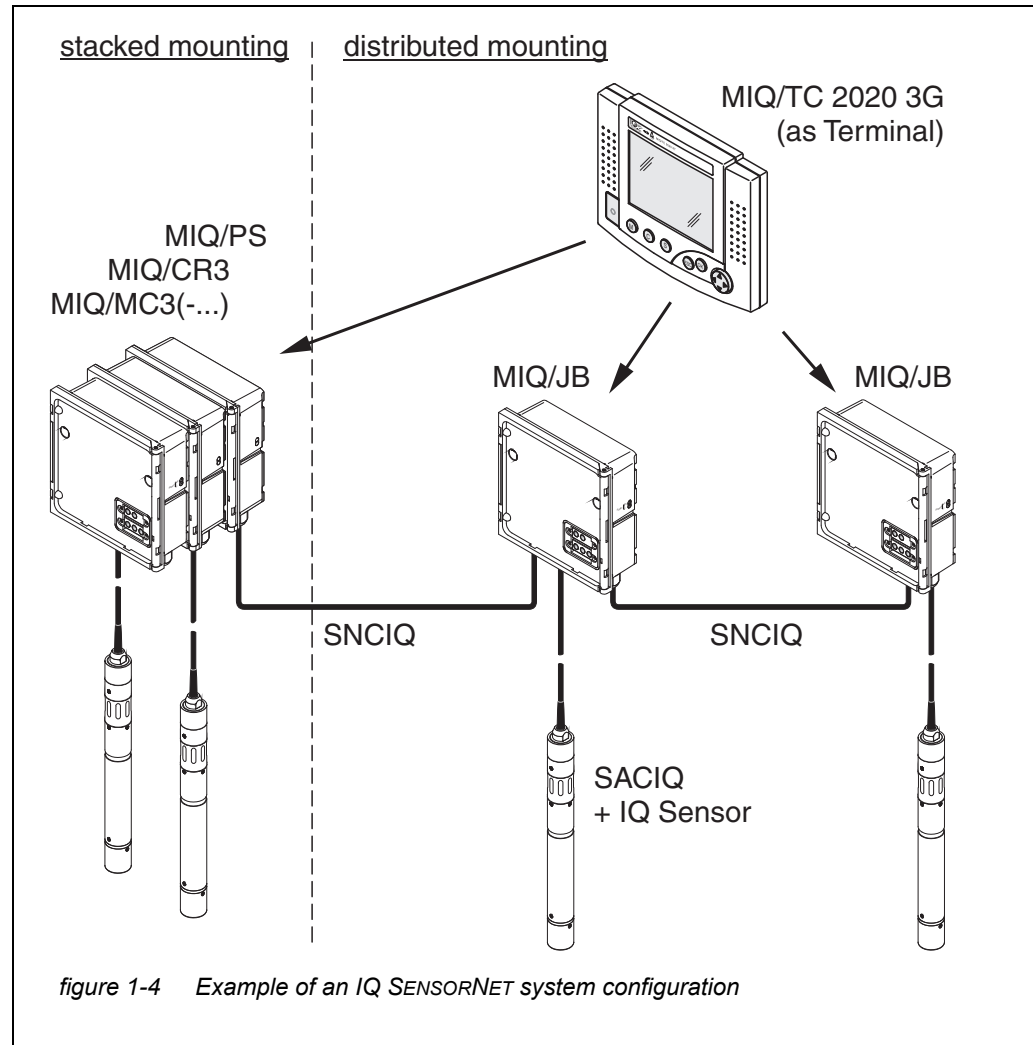
Component or resource	Maximum number
Output channels, can be occupied by: <ul style="list-style-type: none"> <li>– Current outputs</li> <li>– Relay outputs</li> <li>– Valve outputs</li> </ul>	8
Power supply modules (e.g. MIQ/PS)	6
MIQ/JB branching modules	25
Signal amplifier modules MIQ/JBR ("repeaters")	2
Radio modules MIQ/WL PS	Radio modules MIQ/WL PS
Fieldbus interfaces	1

### 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.

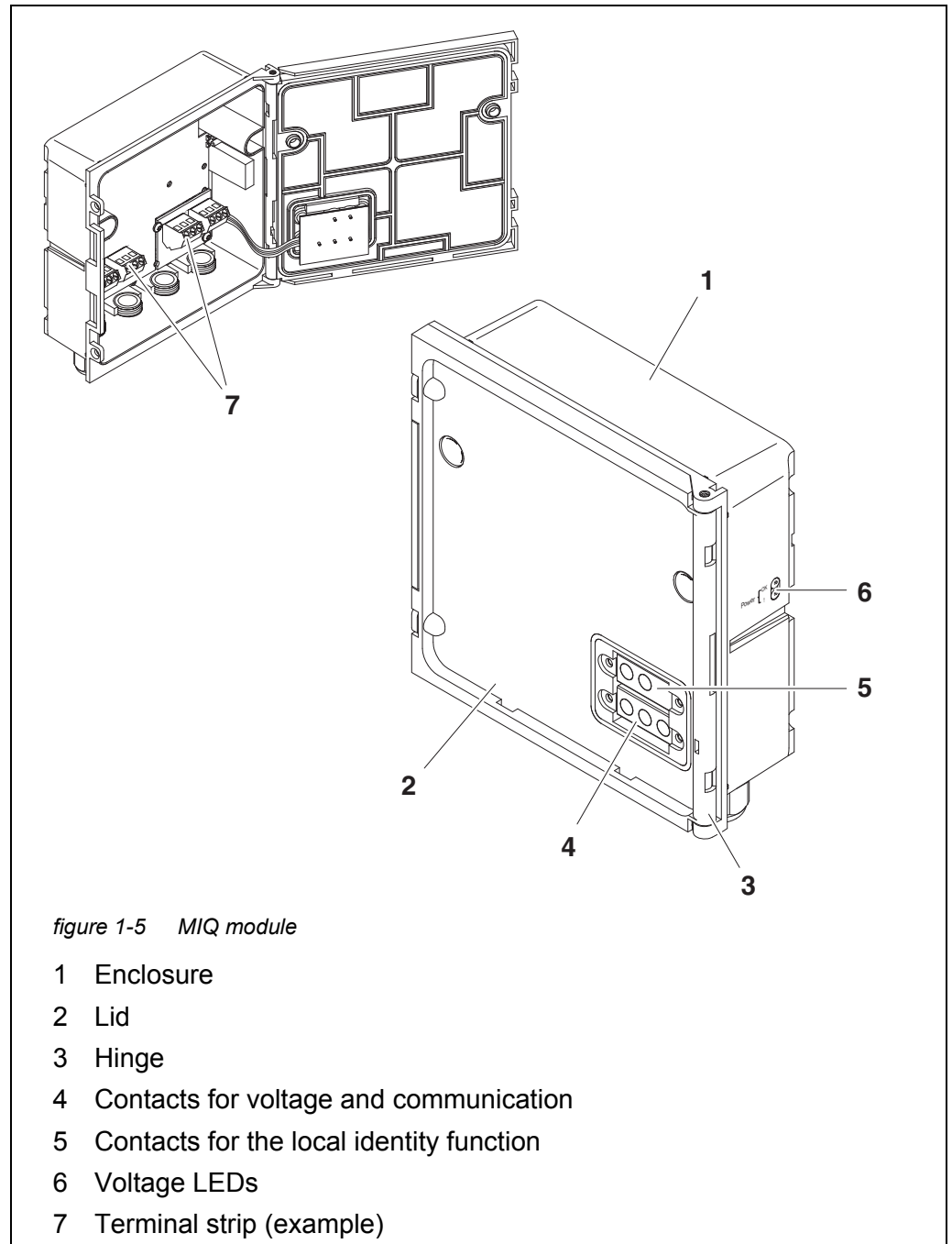
The following diagram shows an IQ SENSORNET system with two mounting variants (figure 1-4).



**IQ sensors** Up to 20 IQ sensors of any type can be used in the 2020 3G system. They can be connected to any MIQ module that has a free connection for the IQ SENSORNET. 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

Depending on their type, the MIQ modules have specific features (e.g. controller, relays, digital interfaces). All MIQ modules have a standard housing with the following features (figure 1-5):



**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 SENSORNET 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 SENSORNET 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**

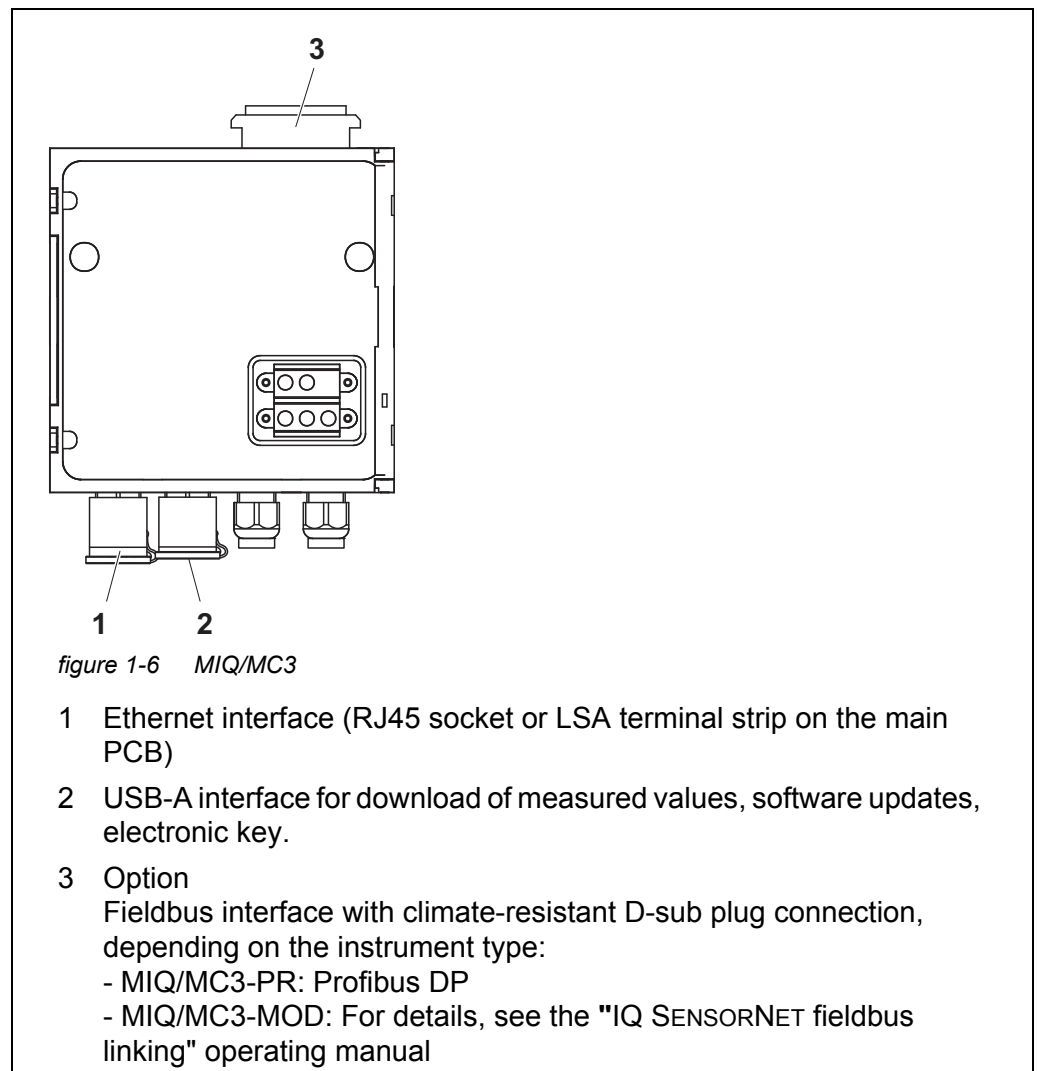
Two LEDs, yellow and red, on the side of the housing are used to monitor the operational voltage of each MIQ module.

### 1.3 Controller MIQ/MC3

The controller does the following jobs:

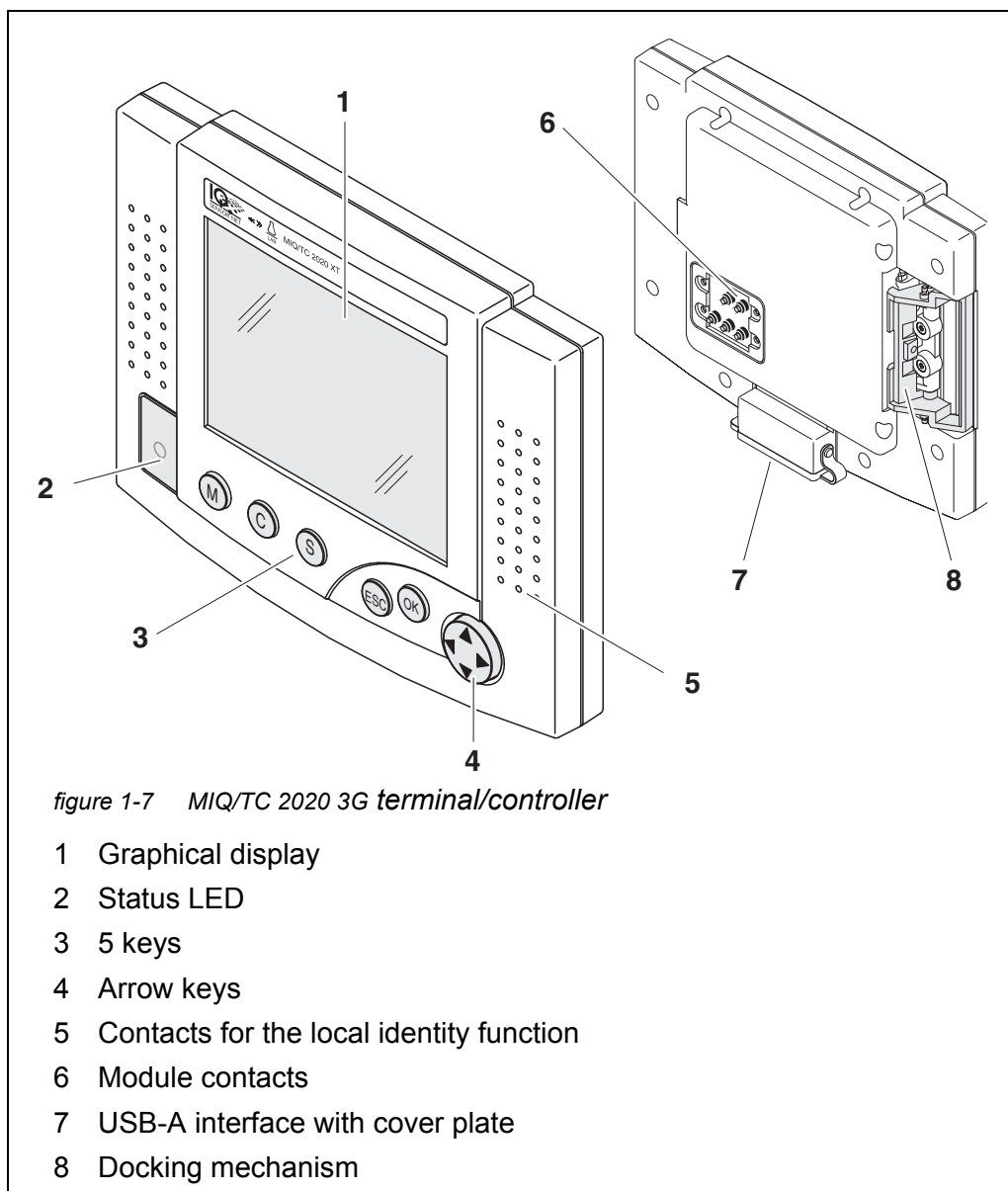
- Control and monitoring of all IQ sensors
- Control and monitoring of all current and relay outputs
- Continuous diagnosis of the system, i.e. the information and error messages of all components are recorded and entered in the system log book (example: voltage monitoring)
- Recording of measurement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

**Digital interfaces** The MIQ/MC3 controller is has the following digital interfaces:









### 1.4 MIQ/TC 2020 3G terminal/controller

The terminal/controller MIQ/TC 2020 3G can be used in the IQ SENSORNET either as controller plus terminal (see section 1.4.1) or just as a terminal (see section 1.4.2).



**Keys** The keys have the following functions:

Key	Designation	Functions
	<M>	– Displays the measured values
	<C>	– Starts the calibration process for the selected sensor
	<S>	– Opens the 180 - <i>System settings</i> menu
	<OK>	– Opens the 300 - <i>Display/Options</i> menu
	<ESC>	– Leaves the current menu without changing the settings
 (arrow keys)	<▲> or <▼>	– Moves the selection in menus, lists and table columns by one position upwards or downwards
	<◀> or <▶>	– Moves the selection in tables by one position left or right – When entering characters, deletes the character left of the cursor

#### 1.4.1 MIQ/TC 2020 3G as controller plus terminal

The MIQ/TC 2020 3G, configured as a controller plus terminal, is a basic component of the 2020 3G system and must therefore remain in the system permanently. The MIQ/TC 2020 3G is connected with the system by docking on to the free front cover of an MIQ module.

The **controller function** takes over the following tasks:

- 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 are recorded and entered in the system log book (example: voltage monitoring)
- Recording measured data in the fixed interval
- Communication with external digital interfaces such as:
  - USB memory
  - Ethernet (via USB Ethernet adapter)
  - Field bus
  - PC

### 1.4.2 MIQ/TC 2020 3G just as a terminal

The MIQ/TC 2020 3G, configured as a terminal, is an expansion component for the IQ SENSORNET system. The System 2020 3G can be docked on all free front covers of MIQ modules as a mobile operating unit and removed again. Docking requires no tools and a simple maneuver by hand is sufficient.

The **terminal function** is the graphical user interface of the system. It is used for the following purposes:

- Display of measured values
- Setting of IQ sensors, outputs, terminal characteristics, date, time, etc.
- Carrying out of maintenance and calibration tasks
- Display of calibration data
- Display of components lists (IQ sensors and outputs)
- Display of log book entries

If the MIQ/TC 2020 3G is registered as a terminal on the system, it is mobile and can be removed at any time. Upon failure of the main controller in the system, the MIQ/TC 2020 3G automatically adopts the job of the failed controller (see section 1.4.3).

### 1.4.3 Backup controller of the MIQ/TC 2020 3G

#### Automatic backup function

The MIQ/TC 2020 3G, configured as a terminal, has a backup controller that takes over the core functions of the IQ SENSORNET controller in the case of its breakdown. Thus, the operating security of the system is significantly increased. For this purpose the System 2020 3G regularly carries out an automatic backup of the system configuration during regular terminal operation.

#### System configuration,

The system configuration contains the following assignments and settings:

- *Settings of sensors and diff. sensors*
- *Settings of outputs and links*
- *Edit list of sensors*
- *Edit list of outputs*
- *Measured value recording* (datalogger settings)
- List of all components including software statuses but without terminal information.
- Application-related calibrations of sensors (e.g. matrix comparison)



In the IQ SENSORNET, the system configuration is stored in the controller (MIQ/MC3 or MIQ/TC 2020 3G, configured as controller plus terminal).

**Functions** If the MIQ/TC 2020 3G operates as a backup controller, all IQ SENSORNET core



functions are carried out. Relay- and current interfaces, MIQ/3-PR, MIQ/3-MOD and RS485 operate without restrictions.

**Constraints** The following functions are not supported:

- Continuation of the datalogger mode of the main controller
- Continuation of the digital communication of the main controller if the communications interface is connected to the main controller.

**Manual backup function**

In addition to the automatic backup of the system configuration, the system configuration can be backed up manually to a USB memory at any time. In the case of a system failure the saved configuration can then be transferred from the USB memory device to another controller.

#### 1.4.4 Status LED

The status LED provides information on the status of the system:

Status LED	Meaning
Permanently on	– The IQ SENSORNET is running without any faults
Permanently off	– No power supply or the status LED is switched off
Flashes	<ul style="list-style-type: none"> <li>– The IQ SENSORNET has detected an alarm.</li> <li>– The IQ SENSORNET has detected a fault, e.g.:               <ul style="list-style-type: none"> <li>– A communication fault in the IQ SENSORNET</li> <li>– An invalid measured value</li> <li>– The backup controller has taken over the controller function</li> </ul> </li> </ul> <p>As long as the fault is present, the LED flashes (even when the logbook message on the fault has already been acknowledged). Detailed information on the fault is given in the log book.</p>

## 1.5 Interfaces of the IQ SENSORNET

### 1.5.1 USB-A interface

USB-A interfaces of the IQ SENSORNET provide the following functions:

- Connection of a USB memory device for the transfer of data (see section 4.9)
  - Measured data
  - Calibration data
  - Configuration data

- Log book
- IQ LabLink data
- Connection of an electronic key for simple access to the system when access control is switched on (see section 5.3.4)
- Connection of a USB hub for the reproduction of the USB interface. (Recommended: Use a USB hub with extra power pack.)



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

## 1.5.2 Ethernet interface

The Ethernet interface provides the following functions:

- Integration into an Ethernet network (see section 6)
- Web server feature IQ WEB CONNECT for the remote monitoring and remote control of the IQ SENSORNET (see section 6)
- Email feature (see section 5.11.4)



With a USB Ethernet adapter, an Ethernet interface with a limited functional range can be provided at the MIQ/TC 2020 3G terminal/controller.

Communication with Ethernet fieldbuses is not possible with a USB Ethernet adapter.

## 1.6 Behavior of the IQ SENSORNET in case of faults

### 1.6.1 Behavior of the IQ SENSORNET 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.

### 1.6.2 Behavior of the IQ SENSORNET 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	<ul style="list-style-type: none"> <li>● The configuration for the IQ sensor (<i>Settings of sensors and diff. sensors</i>) remains stored.</li> <li>● Current measured values are not available.</li> <li>● The measured value display shows <i>ERROR</i>.</li> </ul>
MIQ modules	<ul style="list-style-type: none"> <li>● If an active module fails, an entry is made in the log book. The error symbol flashes on the display.</li> <li>● The configuration for these modules is retained (e.g. links in the case of output modules).</li> </ul>
Controller	<ul style="list-style-type: none"> <li>● No current measured data can be displayed, processed or stored.</li> <li>● If communication with the controller is disturbed, output modules activate the error behavior after 2 minutes (see component operating manual of the output module).</li> <li>● If communication with the controller is disturbed, the fieldbus interfaces and web server will set the sensor status of all sensors to "UNUSED ID" after 2 minutes (see components operating manual of the fieldbus module).</li> </ul>
Output module	<ul style="list-style-type: none"> <li>● The configuration for the output module (<i>Settings of outputs and links</i>) remains stored.</li> </ul>
Terminal	<ul style="list-style-type: none"> <li>● The measured value display is not updated.</li> <li>● The display does not react to entries.</li> <li>● The system continues working.</li> <li>● Stored measured data and the system configuration remain stored.</li> </ul>
Power supply module	like power failure (see section 1.6.1)

### 1.6.3 Availability of the system

The IQ SENSORNET 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 9.4). 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).
- Back up the controller function with the aid of a MIQ/TC 2020 3G terminal/controller, configured as terminal.  
The MIQ/TC 2020 3G terminal/controller has a redundant controller function. It maintains all essential functions of the system in the case of controller malfunction and saves all settings. Controller operation starts automatically.
- 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 to a PC. The data is then transferred via the USB interface or a network connection: The stored system configuration can be loaded from the PC to a substitute controller that might be necessary.

### 1.6.4 Compatibility of the controllers of the System 2020 3G (MIQ/MC3, MIQ/TC 2020 3G) with components of an existing IQ SENSORNET system

If a controller of the System 2020 3G replaces a controller in an existing IQ SENSORNET system, the following compatibilities apply:

<b>Existing IQ SENSORNET system (controller)</b>	<b>Compatibility</b>
System 2020 XT (MIQ/MC2, MIQ/TC 2020 XT)	All existing components of the existing system are fully compatible with a controller (MIQ/MC3, MIQ/TC 2020 3G)
System 2020 (MIQ/MC)	>The following terminal components are not compatible with a controller (MIQ/MC3, MIQ/TC 2020 3G): <ul style="list-style-type: none"><li>- Terminal T2020</li><li>- Terminal T2020 (Plus)</li></ul>

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

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

**WARNING**

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

**CAUTION**

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

**NOTE**

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

#### 2.1.2 Safety signs on the product

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

#### 2.1.3 Further documents providing safety information

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

- Operating manuals of other components of the IQ SENSORNET 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 IQ SENSORNET System 2020 3G consists of its use in online analysis. Only the operation and running of the sensor according to the instructions and technical specifications given in this operating manual is authorized (see chapter 10 TECHNICAL DATA). Any other use is considered unauthorized.

### 2.2.2 Requirements for safe operation

Note the following points for safe operation:

- The product may only be operated according to the authorized use specified above.
- The product may only be operated under the environmental conditions mentioned in this operating manual.
- The product may only be supplied with power by the energy sources mentioned in this operating manual.
- The product may only be opened if this is explicitly described in this operating manual (example: connecting electrical lines to the terminal strip).

### 2.2.3 Unauthorized use

The product must not be put into operation if:

- it is visibly damaged (e.g. after being transported)
- it was stored under adverse conditions for a lengthy period of time (storing conditions, see chapter 10 TECHNICAL DATA).

## 2.3 User qualification

<b>Target group</b>	The IQ SENSORNET 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.
<b>Special user qualifications</b>	The following installation activities may only be performed by a qualified electrician: <ul style="list-style-type: none"><li>● Connection of power supply modules to the power supply (see module operating manual).</li><li>● Connection of external, line voltage-carrying circuits to relay contacts (see module manual of the relay output module).</li></ul>

## 3 Installation

### 3.1 Scope of delivery

- Controller MIQ module MIQ/MC3 or Terminal/Controller MIQ/TC 2020 3G
- Only for MIQ/MC3:
  - Safety screw to secure the terminal/controller to an MIQ module
  - Option: with MODBUS or PROFIBUS connection
- Only for MIQ/TC 2020 3G:  
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 M3x6 to close the module lid  
(+ 2 replacement screws)
  - 1 x contact base with fixing screws
- Operating manual.



### 3.2 Basic principles of installation

#### 3.2.1 System planning

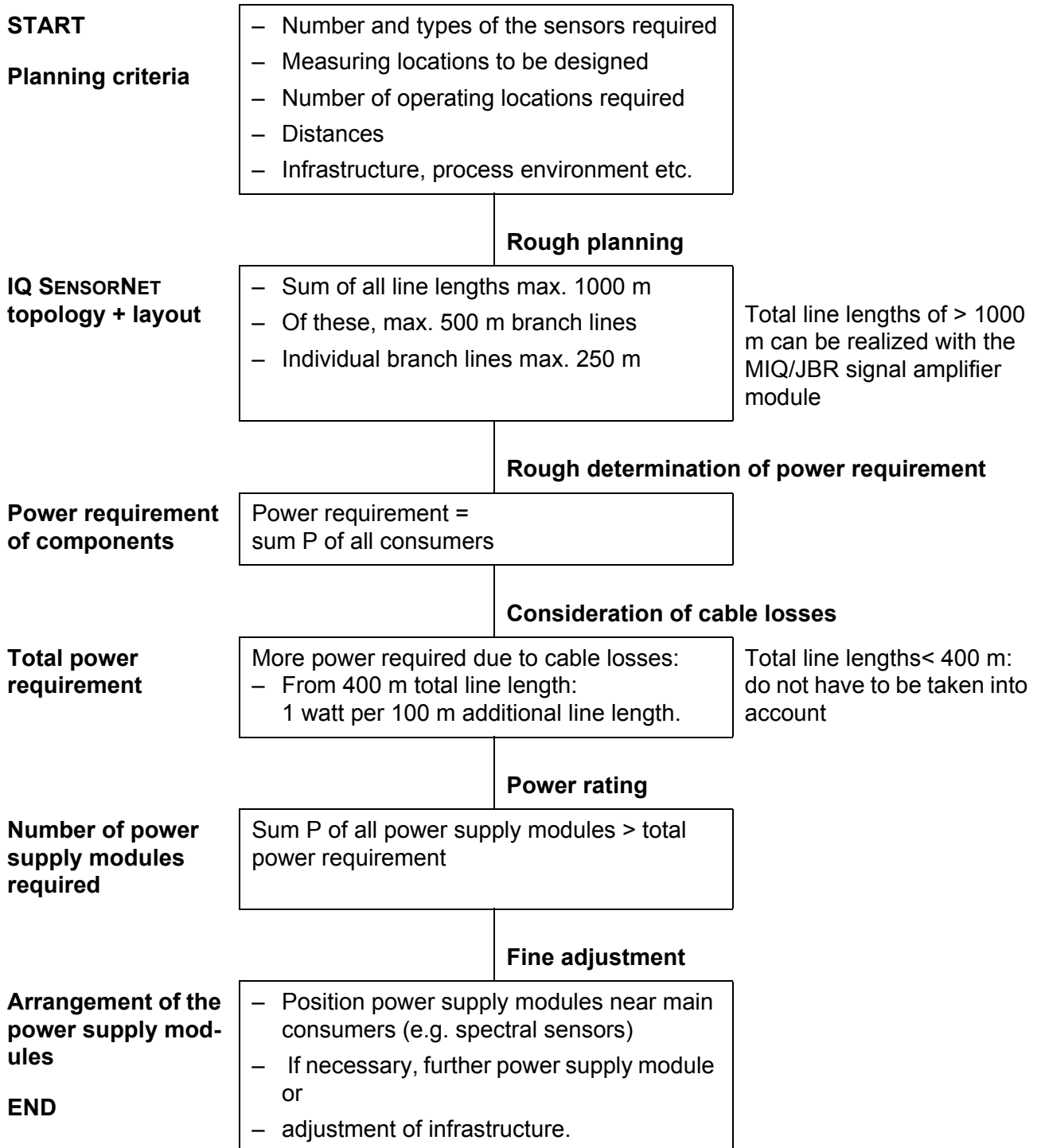


figure 3-1 System planning (planning steps)

**3.2.2 Requirements of the measurement location**

The respective measurement locations of all IQ SENSORNET components must meet the environmental conditions specified in section 10.1 GENERAL SYSTEM DATA.

**Controlled environmental conditions**

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

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

**3.3 Safety requirements of the electrical installation**

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

- Compliance with national regulations (e.g. NEC, VDE and IEC)
- Suitability for the electrical conditions at the place of installation
  - Maximum operational voltage
  - Maximum operational current
- Suitability for the ambient conditions at the place of installation
  - Temperature resistance (minimum and maximum temperature)
  - Stability against UV light in the case of outdoor usage
  - Protection against water and dust (Nema or IP type of protection).
- Suitable fuse protection of the electrical circuit
  - Overcurrent protection devices (according to the technical data of the instrument input or output)
  - Overvoltage limitations of overvoltage category II
- Suitable external separator (e.g. switch or circuit-breaker) for the power supply of permanently installed instruments with separate power connection
  - compliant with the following regulations
    - IEC 60947-1
    - IEC 60947-3
  - in the vicinity of the instruments (recommendation)
- Cables and lines fire resistant and compliant with the following regulations
  - UL 2556 VW-1 (for USA, Canada)
  - IEC 60332-1-2 (outside the USA, Canada)

### 3.4 Installation guidelines for lightning protection

When installing and using the IQ SENSORNET instrumentation, 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 IQ SENSORNET online instrumentation as so-called 'lightning protection' (see chapter 10 TECHNICAL DATA).

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

- 1 All lines of IQ SENSORNET 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 mm<sup>2</sup>), 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 SENSORNET 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 any IQ SENSORNET instrumentation is 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 SENSORNET 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 any IQ SENSORNET instrumentation. Sun shields serve as a protection due to an advantageous development of the electrical field lines and promote the dissipation of the surge via the mounting construction.
- 6 The line voltage for the supply of the IQ SENSORNET instrumentation 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 One part of the IQ SENSORNET safety and lightning protection concept is based on high-grade protective insulation of the IQ SENSORNET instrumentation. It does not normally have any protective ground conductor or earth terminal. Avoid any direct connection of the IQ SENSORNET 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 SENSORNET 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 SENSORNET external resources, cable entry points into buildings or distributions coming from the IQ SENSORNET instrumentation 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.
  - Connect any Ethernet interfaces with a shielded Ethernet cable, especially if installed in an open air location.
  - Do not operate any USB devices permanently at the USB-A interface in

an open air location.

### 3.5 Drawing up the power rating

#### General information

The IQ SENSORNET 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 SENSORNET system:

- Power consumption of all components (power rating). Primarily, this determines the number of MIQ power supply modules required (section 3.5).
- Distance of the components from one another. Large distances may require a further MIQ power supply module and/or an MIQ/JBR signal amplifier module (section 3.5.1).
- Placement of the MIQ power supply modules in the IQ SENSORNET (effect on the power supply - section 3.5.1).



Only IQ SENSORNET products may be used in the IQ SENSORNET.

#### 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 3.5.1.

The power requirement of the individual components is listed in the following table:

Power requirement of IQ SENSORNET components	IQ sensors	Power requirement [W]
		SensoLyt <sup>®</sup> 700 IQ (SW)
	TriOxmatic <sup>®</sup> 70x IQ (SW)	0.2
	FDO <sup>®</sup> 70x IQ (SW)(H)	0.7
	TetraCon <sup>®</sup> 700 IQ (SW)	0.2

<b>IQ sensors</b>	<b>Power requirement [W]</b>
VisoTurb <sup>®</sup> 700 IQ (SW)	1.5
ViSolid <sup>®</sup> 700 IQ (SW)(H)	1.5
AmmoLyt <sup>® Plus</sup> 700 IQ	0.2
NitraLyt <sup>® Plus</sup> 700 IQ	0.2
VARiON <sup>® Plus</sup> 700 IQ	0.2
Spectral sensors XXXVis <sup>®</sup> 7YY IQ (e.g. NiCaVis <sup>®</sup> 705 IQ )	8.0
UV 70x IQ NOx	8.0
UV 70x IQ SAC	8.0
IFL 700 IQ	5.5
IFL 701 IQ	3.0
P 700 IQ (MIQ/WCA 232)	0.5

<b>MIQ modules</b>	<b>Power requirement [W]</b>
MIQ/JB	0.1
MIQ/JBR	0.2
MIQ/CR3	3.0
MIQ/C6	3.0
MIQ/R6	1.5
MIQ/IC2	0.2 + 2.2 W per connected WG 21 A7 power supply/isolator
MIQ/CHV	2.2
MIQ/CHV PLUS	2.5
MIQ/WL PS	0.6
MIQ/3[-PR]/[-MOD]	3.0
MIQ/2-PR	2.0
MIQ/2-MOD	1.6

Terminal, Controller	Power requirement [W]
MIQ/MC3	2.5
MIQ/MC3PR	3.0
MIQ/MC3-MOD	3.0
MIQ/TC 2020 XT	3.0
MIQ/TC 2020 3G	3.5
USB devices	Power requirement [W]
USB memory	approx. 0.5 ... 2
USB Ethernet adapter	approx. 0.5 ... 2

**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 (MIQ/PS or MIQ/24V) as follows:

Total power requirement P	Number of MIQ power supply modules
$P \leq 18 \text{ W}$	1
$18 \text{ W} < P \leq 36 \text{ W}$	2
$36 \text{ W} < P \leq 54 \text{ W}$	3
$54 \text{ W} < P \leq 72 \text{ W}$	4
$72 \text{ W} < P \leq 90 \text{ W}$	5
$90 \text{ W} < P \leq 108 \text{ W}$	6

Sample configuration	Power requirement [W] (component)	Total power requirement P [W] (sum of the components)	Number of MIQ power supply modules required
1 MIQ/MC3	2.5	2.5	1
+ 1 MIQ/TC 2020 3G	+ 3.5	6.0	1
+ 1 NiCaVis <sup>®</sup> 705 IQ	+ 8.0	14.0	1
+ 1 VisoTurb <sup>®</sup> 700 IQ	+ 1.5	15.5	1
+ 1 MIQ/CR3	+ 3.0	18.5	2

+ 1 SensoLyt <sup>®</sup> 700 IQ	+ 0.2	18.7	2
+ 1 MIQ/CR3	+ 3.0	21.7	2
+ 1 MIQ/TC 2020 3G	+ 3.5	25.2	2



The number of MIQ power supply modules required in the IQ SENSORNET that was determined can be higher in the case of:

- Great cable lengths (see section 3.5.1).
- If any USB devices with high power consumption are connected

### Power supply with the aid of the MIQ/WL PS radio module

The MIQ/WL PS radio module can also supply power to components with a total of up to 7 W power consumption on an IQ SENSORNET island. Details of this are given in the operating manual of the MIQ/WL PS.

#### 3.5.1 Effect of the cable length

The length of the cables in the IQ SENSORNET 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 10 TECHNICAL DATA.

### Voltage drop due to cable lengths

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

#### Guideline

If the MIQ 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 MIQ power supply modules required, the most unfavorable design has to be taken into account for mobile components (MIQ/TC 2020 3G). I. e., take into account

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



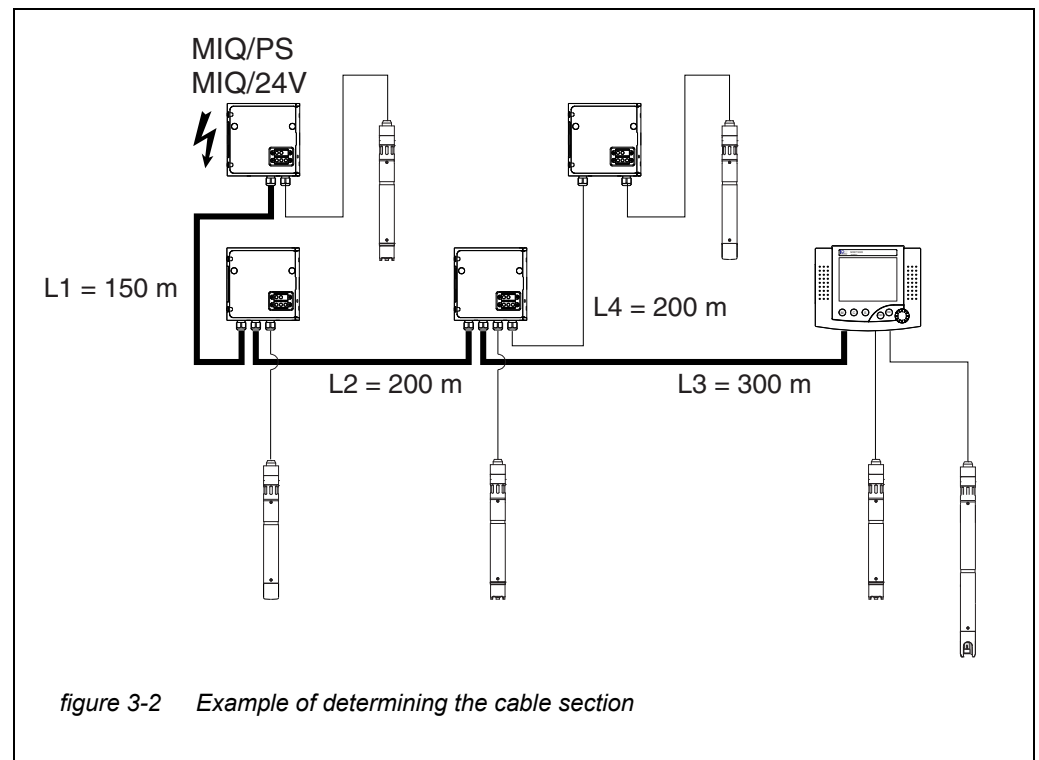
### Determining the length of the cable section

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:

$$L = L1 + L2 + L3$$

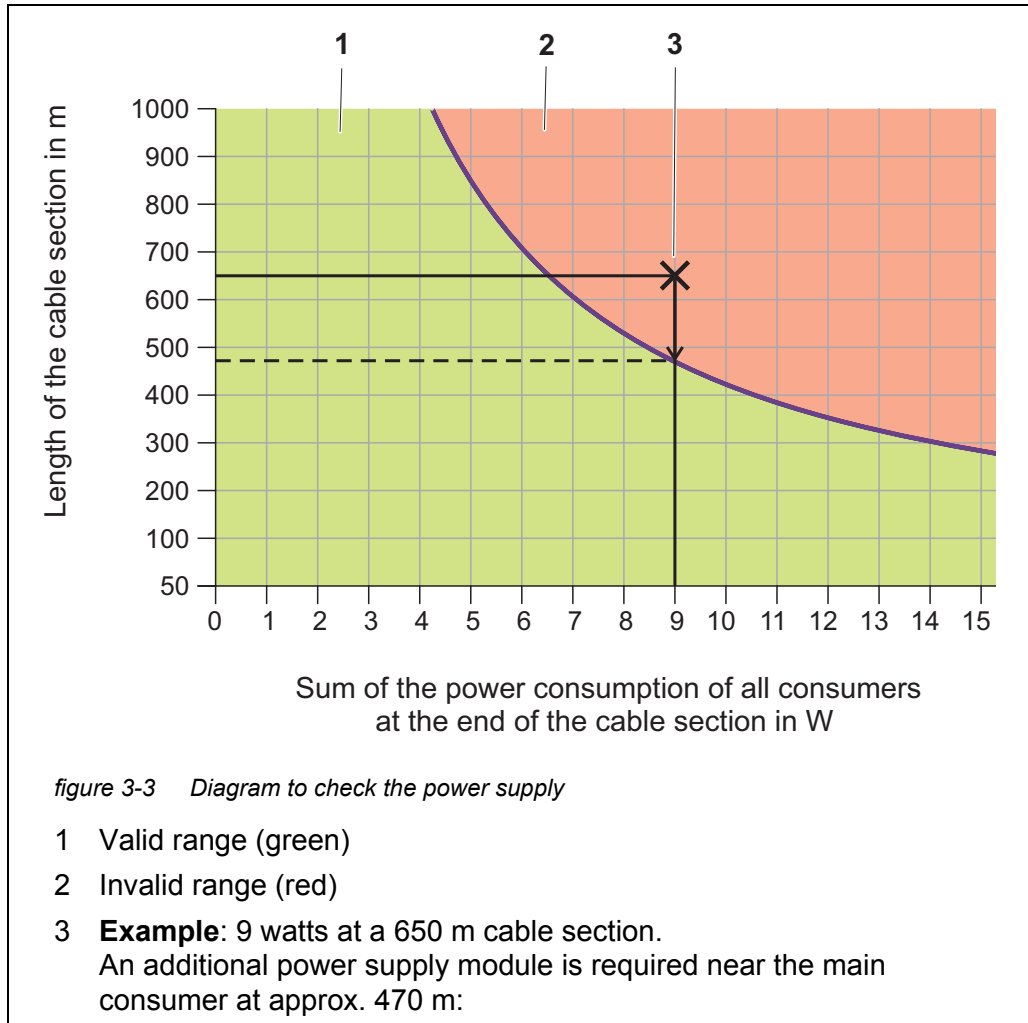


### Checking the power supply

- 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 values determined 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.



- 4 **Evaluation:**  
If the point is in the lower, valid range, no additional MIQ power supply module is required.  
If the point is in the upper, invalid range, an additional MIQ power supply module is required. Install this MIQ 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 sec-

tion of 650 m. Is the power supply with one MIQ power supply module sufficient? At which point must a further MIQ power supply module be installed if necessary?

Proceeding:

- Enter both values as a point in the diagram (point "x" in figure 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 MIQ power supply module is required.
- If any main consumers are near this place, the MIQ 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 9.2.2). The limits of the voltage levels are given in this operating manual in section 9.2.2 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.

### 3.5.2 Optimum installation of MIQ power supply modules

#### Basic rules

- Install the MIQ power supply modules as near as possible to the IQ SENSORNET 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 SENSORNET in a star configuration from the MIQ power supply modules.

## 3.6 Connecting system components

### 3.6.1 General information

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

- **Stacked mounting of MIQ modules**

Up to three MIQ modules can be installed and mechanically connected with one another to form a stack at a single location. The contacts on the front and rear automatically create the electrical connection between the MIQ modules in the stack (section 3.6.2).

- **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 3.6.3).

- **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 with a plug that is standard for all IQ sensors (section 3.6.4).

- **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.



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.

### 3.6.2 Stacked mounting of MIQ modules:

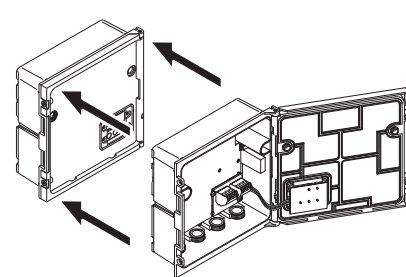


For optimum stability, a maximum of three MIQ modules can be mounted in any one stack. Only one MIQ power supply module may be mounted per module stack.

**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.

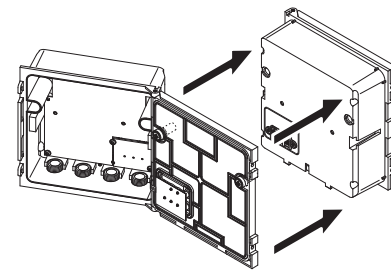
#### Variant 1 - stack expansion forwards.

The back of an MIQ module is attached to the lid of another MIQ module (page 46).



#### Variant 2: - stack expansion backwards.

The lid of an MIQ module is attached to the back of another MIQ module (page 50).



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

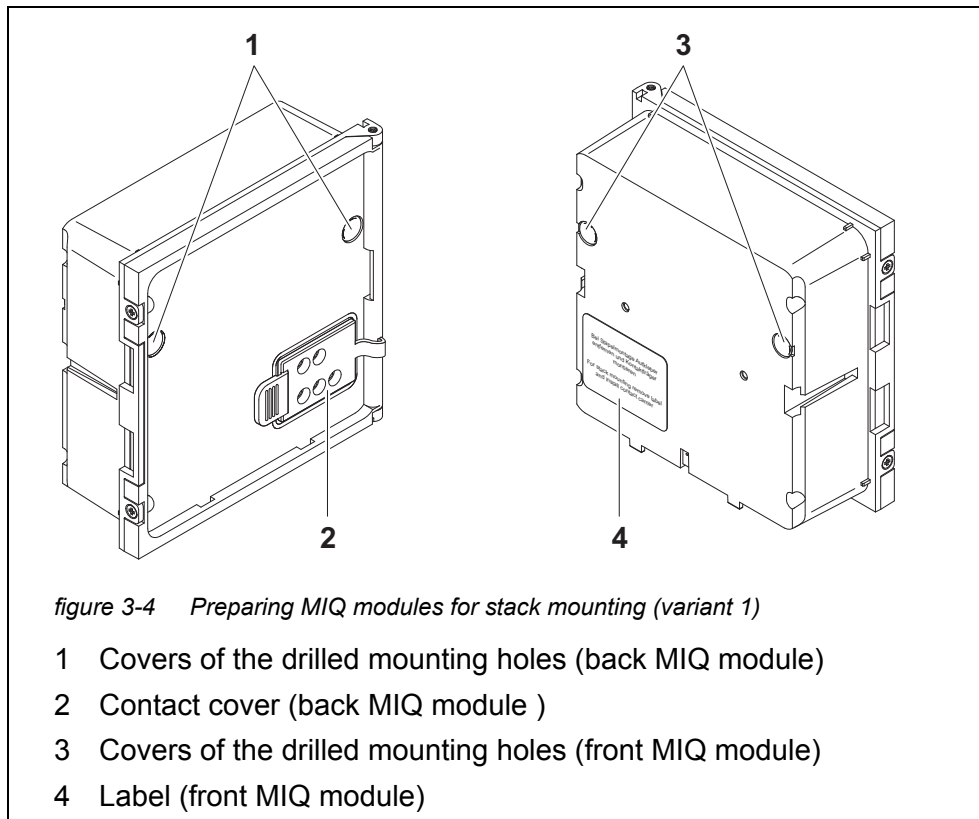


In the case of panel mounting, the front MIQ module can only be installed individually in the switch cabinet aperture. Only then can further MIQ modules be added to its back (variant 2). If necessary, dismantle the front MIQ module from an already mounted stack before mounting.

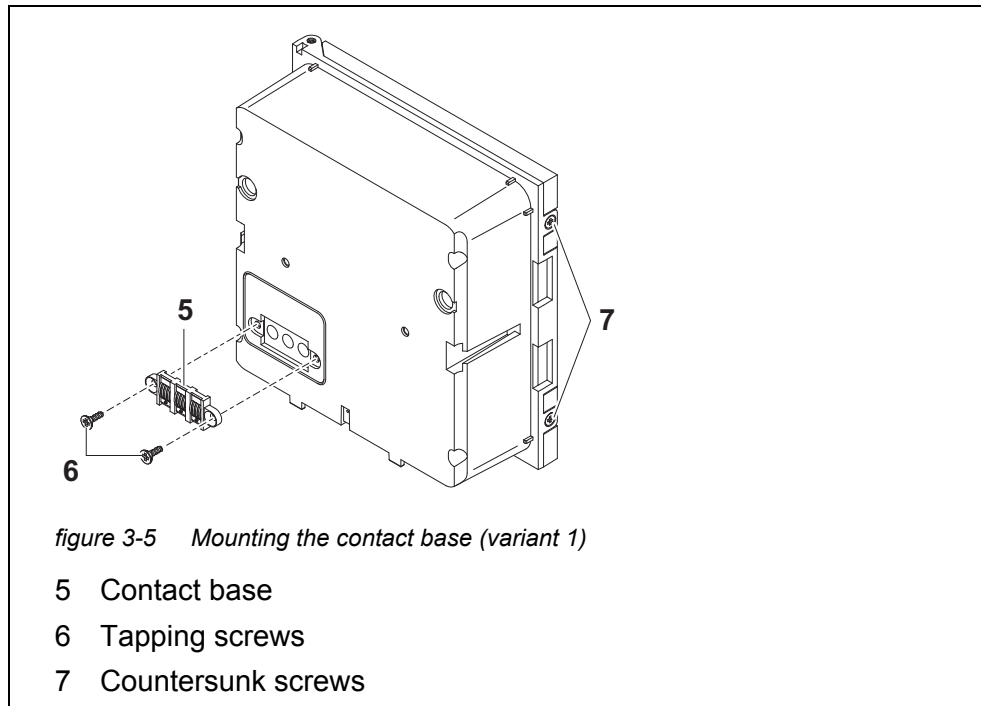
- Materials required**
- 2 x ISO blind nuts (M4)
  - 2 x cheese-head screws (M4x16) with plastic washer
  - 1 x contact base with two plastic tapping screws.

- Tools**
- Phillips screwdriver.

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

**Variant 1: Stack expansion forwards****Preparing the  
stack mounting**

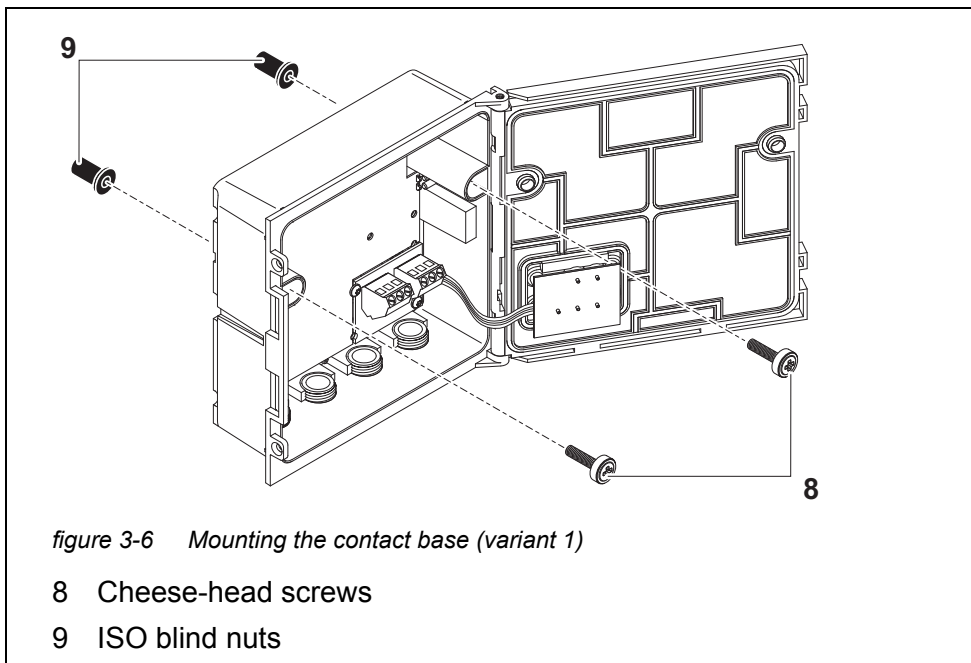
- 1 Remove the covers from the drilled mounting holes (pos. 1 and 3 in figure 3-4).
- 2 Remove the contact cover (pos. 2).
- 3 Pull off the adhesive label (pos. 4).

**Mounting the contact base**

Only IQ Sensor Net products may be used in the IQ Sensor Net.

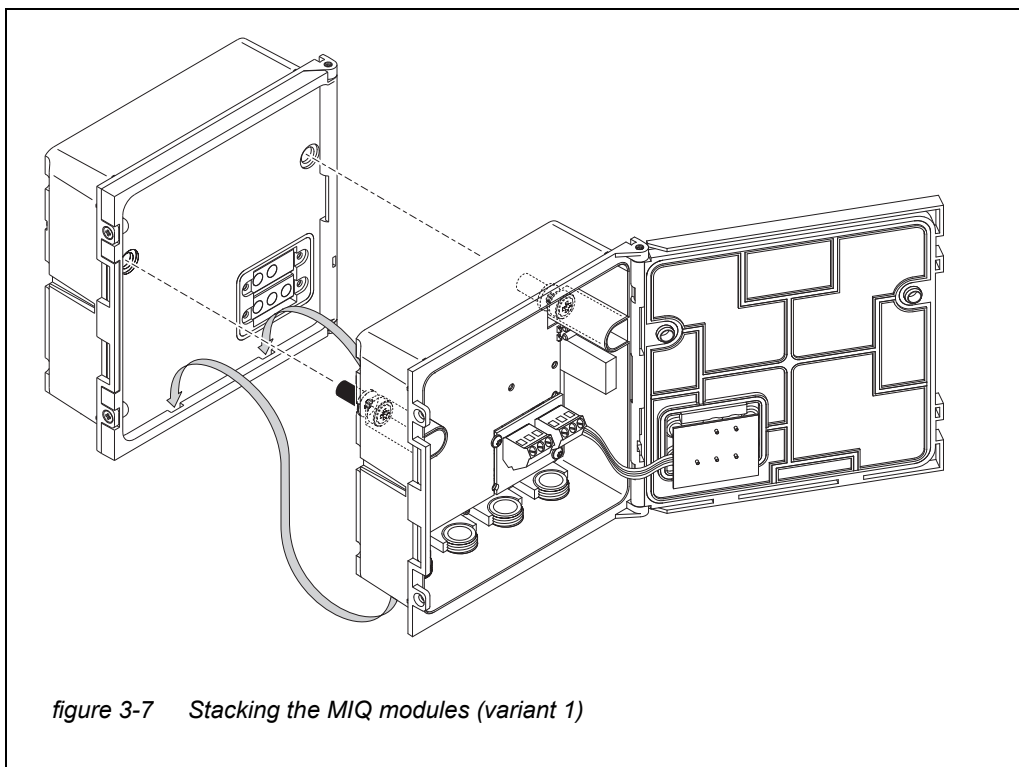
- 4 Attach the contact base (pos. 5 in figure 3-5) on the front MIQ module with the two plastic tapping screws (pos. 6).
- 5 On the front MIQ module, remove the two countersunk screws (pos. 7 in figure 3-5) and swing open the module lid.

**Premounting the ISO blind nuts**



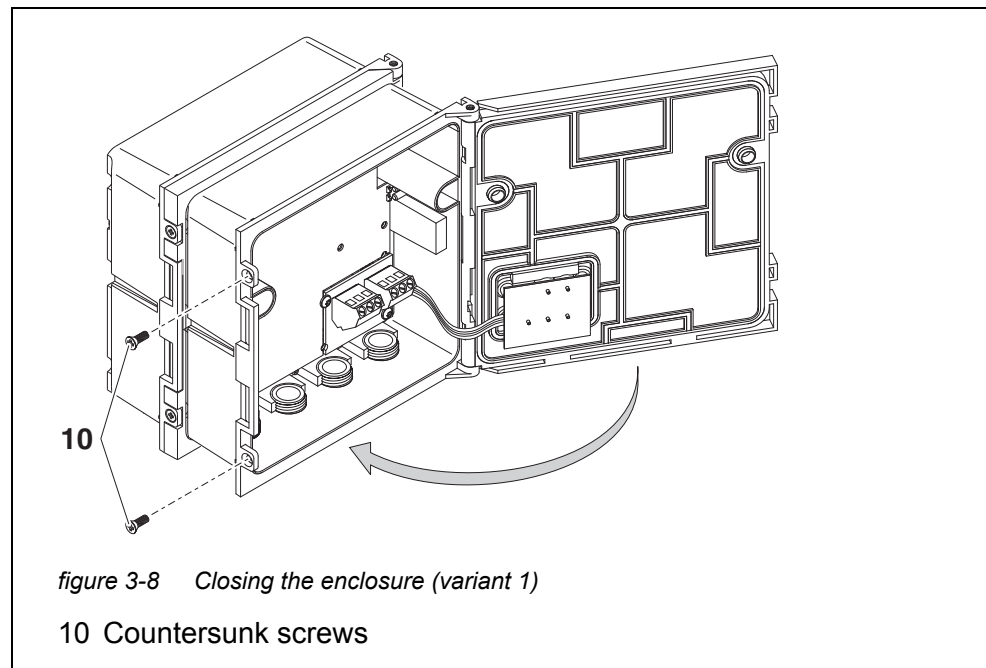
- 6 Insert the cheese-head screws (pos. 8 in figure 3-5) with the plastic washers in the drilled mounting holes in the enclosure and loosely screw in the ISO blind nuts (pos. 9).

**Stacking the MIQ modules**

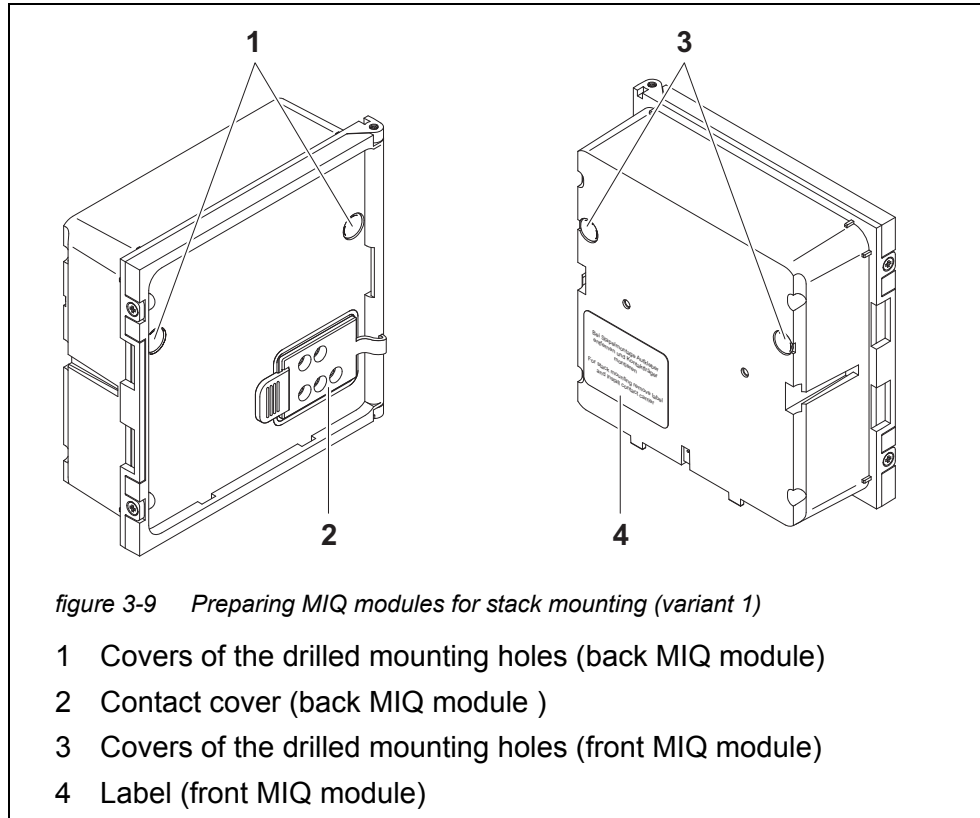




- 7 Attach the prepared MIQ module to the lid of the back MIQ module. At the same time, ensure that the two clips on the front MIQ module click into place in the lid of the back MIQ module. Subsequently, tighten the two screws (pos. 8 in figure 3-6).
- 8 Check the position of the SN terminator switch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

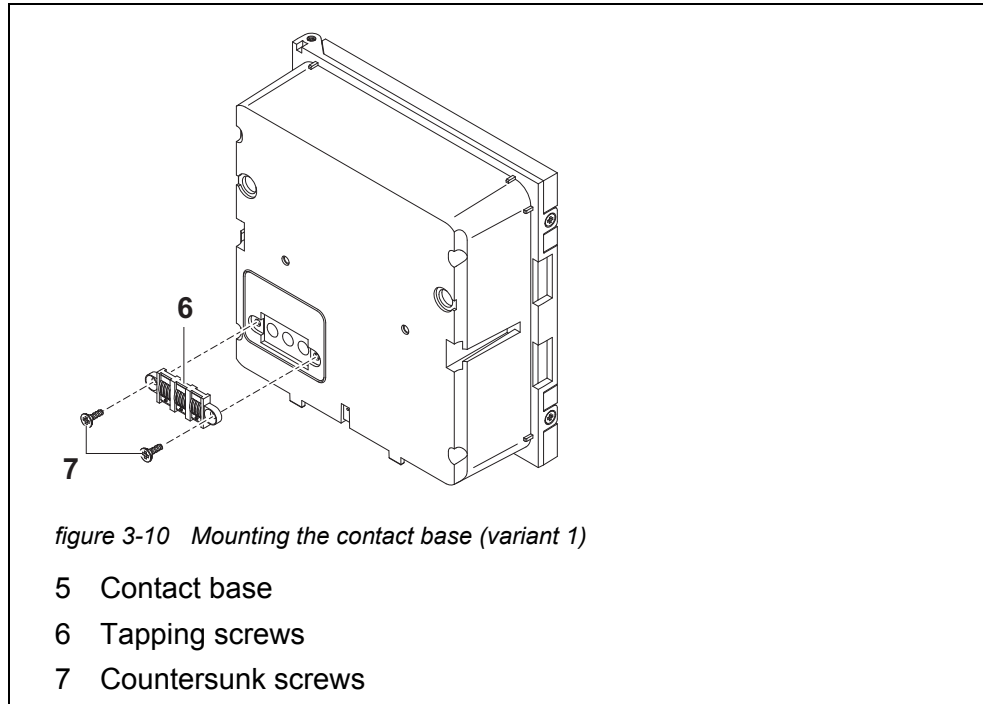


- 9 Close the lid of the front MIQ module and fix it with the two countersunk screws (pos. 7 in figure 3-8).

**Variant 2: stack expansion backwards****Preparing the stack mounting**

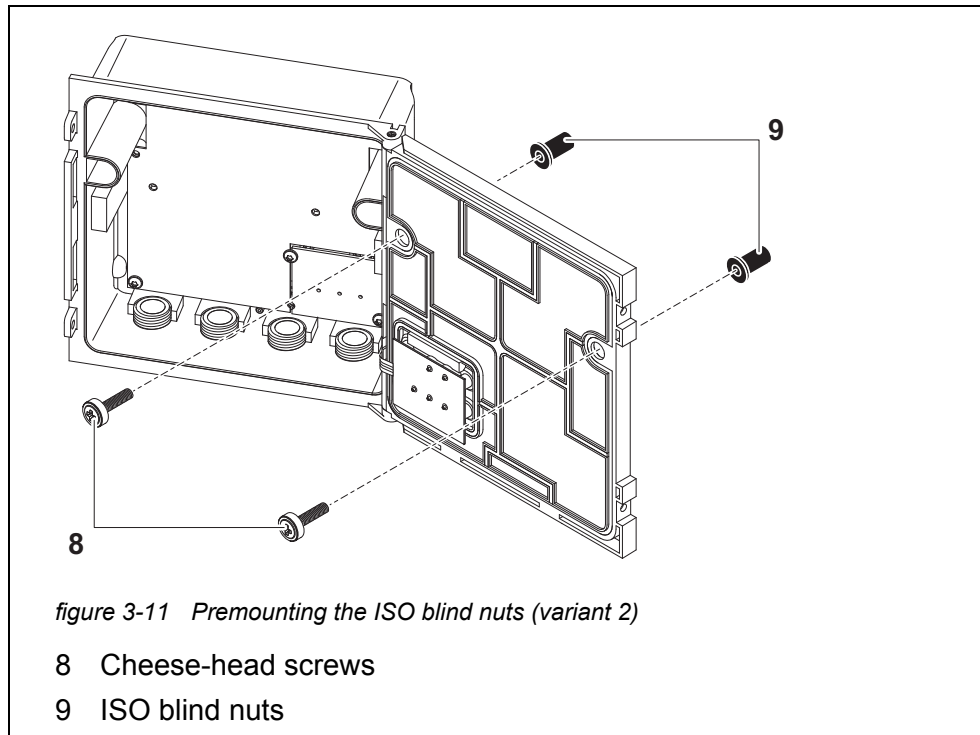
- 1 Remove the covers from the drilled mounting holes (pos. 1 and 3 in figure 3-10).
- 2 Remove the contact cover (pos. 2).
- 3 Pull off the adhesive label (pos. 4).
- 4 On the back MIQ module, remove the two countersunk screws (pos. 5) and swing open the module lid.

### Mounting the contact base



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

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

**Premounting the  
ISO blind nuts**

- 6 Insert the cheese-head screws (pos. 8 in figure 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

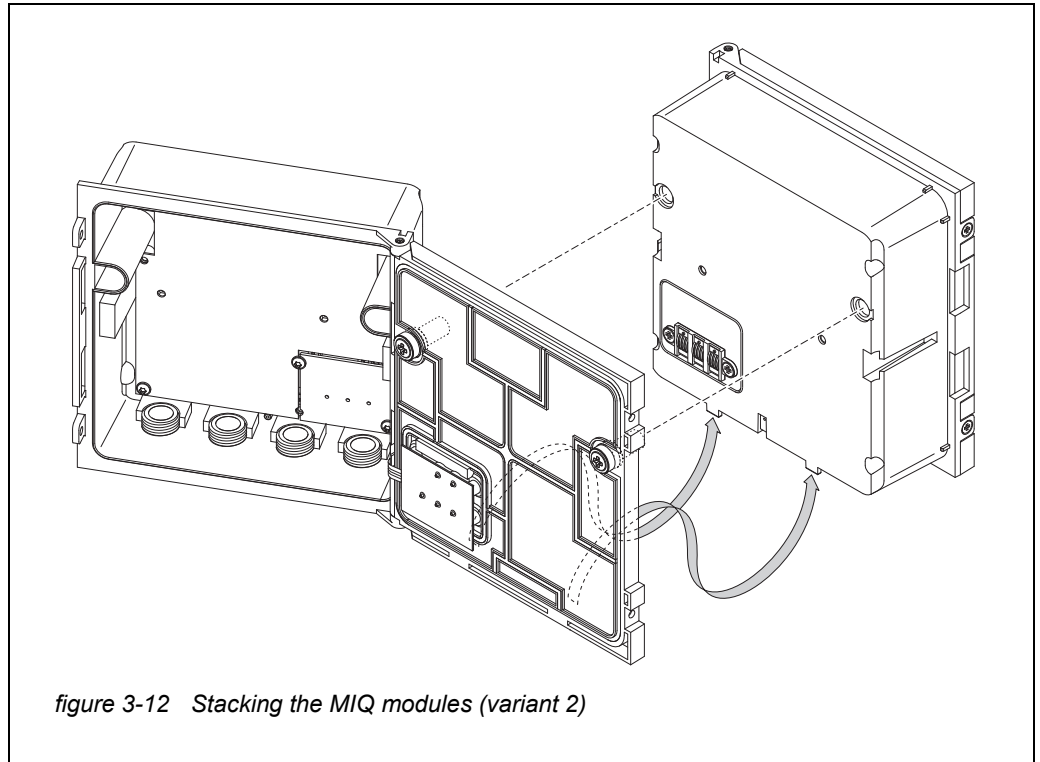
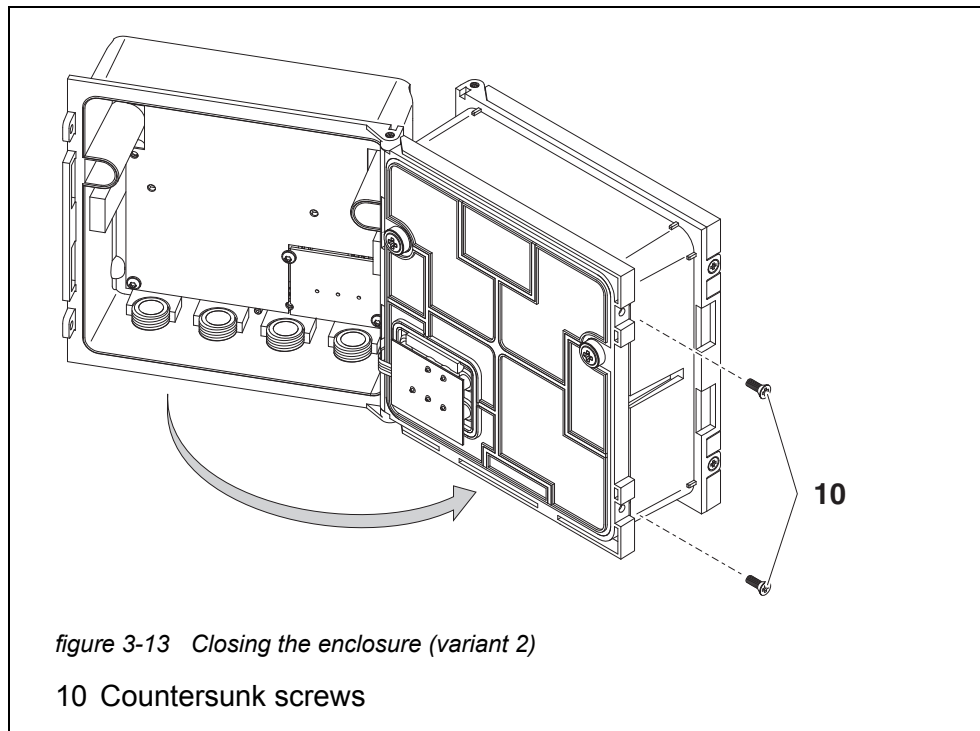


figure 3-12 Stacking the MIQ modules (variant 2)

- 7 Attach the prepared MIQ module to the back of the front MIQ module. At the same time, ensure that the two clips on the front MIQ module click into place in the lid of the back MIQ module. Subsequently, tighten the two screws (pos. 8 in figure 3-11).
- 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 figure 3-13).

### 3.6.3 Distributed mounting of MIQ modules

#### General information

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

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

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

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

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



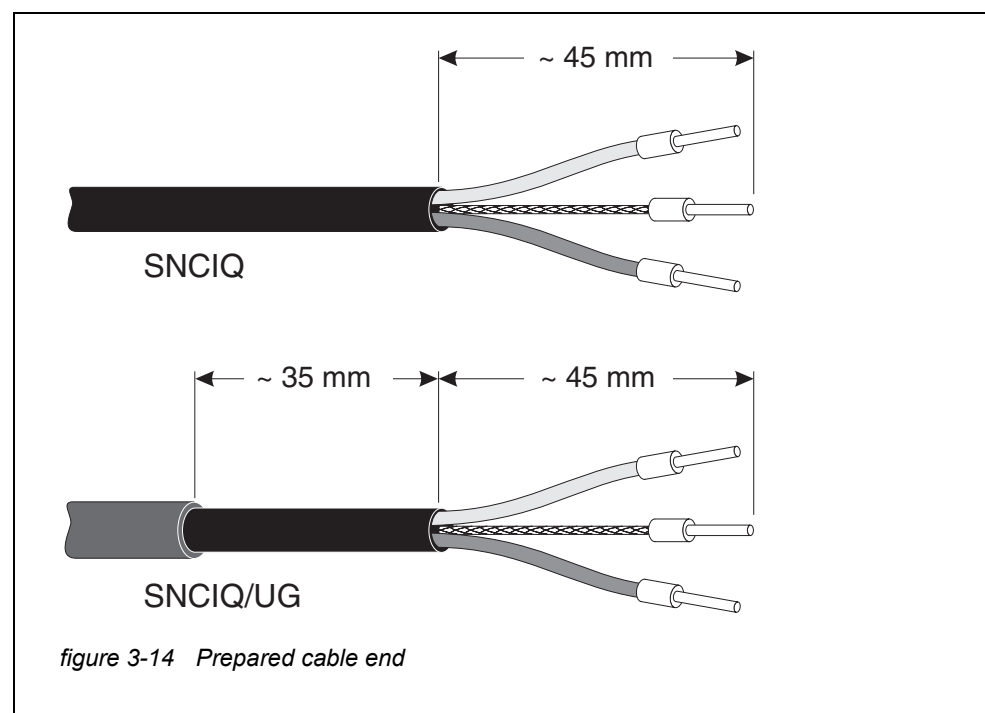
The IQ SENSORNET cable may only be connected to the SENSORNET connections. No wire of the cable may be connected with an external electrical potential. Otherwise, malfunctions could occur.

- Materials required**
- 1 x SNCIQ or SNCIQ/UG connection cable (see chapter 11 ACCESSORIES AND OPTIONS)
  - Wire end sleeves for 0.75 mm<sup>2</sup> wire cross-section with matching crimping tool
  - 1 x cable gland with seal (scope of delivery of MIQ module).

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

**Preparing the cable ends**

- 1 Cut off the cable to the required length.
- 2 Remove approx. 45 mm of cable insulation (in the case of the SNCIQ/UG earth cable, remove both the inner and outer insulation).
- 3 Only for the SNCIQ/UG earth cable: strip the outer insulation for a further 35 mm.
- 4 Shorten the exposed shielding braid up to the cable sheath.
- 5 Shorten the two fillers (plastic inlays) up to the cable sheath.
- 6 Bare the red and green wires and fit them with wire end sleeves.
- 7 Fit the filler stranded wire with a wire end sleeve.



**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 3.6.4):

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

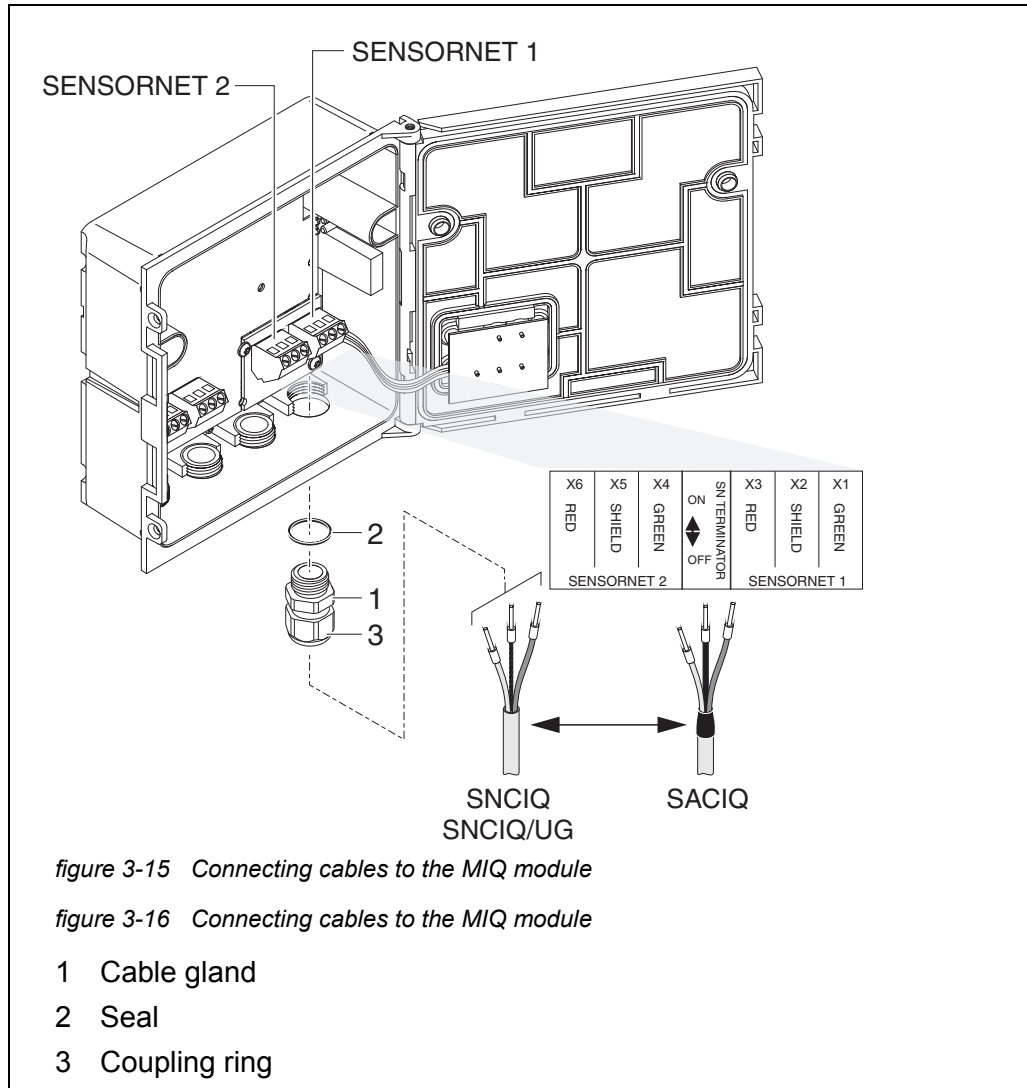


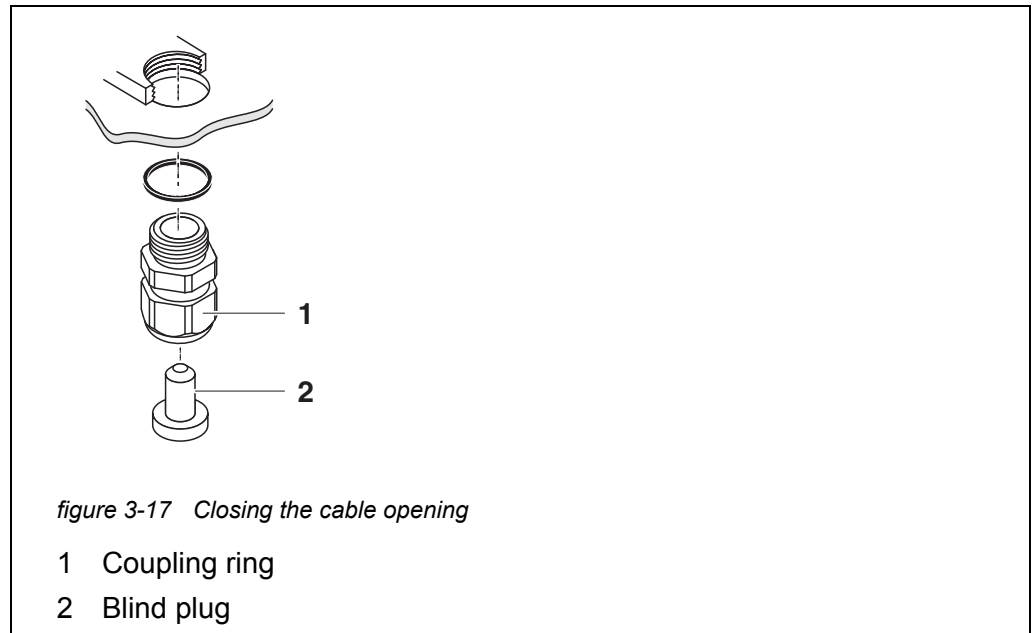
figure 3-15 Connecting cables to the MIQ module

figure 3-16 Connecting cables to the MIQ module

- 3 Screw the cable gland (pos. 1 in figure 3-15) with the sealing ring (pos. 2) into the module housing.
- 4 Loosen the cap nut (pos. 3 in figure 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 figure 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.



- 10 Screw the remaining cable glands with the sealing rings into the remaining free openings and close them with the enclosed blind plugs (pos. 2 in figure 3-17) and tighten the cap nuts (pos. 1) if they are not used.

### Installation with conduits



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

### 3.6.4 Connecting IQ sensors

- Materials required**
- 1 x SACIQ connection cable (see chapter 11 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 screwdriver
  - Small screwdriver.

### 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 123.

### Connect the SACIQ cable to the MIQ module

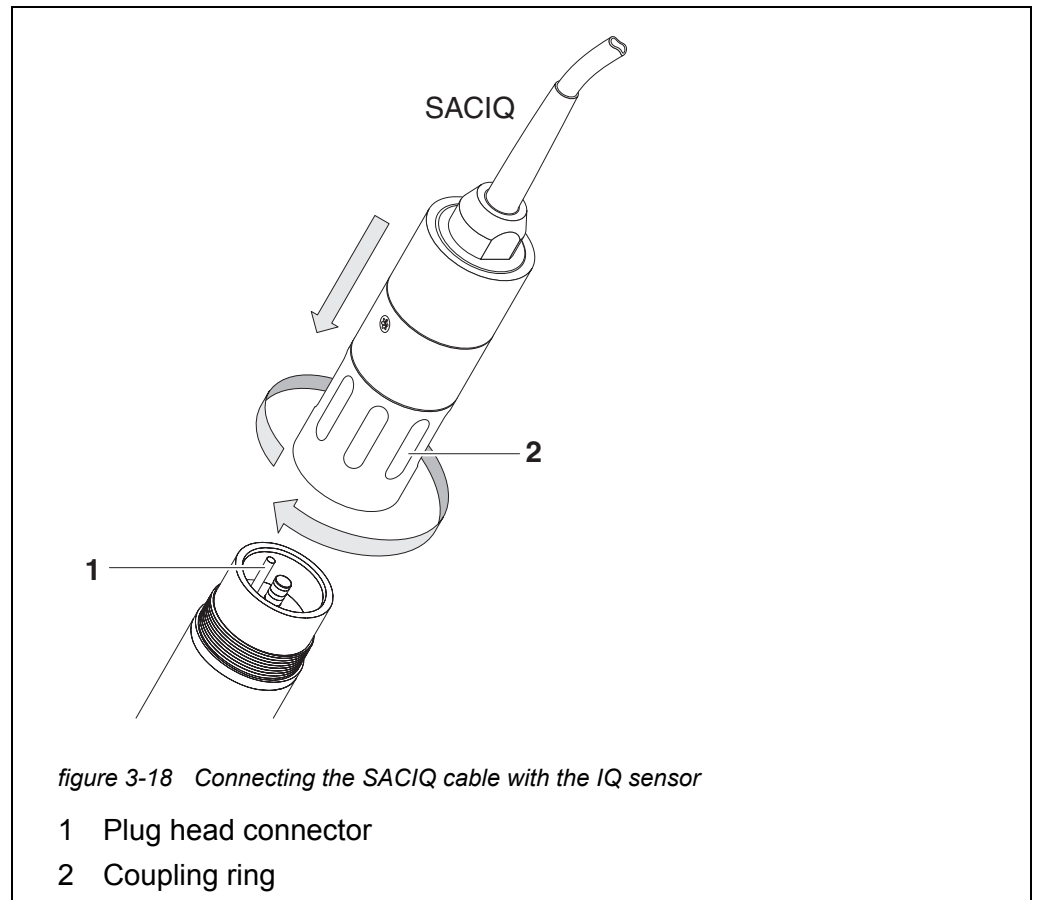
The connection of the SACIQ cable to the terminal strip of an MIQ module is described in section 3.6.3 (see CONNECTING THE CABLES, page 56).



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 occur.

### 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 coupling ring (2) of the IQ sensor connection cable on the IQ sensor up to the stop.



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

### 3.6.5 Installing terminal components

The terminal component is the operating and control unit of the IQ SENSORNET. It serves as an input and output device and is necessary to operate the IQ SENSORNET.

You can install the following terminal components:

- Terminal MIQ/TC 2020 3G
- Terminal MIQ/TC 2020 XT

The terminal component is installed on the lid of any free MIQ module.

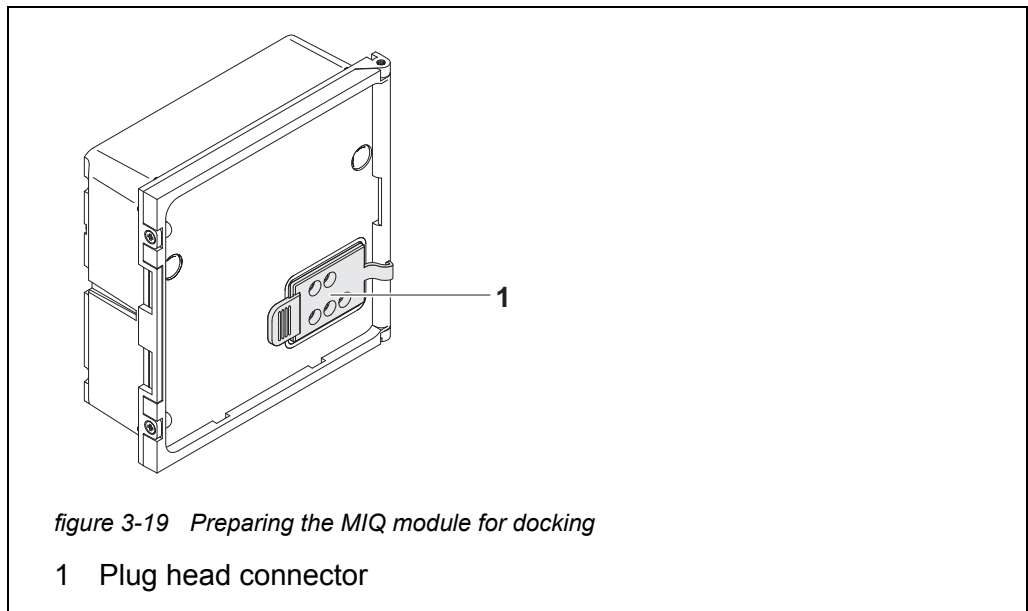
The MIQ/TC 2020 3G, configured as a terminal, is docked on the lid of a free MIQ module.

If the MIQ/TC 2020 3G is configured as a terminal/controller, the MIQ/TC 2020 3G, unlike a mobile terminal (e.g. MIQ/TC 2020 3G configured as a terminal), may not be removed during active operation. To protect against any inadvertent removal, the MIQ/TC 2020 3G can be secured with a locking screw.

**Materials required** Safety screw  
(protection against inadvertent removal of the terminal component)

**Tools** Phillips screw driver  
(to tighten the safety screw)

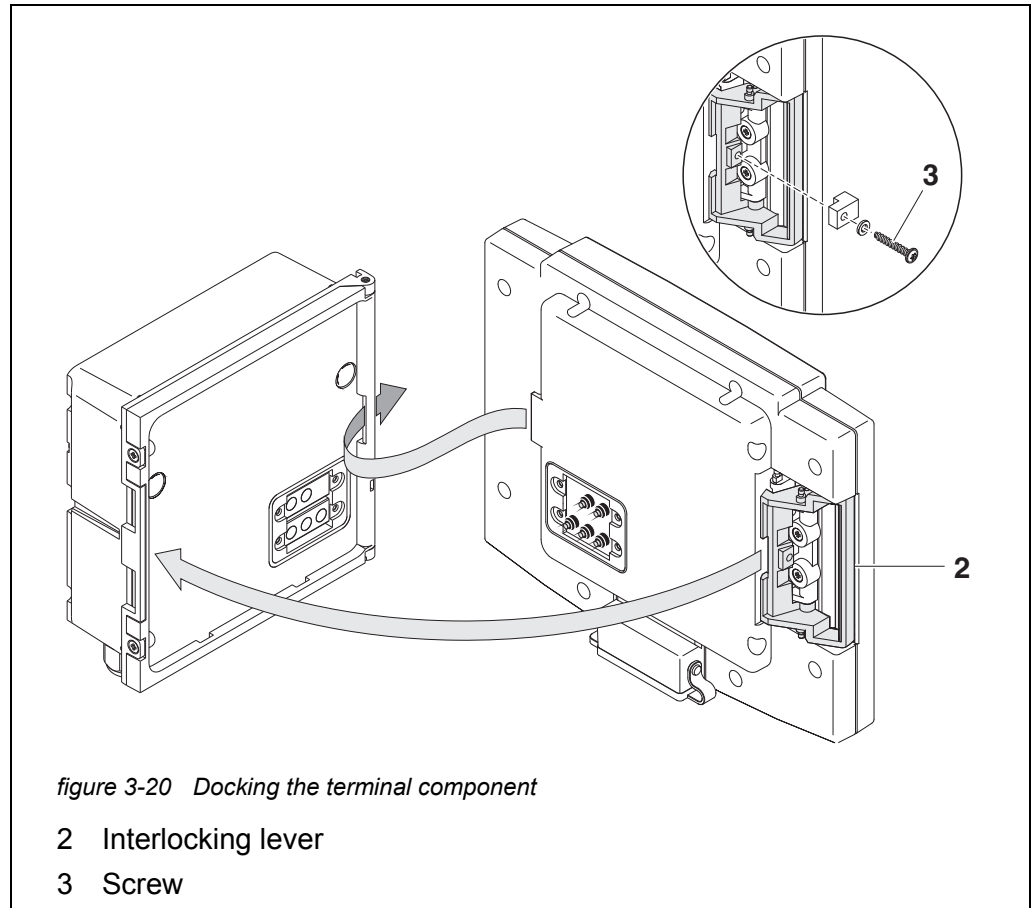
#### Docking the terminal component



- 1 Pull the cover off the contacts (pos. 1 in figure 3-19) on the lid of the MIQ module.



For the temporary docking of a mobile terminal, do not remove the whole contact cover. Leave it hanging on the side of the MIQ module. After removing the terminal, replace the cover again to protect the contacts.



### CAUTION

**Risk of injury due to spring tension.  
Fingers may be trapped and crushed.  
Do not put your fingers under the interlocking lever while it is pulled back.**

- 2 Disconnect any USB devices from the USB interface of the terminal component.  
The terminal only starts correctly if no USB devices are connected.
- 3 Attach the terminal component to the module lid. To do so, insert the flap on the back of the terminal into the slot on the door hinge of the MIQ module. Then, pull back the interlocking lever (pos. 2 in figure 3-20), place the terminal completely on the MIQ module and release the interlocking lever.



To dock the terminal component tightly onto the module lid, the interlocking lever is fixed in position with a strong spring.

- 4 To protect any inadvertent removal of the terminal component, fix the interlocking lever in place with the screw (pos. 3 in figure 3-20).

### Configuring the MIQ/TC 2020 3G as a mobile terminal

During the commissioning of the MIQ/TC 2020 3G on the IQ SENSORNET a prompt appears as to whether the MIQ/TC 2020 3G should work as a terminal or as a controller. Select *Terminal*: (see section 3.10.2).

## 3.7 Installation of the MIQ modules at the installation location

### 3.7.1 General information

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



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 3.7.2).
- **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 3.7.3).
- **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 11 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 10 mm) according to DIN 43700 or IEC 473

(section 3.7.4).

- **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 3.7.5).



**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.

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

**Materials required**

- SSH/IQ sun shield (see chapter 11 ACCESSORIES AND OPTIONS).

**Tools**

- 4 mm set screw wrench
- Phillips screwdriver.

**Mounting the sun shield on a mounting stand**

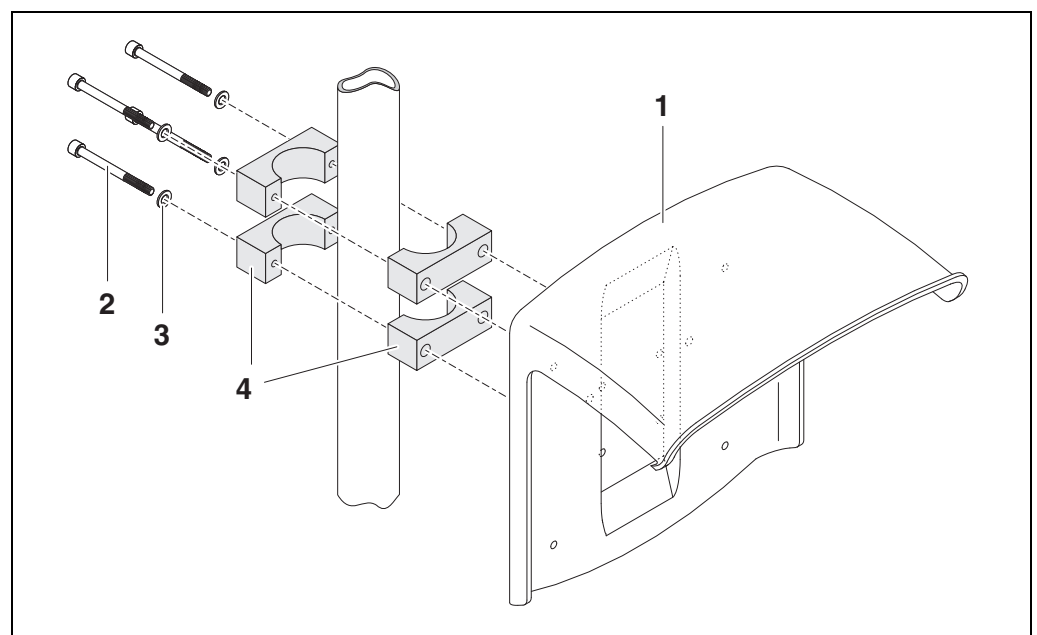
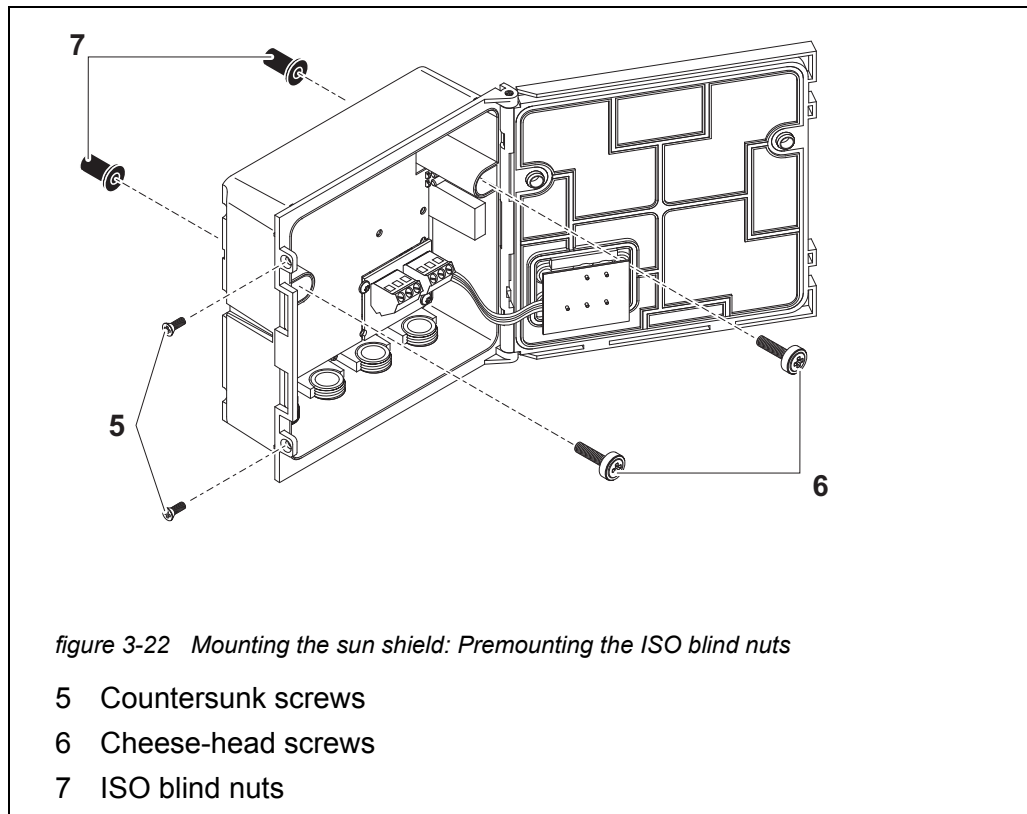


figure 3-21 Mounting the SSH/IQ sun shield on a mounting stand

- 1 Sun shield
- 2 Hexsocket head screws
- 3 Plain washers
- 4 Clamps

- 1 Screw the sun shield (pos. 1 in figure 3-21) with the four hexsocket head screws (pos. 2), the washers (pos. 3) and the clamps (pos. 4) at the required height on the mounting stand from the back.

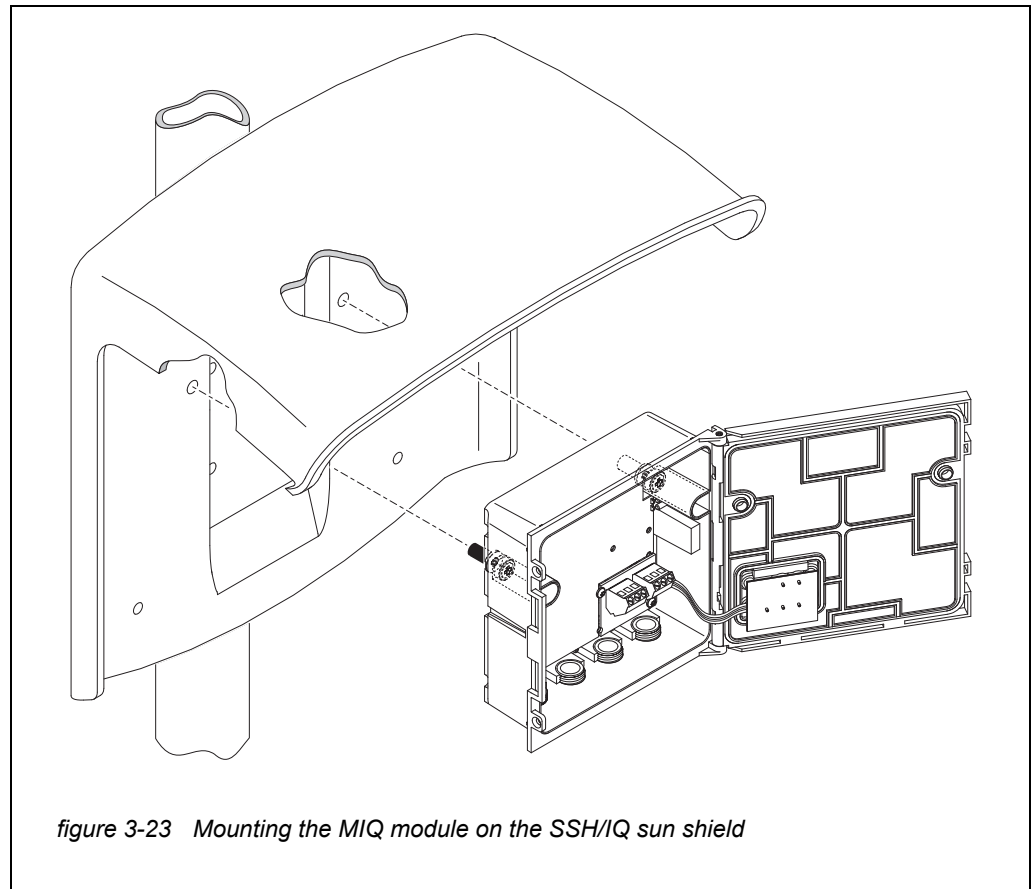
### Premounting the ISO blind nuts



- 2 Remove the two countersunk screws (pos. 5 in figure 3-22) and swing open the module lid.
- 3 Insert the cheese-head screws (pos. 6 in figure 3-22) 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



- 4 Position the MIQ module on the sun shield and fix it into place with the two screws (pos. 6 in figure 3-22).
- 5 Close the module lid and fix it with the two countersunk screws (pos. 5 in figure 3-22).

### 3.7.3 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.



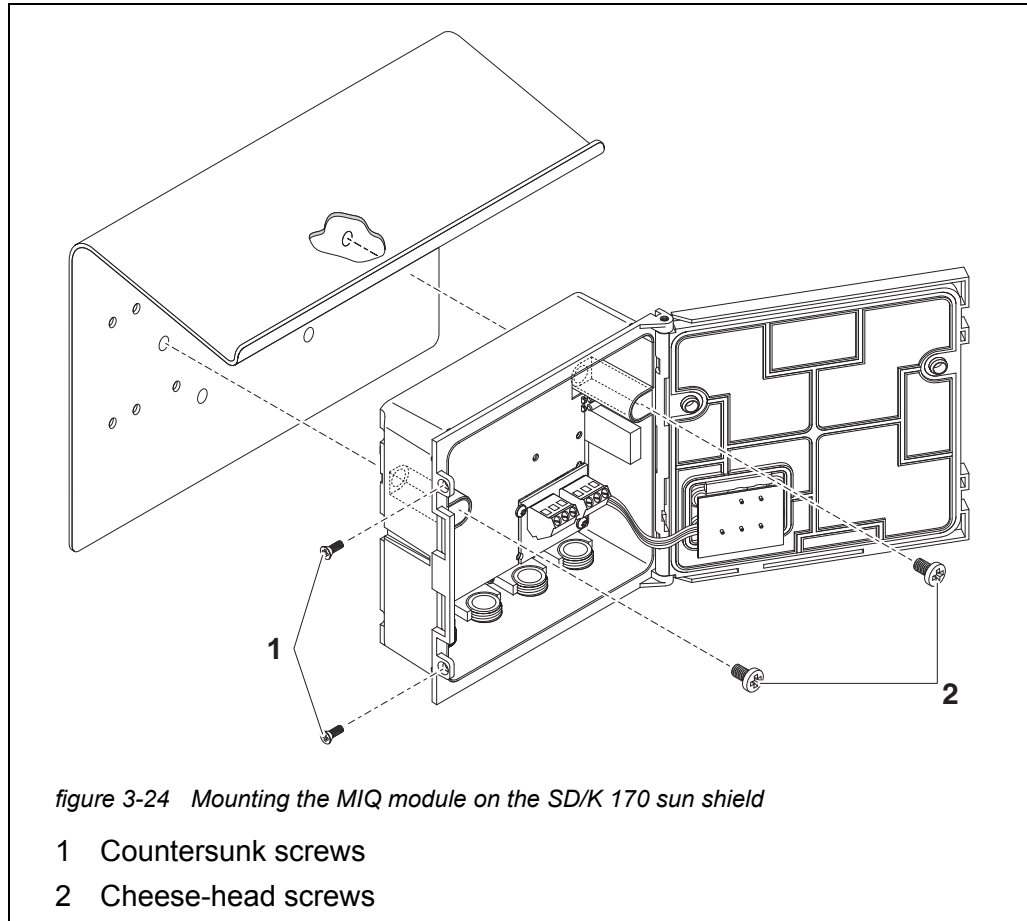
How to mount the sun shield at the installation location is described in the instructions for the sun shield or mounting kit.

#### Materials required

- SD/K 170 sun shield (see chapter 11 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 11 ACCESSORIES AND OPTIONS).

**Tools** ● Phillips screwdriver.

### Mounting the MIQ module under the sun shield



- 1 Remove the two countersunk screws (pos. 1 in figure 3-24) 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 figure 3-24).
- 3 Close the module lid and fix it with the two countersunk screws (pos. 1 in figure 3-24).

#### 3.7.4 Panel mounting



The space required on the panel for a module stack is given in the dimension drawings in section 10.3.



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 3.6.2 - Variant 2).

**Materials required** ● PMS/IQ kit for panel mounting (see chapter 11 ACCESSORIES AND OPTIONS).

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

### Mounting the MIQ module on a panel

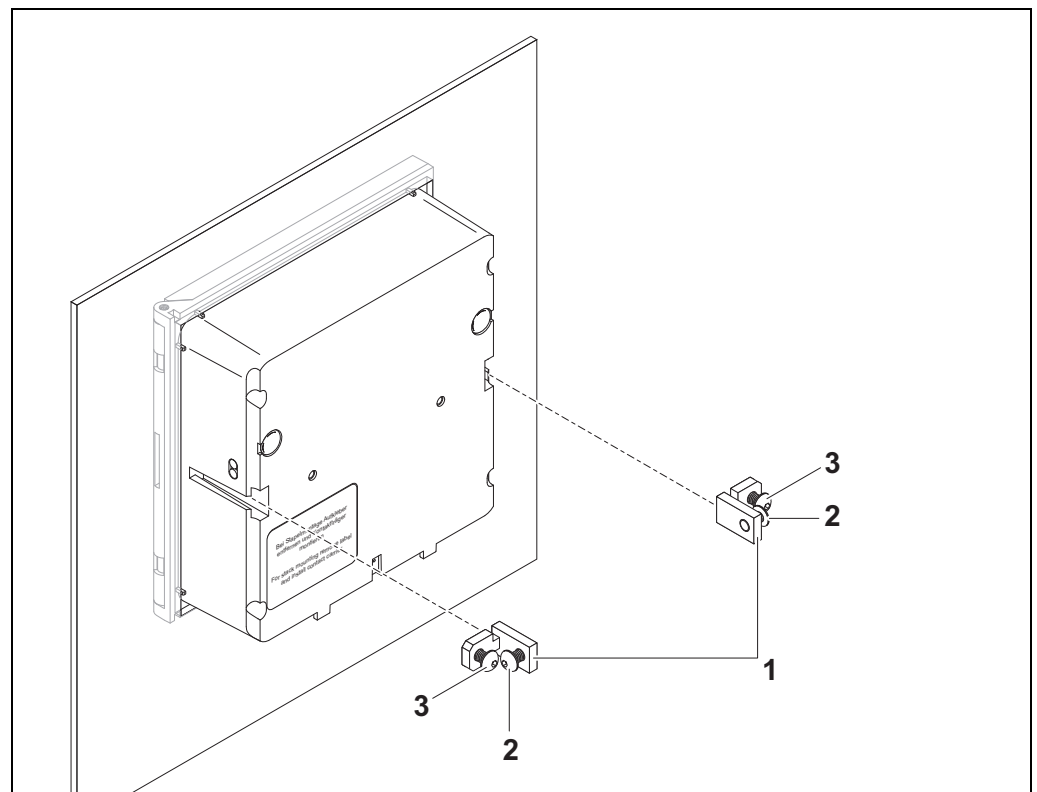


figure 3-25 Mounting the MIQ module on a panel

- 1 Angle bracket
- 2 Bolts
- 3 Bolts

- 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 figure 3-25), but do not remove them.
- 3 Push in the two angle brackets - as shown in figure 3-25 - into the lateral guides of the MIQ module up to the stop.

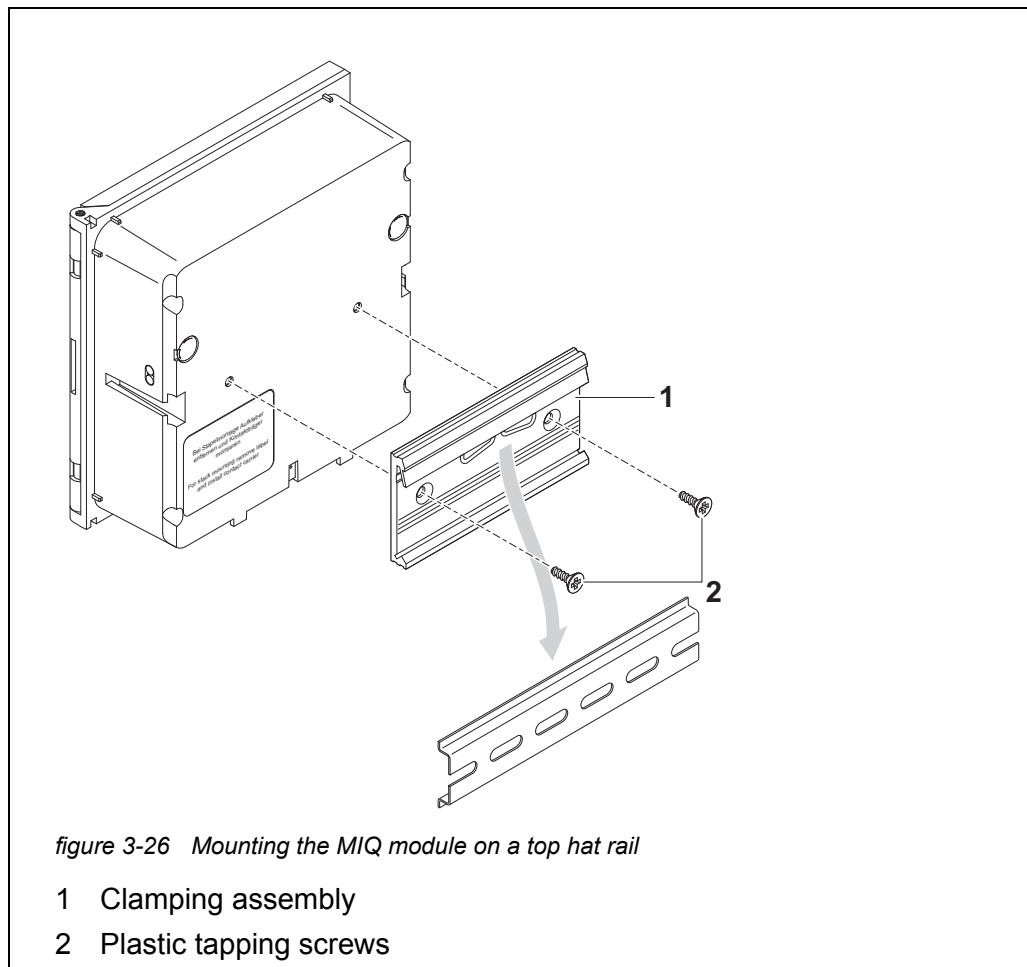
- 4 Tighten the screws (pos. 2).
- 5 Screw in the screws (pos. 3) until the screws rest snugly against the panel.

### 3.7.5 Top hat rail mounting

**Materials required** ● THS/IQ kit for top hat rail mounting (see chapter 11 ACCESSORIES AND OPTIONS).

**Tools** ● Phillips screwdriver.

#### Mounting the MIQ module on a top hat rail



- 1 Screw the clamping assembly (pos. 1 in figure 3-26) 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.

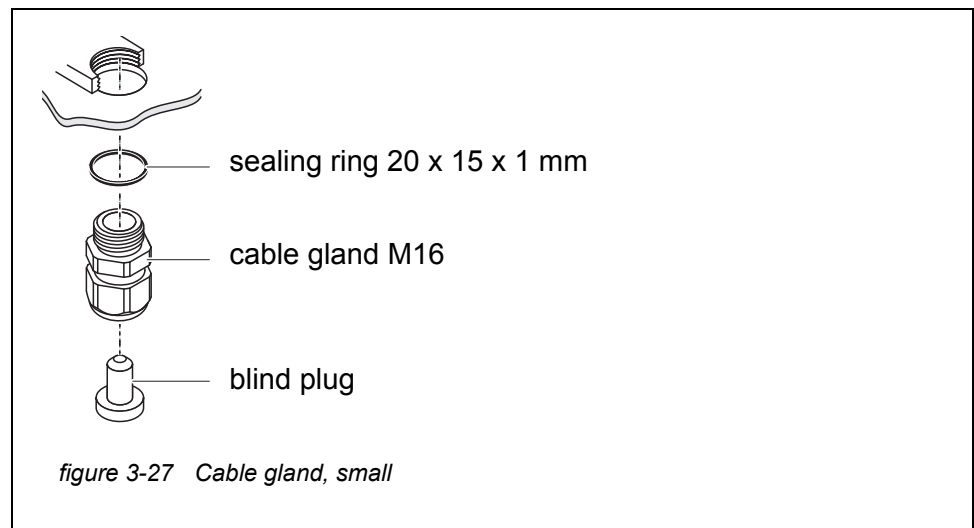
- 3 To unhook the MIQ module, press it downwards and pull it forwards at the bottom.

### 3.8 Electrical connections: General instructions

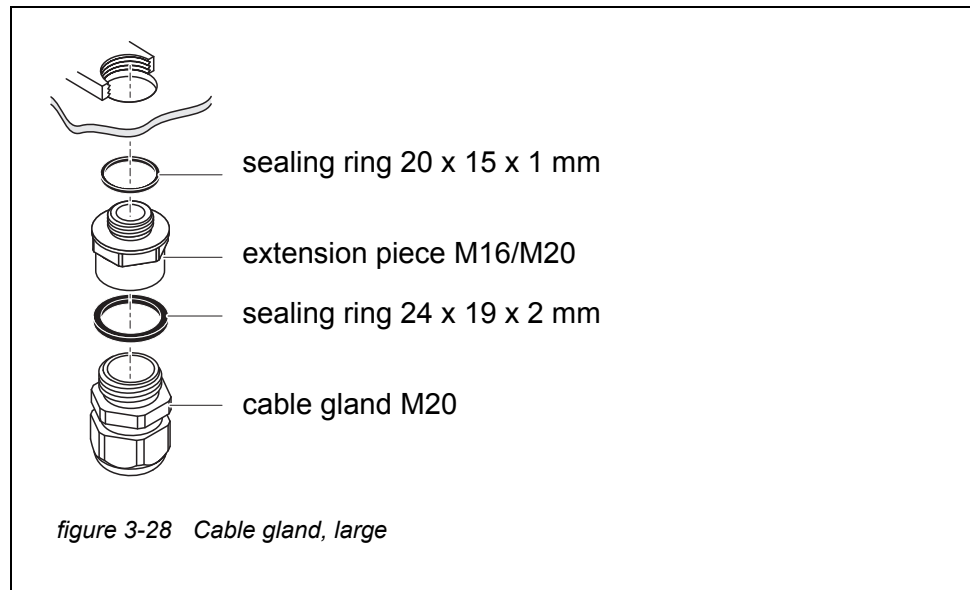
#### Cable glands

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 3.6.3) 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 11 ACCESSORIES AND OPTIONS).

### General installation instructions

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

- Shorten all wires to be used to the length required for the installation
- Always fit all the ends of the wires with wire end sleeves before connecting them to the terminal strip
- Any wires that are not used and project into the enclosure must be cut off as closely as possible to the cable gland.
- Screw a small cable gland with sealing ring into each remaining free opening and close it with a blind plug.



### WARNING

No free wires are allowed to project into the housing. Otherwise, there is a danger that areas safe to contact could come into contact with dangerous voltages. This could result in life threatening electric shock when working with the IQ SENSORNET. Always cut off any wires that are not in use as closely as possible to the cable gland.

### 3.9 Connecting the voltage supply

How to connect the power supply is described in detail in the operating manual of the MIQ power supply module (e.g. MIQ/PS, MIQ/24V).



#### WARNING

If the power supply is connected incorrectly, there may be danger to life from electric shock.

When installing the power supply, observe the safety instructions in the operating manual of the MIQ power supply module (e.g. B. MIQ/PS, MIQ/24V).

### 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 SENSORNET system:

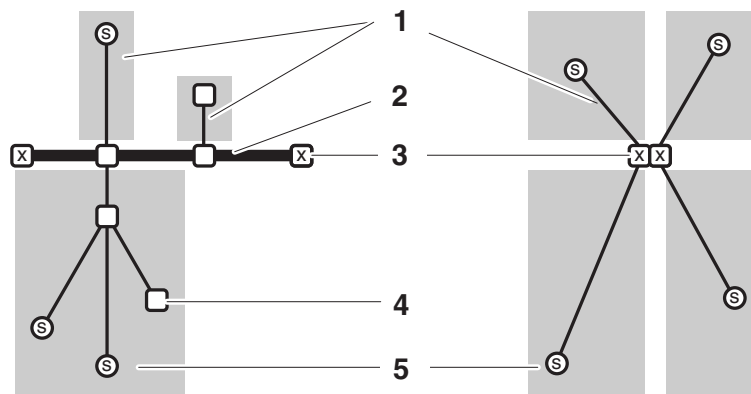


figure 3-29 Correct setting of the terminator switches

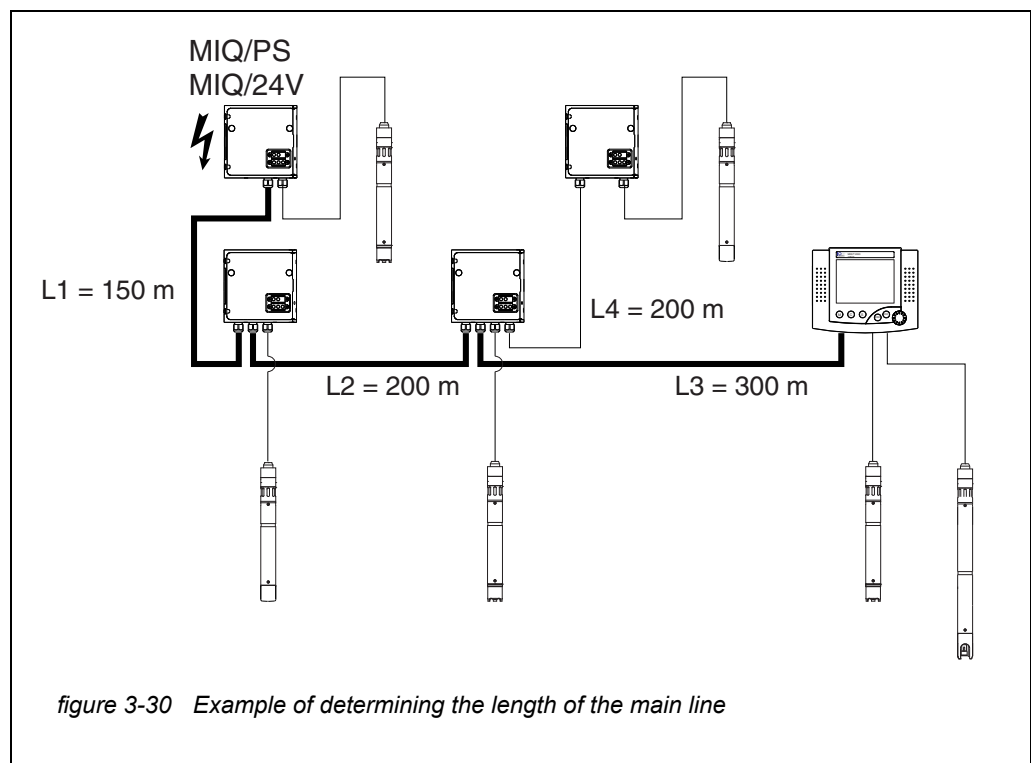
- 1 Branch lines
- 2 Main line ("longest cable section")
- 3 MIQ/... with terminator ON
- 4 MIQ/... mit Terminator OFF
- 5 Sensor

<b>Definitions</b>	<b>Main line</b>	<p><u>Longest</u> 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).</p>
	<b>Branch line</b>	<p>All lines that branch from the main line. Branch lines can be branched further.</p>

- Installation rules**
- The sum of the lengths of all branch lines may not be more than 500 m.
  - The length of a single branch line including the sub-branches may not be more than 250 m.
  - The sum of the lengths of all lines (main line and branch lines) may not be more than 1000 m. This length can be restricted due to the first two rules, if
    - a.) the sum of the length of all branch lines is huge, and
    - b.) the main line is very short.
 Greater systems that exceed the maximum line length can be installed with the aid of the signal amplifier module MIQ/JBR.

**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

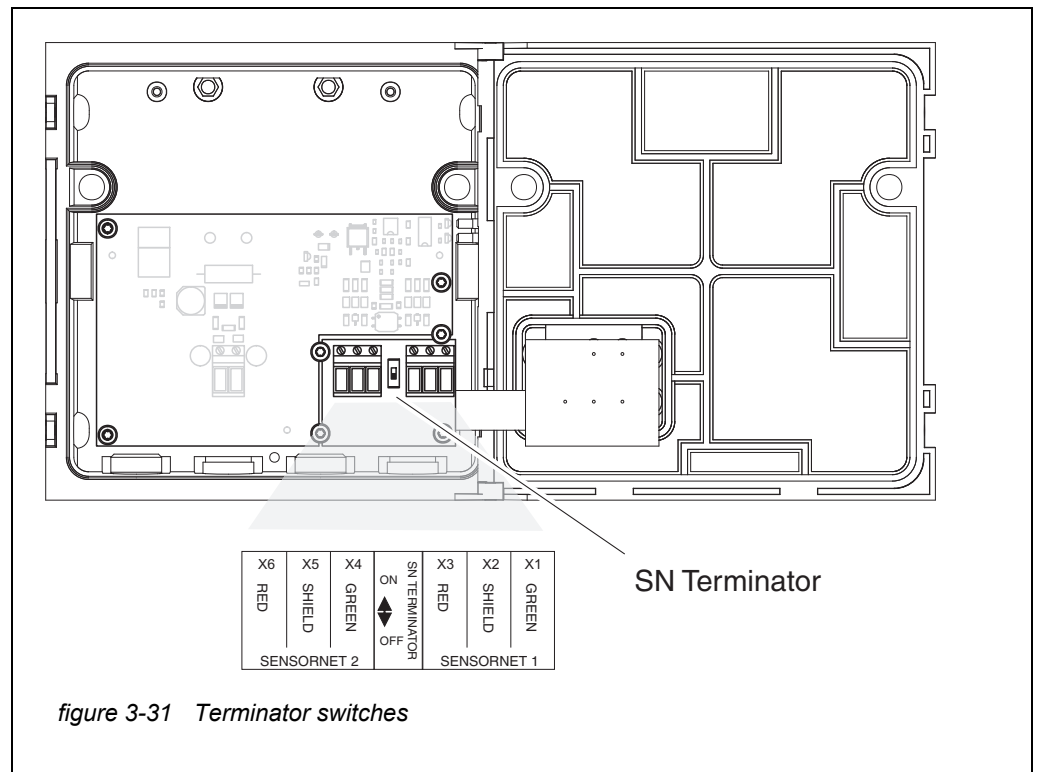


**Example: star-shaped wiring**

Here, the length of the main line is zero, i.e. all lines are branch lines -> the sum of all lines must not be more than 500 m (individual branch line max. 250 m).



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



### 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 MIQ power supply modules (see section 3.2.1)?
  - 2 Are all IQ SENSORNET components correctly connected with one another (see section 3.6)?
  - 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).



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

**Configuration of the MIQ/TC 2020 3G**

During the commissioning of the MIQ/TC 2020 3G on the IQ SENSORNET a query appears as to whether the MIQ/TC 2020 3G should work as a controller or only as a terminal. Select the desired function for each MIQ/TC 2020 3G.

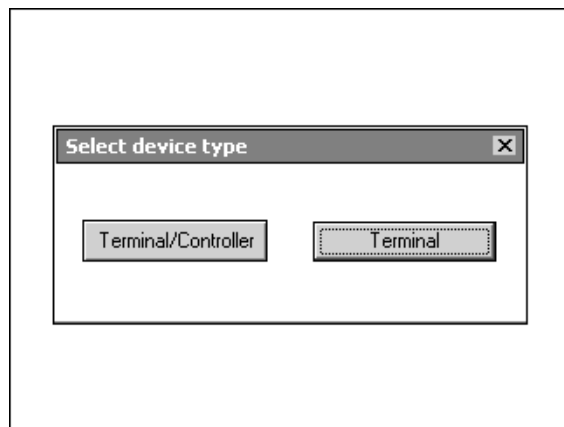


figure 3-32 Selecting the instrument type

The MIQ/TC 2020 3G then tries to register on the IQ SENSORNET with the selected functionality. Note, however, that only one controller can be active in an IQ SENSORNET.

For details for the configuration of the MIQ/TC 2020 3G, see section 1.4.



During the first system start, select the configuration of the MIQ/TC 2020 3G. The selected configuration can be changed by resetting the system to the default condition and a restart.

**Initial start phase**

In the initial start phase, all IQ SENSORNET components are automatically registered on the MIQ/MC3 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:

CONTROLLER				⚠	ℹ
Initialization					
checking internal software...done					
checking hardware...done					
reading EEPROM...done					
waiting for data...					
please wait...					

figure 3-33 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

CONTROLLER	30 July 2016	10 47	🔒	⚠	ℹ
Values: location					
01	<b>3.90</b>	pH	25.0 °C	99160001	
02	<b>1.1</b>	mg/l NH4-N	22.8 °C	04460001	
03	<b>29.1</b>	mg/l NO3-N	22.8 °C	04460001	
Next sensor ↔, Display/Options ⌨					

figure 3-34 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 123.

If the system start failed, see chapter 9 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 (figure 3-35):
  - Yellow lights up: Operational voltage OK
  - Red lights up: The MIQ power supply module is too heavily used. Operation is possibly not stable.
  - No LED lights up: Operational voltage too low or not available.
- 2 Dock any available mobile terminals MIQ/TC 2020 3G on the system as far away as possible from an MIQ power supply module (i.e. test 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) (figure 3-35):
  - Yellow lights up: Operational voltage OK
  - Red lights up: Operational 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 too low or not available.



The relationship between the supply voltage, the LED status and the log book entries is described in the section 10.1 GENERAL SYSTEM DATA.

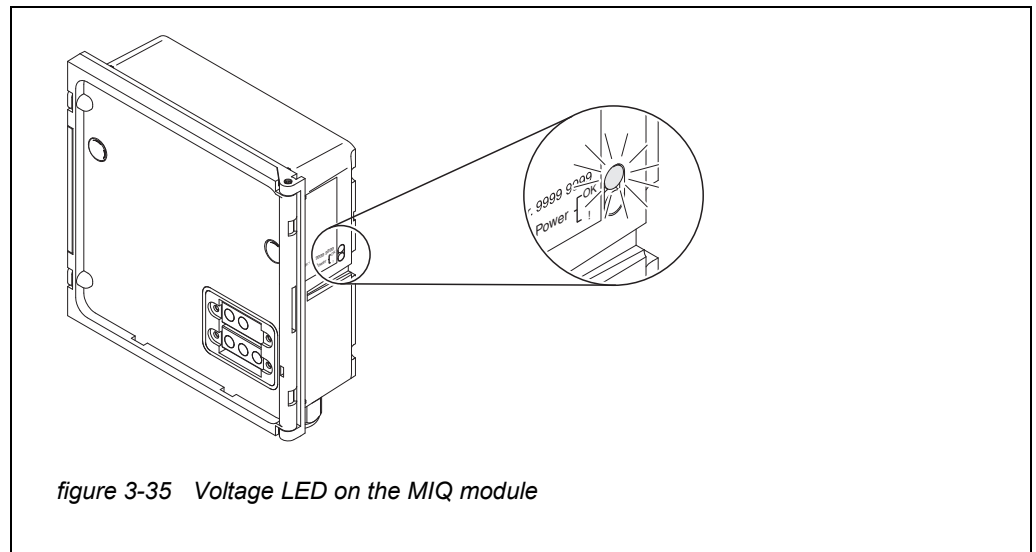


figure 3-35 Voltage LED on the MIQ module



You can measure the voltage that is actually available at the MIQ modules or IQ sensors (see section 9.2.2).

- 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 5.8 EDITING THE LIST OF OUTPUTS).
- 8 If a component is not listed, carry out troubleshooting according to chapter 9 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 4.5.

### 3.11 System extension and modification

The modular structure of the IQ SENSORNET 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**

If the system is switched on while the MIQ/PS power supply module is open, 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, MIQ/R6) 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 3.2.1 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 8.2 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 3.6 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 5.8.2).



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 9.4 REPLACING SYSTEM COMPONENTS.

## 4 Operation

### 4.1 Terminal

The IQ SENSORNET is operated via a terminal. For this, the following options with the same functional range are available:

- MIQ/TC 2020 3G, configured as (mobile) terminal or as (permanently installed) controller. Operation is carried out with keys and display.
- IQ WEB CONNECT, if the IQ SENSORNET is connected to a network via the Ethernet interface. Operation is done with an end device (e.g. PC, tablet PC, smartphone, ..) via a web browser.



The display and keys of the MIQ/TC 2020 3G appear on the IQ WEB CONNECT as a graphical user interface. Both terminals are operated in exactly the same way.

On a terminal, you can

- Display measurement results
- Carry out calibration routines  
(to carry out a complete calibration procedure, the sensor has to be operated on site)
- Perform system and terminal settings
- Display messages.



To guarantee data safety within the IQ SENSORNET, 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.



### 4.1.1 Overview of the operating elements

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 SENSORNET system.

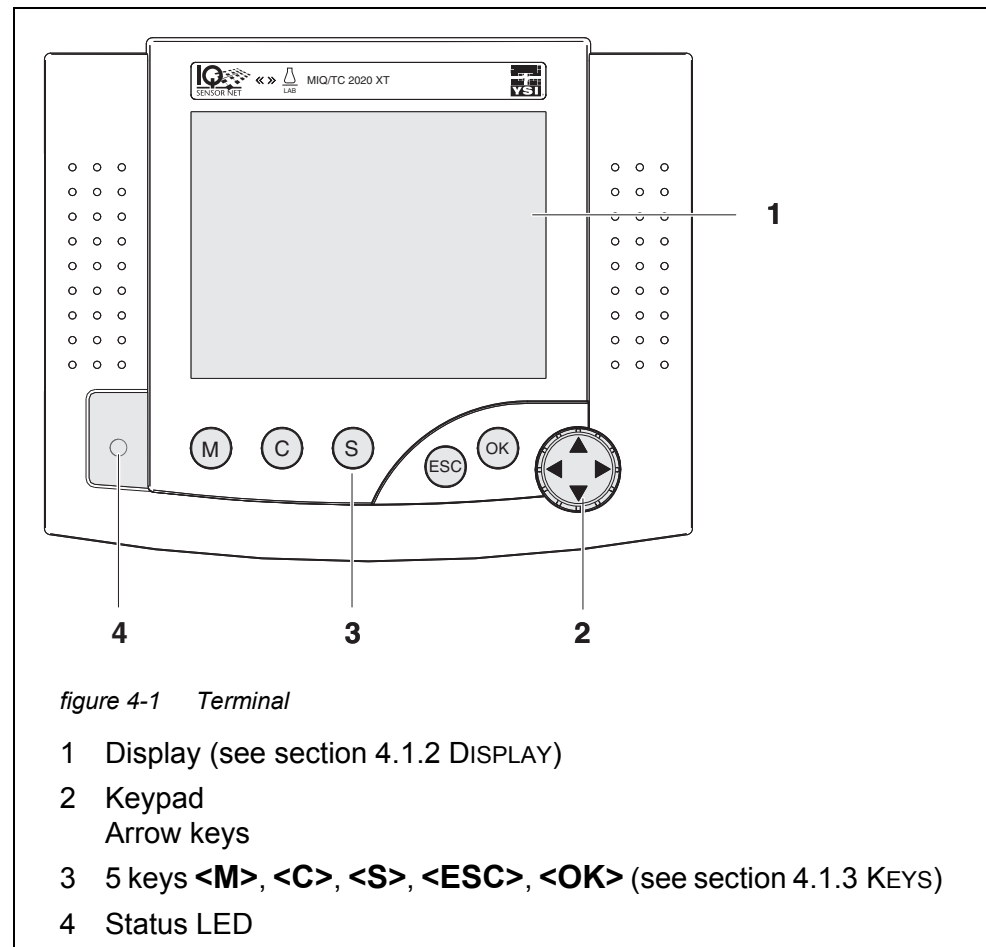


figure 4-1 Terminal

- 1 Display (see section 4.1.2 DISPLAY)
- 2 Keypad  
Arrow keys
- 3 5 keys **<M>**, **<C>**, **<S>**, **<ESC>**, **<OK>** (see section 4.1.3 KEYS)
- 4 Status LED

### 4.1.2 Display

The display contains the following information:

Figure 4-2 shows the display layout with numbered callouts:

- 1: Name of the display (Settings)
- 2: Name of the terminal alternating with the controller function (CONTROLLER or BACKUP CONTROLLER)
- 3: Date (09 Feb 2018)
- 4: Time (09 45)
- 5: User right (lock icon)
- 6: Error symbol (triangle with exclamation mark)
- 7: Info symbol (circle with exclamation mark)
- 8: Display range for measured values, menus, lists, etc. (indicated by a horizontal line)
- 9: Help line with operating instructions (Select menu item <math>\leftarrow\rightarrow</math>, edit <math>\text{F5}</math>)

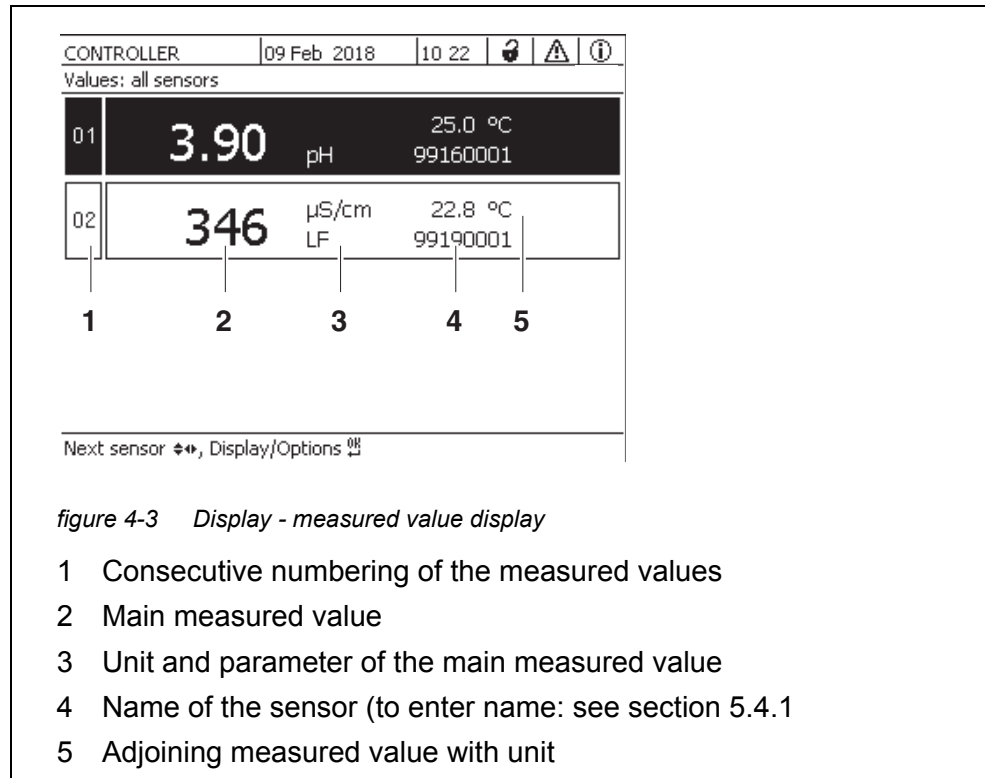
figure 4-2 Display

- 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 right (details see below)
- 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 4.5.3).
- 7 Info symbol : If the info symbol flashes, new or unacknowledged information is present in the log book (see section 4.5.3).
- 8 Display range for measured values, menus, lists, etc.
- 9 Help line with operating instructions

#### Detail on the user right (5)

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

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



**Special displays**

<i>Init</i>	Sensor is being initialized <ul style="list-style-type: none"> <li>● during commissioning or</li> <li>● if a new IQ sensor is recognized that is not yet giving measured values</li> </ul>
----	Invalid measured value
<i>Cal</i>	Sensor is being calibrated
<i>Clean</i>	Cleaning system active, sensor is offline
<i>Error</i>	Sensor is inactive or defective
<i>OFL</i>	Measuring range undercut or exceeded (overflow)
Display flashes	Sensor in maintenance condition

### 4.1.3 Keys

Key	Function
<M>	Display measured values
<C>	Start calibration of the IQ sensor selected in the measured value display
<S>	Open the <i>Settings</i> menu
<ESC>	Change to the higher menu levels or abort entries without storing them
<OK>	Confirm selection
<▲▼◀▶> (arrow keys)	Highlight and select: <ul style="list-style-type: none"> <li>● Menu items</li> <li>● Entries</li> <li>● Columns or fields</li> <li>● Letters or numerals</li> </ul>



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

## 4.2 General operating principles

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

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



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

Examples of the operating principles are given below:

- Navigation in menus, lists and tables (see chapter 4.2.1)
- Entering text and numerical values (see chapter 4.2.2)



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

#### 4.2.1 Navigating in menus, lists and tables

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

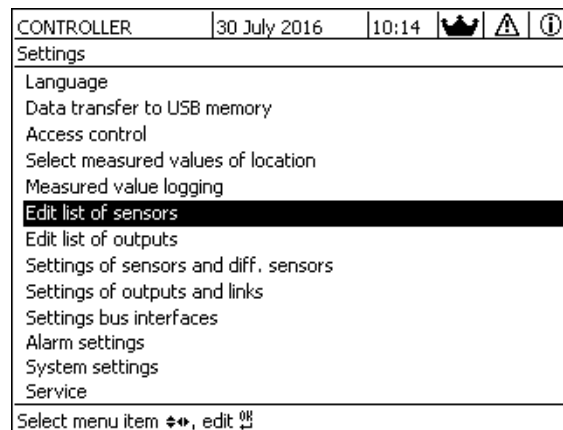


figure 4-4 100 - Settings

- 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>**.

#### 4.2.2 Entering texts or numerals

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

- 1 Open the *Settings* menu with **<S>**.
- 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 **<▲▼◀▶>**.

CONTROLLER		30 July 2016	10:14			
Edit list of sensors						
No.	Model	Ser. no.	Sensor name			
S01	Sensolyt700IQ	99160001	99160001			
S05	TetraCon700IQ	99190001	99886699			
S02	TriOxmatic700IQ	01341000	08410001			
S03	VARION A	04460001	08410001			
S04	VARION N	04460001	03270001			
Select  , display position/erase sensor						

figure 4-5 Edit list of sensors

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

CONTROLLER		30 July 2016	10:14			
Edit list of sensors						
No.	Model	Ser. no.	Sensor name			
S01	SensoLyt700IQ	99160001	OK			
S05	TetraCon700IQ	99190001	99190001			
S02	TriOxmatic700IQ	01341000	01341000			
S03	VARiON A	04460001	04460001			
S04	VARiON N	04460001	04460001			
Select , display position/erase sensor						

figure 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 appears behind the last letter.

CONTROLLER		30 July 2016	10:14			
Edit list of sensors						
No.	Model	Ser. no.	Sensor name			
S01	SensoLyt700IQ	99160001	OK			
S05	TetraCon700IQ	99190001	99190001			
S02	TriOxmatic700IQ	01341000	01341000			
S03	VARiON A	04460001	04460001			
S04	VARiON N	04460001	04460001			
Select , display position/erase sensor						

figure 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.

#### 4.3 Access to the IQ SENSORNET with active access control



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

As soon as an access control of any type is enabled, access to the IQ SENSORNET is protected completely or partly.

Access to the system is enabled as follows:

- Connect the electronic key to the USB interface (controller or terminal), if the administrator has enabled this function
- Enter a password

Simple access control



Enter the password for the simple access control with the arrow keys in the menu *Settings / Unlock/lock settings / Unlock settings*.

Extended access control:



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





Extended access control with instrument block:

Press the any button.

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



Further details on access control (see section 5.3)

#### 4.4 Display of current measured values

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 4.4.1)
- *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 4.4.2)
- *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 4.4.3)
- *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 4.4.6).

Switch between the different types of display as follows:

- 1 Call up the measured value display with **<M>**.
- 2 Open the *Display/Options* menu with **<OK>**.

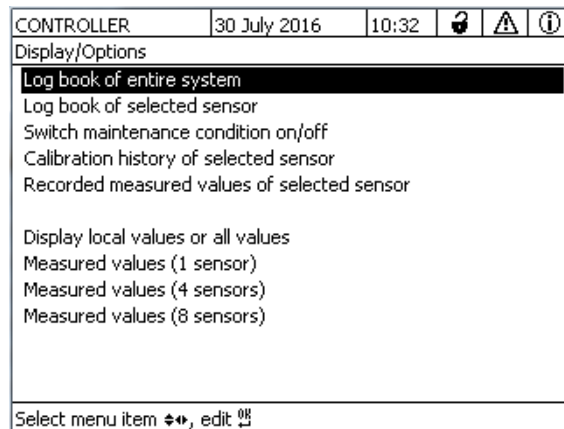


figure 4-8 Display/Options

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

#### 4.4.1 Displaying a single measured value

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

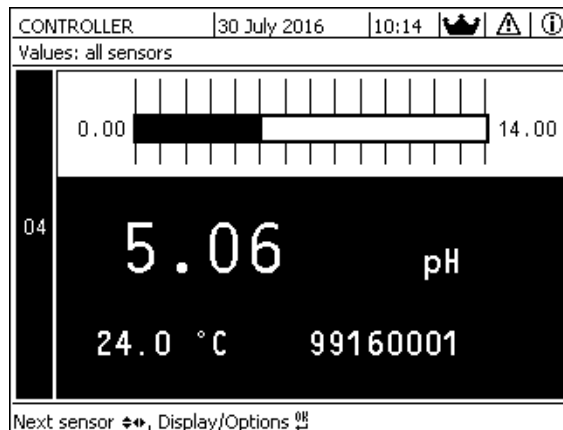


figure 4-9 Values: location -> Measured values (1 sensor)

#### 4.4.2 Displaying four measured values

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

Terminal 1		15 May 2001		01:38		🔒 ⚠️ ⓘ	
Values: all sensors							
01	<b>3.90</b>	pH	25.0 °C	99160001			
02	<b>346</b>	µS/cm LF	22.8 °C	99190001			
03	<b>2.29</b>	mg/l O2	11.7 °C	99010700			
04	<b>1.1</b>	mg/l NH4-N	22.8 °C	04460001			
Next sensor ⏪, display options ⏸							

figure 4-10 Values: location -> Measured values (4 sensors)

#### 4.4.3 Displaying eight measured values

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

Terminal 1		15 May 2001		01 39		🔒 ⚠️ ⓘ	
Values: all sensors							
01	3.90	pH	25.0 °C	99160001			
02	346	µS/cm LF	22.8 °C	99190001			
03	2.29	mg/l O2	11.7 °C	99010700			
04	1.1	mg/l NH4-N	22.8 °C	04460001			
05	29.1	mg/l NO3-N	22.8 °C	04460001			
Next sensor ⏪, display options ⏸							

figure 4-11 Values: location -> Measured values (8 sensors)

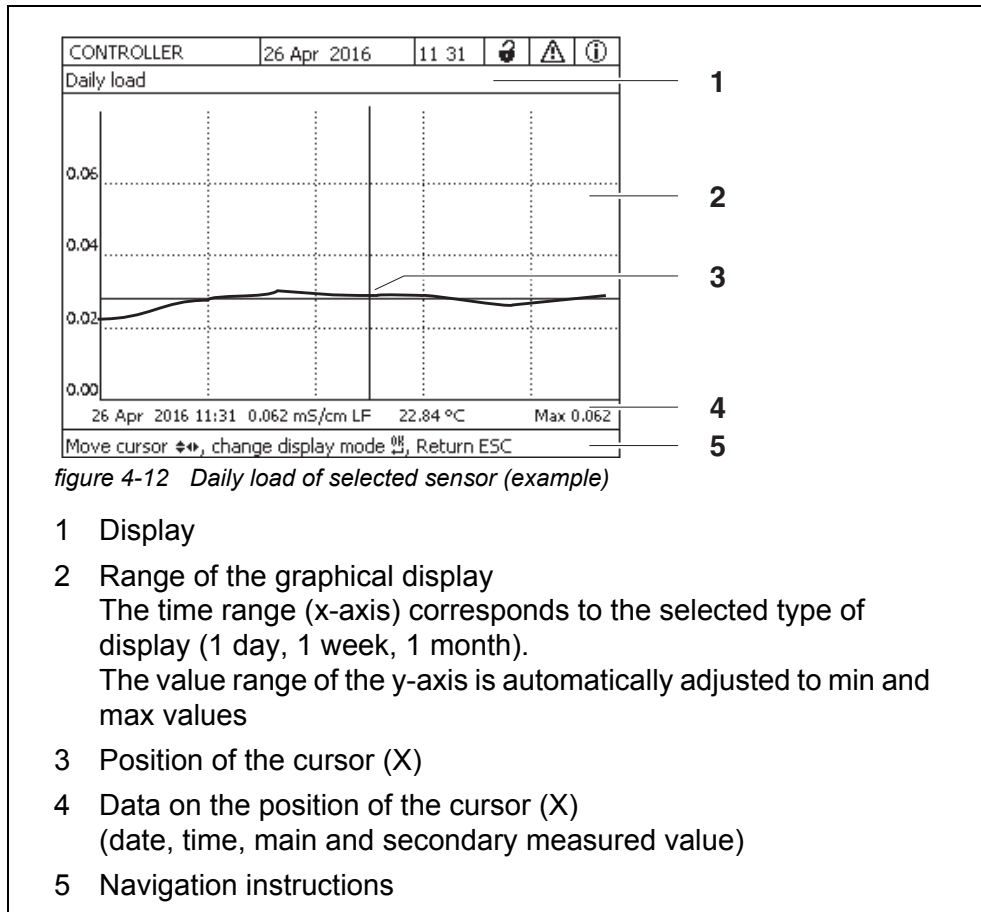
#### 4.4.4 Displaying recorded measured values

If the measured value recording has been activated for an IQ sensor (see section 5.12), 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)



**Displaying recorded measured values**

- 1 Switch to the measured value display with **<M>**.
- 2 Select an IQ sensor with **<▲▼◀▶>**.
- 3 Open the *Display/Options* menu with **<OK>**.
- 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.

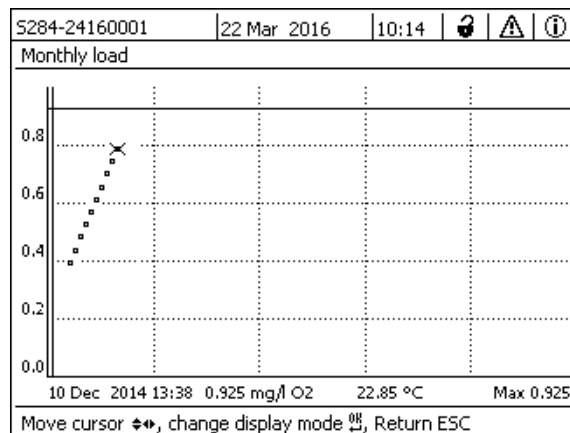


figure 4-13 Monthly load of selected sensor (example)

- 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>.

#### 4.4.5 Transmitting recorded measurement data to a PC

Recorded measured values can be transmitted to a PC via the following interfaces.

- USB interface (see section 4.9.1)
- Ethernet interface (see chapter 6)

#### 4.4.6 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 5.9).

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

- 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.



## 4.5 Messages and log book

The IQ SENSORNET continuously monitors the status of the entire system. If the IQ SENSORNET 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.

### 4.5.1 Message types

The system differentiates two types of messages:

- **Error**   
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 4.5.3).

### 4.5.2 Log book

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

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

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

**Structure of the log book**

5284-24160001		22 Mar 2016	10:14			
Log book of entire system						
	SYS	EI9141	26 Mai 2008	10:29		
	SYS	II4141	26 Mai 2008	10:29		
	SYS	II2141	26 Mai 2008	10:27		✓
	SYS	EI5141	26 Mai 2008	10:27		✓
	SYS	II2141	26 Mai 2008	10:25		✓
	SYS	EI5141	26 Mai 2008	10:25		✓
	SYS	EI5141	26 Mai 2008	10:25		✓
	SYS	EI5141	26 Mai 2008	10:24		✓
	SYS	II2141	26 Mai 2008	10:22		✓
	SYS	EI5141	26 Mai 2008	10:22		✓
	SYS	II2141	26 Mai 2008	10:08		✓
	SYS	EI5141	26 Mai 2008	09:45		✓
Open message/acknowledge message						
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>		

*figure 4-14 Log book of entire system*

- 1 Message category (error or info symbol)
- 2 Module that triggered the message.  
 SYS System (Universal Transmitter, controller)  
 S01 IQ sensor (number 01)  
 S?? IQ sensor (inactive, dataset erased)  
 D01 DIQ output module (number 01)  
 D?? DIQ output module (inactive, dataset erased)
- 3 Message code
- 4 Date and time of the message
- 5 Status field of the message  
 ✓ Message was acknowledged  
 No checkmark Message was not acknowledged

The system provides the following log books:

- *Log book of entire system:*  
List of all messages from all modules
- *Log book of 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 4.5.3) and in the operating manual of the registering module.

**Structure of the message code**

The message code consists of 6 characters and can contain numerals and letters, e.g.: II2152.

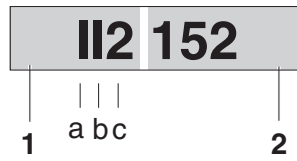


figure 4-15 Structure of the message code

No.	Information	Explanation
1	Short message form	The three-digit short form of the message contains the following information on the message: Category (a), type (b) and type number (c)
A	Category	<ul style="list-style-type: none"> <li>● Info message (I)</li> <li>● Error message (E)</li> </ul>
b	Type	<ul style="list-style-type: none"> <li>● Calibration data (C)</li> <li>● Installation and commissioning (I)</li> <li>● Instructions for service and repair (S)</li> <li>● Application instructions (A)</li> </ul>
c	Type number	Each type contains subtypes (0..9A..Z)
2	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  
II2152**

The component "152" (MIQ/MC3 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.

### 4.5.3 Viewing detailed message texts

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

CONTROLLER		30 July 2016	10:14			
Log book of entire system						
	SYS	EI9141	26 Mai 2008	10:29		
	SYS	II4141	26 Mai 2008	10:29		
	SYS	II2141	26 Mai 2008	10:27		✓
	SYS	EI5141	26 Mai 2008	10:27		✓
	SYS	II2141	26 Mai 2008	10:25		✓
	SYS	EI5141	26 Mai 2008	10:25		✓
	SYS	EI5141	26 Mai 2008	10:25		✓
	SYS	EI5141	26 Mai 2008	10:24		✓
	SYS	II2141	26 Mai 2008	10:22		✓
	SYS	EI5141	26 Mai 2008	10:22		✓
	SYS	II2141	26 Mai 2008	10:08		✓
	SYS	EI5141	26 Mai 2008	09:45		✓

Open message/acknowledge message

figure 4-16 Log book of entire system

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



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

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



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

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

- Messages of the system are given in this operating manual (see section 12.1).
- Messages of a module are given in the respective component operating manual of the module.

#### 4.5.4 Acknowledge all messages

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

#### 4.6 Calibration data



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

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

- Calibration date
- Calibration successful or not successful.

The detailed calibration data of the last calibrations are integrated in the *Calibra-*

tion 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 SENSORNET and must be ready for operation.

#### 4.6.1 Calibration entries in the log book

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

- 1 Call up the measured value display with **<M>**.
- 2 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 Exit the *Calibration history of selected sensor* with **<▲▼◀▶>**.

#### 4.6.2 Calibration history

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

- 1 Call up the measured value display with **<M>**.
- 2 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>**.

#### 4.7 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 SENSORNET.

The status display can be reached in the *Settings/Service/List of all components* menu (see section 4.10).

- 1 Call up the *List of all components* (see section 4.10).
- 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).

CONTROLLER		30 July 2016	10:31	👑	⚠	ℹ
Status of output channels						
No.	Name	Chan.	Status			
D01		R1	open			
D01		R2	open			
D01		R3	open			
D01		C1	0.00 mA			
D01		C2	0.00 mA			
D01		C3	0.00 mA			
Return ESC						

figure 4-17 Status of output channels

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

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

When an IQ sensor is calibrated, cleaned, serviced or repaired, the maintenance condition for the 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 a calibration that was started manually, the IQ sensor remains in the maintenance condition until the maintenance condition is switched off manually (see section 4.8.3)
- during a compressed-air cleaning cycle.

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

##### Outlet

- 1 Switch on the maintenance condition for the IQ sensor (see section 4.8.2).  
The display of the sensor in the measured value display flashes.
- 2 Pull the sensor out of the sample.
- 3 Perform the calibration in the laboratory, cleaning, maintenance or repair (removing and replacing) of the sensor (about these topics, see the component operating manual of the corresponding sensor).
- 4 Submerge the sensor in the sample again.
- 5 Wait until the measured value no longer changes.
- 6 Switch off the maintenance condition for the sensor (see section 4.8.3).  
The display of the sensor in the measured value display no longer flashes.

4.8.1 Maintenance condition of IQ sensors

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

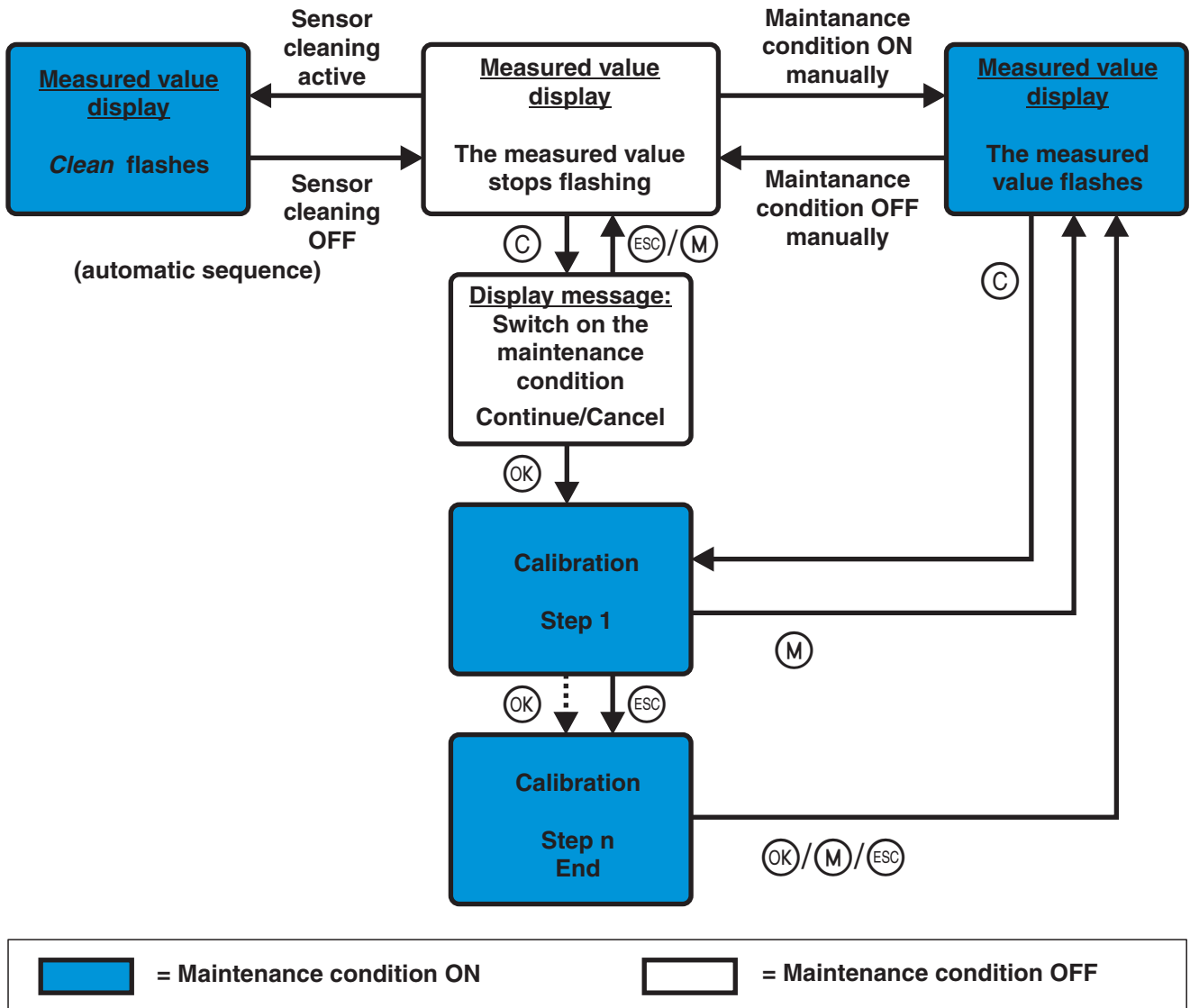


figure 4-18 Maintenance condition of IQ sensors (general information)

### 4.8.2 Switching on the maintenance condition

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

- 1 Call up the measured value display with **<M>**.
- 2 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 Open the *Display/Options* menu with **<OK>**.
- 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 Use **<OK>** to confirm *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 4.8.3).

### 4.8.3 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 Open the *Display/Options* menu with **<OK>**.
- 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 Use **<OK>** to confirm *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 4.8.3).

## 4.9 USB interface

The USB interface on the MIQ/MC3 can be used for the following actions:

- Save data of the IQ SENSORNET to a USB memory device (see section 4.9.1)
- Configuration data transfer to a USB memory (see section 4.9.2)
- Transmit configuration data to the controller (see section 4.9.3)
- Carry out a software update (see section 4.11)

You can save the following data types:

- Measurement data (see section 4.9.1)
- Log book (see section 4.9.1)
- Calibration history (see section 4.9.1)
- Configuration data (see section 4.9.2)

### 4.9.1 Saving IQ SENSORNET data to a USB memory device

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



In principle, any USB connection on the IQ SENSORNET system can be used for a data backup. Please note that the data transmission is considerably slower if there is an IQ SENSORNET connection between the USB connection and controller. Therefore, preferably use the USB connection of the active controller (MIQ/MC3 or MIQ/TC 2020 3G, configured as controller). If this is not possible, you can limit the backup of measurement data to certain sensors.



**Data backup**

- 1 Switch to the measured value display with **<M>**.
- 2 Open the *100 - Settings* menu with **<S>**.
- 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>**.



Only if the measurement data backup is done via the IQ SENSORNET connection between USB connection and controller (slower data transmission):

- 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.
  - 4-6 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 SENSORNET 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.

#### 4.9.2 Saving the system configuration manually

During the normal terminal operation of the MIQ/TC 2020 3G, 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.

The system configuration comprises the following data:

- *Settings of sensors and diff. sensors*
- *Settings of outputs and links*
- *Edit list of sensors*
- *Edit list of outputs*
- *Measured value recording* (data logger settings)
- *Language*
- *Access control*
- *Alarm settings*
- *180 - System settings*



If you want to carry out changes to the system configuration that may have to be canceled again (e.g. if you want to briefly try out certain functions), a manual backup can be carried out beforehand.

To do so, proceed as follows:

- 1 Open the *Settings* menu with <S>.
- 2 Press <▲▼◀▶> to select the menu item *Data transfer to USB memory* and press <OK>.
- 3 Press <▲▼◀▶> to select the *Backup configuration* menu item and press <OK>. The process is started.
- 4 Wait until the backup is terminated.
- 5 Confirm the concluding message with <OK>.

### 4.9.3 Restore system configuration



If the MIQ/TC 2020 3G is operated as a backup controller, restoration of the last automatic backup of the system configuration is automatically suggested when a new controller is identified by the system.

Proceed as follows to transfer to a controller a system configuration manually stored to a USB memory device (e.g. after replacing a defective controller):

- 1 Open the *Settings* menu with **<S>**.
- 2 Press **<▲▼◀▶>** to select the menu item *Data transfer to USB memory* and press **<OK>**.
- 3 Press **<▲▼◀▶>** to select the menu item *Retransfer configuration* and press **<OK>**. A list with the stored system configurations is displayed.
- 4 Select a stored system configuration with **<▲▼◀▶>** and press **<OK>**. The process is started.
- 5 Wait until the restore is terminated.
- 6 Confirm the concluding message with **<OK>**.

### 4.10 Info on software versions

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

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

CONTROLLER		30 July 2016	10:14			
List of all components						
No.	Model	Ser. no.	Softw. vers.			
SYS	CTRL TC2020	99000001	9.01			
S01	SensoLyt700IQ	99160001	2.18			
S02	TriOxmatic700IQ	01341000	2.21			
S05	TetraCon700IQ	99190001	2.30			
ADA	VARiON700IQ	04460001	9.15			
S03	VARiON A	04460001	9.15			
S04	VARiON N	04460001	9.15			
D01	MIQCR3	99200001	2.80			

Select , view component status

figure 4-19 List of all components

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



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

#### 4.11 Software-Update for IQ SENSORNET

With a Software-Update, you maintain the latest state of the instrument software for your IQ SENSORNET system 2020 3G and all active components.

The update packet with the current instrument software for active IQ SENSORNET components and detailed instructions on how to proceed are available on the Internet under [www.YSI.com](http://www.YSI.com).

The instrument software is transferred to the System 2020 3G via the USB port and with the aid of a USB memory device.

While a software update is running, the yellow LED on the controller MIQ/MC3 flashes rapidly.



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



You can view the software versions of all components in the dialog box, *List of all components* (see section 4.11).

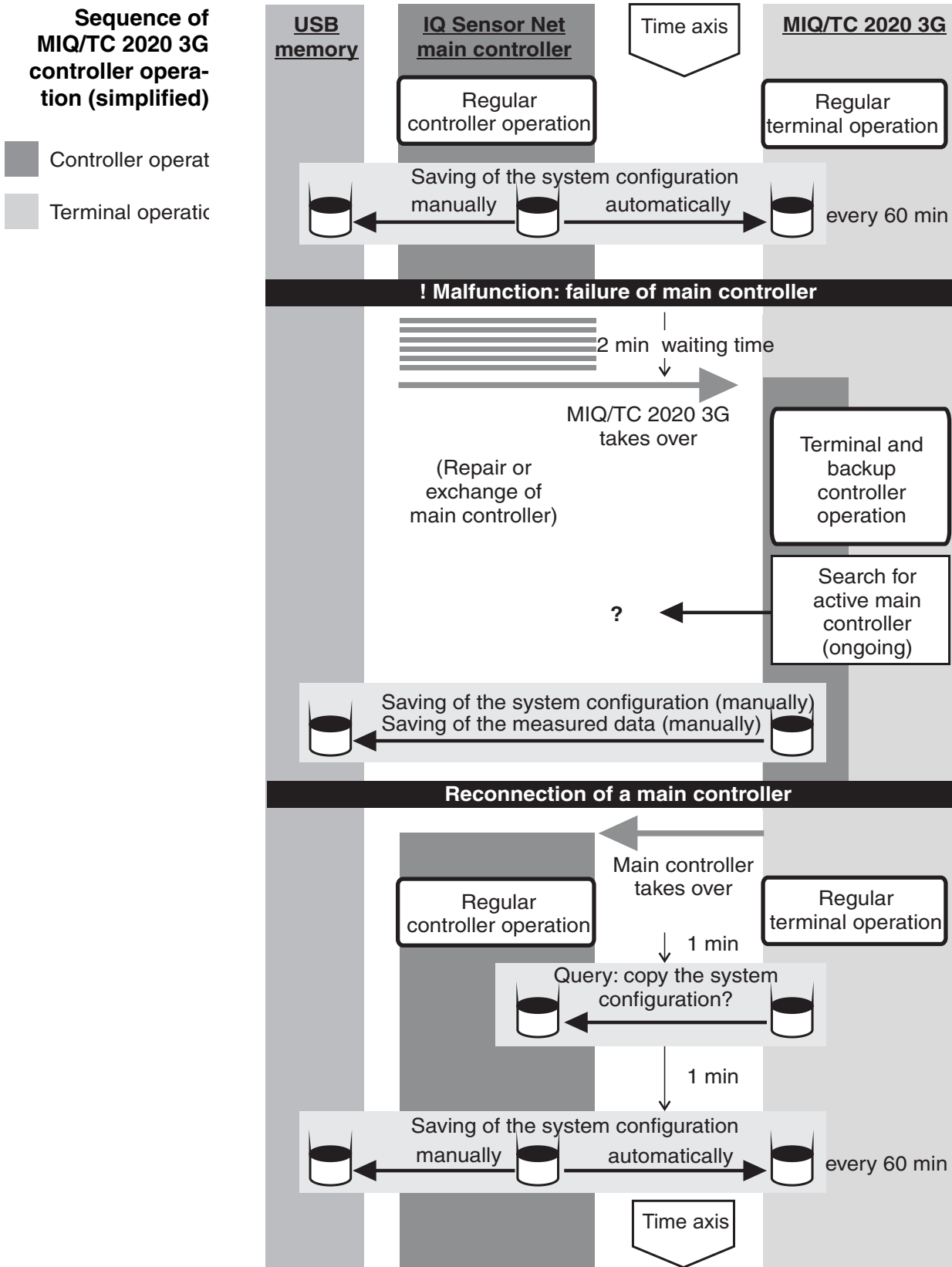
While a software update is running, the voltage LEDs on the MIQ/MC3 controller indicate the status of the software update:

LEDs	Status	Status of the update	Next step
Yellow	● Flashing rapidly (5x/s)	Update of the controller is being carried out	Wait until the update is finished (LED flashing slowly)
	● Flashing slowly (1x/s)	Update of the controllers finished	Restart the controller
Red	● Flashing rapidly (5x/s)	Update of the controller was interrupted	Repeat the update
Yellow and red	● Flashing alternately	Update of a component was interrupted	Repeat the update

#### 4.12 The MIQ/TC 2020 3G in its function as terminal and backup controller

If the MIQ/TC 2020 3G was configured as a terminal, the integrated controller works as a backup controller. The backup controller saves the system data at regular intervals and is immediately available in the system as a backup controller if the main controller fails. If several MIQ/TC 2020 3G are configured as terminals in the IQ SENSORNET, one MIQ/TC 2020 3G takes over the function of the backup controller. The function is shown on the display.

The diagram on the following page shows how the MIQ/TC 2020 3G works when it is configured as a terminal:



The procedure in detail:

- Normal operation**
- During normal operation the main controller carries out regular controller operation.
  - The MIQ/TC 2020 3G (configured as a terminal) works as a regular terminal.
  - The MIQ/TC 2020 3G (configured as a terminal) backs up the system configuration:
    - Automatic backups are carried out 2 minutes after initialization and then regularly every 60 mins.
    - In addition to the automatic backup, the backup can also be started manually at any time (see section 4.9.2). The timer for the automatic backup is reset for this.
    - Automatic backup is always only carried out in the measuring mode (normal measured value display). If the MIQ/TC 2020 3G is in another operating mode, the next backup is carried out as soon as a switch is made back again to measuring mode.
    - If a backup fails, e.g. because another terminal is in the setting or calibration mode, a new backup is attempted after 30 s. After three failed attempts the next automatic backup takes place after 60 mins.
    - During the backup a message appears on the display. If necessary, the running backup can be cancelled with the **<ESC>** or **<M>** key.
  - The MIQ/TC 2020 3G receives ongoing information on the status of the main controller.

**Event:  
Failure of the main  
controller  
(MIQ/TC 2020 3G  
controller  
operation)**

- If the MIQ/TC 2020 3G (configured as a terminal) receives no more valid telegrams from the main controller **for a period of 2 min**, it takes over controller operation as a backup controller. The MIQ/TC 2020 3G is reinitialized.
- On takeover of the controller operation a logbook message is generated.
- In MIQ/TC 2020 3G backup controller operation
  - the status LED flashes
  - BACKUP CONTROLLER appears alternately with the terminal name on the display
  - the MIQ/TC 2020 3G (configured as a terminal) keeps its own logbook. The logbook is empty when controller operation is adopted. The topmost message contains the reference to controller operation. It can neither be acknowledged nor deleted. The logbook is deleted when controller operation is terminated.

**Event: main  
controller goes  
back into  
operation**

- As soon as the MIQ/TC 2020 3G (configured as terminal) again receives a valid telegram from a main controller in the IQ SENSORNET, it is reinitialized as a regular terminal. The main controller again works as a regular controller. It uses its own settings for this (or the factory settings in the case of a brand new controller).
- The MIQ/TC 2020 3G (configured as terminal) detects whether the system configuration in the main controller differs from the backed-up system config-

uration and, if necessary, offers to restore the backed-up system configuration to the main controller.

If the system configuration is not transferred to the main controller, the first regular backup from the main controller to the MIQ/TC 2020 3G is carried out after 2 minutes.



## 5 Settings/setup

### 5.1 Selecting the language

A list shows all the available system languages.

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

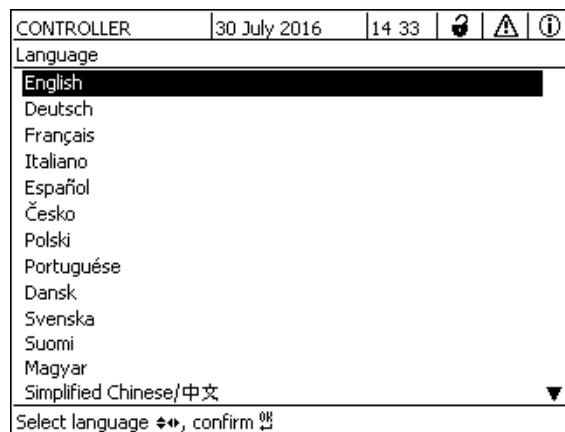


figure 5-1 Language

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



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

### 5.2 Terminal settings

The terminal settings include:

- *Terminal name*

- *Illumination brightness*
- *Illumination brightness (standby)*
- *Display contrast*
- *Status LED*



Terminal settings cannot be made with access via IQ WEB CONNECT.

CONTROLLER	30 Juli 2014	10:14				
Terminal settings						
<b>Terminal name</b>	Terminal 1					
Illumination brightness	100 %					
Illumination brightness (standby)	0 %					
Display contrast	50 %					
Status-LED	active					
Select , confirm						

figure 5-2 Terminal settings

Setting	Selection/Values	Explanation
<i>Terminal name</i>	AaBb..Zz 0..9µ%&/() + -= > < ! ? _ °	User-defined character string with max. 15 characters
<i>Illumination brightness</i>	Auto 0 ... 100 %	Brightness of the display during operation of the terminal AUTO: Automatic brightness regulation according to the ambient brightness.
<i>Illumination brightness (standby)</i>	Auto 0 ... 50 %	Brightness of the display during operation if no key is pressed for a longer period of time AUTO: Automatic brightness regulation according to the ambient brightness.
<i>Status LED</i>	<i>active</i> <i>not active</i>	The blue status LED on the MIQ/TC 2020 3G can be switched on or off.

**Terminal name in the Ethernet network**

The terminal name of the controller is part of the network address of the IQ SENSORNET system.

To create a valid network address for the IQ SENSORNET, the terminal name may only contain letters, numerals and the special characters \_+.

**5.3 Access control**

Use the *Access control* function to define the safety settings for the IQ SENSORNET.

The MIQ/TC 2020 3G configured as a terminal/controller provides the following steps of system security:

- No/simple access control (see section 5.3.1)
- Extended access control (3 authorization levels, see section 5.3.2):
  - Administrator authorization
  - Maintenance authorization
  - Read permission
- Extended access control with instrument block for the terminal (see section 5.3.3):



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

**Default settings**

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

**Saving the password**

If access control for the IQ SENSORNET is active and the administrator password is lost, rapid administrator access to the IQ SENSORNET is no longer possible.

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

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

**5.3.1 Activating the simple access control (Unlock/lock settings)**

The simple access control 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 the user rights can be changed a password query

appears.

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

Simple access control	Symbol	User rights
Settings are unlocked (access control swiched off)	🔓	All functions in the system are accessible to all users
Settings are locked	🔒	Access to the system settings is only possible with a password  Unprotected functions: <ul style="list-style-type: none"> <li>● Calibration</li> <li>● Data backup</li> <li>● View measured values</li> </ul>



If the closed lock symbol 🔒 is visible on the display, changes to the system settings are only possible after entering a password.

**Switching on the simple access control**

- 1 If necessary, switch off the extended access control (see section 5.3.2).
- 2 Using **<S>**, open the *Settings* menu.
- 3 Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *Access control -> Unlock/lock settings*.  
The *Unlock/lock settings* dialog window opens.

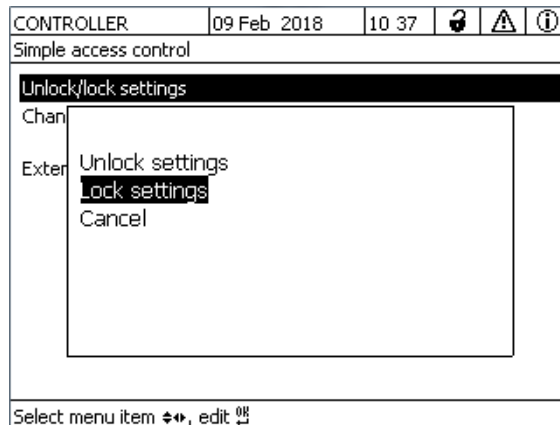


figure 5-3 Settings -> Unlock/lock settings

- 4 Press <▲▼◀▶> and <OK> to select a function and <OK> to confirm. The dialog window for entering the password opens.
- 5 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).

### Switching off the simple access control (open system)

The simple access control is switched off as follows:

- 1 Using <S>, open the *Settings* menu.
- 2 Using <▲▼◀▶>, select the menu item, *Access control* and confirm with <OK>.
- 3 Press <▲▼◀▶> to select the *Enable/Block settings* menu item and confirm with <OK>.
- 4 Press <▲▼◀▶> to select the *Enable settings* menu item and confirm with <OK>.  
All system functions can be accessed without a password.

### 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, *Access control -> Change password*.  
The *Change password* dialog window opens.

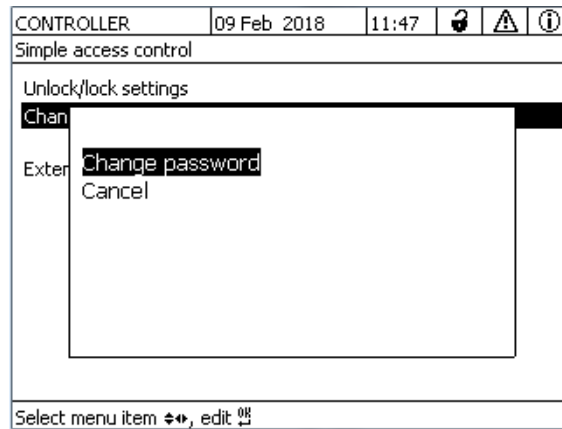


figure 5-4 System settings -> Change password

- 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).

### 5.3.2 Activating the extended access control

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

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

Validity	User right	Symbol	User rights
System-wide	<i>Administration</i>		<ul style="list-style-type: none"> <li>● Access only with password</li> <li>● Change system settings</li> <li>● Assign user rights</li> <li>● Calibration</li> <li>● Data backup</li> <li>● Restore configuration</li> <li>● View measured values</li> <li>● Carry out software updates</li> </ul>

Validity	User right	Symbol	User rights
	<i>Maintenance</i>		<ul style="list-style-type: none"> <li>● Access only with password</li> <li>● Calibration</li> <li>● Data backup</li> <li>● View measured values</li> </ul>
	<i>Viewer</i>		<ul style="list-style-type: none"> <li>● Without instrument block: Access without password</li> <li>● With instrument block: Access only with password</li> <li>● Data backup</li> <li>● View measured values</li> </ul>
For the terminal on which the function was activated	Instrument block		<ul style="list-style-type: none"> <li>● Instrument block switched off: User rights as for <i>Viewer</i>.</li> <li>● Instrument block active: The System 2020 3G is blocked. Only the IQ SENSORNET logo is displayed. Access only with password.</li> </ul>

**Switching on the extended access control**

- 1 If necessary, switch off the simple access control (see section 5.3.1).
- 2 Open the *Settings* menu with **<S>**.
- 3 Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *Access control*.  
The *Simple access control* dialog window opens.
- 4 Using **<▲▼◀▶>**, select the function, *Activate extended access control* and confirm with **<OK>**.  
User right and instrument block can be selected.

CONTROLLER	30 July 2016	15 25			
Extended access control					
User right		Access code			
Administration		1111			
Maintenance		2222			
Viewer		3333			
Device lock		active			
Extended access control		active			
<b>Apply settings</b>					
Select menu item , edit					

figure 5-5 Settings -> Access control -> Extended access control

The instrument automatically generates a password for each user right. This password can be accepted or changed.

- 5 Press **<▲▼◀▶>** to select a user right and confirm with **<OK>**.  
If necessary, change the password in the selection dialog and/or save the password to a connected USB memory.
- 6 Note passwords.  
For reasons of safety the administrator password at least should be saved in such a way that it can be accessed in an emergency.
- 7 Press **<▲▼◀▶>** to select the *Apply settings* function and confirm with **<OK>**.  
A security prompt opens.
- 8 Using **<▲▼◀▶>**, select *OK* and confirm with **<OK>**.  
The settings are adopted.  
The *Extended access control* window is still open.  
The current passwords are visible.  
The *Viewer* user right is active.

### Switching off the extended access control

- 1 Press **<OK>** to open the *Display/Options / Change user rights* menu.  
The password query is displayed.
- 2 Enter and confirm the administrator password with **<▲▼◀▶>** and **<OK>**.
- 3 Using **<S>**, open the *Settings* menu.  
Deactivate extended access control.  
Take over the setting.





Forgotten the password? Then you can release the IQ SENSORNET again (see section 14.1).

### 5.3.3 Activating the instrument block for a terminal

Use the *Device lock* function to protect the terminal on which this function is activated – not only against unauthorized operation, but also against unauthorized reading of the current measured values. By activating the *Device lock* function the password for viewing the measured values is activated.

After an interval (approx. 10 min) without any user input the system is automatically blocked. In this case the display only shows the IQ SENSORNET logo.

#### Switching on the *Device lock*

- 1 Call up extended access control (see section 5.3.2).
- 2 Press **<▲▼◀▶>** to select the *Device lock* function and confirm with **<OK>**.  
A checkmark appears next to the function.
- 3 Press **<▲▼◀▶>** to select the *Apply settings* function and confirm with **<OK>**.  
A security prompt opens.
- 4 Using **<▲▼◀▶>**, select *OK* and confirm with **<OK>**.  
The settings are adopted.  
The *Access control* dialog window is still open.  
The current passwords are visible.

If the *Device lock* function is switched on, the system is automatically blocked after an interval (approx. 10 min) without any user input. The system can also be blocked with the menu *Display/Options / Activate device lock*.

The display of the blocked instrument shows only the IQ SENSORNET logo.

#### Switch off *Device lock*

- 1 Press **<OK>** to open the *Display/Options / Change user rights* menu.  
The password query is displayed.
- 2 Enter and confirm the administrator password with **<▲▼◀▶>** and **<OK>**.
- 3 Using **<S>**, open the *Settings* menu.  
Deactivate extended access control.  
Take over the setting.

### 5.3.4 Electronic key

The administrator can simplify access to the IQ SENSORNET by saving the password to USB memory. The USB memory thereby becomes an electronic key.

When the electronic key is connected to the System 2020 3G, the user right stored there with the relevant password is automatically read out. The user of the electronic key is logged on to the system with his user right without any further password prompt.

When the electronic key is disconnected, the IQ SENSORNET automatically switches to the lowest user right.

Passwords for different IQ SENSORNET systems can be saved to every electronic key.

For each IQ SENSORNET system only one password can be saved to each electronic key.

#### Saving a password to an electronic key

##### Simple access control


- 1 Connect the USB memory to the USB-A interface.
- 2 Using **<S>**, open the *Settings* menu.
- 3 Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *Access control*.  
The *Access control* dialog window opens.
- 4 Press **<▲▼◀▶>** and **<OK>** to select and confirm the menu item, *Change access control*.
- 5 Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *Save access code on USB memory*.  
The password for the system settings is saved to the USB memory.

##### Extended access control:




- 1 Connect the USB memory to the USB-A interface.
- 2 Using **<S>**, open the *Settings* menu.
- 3 Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *Access control*.  
The *Access control* dialog window opens.
- 4 Press **<▲▼◀▶>** to select an authorization level and confirm with **<OK>**.
- 5 Using **<▲▼◀▶>**, select the menu item, *Save access code on USB memory* and confirm with **<OK>**.  
The password for the system settings is saved to the USB memory.

### 5.3.5 Access to the IQ SENSOR NET with active access control

#### Simple access control

- 
  - Administrator access after entering the password in order to take over a changed setting:  
The protection is automatically reactivated after the one setting was changed.
  - Administrator access through connecting the electronic key: The protection is restored by disconnecting the electronic key

#### Extended access control (with instrument block):

- 
  - Administrator access through entering the password:
    - After 10 minutes without key-pressing, the highest protection level is automatically activated.
- 
  - Select the menu *Display/Options / Viewing only*.  
The highest level of protection is activated.
- 
  - Administrator access through connecting the electronic key: The protection is restored by disconnecting the electronic key

## 5.4 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 9.4.2).

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

- assign sensor names (see section 5.4.1)
- delete inactive datasets (see section 5.4.3)
- 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>.





CONTROLLER		30 July 2016	10:14			
Edit list of sensors						
No.	Model	Ser. no.	Sensor name			
S01	Sensolyt700IQ	99160001	99160001			
S05	TetraCon700IQ	99190001	99190001			
S02	TriOxmatic700IQ	01341000	01341000			
S03	VARION A	04460001	04460001			
S04	VARION N	04460001	04460001			
Select ◀▶, display position/erase sensor 						

figure 5-6 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.

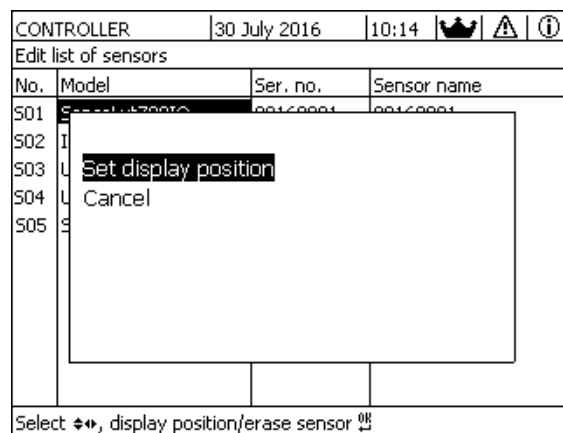


figure 5-7 Edit list of sensors -> Set display position

- 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 9.4.2). All settings are retained. If these data are no longer required, they can be erased. 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>.

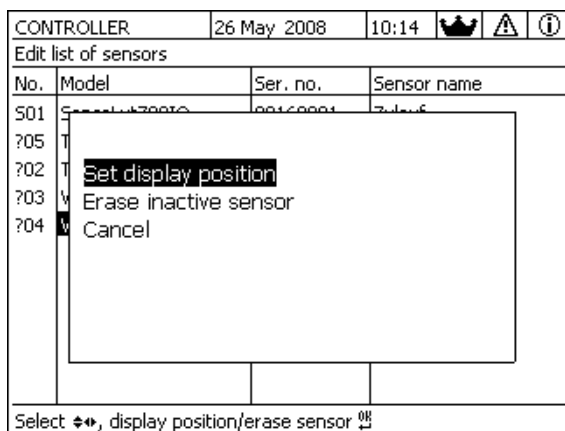


figure 5-8 Edit list of sensors -> Erase inactive sensor

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

## 5.5 Setting up 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.

CONTROLLER		30 July 2016	10:14			
Link with...						
No.	Sensor name	Measuring range				
503	01351000	O2	0 ... 60,0 mg/l			
Select sensor , confirm						

figure 5-9 Settings of sensors and diff. sensors -> Link with...

- 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.

- Using **<S>**, open the *Settings* menu.
- 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.
- Press **<▲▼◀▶>** to highlight the **&** column and confirm with **<OK>**.
- Press **<▲▼◀▶>** to highlight a differential sensor and confirm with **<OK>**.

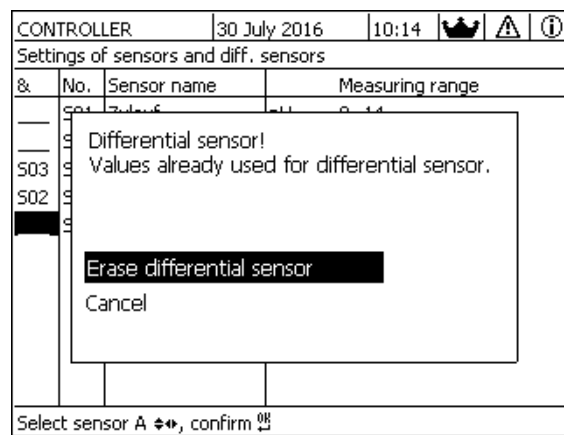


figure 5-10 Settings of sensors and diff. sensors -> Erase differential sensor

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



### 5.6 Settings for sensors/differential sensors

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

**Enhanced sensor functions**

For certain sensors, special representation types and settings are available in the menu, *Extended sensor functions*. An example for an enhanced sensor function is the editing of measured values as a graphic representation with cursor and zoom function (e.g. echo profile for the sludge level sensor IFL 700 IQ).

**Sensor settings**

The following diagram shows the operating steps to call up the sensor setting menu and enhanced sensor functions:

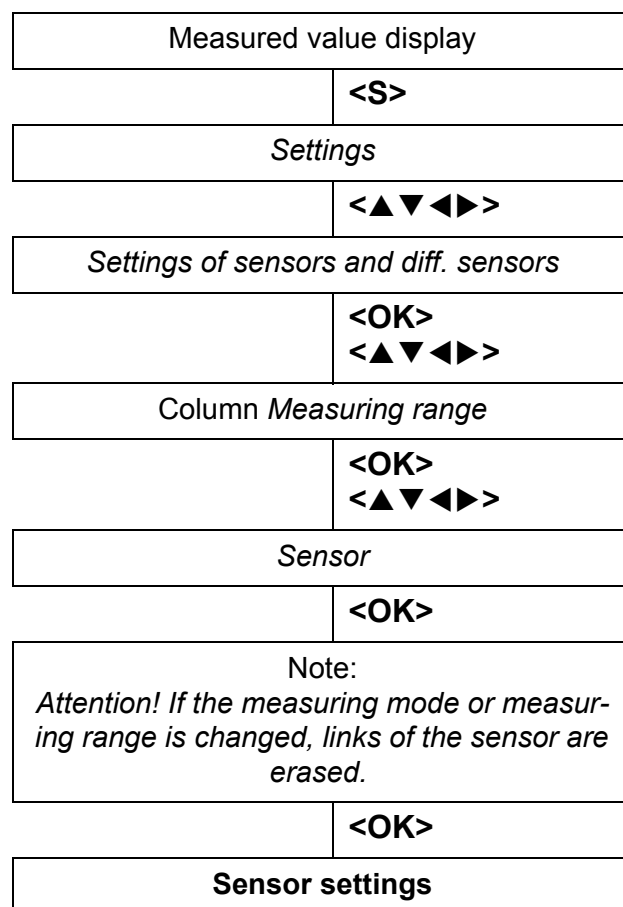


figure 5-11 Calling up the sensor settings



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

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

## 5.7 *Sensor-sensor link* (automatic offset of an influencing quantity)

The *Sensor-sensor link* function automatically makes available the measured value of a sensor to another sensor in the IQ SENSORNET system.

### **Example: Measuring the D.O. concentration**

D.O. sensors measure the D.O. partial pressure and use the solubility function of oxygen in the test sample to calculate the D.O. concentration (mg/l). The solubility of oxygen in water is influenced by the salt content (the salinity) of the solution and other factors such as the temperature or air pressure.

### **Static salinity correction**

To take into account the influence of the salinity on the D.O. concentration, many D.O. measuring systems provide a function where you can manually enter the salinity value. The sensor includes the salinity and provides a corrected measured value.

This type of static salinity correction is especially suitable for test samples with almost unchanging salinity.

To obtain optimum measurement results even with changing salinity values, the actual salinity has to be newly determined and entered for each measurement of the D.O. concentration.

### **Dynamic salinity correction**

A dynamic salinity correction is provided by the *Sensor-sensor link* function. This function supplies the D.O. sensor continuously with the current salinity value and is thus especially suitable for the continuous measurement of the D.O. concentration with changing salinity values.

### 5.7.1 Establishing the sensor-sensor link

#### **Requirements for a sensor-sensor link**

The following requirements have to be met for a sensor-sensor link:

- Hardware
  - A sensor for which an influence quantity can be corrected (e. g. FDO<sup>®</sup> 700 IQ, TriOxmatic<sup>®</sup> 700 IQ) is in the IQ SENSORNET system.
  - A sensor that measures the influence quantity (e.g. TetraCon<sup>®</sup> 700 IQ) is in the IQ SENSORNET system.
- Software
  - The software of the sensor with correction function (e.g. FDO<sup>®</sup> 700 IQ) supports the *Sensor-sensor link* function.
  - The software of the sensor measuring the influence quantity (e.g. TetraCon<sup>®</sup> 700 IQ) supports the *Sensor-sensor link* function.
- Sensor settings
  - The correction function is enabled in the setting menu for the sensor with correction function (e.g. FDO<sup>®</sup> 700 IQ).
  - The automatic (dynamic) correction is enabled in the setting menu for the sensor with correction function (e.g. FDO<sup>®</sup> 700 IQ).
  - A sensor measures the influence quantity and displays it with the unit which is used for manual input in the menu of the sensor with correction

function (e.g. TetraCon® 700 IQ measures the salinity - salinity is quoted dimensionless).

- The manually entered value for the static correction is set to the mean value of the influence quantity (e.g. salinity value) of the test sample. If no measured value for the influence quantity is available, the correction is made with the value that was manually entered (static correction).

**Establishing the link**

- 1 Using **<S>**, open the *Settings* menu.
- 2 Using **<▲><▼>** and **<OK>**, select and confirm the menu item, *System settings -> Sensor-sensor link*.  
The *Sensor-sensor link* overview opens.  
The displayed list includes all sensors with which the correction of an influence quantity is possible (e.g. FDO® 700 IQ).

CONTROLLER		30 July 2016	10 48	🔍	⚠	ℹ
Link (sensor to sensor)						
No.	Model	Sensor name	&			
S01	SC FDO 700	03270001	-			
⚡-Select parameter, ESC - back						

figure 5-12 System settings -> Sensor-sensor link

- 3 Using **<▲><▼>**, highlight a sensor and confirm with **<OK>**.  
The influence quantity to be linked and the current state of the link are displayed.

CONTROLLER	30 July 2016	10:55	🔒	⚠️	ℹ️
Link (sensor to sensor)					
S01 SC FDO 700 03270001					
Parameter	Linked sensor				
&1 SAL	-				
◆◆-Select parameter, ESC - back					

figure 5-13 System settings -> Sensor-sensor link

- 4 Using **<▲><▼>**, highlight a parameter to be linked, and confirm with **<OK>**.  
The displayed list includes all sensors that measure an influence quantity with the correct unit (e.g. TetraCon<sup>®</sup> 700 IQ, which measures the salinity in mg/l).

CONTROLLER	30 July 2016	10:21	🔒	⚠️	ℹ️
Link (sensor to sensor)					
S01 SC FDO 700 03270001					
Parameter	Linked sensor				
&1 SAL	-				
S03 TetraCon700IQ 99190001	SAL				
Erase link					
◆◆-Select parameter, ESC - back					

figure 5-14 System settings -> Sensor-sensor link

- 5 Using **<▲><▼>**, highlight a sensor that can be linked, and confirm with **<OK>**.  
The sensors are linked. The influence quantity to be linked and the linked sensor are displayed.
- 6 Leave the system settings with **<M>**.  
In the measured value display, the corrected measured value is marked by an asterisk (\*).

Behavior if there is no measured value for the influence quantity	Cause	Behavior
	– Sensor failure	<ul style="list-style-type: none"> <li>– The manually entered value for the influence quantity is automatically used for correction. An exclamation mark (!) indicates the interrupted link.</li> <li>– The sensor-sensor link is reactivated as soon as the measured value for the influence quantity is available again.</li> </ul>
	– Maintenance condition active	<ul style="list-style-type: none"> <li>– The value last measured for the influence quantity is automatically used for correction.</li> <li>– The current measured value is used for correction as soon as the measured value for the influence quantity is available again.</li> </ul>

### 5.7.2 Erasing a *Sensor-sensor link*

- 1 Using **<S>**, open the *Settings* menu.
- 2 Using **<▲><▼>** and **<OK>**, select and confirm the menu item, *System settings -> Sensor-sensor link*.  
The *Sensor-sensor link* overview opens.  
The displayed list includes all sensors with which the correction of an influence quantity is possible (e.g. FDO<sup>®</sup> 700 IQ).
- 3 Using **<▲><▼>**, highlight a sensor and confirm with **<OK>**.  
The displayed list includes all linked sensors.
- 4 Using **<▲><▼>**, highlight a sensor and confirm with **<OK>**.  
The displayed list includes all sensors that measure an influence quantity with the correct unit (e.g. TetraCon<sup>®</sup> 700 IQ, which measures the salinity in mg/l) and the menu item *Erase link*.
- 5 Using **<▲><▼>**, highlight the menu item, *Erase link*, and confirm with **<OK>**.  
The sensor-sensor link is erased.
- 6 Leave the system settings with **<M>**.  
In the measured value display, the measured value is corrected by the manually entered value.



The *Sensor-sensor link* function is automatically deactivated if the measured parameter of the linked sensor is changed (e.g. by switching the display of the TetraCon<sup>®</sup> 700 IQ conductivity sensor from salinity to conductivity).

## 5.8 Editing the list of outputs

The *Edit list of outputs* display provides an overview of all outputs, links and inactive datasets (see section 9.4.3).

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).

### 5.8.1 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>**.

CONTROLLER		30 July 2016	10:14			
Edit list of outputs						
No.	Model/Channel	Ser. no.	Name			
D01	MIQCR3/R1	99200004				
D01	MIQCR3/R2	99200004				
D01	MIQCR3/R3	99200004				
D01	MIQCR3/C1	99200004				
D01	MIQCR3/C2	99200004				
D01	MIQCR3/C3	99200004				

Select , edit output names

figure 5-15 *Edit list of outputs -> enter a name*

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

CONTROLLER		30 July 2016	10:14			
Edit list of sensors						
No.	Model	Ser. no.	Sensor name			
S01	SensoLyt700IQ	99160001	??			
S05	TetraCon700IQ	99190001	99190001			
S02	TriOxmatic700IQ	01341000	01341000			
S03	VARiON A	04460001	04460001			
S04	VARiON N	04460001	04460001			

Select  $\leftrightarrow$ , display position/erase sensor  $\text{OK}$

figure 5-16 Edit list of sensors

### 5.8.2 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 9.4.3). 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 and confirm the *Model/Channel* column. This column can only be highlighted if an inactive dataset (?xx) is present.
- 4 Press **<▲▼◀▶>** to highlight a *Model/Channel* and confirm with **<OK>**.

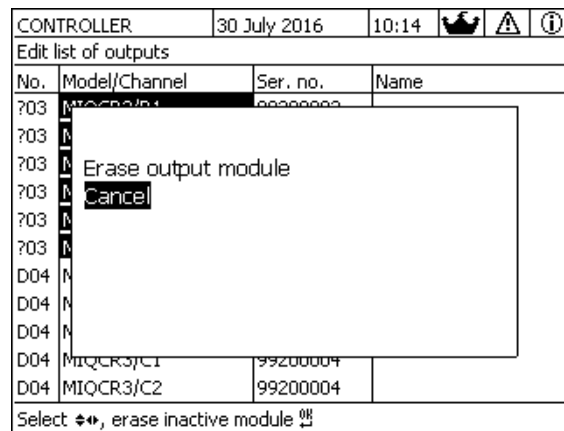


figure 5-17 Edit list of outputs -> Erase output module

- 5 Using **<▲▼◀▶>**, select *Erase output module* and confirm with **<OK>**. The dialog window for the security prompt appears.
- 6 Using **<▲▼◀▶>**, select *Erase output module* and confirm with **<OK>**. The output is erased.

### 5.8.3 Output links/settings

The proceeding and the possible settings for the linking of outputs with sensors are described with the description of the outputs (see chapter 7).

## 5.9 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 *Location display* display opens.



CONTROLLER		30 July 2016	10:14			
Location display:						
loc	Model	Ser. no.	Sensor name			
✓	SensoLyt700IQ	99160001	99160001			
✓	TetraCon700IQ	99190001	99190001			
✓	TriOxmatic700IQ	01341000	01341000			
✓	VARION A	04460001	04460001			
✓	VARION N	04460001	04460001			
Edit name of location						

figure 5-18 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 4.2.2).

### 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 4.4.4).

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.

You can select your sensors in the menu *Location display*. 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 (✓).

## 5.10 Alarm settings

### 5.10.1 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)
- As an E-mail (see section 5.11.4)



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.

### 5.10.2 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.

CONTROLLER		30 July 2016	10:14			
Alarm link overview						
Alarm	Sensor	Designation				
A01						
A02	S03 01341000	lack of oxygen				
A03	S02 99191001	cond. too high				
A04						
A05						
A06						
A07						
A08						
A09						
A10						

Select , Set alarm

figure 5-19 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).

CONTROLLER		30 July 2016	10:14			
Select sensor for alarm link						
No.	Model	Ser. no.	Sensor name			
S01	SensoLyt700IQ	99160001	Zulauf			
S05	TetraCon700IQ	99190001	Zulauf			
S02	TriOxmatic700IQ	01341000	Belebung 1			
S03	VARION A	04460001	04460001			
S04	VARION N	04460001	04460001			
Select sensor ◀▶, confirm OK						

figure 5-20 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.

CONTROLLER		30 July 2016	10:14			
Set alarm link						
Measured variable	Main variable					
Limit value	Upper limit					
Upper limit	48.0 mg/l					
Hysteresis	6.00 mg/l					
Designation						
Relay output	D01 R1					
Accept						
Cancel						
Adjust setting ◀▶, confirm OK						

figure 5-21 Set alarm link

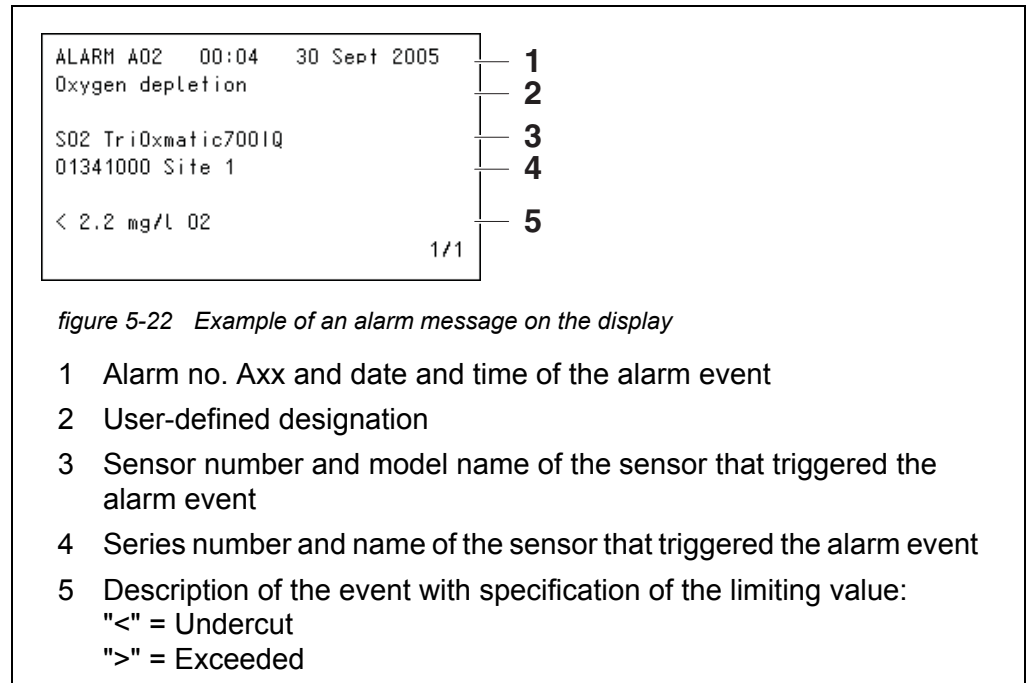
- 5 Edit the setting table. The required operating steps are described in detail in section 4.2 GENERAL OPERATING PRINCIPLES.

### Alarm links setting table

Menu item	Selection/Values	Explanations
<i>Measured variable</i>	<ul style="list-style-type: none"> <li>● <i>Main variable</i></li> <li>● <i>Adjoining variable</i></li> </ul>	<i>Main variable</i> designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). <i>Adjoining variable</i> designates an additional measured parameter (e.g. temperature).
<i>Limit value</i>	<ul style="list-style-type: none"> <li>● <i>Lower limit</i></li> <li>● <i>Upper limit</i></li> </ul>	Type of the alarm event. <i>Lower limit</i> : An alarm is triggered if the defined limit value is undercut. <i>Upper limit</i> : An alarm is triggered if the defined limit value is exceeded.
<i>Lower limit / Upper limit</i>	within the measuring range (sensor-dependent)	Limit value for the alarm event
<i>Hysteresis</i>	0 - 10 % of the measuring range	Hysteresis for the limit value
<i>Designation</i>	(max. 20 characters)	User-defined designation for easier identification in the alarm message.
<i>Relay output</i>	Dxx / .../ Ry ... ... ... <i>No relay output</i>	Opens a list with all relay outputs where the <i>Alarm contact</i> is set. Dxx: number of the output module .../Ry: relay output channel Here you can select a relay output. When the alarm event occurs, it carries out the specified action (Open or Close). For details, see section 5.10.3 ALARM OUTPUT TO DISPLAY.
<i>Accept</i>		The settings are taken over in the setting table by pressing <b>&lt;OK&gt;</b> . The display switches to the next higher level.
<i>Cancel</i>		The display switches to the next higher level without storing the new settings.

### 5.10.3 Alarm output to display

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



#### 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.

### 5.10.4 Alarm output as relay action

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

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

### 5.10.5 Alarm message as an email

All alarm messages can be sent to an email address. In this case, the same information that is output on the display is transmitted. For details, see

section 5.11.4.

**Prerequisite** A connection to the Internet exists (see chapter 6 ETHERNET CONNECTION).



For critical alarm events take into account that Email messages may possibly be received delayed.

## 5.11 System settings

System settings include:

- *Language* (see section 5.1)
- *Date/Time* (see section 5.11.1)
- *Location altitude/Air pressure* (see section 5.11.2)
- *TCP/IP settings*
- *E-mail*
- *Settings bus interfaces*
- *Function code*

### 5.11.1 Setting the date and time

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

- 1 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*.

CONTROLLER	30 July 2016	10:14			
Date/Time					
<b>Set date</b>					
Year	2008				
Month	May				
Day	26				
Set time					
Hour	10				
Minute	43				
Select , confirm					

figure 5-23 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/MC3 and MIQ/TC 2020 3G bridges periods of power failure for several hours. After a longer power failure, the time is reset. A message and an entry in the log book provide information on the power failure and the necessity for resetting the clock.

### 5.11.2 Location altitude / average air pressure

#### Automatic air pressure measurement

In systems with automatic air pressure measurement, the currently measured air pressure value is displayed in the menu *System settings -> Location altitude/Air pressure*. Values that are manually set are not accepted by the system.

#### Setting the air pressure manually

If the automatic air pressure measurement does not work, and in systems without automatic air pressure measurement, air pressure values can be set within a range of 500 to 1100 mbar.

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

CONTROLLER	30 Juli 2014	10:14	👑	⚠	ℹ
Location altitude/Air pressure					
<b>Set altitude of location</b>					
Loc. altitude:	590 m	amsl			
Set air pressure					
Air pressure:	1013 mbar				
Select ⬅➡, confirm ⏹					

figure 5-24 Location altitude/Air pressure

- 3 Press <▲▼◀▶> to select *Set altitude of location* or *Set air pressure* and confirm with <OK>.
- 4 Press <▲▼◀▶> to change the values for *Loc. altitude* or *Air pressure* and confirm with <OK>.

### 5.11.3 TCP/IP settings

The *TCP/IP settings* menu includes functions and settings for the operation of the IQ SENSORNET in an Ethernet network.

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



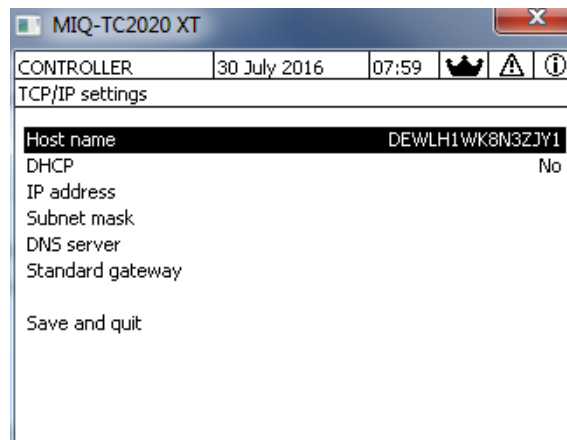


figure 5-25 TCP/IP settings

- 3 Press **<▲▼◀▶>** and **<OK>** to select and confirm a menu item. An entry field or selection list opens up.

Setting	Selection/Values	Explanation
<i>DHCP</i>	Yes	The IQ SENSOR NET is configured as a DHCP client. If a DHCP server is in the network, the IQ SENSOR NET receives all further network settings from the DHCP server.
	No	The IQ SENSOR NET is not configured as a DHCP client. All other settings have to be made as necessary.
<i>IP address</i>	Address	Permanent IP address for the IQ SENSOR NET in the LAN (if <i>DHCP</i> No).

Setting	Selection/Values	Explanation
<i>Subnet mask</i>	Address	Subnet mask (if <i>DHCP No</i> ). The subnet mask depends on the network size (for small networks: e.g. 255.255.255.0).
<i>DNS server</i>	Address	Entry for fieldbuses not required. For a connection with the Internet (if <i>DHCP No</i> ), e.g.: <ul style="list-style-type: none"> <li>● IP address of the DNS server in the network</li> <li>● Entry of <i>IP address</i> or e.g. 127.0.0.1</li> </ul>
<i>Standard gateway</i>	Address	Entry for fieldbuses not required. For a connection with the Internet (if <i>DHCP No</i> ), e.g.: <ul style="list-style-type: none"> <li>● IP address of the instrument providing access to the Internet</li> <li>● Entry of <i>IP address</i> or e.g. 127.0.0.1</li> </ul>

- 4 Enter texts with <▲▼◀▶> and <OK>, or select and confirm an option from the list.
- 5 Complete the entries on the display *TCP/IP settings*.

#### 5.11.4 E-mail

**Prerequisite** An Internet connection exists.

The *E-mail* menu contains functions and settings for the sending of alarm messages via email.

- 1 Open the *Settings* menu with <S>.
- 2 Using <▲▼◀▶> and <OK>, select and confirm the menu item, *System settings -> E-mail*.  
The *E-mail* display opens.

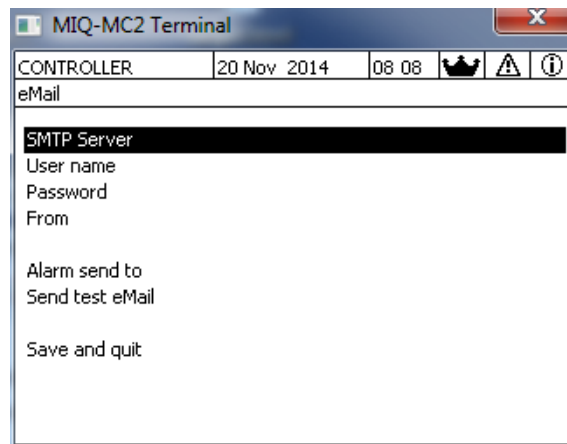


figure 5-26 E-mail settings

- 3 Press <▲▼◀▶> and <OK> to select and confirm a menu item. An entry field or selection list opens up.

Setting	Selection/Values	Explanation
<i>SMTP Server</i>	Address	Address of the SMTP server of the email provider through which the email will be sent.
<i>User name</i>	Name	User name of the email account
<i>Password</i>	Character string	Password to log on to the email account
<i>From</i>	Name	Email sender address
<i>Alarm send to</i>	Name	Email target address
<i>Send test email</i>		A test email with the specified settings is sent.

- 4 Enter texts with <▲▼◀▶> and <OK>, or select and confirm an option from the list.
- 5 Complete the entries on the display *E-mail*.
- 6 Using <▲▼◀▶> and <OK>, select and confirm the menu item, *Save and quit*. The settings are stored. The menu ist closed.

### 5.11.5 Settings bus interfaces

The *Settings bus interfaces* menu contains functions and settings for the com-

munication of the IQ SENSORNET with a fieldbus. Prerequisite: An interface to a fieldbus is available (hardware, optional).

For details, see operating manual ba77010 "IQ SENSORNET Fieldbus linking", for download under [www.YSI.com](http://www.YSI.com).

### 5.11.6 Function code

Function for the service staff.

## 5.12 Measured value logging

As soon as the IQ SENSORNET system identifies a sensor, the recording of measured values start automatically (recording interval 1 min, recording duration 14 days).

You can display the stored measured values

- as a list or
- display the temporal course of the stored measured values graphically (see section 4.4.4).
- display the stored measured values to a PC.

You can adjust to your requirements the standard settings for the measured value recording of IQ sensors or differential sensors in the menu, *Measured value logging*.

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 durations 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

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

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

Terminal PC   01 Jan 2001   00:50   🔒   ⚠️   ⓘ				
Measured value logging				
No.	Model	Sensor name	dt	Dur.
S01	SensoLyt700IQ	Zulauf	1 min	1 d
S05	TetraCon700IQ	Zulauf	5 min	5 d
S02	TriOxmatic700IQ	Belebung 1	10 min	30 d
S06	TriOxmatic701IQ	01341001	15 min	15 d

Save and quit      Quit

Free storage: 100 %

select ⌘, edit log interval ⌘

figure 5-27 Measured value logging

- 3 Press **<▲▼◀▶>** and **<OK>** to select and confirm the *dt* column.
- 4 Select and confirm a sensor with **<▲▼◀▶>** and **<OK>**.
- 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 Select and confirm a sensor with **<▲▼◀▶>** and **<OK>**.
- 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 block are occupied (*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 Ethernet connection

The Ethernet interface for the IQ SENSORNET system is on the MIQ/MC3 controller.



If, in the IQ SENSORNET system, no MIQ/MC3 controller is available, an Ethernet connection can also be realized via the USB interface of the MIQ/TC 2020 3G controller and an external USB Ethernet adapter.

Please note the following restrictions with an Ethernet connection via a USB Ethernet adapter:

- no connection to Ethernet fieldbuses
- possible interferences due to electromagnetic influences

If the IQ SENSORNET system is connected to an Ethernet network, communication with the IQ SENSORNET is enhanced and facilitated.

- The Ethernet interface allows the IQ SENSORNET to be integrated into a local network and to be connected to other networks (e.g. Internet) using commercially available network technology.
- The web server of the controller makes available the measurement data of the IQ SENSORNET as a web page.
- Communication with the IQ SENSORNET 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 SENSORNET.
  - The programs of the IQ WEB CONNECT can be used to operate and manage the IQ SENSORNET on a PC.
- Extraction of the data provided by the web server is possible using commercially available or self-created programs (DataLogger).
- With the Ethernet interface of the MIQ/MC3, the instrument can additionally be integrated into an EtherNet/IP™, Profinet and Modbus TCP environment. Details on this subject are given in the operating manual ba77010e ("IQ SENSORNET fieldbus linking"). The current version can be found on the Internet at [www.YSI.com](http://www.YSI.com).

### 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 operating manual for your device.  
If you have no knowledge of networks, please contact your network administrator.

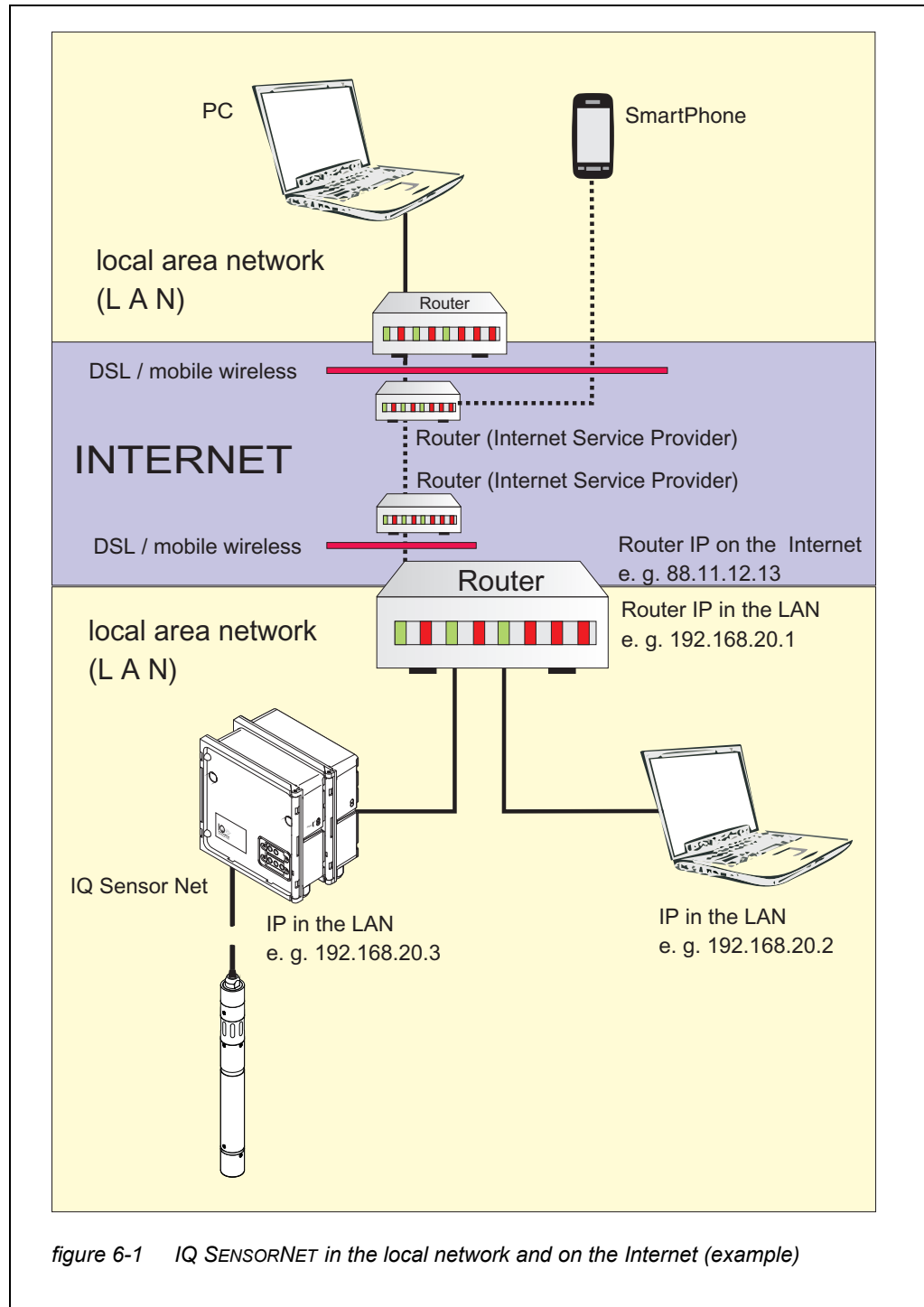


figure 6-1 IQ SENSORNET in the local network and on the Internet (example)



**USB Ethernet adapter for MIQ/TC 2020 3G**

With the MIQ/TC 2020 3G as controller, the connection to the Ethernet takes place via a USB Ethernet adapter. Suitable are USB/Ethernet adapters with Asix AX88772(A/B/C) chip set. We recommend the following adapters:

- DIGITUS 10/100 ETHERNET ADAPTER USB2.0 (VERSION A)
- TRENDNET TU-ET100(V3\_DR)
- Edimax EU-4208
- I-tec U2LAN



Operating a USB Ethernet adapter on the MIQ/TC 2020 3G can increase the electromagnetic susceptibility of the MIQ/TC 2020 3G.

Especially for permanent operation with a USB Ethernet adapter, we recommend operating the system in an environment with a rather low electromagnetic load.

Interference free operation (e.g. in an industrial electromagnetic environment) is possible via the Ethernet interface of the MIQ/MC3.

Please keep in mind that if any USB Ethernet adapters are used, we cannot guarantee a fault-free functioning and cannot answer any requests for support.

**6.1.1 Communication in a local network (LAN)**

	<b>Prerequisites</b>	<b>Details / Examples / Designations</b>
<b>Hardware</b>	IQ SENSOR NET System 2020 3G	IQ SENSOR NET controller:MIQ/MC3 or MIQ/TC 2020 3G, configured as controller, with USB Ethernet adapter
	Ethernet cable	RJ45 cable to connect the IQ SENSOR NET and router. <u>Note:</u> If the MIQ/MC3 is operated outdoors, note section 6.2.
<b>Software</b>	Terminal equipment (a network subscriber that sets up the communication), e.g.:	<ul style="list-style-type: none"> <li>● PC</li> <li>● Tablet PC</li> <li>● Smartphone</li> </ul>
	Communication software on the terminal equipment, e.g.:	<ul style="list-style-type: none"> <li>● Web browser</li> </ul>

	Prerequisites	Details / Examples / Designations
	Network services (e.g. on the terminal device or router)	<ul style="list-style-type: none"> <li>● WINS server</li> <li>● DHCP and DNS servers (for network access in the LAN via the name of the MIQ/MC3 or MIQ/ TC 2020 3G)</li> </ul>
<b>Network address of the controller in the LAN</b>	Configuration of the termi- nal or controller	<ul style="list-style-type: none"> <li>● Instrument name (is defined in the terminal settings (see section 5.2) In the default condition, the name is the com- bination "instrument name-serial number (e.g. "MC3-16160001").</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>● Fixed local IP address of the controller (defined in the settings of the controller (see section 6.1.2).</li> </ul>

### 6.1.2 Communication on the Internet

	Prerequisite	Details / Examples / Designations
<b>Hardware</b>	IQ SENSOR NET System 2020 3G	IQ SENSOR NET controller:MIQ/MC3 or MIQ/TC 2020 3G, configured as controller, with USB Ethernet adapter
	Router, e.g.	<ul style="list-style-type: none"> <li>● DSL router</li> <li>● Mobile wireless router</li> </ul>
	Ethernet cable	RJ45 cable to connect the IQ SENSOR NET and router. <u>Note:</u> If the MIQ/MC3 is operated outdoors, note section 6.2.
	Terminal equipment (network subscriber that sets up the communica- tion), e.g.:	<ul style="list-style-type: none"> <li>● PC</li> <li>● Tablet PC</li> <li>● Smartphone</li> </ul>
<b>Software</b>	Communication software on the terminal equipment, e.g.:	<ul style="list-style-type: none"> <li>● Web browser</li> </ul>
<b>Network address of the MIQ/MC3 on the Internet</b>	Internet services	The network address of the router on the Internet is configured via an Internet service (see below).

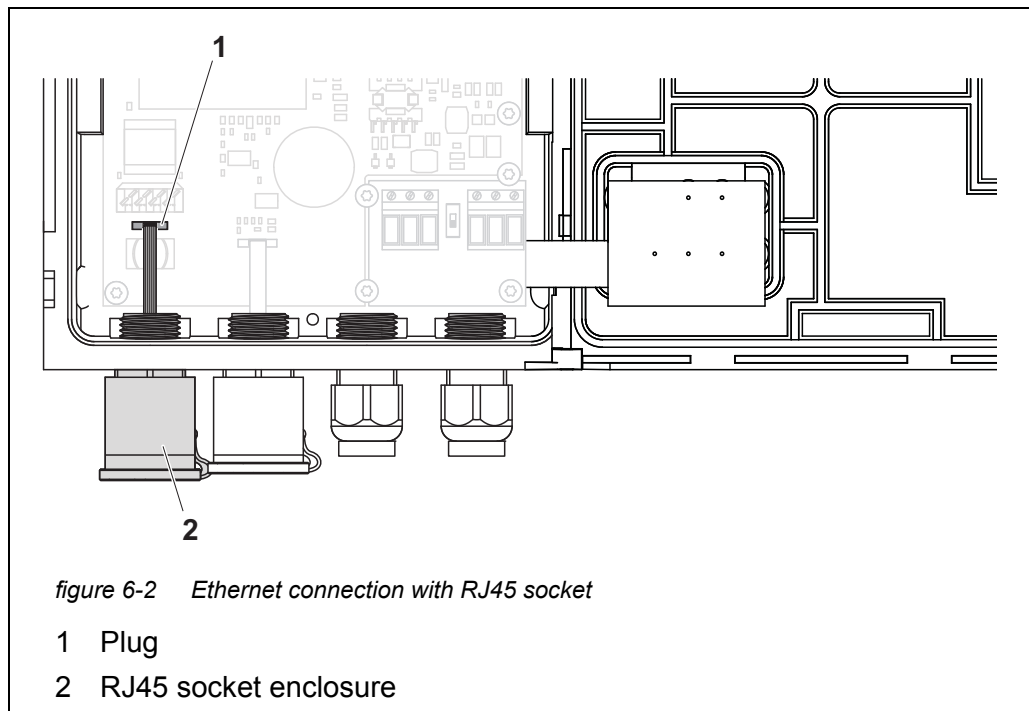
	Prerequisite	Details / Examples / Designations
<b>Internet services</b>	Internet access with data flat rate, e.g.:	<ul style="list-style-type: none"> <li>● DSL connection</li> <li>● Mobile wireless connection (SIM card)</li> </ul>
	Internet service which makes the router publicly addressable on the Internet, e.g.:	<ul style="list-style-type: none"> <li>● A public IP address (e.g. available at an Internet service provider)</li> <li>● A service (e.g. DynDNS), which assigns a fixed name to a changing IP address of an Internet subscriber so that the subscriber is always accessible under the same name</li> </ul>
<b>Special settings of the network subscriber</b>	IQ SENSOR NET	<p>Menu: <i>System settings / TCP/IP settings:</i></p> <ul style="list-style-type: none"> <li>● <i>DHCP: No</i></li> <li>● <i>IP address:</i> Enter static IP address Default setting: MIQ/MC3: <b>192.168.1.200</b> MIQ/TC 2020 3G: <b>192.168.1.201</b> The IP address must lie outside the address range of the DHCP server (the DHCP server is often a network service of the router).</li> <li>● <i>Subnet mask:</i> Default setting: <b>255.255.255.0</b> The IP address depends on the local network.</li> <li>● <i>DNS server:</i> Local IP address of the router (e.g. 129.168.179.1)</li> <li>● <i>Standard gateway:</i> Local IP address of the router (e.g. 129.168.179.1)</li> </ul>
	Router  (see operating manual for your router)	<ul style="list-style-type: none"> <li>● Data for Internet access (from Internet service provider)</li> <li>● Port forwarding of port 8080 to port 80 of the fixed IP address of the MIQ/MC3</li> </ul>

## 6.2 Ethernet connection with installation outdoors (MIQ/MC3)

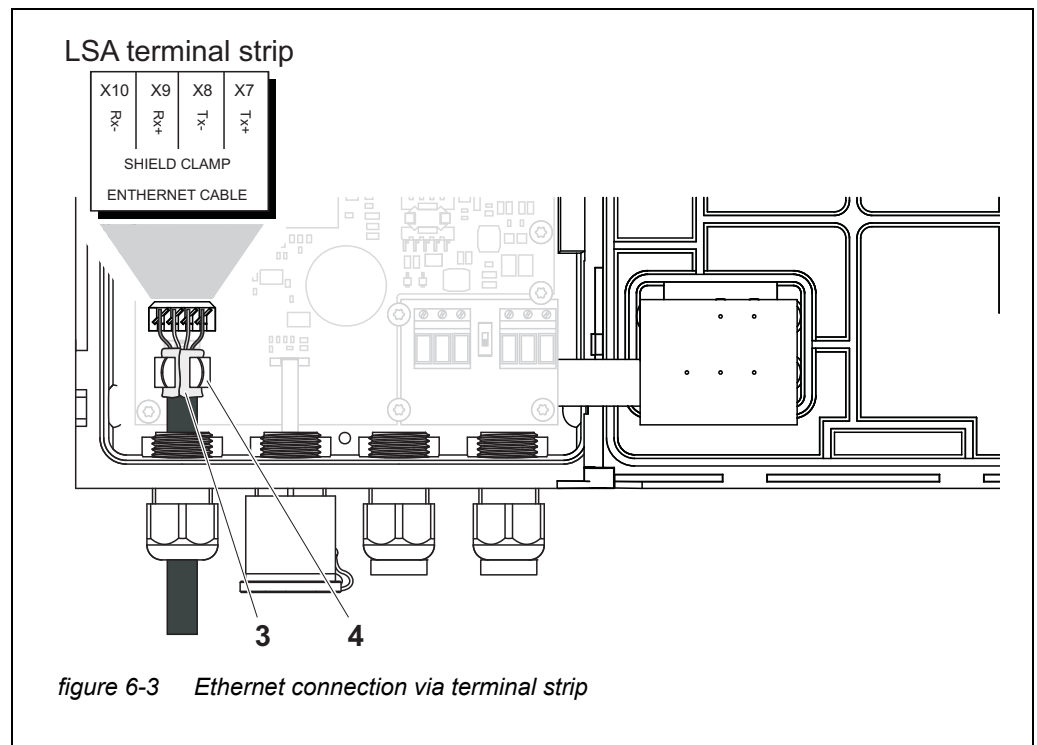
When plugged in, the RJ45 socket is not sufficiently protected against moisture. With open air installation, the Ethernet cable must therefore be clamped directly onto the PCB of the MIQ/MC3 controller to ensure a safe Ethernet communication. For this purpose there is a 4-pole terminal strip and a shielding 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 Remove the anti-twist protection on the RJ45 socket enclosure (pos. 2 in ) with a Torx screw driver (Tx10). The anti-twist protection consists of 2 plastic parts and a screw.  
Caution: Do not lose the parts!



- 3 Disconnect the flat flexible cable from the plug (pos. 1) on the main PCB.
- 4 Unscrew the RJ45 socket enclosure (pos. 2).
- 5 Screw a cable gland with sealing ring into the free duct.
- 6 Remount the anti-twist protection. If necessary, screw out the cable gland somewhat so the anti-twist protection can be mounted.



- 7 Strip the Ethernet cable for approx. 2 cm and untwist the Rx+, Rx-, Tx+ and Tx- wires.
- 8 Carefully slash the cable shield (foil + netting) lengthwise and put it backwards over the cable sheath (pos. 3 in figure 6-3).
- 9 Loosen the coupling ring of the cable gland and feed the Ethernet cable into the module housing.
- 10 Where the cable shield was put backwards, press the Ethernet cable into the shielding terminal (pos. 4 in figure 6-3). The shielding terminal must contact the cable shield across a wide area.
- 11 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.
- 12 Fasten the cap nut of the screwed cable gland.
- 13 Close the module.

## 6.3 Establishing the connection with the IQ SENSOR NET via a network

### 6.3.1 Opening the IQ WEB CONNECT

The web server of the MIQ/MC3 provides functions for the (remote) operation of the MIQ/MC3 and for the data exchange (e.g. with a PC) via a network address.

- Prerequisites**
- All network components (Universal Transmitter, router, network-capable devices with browser) are connected
  - The network services are active
  - Web browser (HTML 5)



The IP address and the other network settings for the Universal Transmitter MIQ/MC3 are configured in the *System settings* -> *TCP/IP settings* menu.

**Procedure** Enter the network address of the MIQ/MC3 in the address line in the web browser

- 1 Enter the network address of the MIQ/MC3 in the address line of the web browser
  - in the LAN  
e.g. name or IP address of the MIQ/MC3
  - On the Internet,  
e.g. fixed IP address of the router or DynDNS name

The network connection to the MIQ/MC3 is established.  
The start page of the IQ SENSOR NET is displayed.

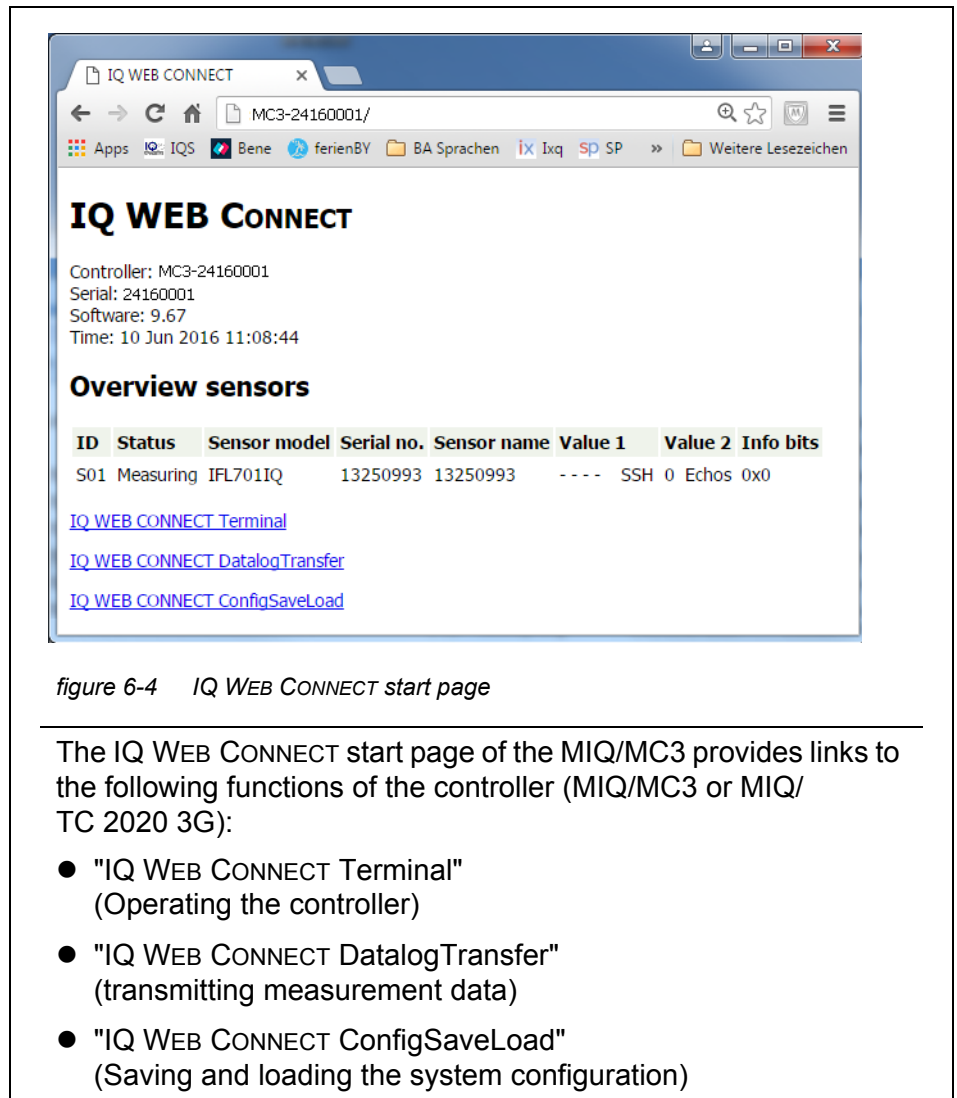


figure 6-4 IQ WEB CONNECT start page

The IQ WEB CONNECT start page of the MIQ/MC3 provides links to the following functions of the controller (MIQ/MC3 or MIQ/TC 2020 3G):

- "IQ WEB CONNECT Terminal"  
(Operating the controller)
- "IQ WEB CONNECT DatalogTransfer"  
(transmitting measurement data)
- "IQ WEB CONNECT ConfigSaveLoad"  
(Saving and loading the system configuration)

- 2 Open a link on the IQ WEB CONNECT start page.
- 3 Enter the user name and password  
(User name: "ADMIN"  
Password: is determined in the setting of the extended access control on the MIQ/MC3 (factory setting of the password: "1111")  
The selected website is displayed.

### 6.3.2 IQ WEB CONNECT Terminal

With the "IQ WEB CONNECT Terminal", you can operate your MIQ/MC3 just like you are used to on the instrument.



You can save data to a USB memory device connected to the instrument (similar to operation of the instrument). To save data to a PC, select the function "IQ WEB CONNECT DatalogTransfer" (see section 6.3.3).

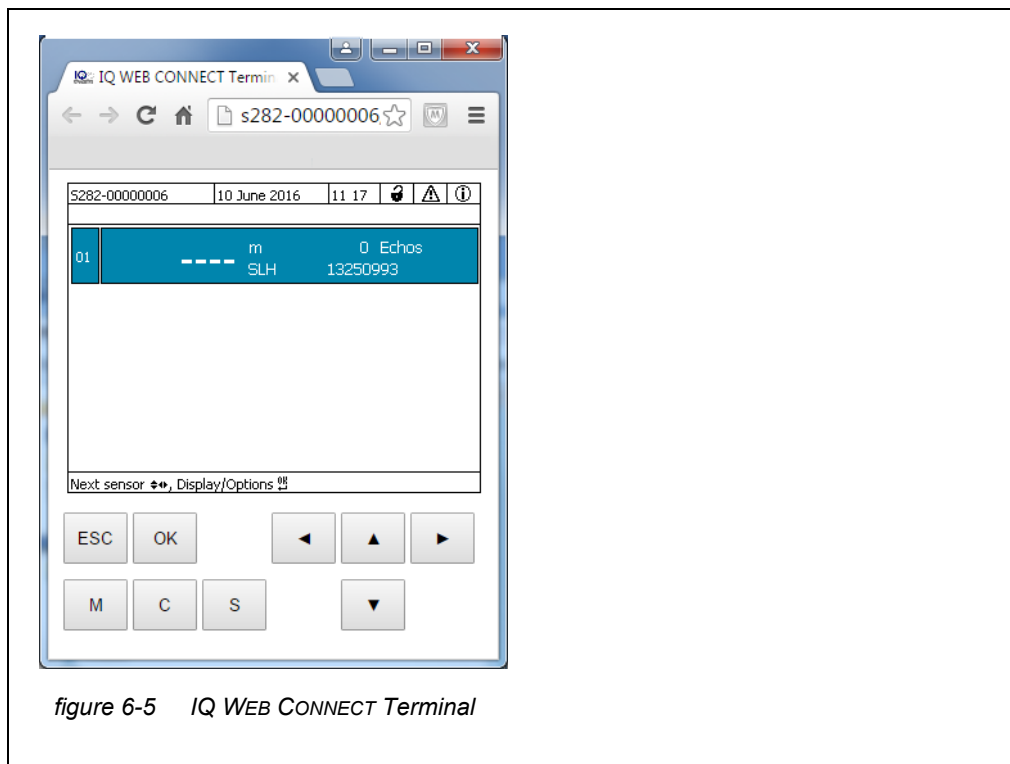


figure 6-5 IQ WEB CONNECT Terminal

### 6.3.3 IQ WEB CONNECT DatalogTransfer



"IQ WEB CONNECT DatalogTransfer" exchanges data with the terminal device with which you are carrying out IQ WEB CONNECT functions. The data exchange is optimized for the following operating systems:

- Microsoft® Windows®
- Linux

Via the website "IQ WEB CONNECT DatalogTransfer", you can save measurement data of the MIQ/MC3 directly to a PC.

The transmitted measurement data are stored in a separate file in CSV data format for each sensor. The file name (e. g. S03\_TriOxmatic700IQ\_1.csv) is automatically assigned and includes:

- sensor number (e. g. S03)
- sensor model (e. g. TriOxmatic700IQ)
- consecutive number.



For processing you can open the csv file, e.g. with Microsoft Excel.

	2	3	4	5	6	7	8	9
1	S01	TetraCon700IQ	Bio1	12010002	01.02.2012 11:42			
2								
3	01.02.2012 9:00	Valid	0.00433635	mS/cm	Cond	Valid	24.437	°C
4	01.02.2012 8:58	Valid	0.00433578	mS/cm	Cond	Valid	24.341	°C
5	01.02.2012 8:57	Valid	0.00433541	mS/cm	Cond	Valid	24.327	°C
6	01.02.2012 8:56	Valid	0.00433485	mS/cm	Cond	Valid	24.313	°C
7	01.02.2012 8:55	Valid	0.00433391	mS/cm	Cond	Valid	24.298	°C
8	01.02.2012 8:54	Valid	0.00433344	mS/cm	Cond	Valid	24.269	°C

figure 6-6 Example of a CSV file after being imported into Microsoft Excel

1 Identification of the measurement data (from left to right, line 1)

- Sensor number (Sxx)
- Sensor model
- Sensor name
- Serial number (sensor)
- Date and time of the file save

2 Date and time of the measured value save

3 Measured value status

4 Measured value

5 Unit of the measured value

6 Measured parameter

7 Measured value status of the secondary measured value

8 Secondary measured value

9 Unit of the secondary measured value



The measured values are transmitted unprocessed. Therefore, the measured values may have a number of decimal places that exceeds the display accuracy of the respective sensor.

When you want to display and process the transmitted measured values, it may be required to limit the number of digits (e. g. by rounding).

### 6.3.4 IQ WEB CONNECT ConfigSaveLoad



"IQ WEB CONNECT DatalogTransfer" exchanges data with the terminal device with which you are carrying out IQ WEB CONNECT functions. The data exchange is optimized for the following operating systems:

- Microsoft® Windows®
- Linux

Via the website IQ WEB CONNECT ConfigSaveLoad, you can display or save the system configuration of the MIQ/MC3 or load it to a MIQ/MC3.

The system configuration contains the same data as with the backup via the USB :interface (see section 4.9.2).

## 6.4 Communication with fieldbuses (MIQ/MC3[-XX])

Details on communication with fieldbuses are given in the operating manual ba77010e ("IQ SENSORNET fieldbus linking"). The current version can be found on the Internet at [www.YSI.com](http://www.YSI.com).

## 6.5 Troubleshooting

The IQ SENSORNET provides an Ethernet interface for the connection of the IQ SENSORNET to private networks, company networks and public networks.

To establish accessibility of the IQ SENSORNET 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 SENSORNET operating manual because of the multitude of service providers, network architectures and connection options involved.

### Ethernet LED (MIQ/MC3)

A working Ethernet data connection is displayed by means of an LED in the MIQ/MC3:

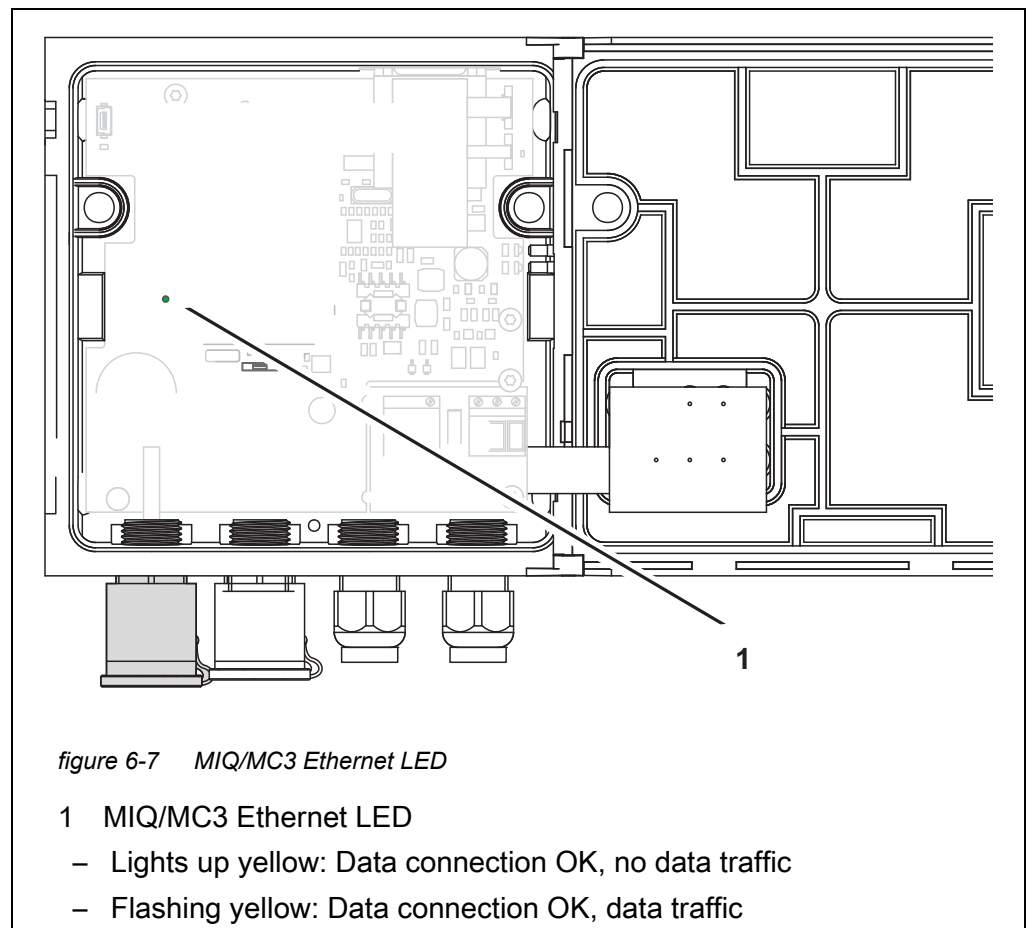


figure 6-7 MIQ/MC3 Ethernet LED

#### 1 MIQ/MC3 Ethernet LED

- Lights up yellow: Data connection OK, no data traffic
- Flashing yellow: Data connection OK, data traffic

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
	<ul style="list-style-type: none"> <li>- Ethernet hardware defective, e.g.               <ul style="list-style-type: none"> <li>- Ethernet cable defective</li> <li>- Ethernet connection on the MIQ/MC3 or router defective</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Open the MIQ/MC3 and check the yellow Ethernet LED.               <ul style="list-style-type: none"> <li>- The yellow Ethernet LED is not illuminated (hardware defective): Use different hardware, e.g.: Ethernet cable, Ethernet socket on the router, router</li> <li>- The yellow Ethernet LED lights up or flashes (hardware OK): Check for other errors (see below)</li> </ul> </li> </ul>
	<ul style="list-style-type: none"> <li>- Incorrect network address entered in the LAN (name)</li> </ul>	<ul style="list-style-type: none"> <li>- Enter the correct name: "Device name-series number", replace special characters (/ , blanks etc.) with "-", e.g. MC3-16340001</li> <li>- Ascertain or define the correct IP address of the controller in the local network (e.g. IQ SENSORNET setting + router setting) and enter</li> </ul>
	<ul style="list-style-type: none"> <li>- Incorrect network address on the Internet (IP address of the router)</li> </ul>	<ul style="list-style-type: none"> <li>- Ascertain or define the correct Internet IP address of the router (e.g. FixedPublicIP) and enter</li> </ul>
	<ul style="list-style-type: none"> <li>- the maximum number of IQ WEB CONNECT network connections from an end device to the controller is exceeded</li> </ul>	<ul style="list-style-type: none"> <li>- terminate an IQ WEB CONNECT connection (maximum number of IQ WEB CONNECT connections, see section 1.2.4)</li> </ul>
	<ul style="list-style-type: none"> <li>- Incorrect setting in the router (e.g. Internet access data, port forwarding)</li> </ul>	<ul style="list-style-type: none"> <li>- Correct settings</li> </ul>
	<ul style="list-style-type: none"> <li>- Incorrect setting in the IQ SENSORNET (System menu/ TCP/IP settings)</li> </ul>	<ul style="list-style-type: none"> <li>- Correct settings</li> </ul>

Cause	Remedy
<ul style="list-style-type: none"> <li>- Ports which are used by the IQ SENSORNET are already assigned to other devices in the network (e.g. another IQ SENSORNET system)</li> </ul>	<ul style="list-style-type: none"> <li>- Have your network administrator assign free ports to you</li> <li>- Specify the port (1-65535) manually in the address line of the browser/IQ WEB CONNECT (example: http://10.11.12.13:65535)</li> <li>- Forward this port (65535) in the router to the IP address of the controller.</li> </ul>
<ul style="list-style-type: none"> <li>- Blocking by firewall</li> </ul>	<ul style="list-style-type: none"> <li>- Contact your network administrator or a network specialist</li> </ul>

#### Interrupted Ethernet connection

Cause	Remedy
<ul style="list-style-type: none"> <li>- Electromagnetic interferences in the vicinity of the Terminal/Controller MIQ/TC 2020 3G interrupt the Ethernet connection via a USB Ethernet adapter</li> </ul>	<ul style="list-style-type: none"> <li>- Establish an Ethernet connection via the IQ SENSORNET controller MIQ/MC3</li> <li>- Increase the shielding of the cable at the USB Ethernet adapter against electromagnetic interference</li> </ul>

## 6.6 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 the communication interfaces (ports) that are not used for standard communication (web browser, email 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). 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.

---

<b>Port</b>	<p>A port is the communication interface of an application (possible port numbers: 0-65535).</p> <p>Some ports (port numbers) are reserved for special applications, e.g.:</p> <ul style="list-style-type: none"><li>● 21: FTP (File Transfer Protocol)</li><li>● 25: SMTP (Simple Mail Transfer Protocol)</li><li>● 80: HTTP (Hypertext Transfer Protocol) (used by the web browser for communication with web servers)</li></ul>
<b>Port release</b>	<p>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.</p> <p>In local networks, this function is often assumed by the router.</p> <p>The IQ SENSORNET controller MIQ/MC3 uses port 80.</p>
<b>Port forwarding</b>	<p>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.</p> <p>In local networks, this function is mostly carried out by the router.</p>
<b>Router</b>	<p>A router fulfills the following tasks as an interface between two networks:</p> <ul style="list-style-type: none"><li>● It connects the local network to the Internet.</li><li>● 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.</li></ul> <p>Routers often assume other services in a network, e. g.:</p> <ul style="list-style-type: none"><li>● DNS (assigning of names to IP addresses)</li><li>● Firewall (protects the network subscriber against attacks from the Internet)</li><li>● Port forwarding</li></ul>
<b>TCP/IP (Transmission Control Protocol / Internet Protocol)</b>	<p>The Internet Protocol is the common language (protocol) of the network subscriber.</p>

## 7 Outputs

### 7.1 Outputs of the System 2020 3G

Extension modules with outputs extend your IQ SENSORNET System 2020 3G by the following types of outputs:

MIQ module	Outputs		
	Current (C)	Relays (R)	Valve (V)
MIQ/CR3	3	3	-
MIQ/CR	-	6	-
MIQ/C6	6	-	-
MIQ/CHV PLUS	-	-	1

#### Functioning of the outputs

- Relay outputs work as openers or closers.
- Current outputs provide a variable or fixed current value.
- Valve outputs switch on or off the compressed air for sensor cleaning functions.

#### 7.1.1 Settings for outputs

On the terminal of the IQ SENSORNET System 2020 3G

- Assign names for the outputs (see section 7.3).
- Link outputs with sensors (see section 7.4)
- Erase links between outputs and sensors (see section 7.5)
- Set up outputs (see section 7.6 and section 7.7)
- Check the conditions of the outputs (see section 7.9)

#### 7.1.2 Functions the outputs

#### Relays outputs (see section 7.6)

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



- *Sensor-controlled*
- *Manual control*
- *Alarm contact*

Basis information on the use of relay outputs is given in section 7.2.

**Current outputs  
(see section 7.7)**

- *Recorder*
- *PID controller*
- *Fixed current value*

**Valve outputs  
(see section 7.8)**

- *Cleaning*  
(Setting of the cleaning procedure in the menu *Settings of outputs and links*)
- *Sensor-controlled*  
(Setting of the cleaning procedure in the menu *Settings of sensors and diff. sensors* of the respective sensor)
- *Manual control*

## 7.2 Basic information on relay functions

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

- Monitoring (see section 7.2.1)
- Limit indicator (see section 7.2.2)
- Proportional output (see section 7.2.3)

### 7.2.1 Monitoring

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



For monitoring functions, use the relay preferably as normally closed (see section 7.6.1). In the case of an error, the relay opens. As a result, the monitoring function operates even if, for instance, the supply voltage fails.

### 7.2.2 Limit indicator

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

Limit indicators can be used in the following way:

- Monitoring a limiting value using a relay:  
when a limiting value (upper or lower limiting value) is exceeded or undercut, a relay switches. The *Open* or *Close* relay actions are possible in each case (see page 170).
- Monitoring two limiting values using two relays:  
If the upper limiting value is exceeded or undercut, a relay switches, and if the lower limiting value is exceeded or undercut, another relay switches. The *Open* or *Close* relay actions are possible in each case (see page 170).



If the simple monitoring function (*Open*, *Close*) with one or two relays is not sufficient, use proportional output (see section 7.2.3).

**Monitoring limiting values using one or two relays**

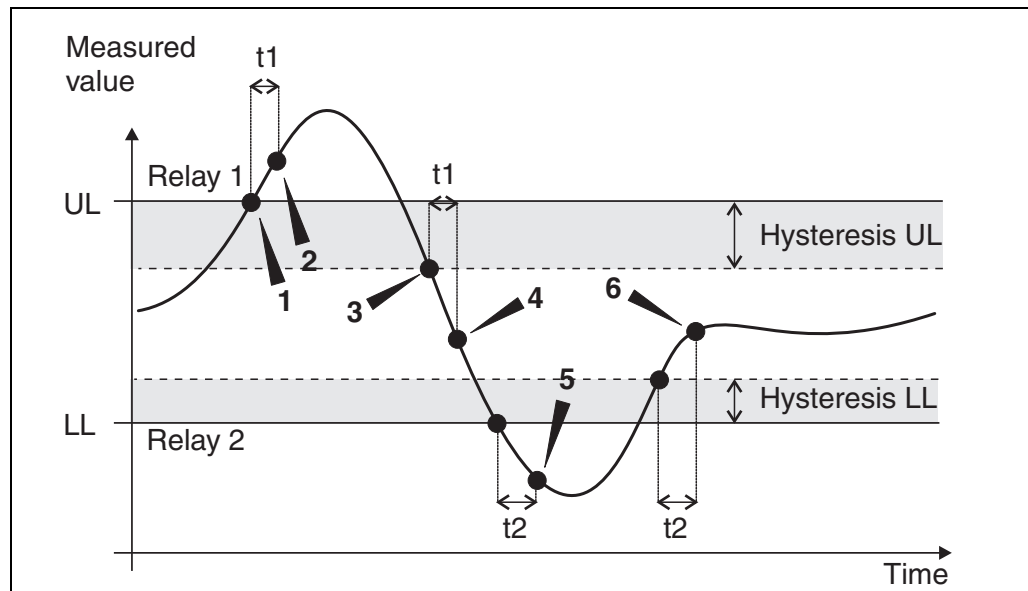


figure 7-1 Switching points for relays with the function of a limit indicator

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

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

### 7.2.3 Proportional output

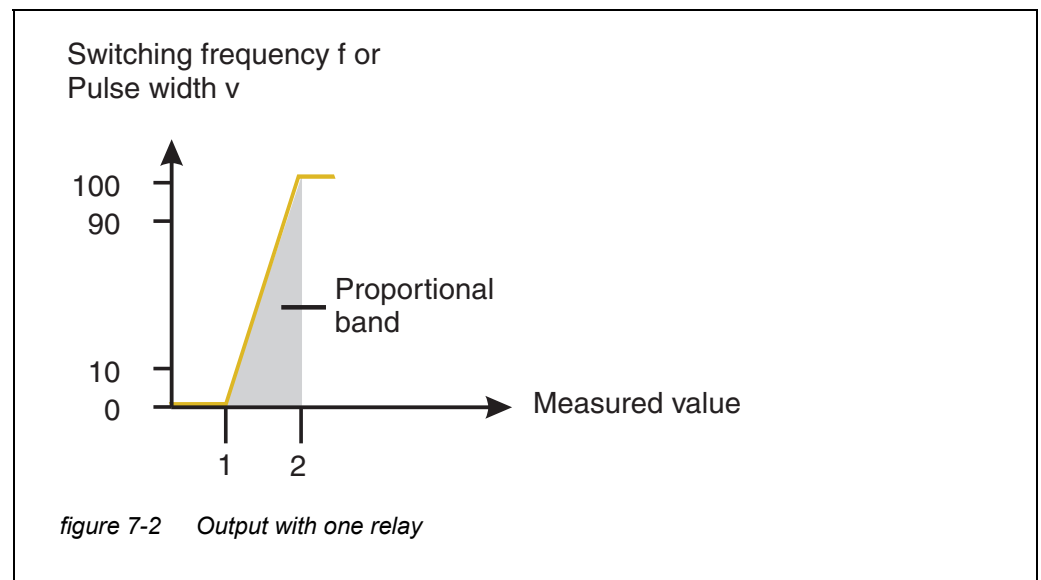
In the case of proportional output, a relay switches cyclically on and off in a defined measured value range (proportional range). At the same time, the relay switches with a:

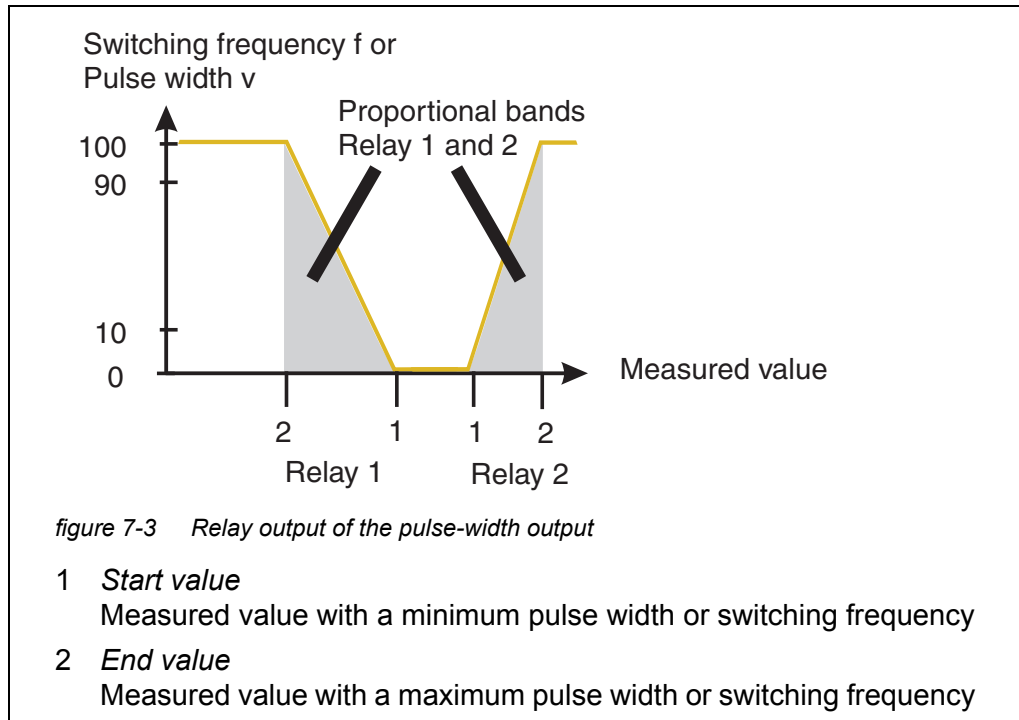
- duration of operation that corresponds to the measured value (pulse-width output, see page 172) or
- switching frequency (frequency output, see page 173).

Proportional outputs can be used in the following way:

- Output with one relay:  
An output range is defined with a *Start value* and an *End value*. No output takes place above and below the output range (see page 171).
- Output with two relays:  
An output range is defined for each relay with a *Start value* and an *End value*. One relay outputs in the upper output range and a further relay in the lower output range (see page 172).

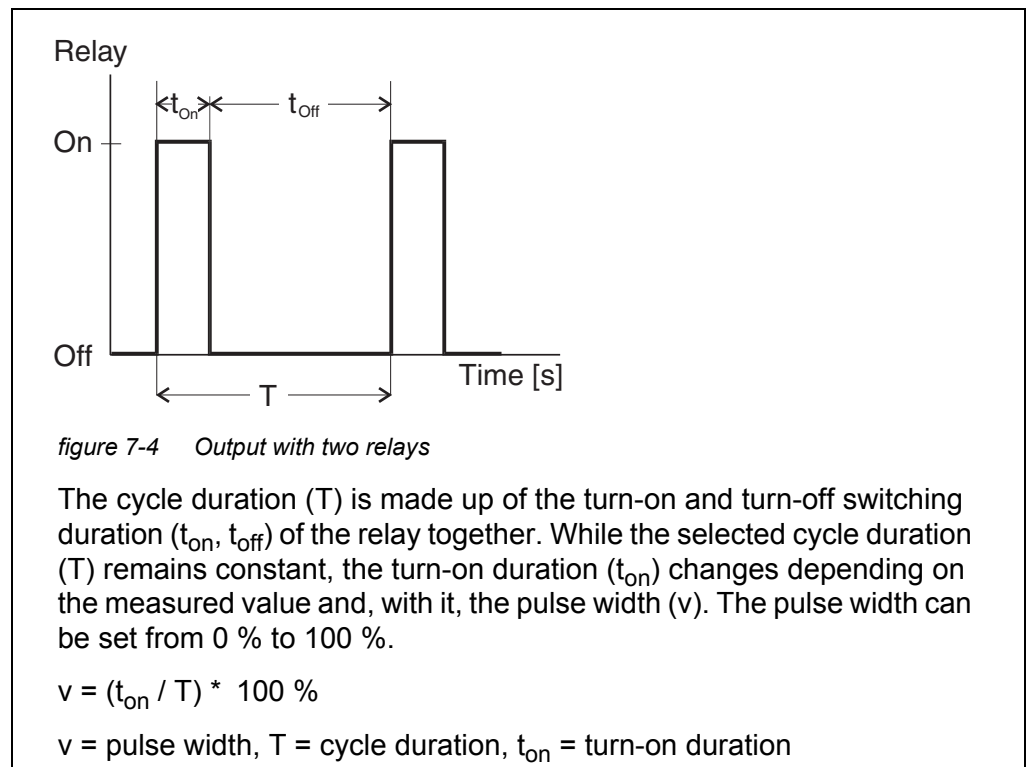
#### Output with one relay



**Output with two relays**

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

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



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

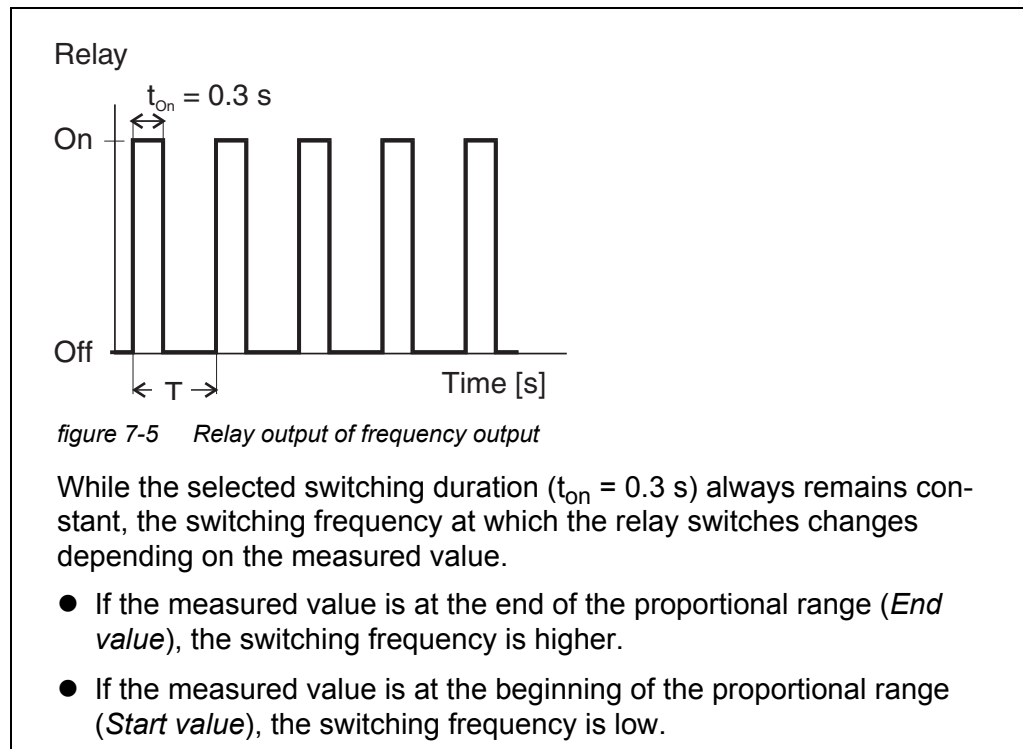


If the duration of the closing or opening pulse is shorter than 0.1 s, the relay remains open or closed for the complete cycle duration.

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

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

switched more often or less often.

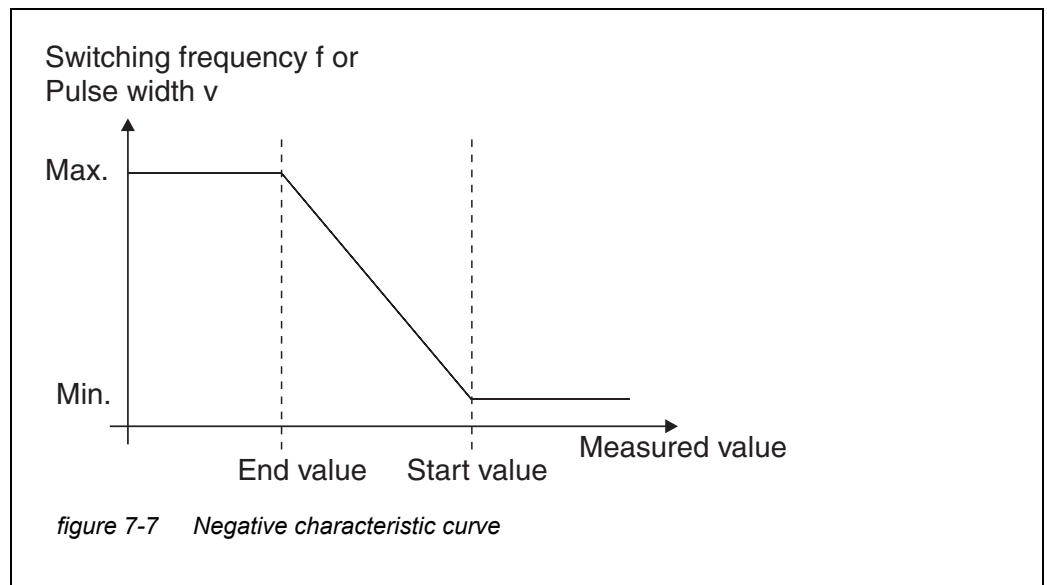
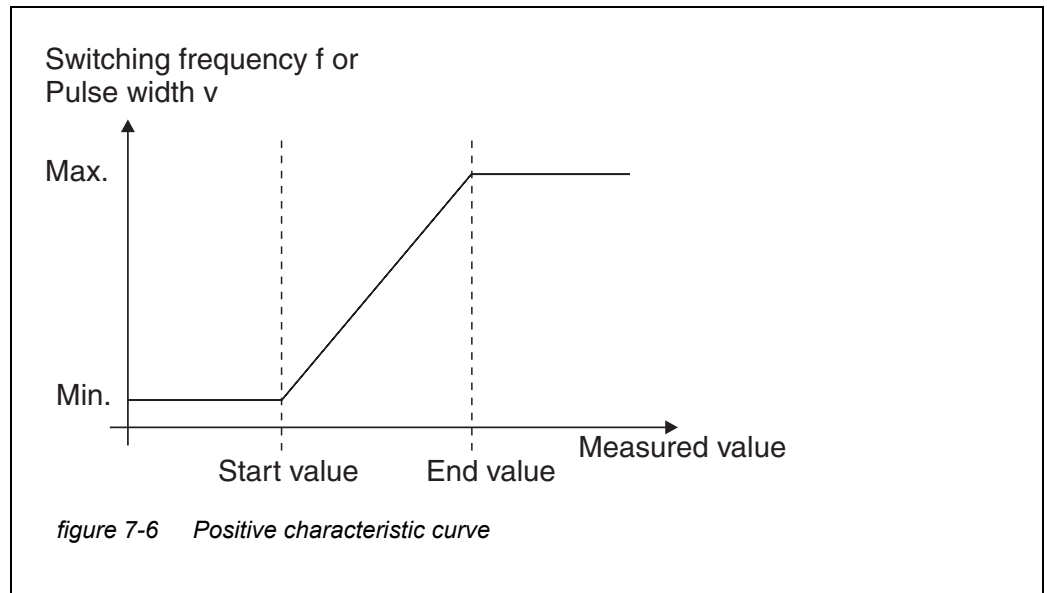


**Characteristic curves**

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

- Positive characteristic curve:  
Select the *End value* to be greater than the *Start value*.  
The turn-on duration or frequency increases with an increasing measured value (see page 176).
- Negative characteristic curve:  
Select the *End value* to be smaller than the *Start value*.  
The turn-on duration or frequency decreases with an increasing measured value (see page 177).

The maximum values for the pulse width or switching frequency are assigned to the *End value* value and the minimum values for turn-on duration or frequency are assigned to the *Start value* value.



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

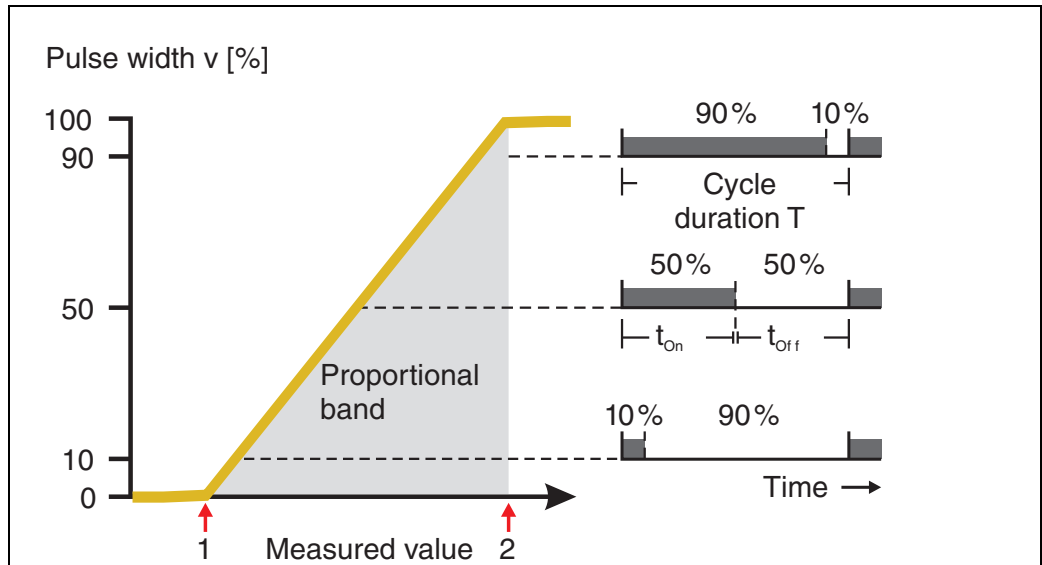


figure 7-8 Pulse width output

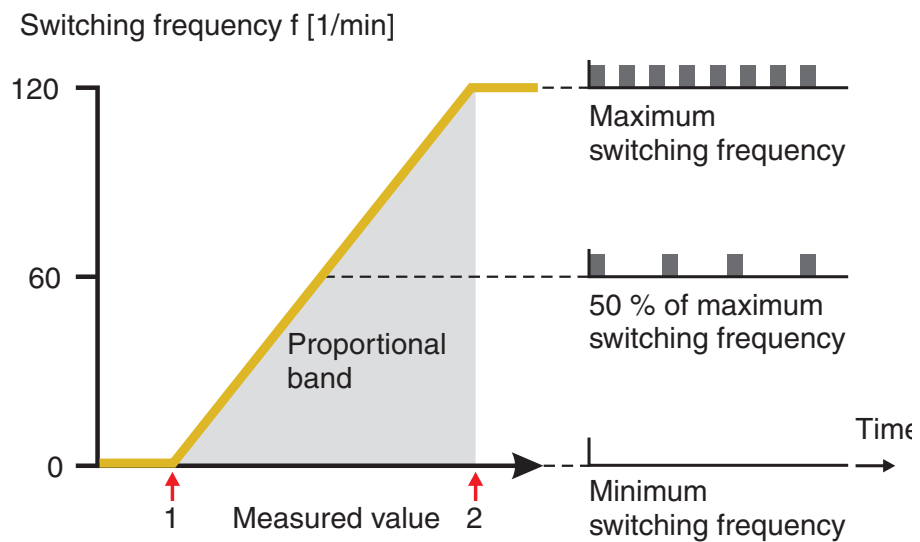


figure 7-9 Frequency output

- 1 **Start value**  
Measured value with a minimum pulse width or switching frequency
- 2 **End value**  
Measured value with a maximum pulse width or switching frequency



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

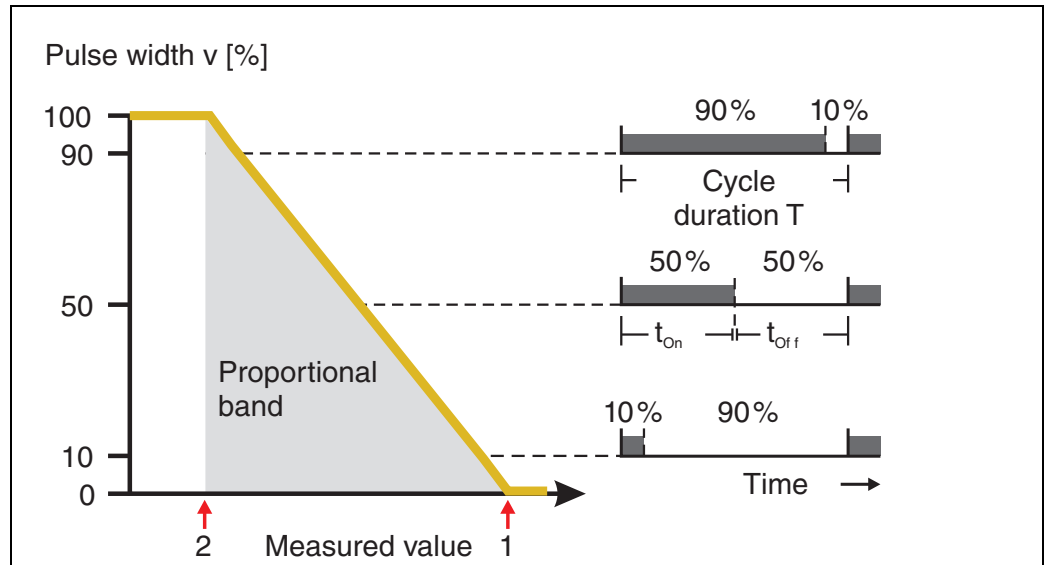


figure 7-10 Pulse width output

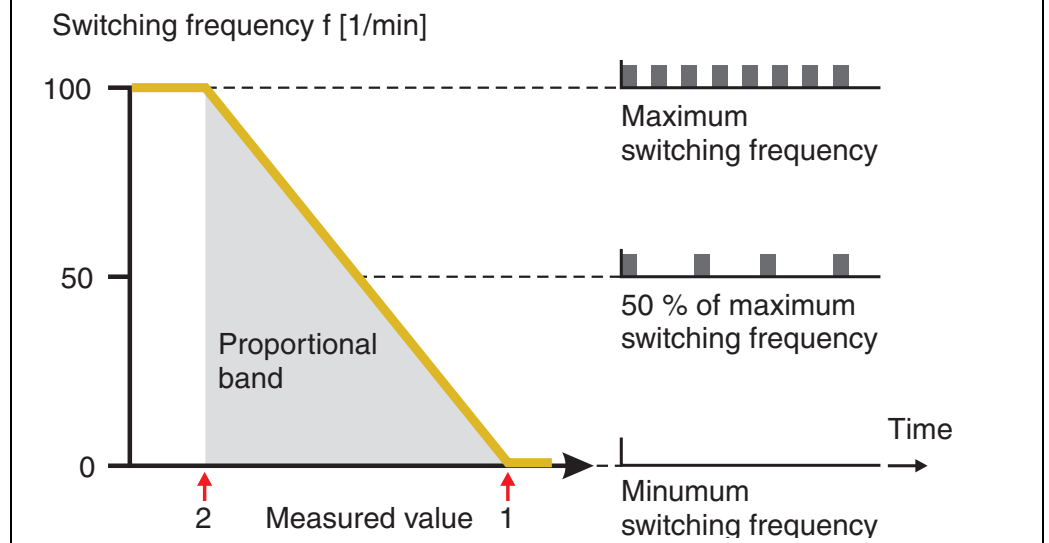


figure 7-11 Frequency output

- 1 *Start value*  
Measured value with a minimum pulse width or switching frequency
- 2 *End value*  
Measured value with a maximum pulse width or switching frequency

### 7.3 Entering / editing the name of an output

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

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

CONTROLLER		30 July 2016	10:14	👑	⚠	ℹ
Edit list of outputs						
No.	Model/Channel	Ser. no.	Name			
D01	MIQCR3/R1	99200004				
D01	MIQCR3/R2	99200004				
D01	MIQCR3/R3	99200004				
D01	MIQCR3/C1	99200004				
D01	MIQCR3/C2	99200004				
D01	MIQCR3/C3	99200004				

Select ⚡, edit output names ⌨

figure 7-12 *Edit list of outputs*

- 4 Select a letter, number or special character with **<▲▼◀▶>** and confirm with **<OK>**.
- 5 Complete the name of the output and confirm with **<OK>**.

## 7.4 Linking the output with a sensor

- 1 Open the *Settings* menu with **<S>**.
- 2 Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Settings of outputs and links*. The *Settings of outputs and links* display opens.
- 3 Press **<▲▼◀▶>** to highlight the **&** column and confirm with **<OK>**.
- 4 Select an output with **<▲▼◀▶>** and confirm with **<OK>**. The *Link with...* display opens.  
The display shows a list of sensors that can be linked.

CONTROLLER		26 Apr 2016	09 47			
Link with...						
No.	Sensor name	Measuring range				
503	99190001	COND	AutoRange			
Select sensor , confirm						

figure 7-13 Settings of outputs and links: Link with...

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



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

## 7.5 Deleting a link with an output

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

- 1 Open the *Settings* menu with **<S>**.
- 2 Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Settings of outputs and links*. The *Settings of outputs and links* display opens.
- 3 Press **<▲▼◀▶>** to highlight the **&** column and confirm with **<OK>**.
- 4 Select a linked output with **<▲▼◀▶>** and confirm with **<OK>**.

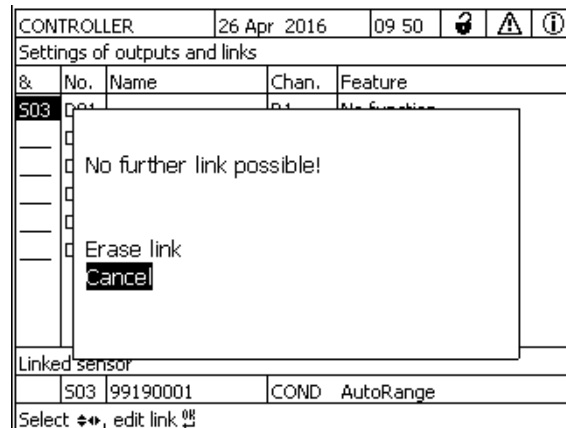


figure 7-14 *Settings of outputs and links: Erase link*

- 5 Select and confirm *Erase link* with **<▲▼◀▶>** and **<OK>**. A safety query appears.
- 6 Select and confirm *Erase link* with **<▲▼◀▶>** and **<OK>**. The link is deleted.

## 7.6 Setting the relay outputs (MIQ/CR3, MIQ/R6)

- 1 Call up the measured value display with **<M>**.
- 2 Open the *Settings* menu with **<S>**.
- 3 Using **<▲▼◀▶>**, highlight the menu item, *Settings of outputs and links*, and confirm with **<OK>**. The *Settings of outputs and links* display appears.
- 4 Using **<▲▼◀▶>**, highlight the *Feature* column. Confirm with **<OK>**.
- 5 Using **<▲▼◀▶>**, highlight a line for a relay output (Rx) in the column *Feature*. Confirm with **<OK>**.  
The *Settings of outputs and links* display opens.
- 6 Using **<▲▼◀▶>**, highlight the menu item, *Relay function*, and confirm with **<OK>**.

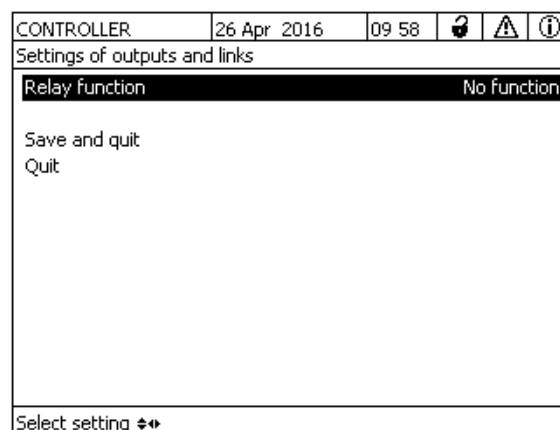


figure 7-15 Settings of outputs and links

- 7 Using **<▲▼◀▶>**, select one of the functions listed below. Confirm with **<OK>**.

Function	Description
<i>No function</i>	The relay output is not used.
<i>System monitoring</i>	see section 7.6.2
<i>Sensor monitoring</i>	see section 7.6.3
<i>Limit indicator</i>	see section 7.6.4
<i>Frequency controller</i>	see section 7.6.5
<i>Pulse-width output</i>	see section 7.6.6
<i>Cleaning</i>	see section 7.6.7
<i>Sensor-controlled</i>	see section 7.6.8
<i>Manual control</i>	see section 7.6.9
<i>Alarm contact</i>	see section 7.6.10

- 8 Make the settings for the relay outputs with **<▲▼◀▶>** and **<OK>**. The settings comprise the relay action (see section 7.6.1) and sensor dependent settings.
- 9 Using **<▲▼◀▶>** and **<OK>**, highlight and confirm *Save and quit*. The new settings are stored.

As soon as a function was selected for a relay output, you can select a relay action (see section 7.6.1).

### 7.6.1 Relay action

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

Settings	Explanations
<i>Open</i>	The relay should open on every event.
<i>Close</i>	The relay should close on every event.



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

### 7.6.2 System monitoring

**Function** The *System monitoring* function enables the monitoring of system errors. In order to set up the *System monitoring* function for a relay output, the relay output must not be linked with a sensor (see section 7.4).

It can be used to monitor the following system errors.

Settings	Settings	Selection	Explanations
	<i>Power failure</i>	<i>On</i> <i>Off</i>	The <i>Power failure On</i> function monitors the supply voltage in the IQ SENSORNET at the controller or the combination output module. If the voltage falls below the critical value, the relay switches.
	<i>Communication</i>	<i>On</i> <i>Off</i>	The <i>Communication On</i> function monitors the functioning of the controller and the communication to the combi output module.
	<i>Collective error message</i>	<i>On</i> <i>Off</i>	<i>Collective error message On</i> function simultaneously monitors the proper functioning of all sensors and the functioning of the combination output module to be monitored. (for details, see below this table)
	<i>Action</i>	<i>Open</i>	For all functions of the <i>System monitoring</i> , the relay action is set to <i>Open</i> .

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

- One of the sensors properly registered at the controller does not supply a valid main measured value
- One of the sensors properly registered at the controller does not supply a valid secondary measured value
- The monitoring combi output module has not received any new data from the controller for two minutes.

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

In the following cases, the relay does not open despite an invalid measured value:

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

### 7.6.3 Sensor monitoring

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

In order to set up the *Sensor monitoring* function for a relay output, the relay output must be linked with a sensor (see section 7.4).

Settings	Setting	Selection	Explanation
	<i>Error</i>	<i>Special</i>	Special sensor errors are monitored and can prompt a relay action.
		<i>All</i>	All sensor errors (special ones and general ones) are monitored and can prompt a relay action.
		<i>Off</i>	Sensor errors are not monitored.
	<i>Mainten. Condition</i>	<i>On</i> <i>Off</i>	Switching on and off the maintenance condition (see section 7.11) is monitored and can prompt a relay action.
	<i>Action</i>	<i>Open</i> <i>Close</i>	Relay action (see section 7.6.1)



Preferably set up the relay output for monitoring functions as an opener (*Action Open*, see section 7.6.1).

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

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

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

### 7.6.4 Limit indicator

**Function** The characteristic of the limit indicator is laid down in the *Limit value UL*, *Limit*



*value LL*, *Hysteresis UL* and *Hysteresis LL* settings. The fundamentals of the function are described in the introductory chapter (see section 7.2.2).

In order to set up the *Limit indicator* function for a relay output, the relay output must be linked with a sensor (see section 7.4).

Settings	Setting	Selection/Values	Explanation
	<i>Limit values</i>	<i>UL main variable</i> <i>LL main variable</i>  <i>UL adjoining var.</i> <i>LL adjoining var.</i>	<i>Main variable</i> designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). <i>Adjoining variable</i> designates an additional measured parameter (e.g. temperature).
	<i>Limit value UL</i>	Upper or lower limiting value	Minimum difference between the upper and lower limit value: 5 % of the measuring range
	<i>Limit value LL</i>	Any value within the measuring range (sensor-dependent)	
	<i>Hysteresis UL</i>	0 - 5% of the measuring range	Hysteresis for <i>Limit value UL</i> and <i>Limit value LL</i> .
	<i>Hysteresis LL</i>		
	<i>Behavior at error</i>	<i>Open</i> <i>Close</i> <i>Unchanged</i>	The relay opens, closes or remains unchanged in the case of system errors or sensor errors (see page 202).
	<i>Action</i>	<i>Open</i> <i>Close</i>	Relay action (see section 7.6.1)
	<i>Switching delay</i>	0 ... 3600 s	The time period for which a limiting value must be exceeded before the relay operates. Prevents frequent switching for measured values that are close to the limiting value.

### 7.6.5 Frequency controller

**Function** The characteristic of the frequency output is laid down in the *Start value*, *End value*, *Frequency (f) min.* and *Frequency (f) max.* settings. The fundamentals of the function are described in the introductory chapter (see section 7.2.3).

In order to set up the *Frequency controller* function for a relay output, the relay output must be linked with a sensor (see section 7.4).

Settings	Setting	Selection/Values	Explanation
	<i>Measured variable</i>	<i>Main variable</i> <i>Adjoining variable</i>	<i>Main variable</i> designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). <i>Adjoining variable</i> designates an additional measured parameter (e.g. temperature).
	<i>Start value</i>	within the measuring range (sensor-dependent)	Minimum spacing: 5 % of the measuring range
	<i>End value</i>		
	<i>Frequency (f) min.</i>	0 to 120 1/min	Minimum spacing: 10 1/min
	<i>Frequency (f) max.</i>		
	<i>Frequency with error</i>	0 to 120 1/min	In case of system errors or sensor errors (see page 202), the relay switches with the frequency specified.
	<i>Action</i>	<i>Open</i> <i>Close</i>	Relay action (see section 7.6.1)

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

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

### 7.6.6 Pulse-width output

**Function** The characteristic of the pulse width output is laid down in the *Start value*, *End value*, *Pulse width (v) min.* and *Pulse width (v) max.* settings. The fundamentals of the function are described in the introductory chapter (see section 7.2.3).

In order to set up the *Pulse-width output* function for a relay output, the relay output must be linked with a sensor (see section 7.4).

Settings	Setting	Selection/Values	Explanation
	<i>Measured variable</i>	<i>Main variable</i> <i>Adjoining variable</i>	<i>Main variable</i> designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). <i>Adjoining variable</i> designates an additional measured parameter (e.g. temperature).
	<i>Start value</i>	within the measuring range (sensor-dependent)	Minimum spacing: 5 % of the measuring range
	<i>End value</i>		
	<i>Pulse width (v) min.</i>	0 ... 100 %	Minimum spacing: 10 % of the <i>Cycle duration (T)</i>
	<i>Pulse width (v) max.</i>		
	<i>Cycle duration (T)</i>	5 ... 100 s	Length of the switching period T $T = (t_{on} + t_{off})$
	<i>Error pulse width</i>	0 ... 100 %	In case of system errors or sensor errors (see page 202), the relay switches with the pulse-width specified.
	<i>Action</i>	<i>Open</i> <i>Close</i>	Relay action (see section 7.6.1)

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

### 7.6.7 Cleaning



If the valve module MIQ/CHV PLUS is used, it is best to set the *Cleaning* function directly at the valve output (V) of the MIQ/CHV PLUS (see operating manual MIQ/CHV PLUS).

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

In order to set up the *Cleaning* function for a relay output, the relay output must be linked with a sensor (see section 7.4).

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

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

During the cleaning cycle the *Clean* display flashes. The outputs linked with this sensor are frozen. The maintenance condition (see section 7.11) is active.

After the *Cleaning duration*, the relay is opened. During the following *Adjustment time* the outputs remain blocked.

The outputs linked with this sensor are only released when the cleaning cycle is complete. The *Clean* display disappears. The maintenance condition is finished.

**Testing the operativeness** You can test the operativeness of the cleaning system as follows: Manually open or close the relay with the *Manual control* function (see section 7.6.9) and, while doing so, check the behavior of the cleaning system.

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

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

Setting	Selection/Values	Explanation
<i>Adjustment time</i>	0 ... 900 s	Time extension to allow the sensor to adjust to the test sample after cleaning.

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

<i>Cleaning interval</i>	<i>Cleaning duration</i>	<i>Adjustment time</i>
≤ 10 min	max. 60 s	max. 120 s
≤ 20 min	max. 180 s	max. 300 s



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

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

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

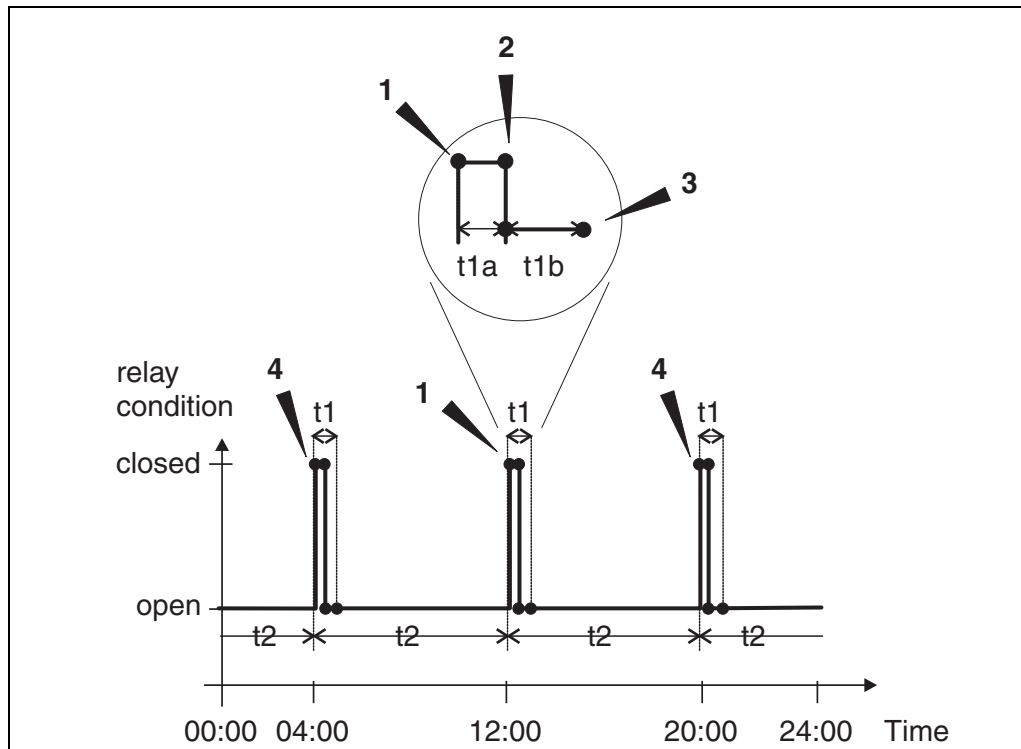


figure 7-16 Cleaning

- 1 Reference time  
Begin of a cleaning cycle (**t1**)  
Begin of the specified *Cleaning duration* (**t1a**)
- 2 End of the specified *Cleaning duration* (**t1a**)  
Begin of the specified *Adjustment time* (**t1b**)
- 3 End of the specified *Adjustment time* (**t1b**)  
End of the cleaning cycle (**t1**)
- 4 Reference time ± *Cleaning interval* (**t2**)  
Begin of a cleaning cycle

**Canceling the cleaning**

A running cleaning cycle is canceled:

- Automatic
  - if the sensor switches to the inactive condition during the cleaning cycle
- Manual
  - By pressing the **<C>** key
  - By switching on the maintenance condition

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

If the cleaning cycle is canceled automatically, the outputs linked to the sensor are released immediately.

If the cleaning cycle is canceled manually, the sensor is in the maintenance con-

dition. The linked outputs are only released after the maintenance condition was terminated manually.

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



In case of a power failure, all relays open. The cleaning cycle is canceled. The outputs linked with the sensor change to the non-active condition (see section 7.10.2). As soon as the power is available, the outputs are released again. The next cleaning cycle will be performed at the time set up.

### 7.6.8 Sensor-controlled

With the *Sensor-controlled* function, the relay is controlled by a linked sensor.

**Prerequisites** ● Sensor that sends signals to trigger a cleaning cycle, e.g. UV/VIS sensor

Settings	Setting	Selection/Values	Explanation
	<i>Pulse length</i>	<i>Automatic</i>	The duration of the cleaning procedure with air is programmed in the sensor. The relay automatically takes over from the sensor the cleaning duration.
		0.5 s 1 s 2 s 3 s	The relay finishes the cleaning procedure after the interval selected here.



Set up the cleaning process in the menu *Settings of sensors and diff. sensors* of the relevant sensor.

**7.6.9 Manual control**

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

Setting	Selection/Values	Explanation
<i>Relay function</i>	<i>Manual control</i>	The selected relay action is carried out with <i>Save and quit</i> .
<i>Action</i>	<i>Open</i> <i>Close</i>	Relay action (see section 7.6.1)



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

**7.6.10 Alarm contact**

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

Setting	Selection/Values	Explanation
<i>Relay function</i>	<i>Alarm contact</i>	The selected relay action is carried out with <i>Save and quit</i> .
<i>Action</i>	<i>Open</i> <i>Close</i>	Relay action (see section 7.6.1)

**7.7 Setting the current outputs (MIQ/CR3, MIQ/C6)**

- 1 Call up the measured value display with **<M>**.
- 2 Open the *Settings* menu with **<S>**.
- 3 Using **<▲▼◀▶>**, highlight the menu item, *Settings of outputs and links*, and confirm with **<OK>**. The *Settings of outputs and links* display appears.
- 4 Using **<▲▼◀▶>**, highlight the *Feature* column. Confirm with **<OK>**.



- 5 Using <▲▼◀▶>, highlight a line for a current output (Cx) in the column *Feature*. Confirm with <OK>. The *Settings of outputs and links* display opens.
- 6 Using <▲▼◀▶>, highlight the menu item, *Current output*, and confirm with <OK>.

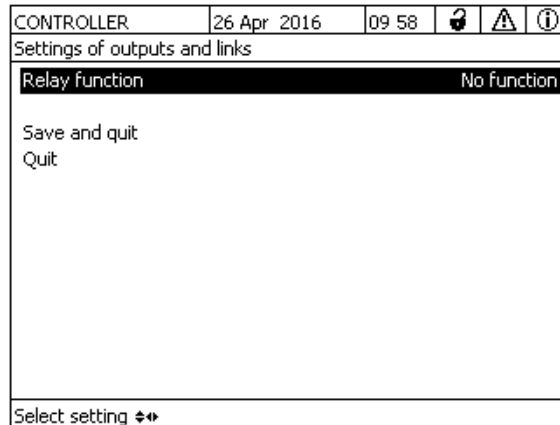


figure 7-17 Settings of outputs and links

- 7 Select and confirm a function with <▲▼◀▶> and <OK>.

Function	Settings
<i>No function</i>	The current output is not used.
<i>Recorder</i>	see section 7.7.1
<i>PID controller</i>	see section 7.7.2
<i>Fixed current value</i>	see section 7.7.3

- 8 Make the settings for the current output with <▲▼◀▶> and <OK>.
- 9 Using <▲▼◀▶> and <OK>, highlight and confirm *Save and quit*. The new settings are stored.

### 7.7.1 Recorder

**Function** The measured values of the linked sensor at the current output are set up as current intensity in the *Recorder* application. The output of measured values is laid

down in the *Recorder type*, *Start value* and *End value* settings.

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

### 7.7.2 PID controller

**Function** The *PID controller* function can use an output as a controller output. The regulator can be configured as a **Proportional** regulator with switchable **Integral** and **Differential** regulator parts (**PID Controller**).

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

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

with:

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

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

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

$I_{Controller}$  Current on the controller output at time  $t$

$I_0$  Current on the output if  $x_{actual} = x_{set}$

$K$  Amplification

$X_p$  Proportional range

$x_e$  Control difference

$x_{actual}$  Actual value (current measured value)

$x_{set}$  Set value

$ti$  Integral algorithm

$td$  Differential control part

$t$  Time

$I_{min}$  Lower current limitation

$I_{max}$  Upper current limitation

The adjustable control parameters are  $x_{target}$ ,  $I_0$ ,  $X_p$ ,  $I_{min}$ ,  $I_{max}$ ,  $ti$  and  $td$  (see setting table on page 198).

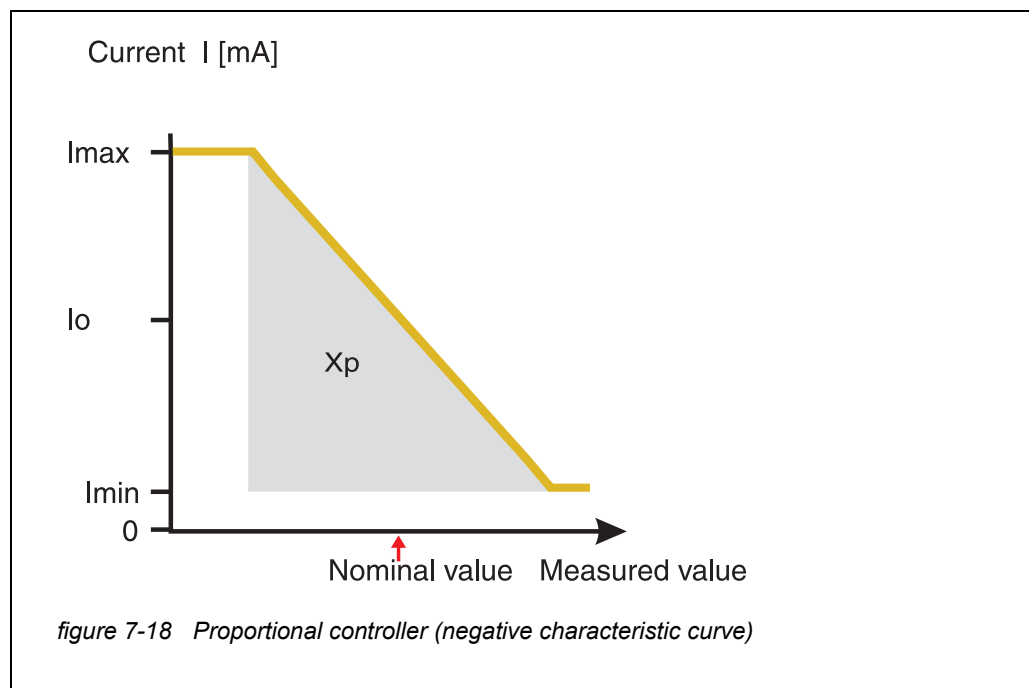
By activating or deactivating the **Integral** ( $ti$ ) and **Differential** ( $td$ ) controller part,

the following controller types can be configured:

Regulator type	$t_d$ [s]	$t_i$ [s]
P controller	0	0
PI controller	0	1 to 9999
PD controller	1 to 9999	0
PID controller	1 to 9999	1 to 9999

**Characteristic curve of the proportional controller**

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

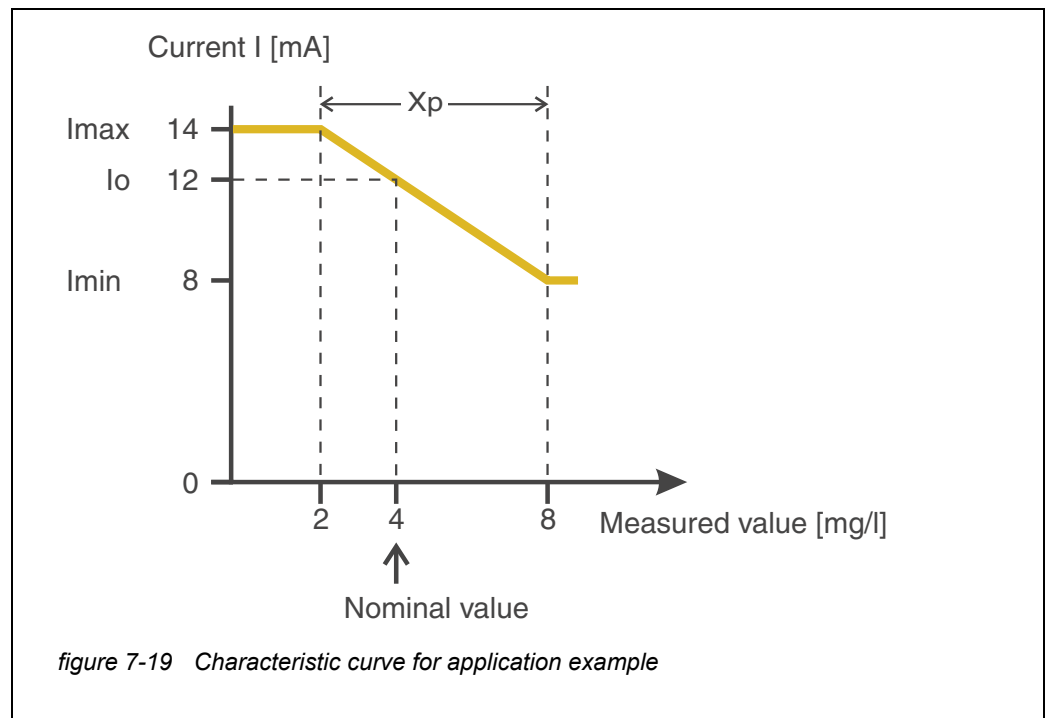


The proportional range  $X_p$  is limited by the measurement range of the linked sensor. If a value is entered for the parameter  $X_p$  that is greater than zero, the controller has a positive characteristic curve (example figure 7-18). To obtain a positive characteristic curve, a negative value must be entered for  $X_p$ .

- Application example**
- Regulation of the oxygen concentration
  - Sensor: TriOxmatic 700 IQ (measuring range: 0 to 60 mg/l)

Control parameter	Value
Nominal value	4 mg/l
$X_p$	10 % of the measuring range or 6 mg/l
$I_{min}$	8 mA
$I_{max}$	14 mA
$I_o$	12 mA
$t_i$	0 s (no I algorithm)
$t_d$	0 s (no D algorithm)

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



The controller works with the following amplification:

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

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

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

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

The highest concentration at which the controller still works in the proportional range is 8 mg/l (corresponding to  $I_{\text{min}} = 8 \text{ mA}$ ) and the lowest is 2 mg/l (corresponding to  $I_{\text{max}} = 14 \text{ mA}$ ).

Settings	Setting	Selection/Values	Explanation
	<i>Measured variable</i>	<i>Main variable</i> <i>Adjoining variable</i>	<i>Main variable</i> designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). <i>Adjoining variable</i> designates an additional measured parameter (e.g. temperature).
	<i>Nominal value</i>	within the measuring range (sensor-dependent)	Nominal value the measured value is regulated to
	<i>Xp</i>	5 ... 100 % -5 ... -100 % % of the measuring range	Proportional range of the controller. Negative values result in a positive characteristic curve.
	<i>Imin</i>	0 ... 20 mA	Lower current limitation *
	<i>Imax</i>	0 ... 20 mA	Upper current limitation *  * Note: Spacing between <i>Imin</i> and <i>Imax</i> : at least 5 mA

Setting	Selection/Values	Explanation
<i>Io</i>	0 ... 20 mA	Current value on the output if the measured value equals the <i>Nominal value</i>
<i>ti</i>	0 ... 9999 s	Hold-back time: Integral part of the controller (0 = not effective)
<i>td</i>	0 ... 9999 s	Reset time: Differential part of the controller (0 = not effective)
<i>Behavior at error</i>	<i>Fixed current value</i>	In the case of an error, the current output supplies the current value defined in the <i>Current with error</i> field (any in the range 0 ... 21 mA).
	<i>Unchanged</i>	In the case of an error, the current on the output remains unchanged.

### 7.7.3 Fixed current value

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

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



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

### 7.8 Setting the valve output (MIQ/CHV Plus)

- 1 Call up the measured value display with **<M>**.
- 2 Open the *Settings* menu with **<S>**.
- 3 Using **<▲▼◀▶>**, highlight the menu item, *Settings of outputs and links*, and confirm with **<OK>**. The *Settings of outputs and links* display appears.
- 4 Using **<▲▼◀▶>**, highlight the *Feature* column. Confirm with **<OK>**.
- 5 Highlight the cell for the valve output (Vx) with **<▲▼◀▶>** in the *Feature* column and confirm with **<OK>**. The *Settings of outputs and links* display opens.
- 6 Using **<▲▼◀▶>**, highlight the menu item, *Valve function*, and confirm with **<OK>**.

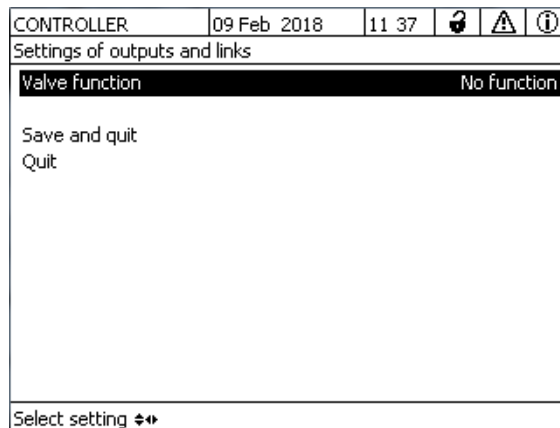


figure 7-20 150 - Settings of outputs and links

- 7 Using **<▲▼◀▶>**, select one of the functions listed below. Confirm with **<OK>**.



The settings and functions correspond to the setting for the relays.

Function	Description
<i>No function</i>	The valve output is not used.
<i>Cleaning</i>	see section 7.6.7
<i>Sensor-controlled</i>	see section 7.6.8



Function	Description
<i>Manual control</i>	see section 7.6.9

- 8 Make the settings for the relay outputs with <▲▼◀▶> and <OK>.
- 9 Highlight and confirm *Save and quit* with <▲▼◀▶> and <OK> . The new settings are stored.

### 7.9 Checking the condition of the outputs

This function provides a simple overview of the conditions of all outputs of the combination output module.

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

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

- 1 Call up the measured value display with <M>.
- 2 Open the *Settings* menu with <S>.
- 3 Using <▲▼◀▶>, highlight the menu item, *Service*, and confirm with <OK>. The *Service* dialog window opens.
- 4 Using <▲▼◀▶>, highlight the menu item, *List of all components*, and confirm with <OK>. The *List of all components* dialog window opens.
- 5 Highlight the required component with <▲▼◀▶> (column *Model*, entry *MIQCR3*) and confirm with <OK>. The *394 - Status of output channels* window opens.

S284-24160001		26 Apr 2016	10 43			
Status of output channels						
No.	Name	Chan.	Status			
D01	GW Lft 1	R1	open			
D01	GW Lft 2	R2	open			
D01	GW Lft 3	R3	open			
D01	O2 Bel 1	C1	6.78 mA			
D01	O2 Bel 2	C2	0.00 mA			
D01	O2 Bel 3	C3	10.13 mA			
Return ESC						

figure 7-21 394 - Status of output channels

- 6 Exit the 394 - *Status of output channels* window with **<M>** or **<ESC>**.

## 7.10 Behavior of linked outputs

### 7.10.1 Behavior in case of error

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

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

Output	Menu
<i>Frequency controller</i>	<i>Frequency with error</i> (see section 7.6.5)
<i>Pulse-width output</i>	<i>Error pulse width</i> (see section 7.6.6)
<i>Recorder</i>	<i>Current with error</i> (see section 7.7.1)

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

- The linked sensor does not provide any valid measured value (display of *Init*, *Error*, "----", or *OFL*)
- Communication with the controller is interrupted for more than 2 minutes.
- The supply voltage for the controller is too low.
- In the function *Recorder*, the measured value of the linked sensor is outside the range between *Start value* and *End value*.

### Freezing the conditions of the outputs

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

- The linked sensor is in the maintenance condition (display of *Cal*, *Clean*, or flashing measured value).
- Communication with the controller is temporarily interrupted. After an interruption of 2 minutes the output changes to the behavior defined for error.

### Restoring the normal functioning

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

### 7.10.2 Behavior in non-operative condition

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

An output becomes non-operative in case of

- Power failure  
(As soon as the supply voltage is sufficient again, the non-operative condition of the outputs ends. The outputs function as specified by the user again.)
- Erasing a link to a sensor
- Changing the *Measuring mode* sensor setting for a linked sensor
- Changing the *Measuring range* sensor setting for a linked sensor



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

**Settings in the  
non-active  
condition**

**Current output**

Current: 0 A

**Relay output**

Relay: Open

### 7.11 Maintenance condition of the sensors

The maintenance condition of the sensors is used for calibrating, cleaning, servicing and repairing (removing and exchanging) the sensors.

In the maintenance condition

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

The maintenance condition is automatically activated

- during calibration. After calibration the sensor remains in the maintenance condition until the maintenance condition is switched off manually (see section 7.11.2)
- during the cleaning cycle (see section 7.6.7)

If you want to calibrate, clean, service or repair (remove and exchange) a sensor, switch on the maintenance condition manually (see section 7.11.1).

When you have finished cleaning, servicing or repairing the sensor, switch off the maintenance condition manually (see section 7.11.2).



If the maintenance condition is activated for a sensor, the measured values or status indicators of this sensor flash in the measured value display.

### 7.11.1 Switching on the maintenance condition

- 1 Call up the measured value display with **<M>**.
- 2 Select the sensor you want to switch on the maintenance condition for with **<▲▼◀▶>**. The measured values of the sensor do not flash.
- 3 Open the *Display/Options* menu with **<OK>**.
- 4 Using **<▲▼◀▶>**, highlight the menu item *Switch maintenance condition on/off* or *Maintenance Sensor S0x* 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 measured values of the sensor flash.

### 7.11.2 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 measured values of the sensor flash.
- 3 Open the *Display/Options* menu with **<OK>**.
- 4 Using **<▲▼◀▶>**, highlight the menu item *Switch maintenance condition on/off* or *Maintenance Sensor S0x* 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 measured values of the sensor do not flash.

## 8 Maintenance and cleaning

### 8.1 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

### 8.2 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.



The housings are made of synthetic material. Thus, avoid contact with acetone and similar detergents. Remove any splashes immediately.

Never use high-pressure cleaners to clean components of the IQ SENSORNET.

#### 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.

## 9 What to do if ...

### 9.1 Information on errors

**Log book** The IQ SENSORNET 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 4.5 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.

#### Status LED of the MIQ/TC 2020 3G

In addition to the logbook entries, pending errors and alarms or system faults are indicated by the flashing of the status LED on the MIQ/TC 2020 3G (see section 1.4.4).

### 9.2 Diagnosing faults in the voltage supply

#### 9.2.1 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 4.5.

- **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 9.2.2 MEASURING THE VOLTAGE).



The relationship between the supply voltage, the LED status and the log book entries is described in the section 10.1 GENERAL SYSTEM DATA.

#### 9.2.2 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 (figure 9-1 on page 208):

- Outside on the free contacts on the front of the SENSORNET module
- Inside on the SENSORNET connections of the terminal strip (see section 9.2.2 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, MIQ/R6). 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 figure 9-1).

**Tapping points for measuring the voltage**

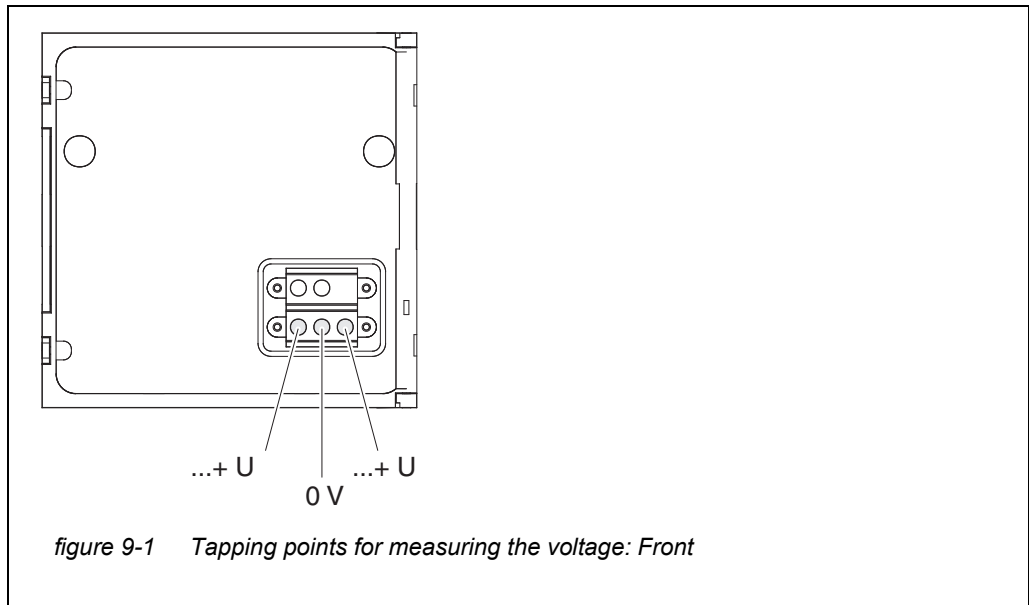


figure 9-1 Tapping points for measuring the voltage: Front

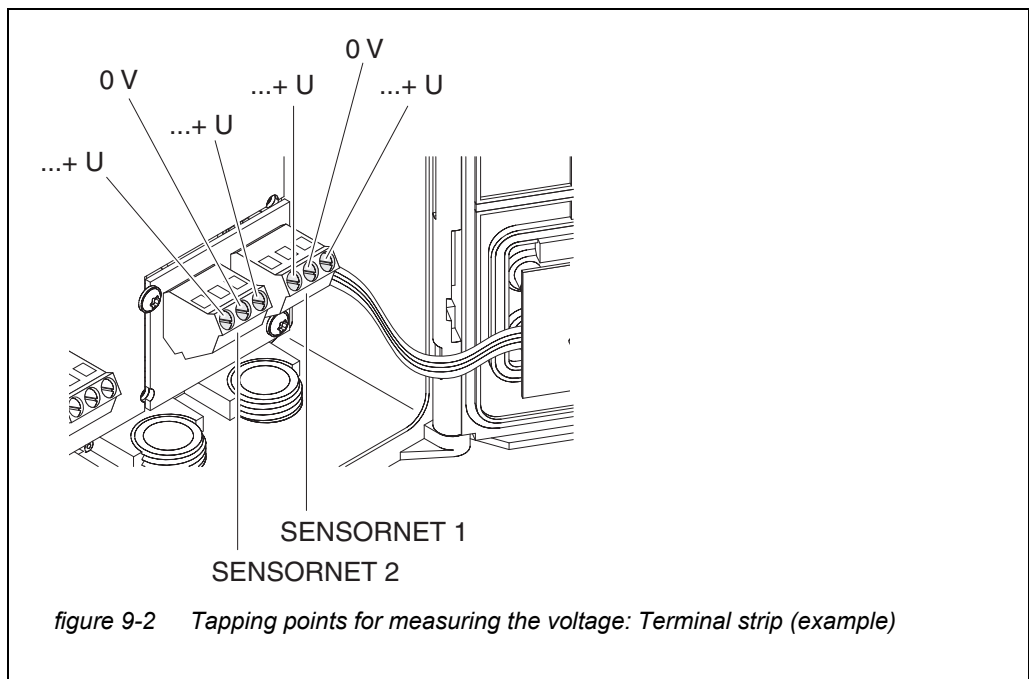


figure 9-2 Tapping points for measuring the voltage: Terminal strip (example)



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 10.1.



### 9.2.3 Tips for clearing errors in the voltage supply



Admissible values for the internal voltage supply (+U) are given in section 10.1.

Supply voltage not present or in the warning or error range	Cause	Remedy
	<ul style="list-style-type: none"> <li>– Number of power MIQ power supply modules is not sufficient</li> </ul>	<ul style="list-style-type: none"> <li>– Check power rating. If necessary, install another MIQ power supply module (for details of how to do this, see section 3.5 DRAWING UP THE POWER RATING).</li> </ul>
	<ul style="list-style-type: none"> <li>– Cable section is too long</li> </ul>	<ul style="list-style-type: none"> <li>– Check length of the cable section. If necessary, install another MIQ power supply module (for details of how to do this, see section 3.5.1 EFFECT OF THE CABLE LENGTH).</li> </ul>
	<ul style="list-style-type: none"> <li>– Electrical connection between MIQ power supply module and component is defective (distributed mounting)</li> </ul>	<ul style="list-style-type: none"> <li>– Check cable connection step-by-step starting with the MIQ power supply module, and replace defective cable sections.</li> <li>– Check contacts on the MIQ modules (stack mounting). Clean any dirty contacts. Carefully bend back any contact springs that have been pressed flat or bent (pay attention to sufficient spring tension).</li> <li>– Tighten all screws on the terminals.</li> </ul>
Malfunctions despite adequate supply voltage on both +U wires	Cause	Remedy
	<ul style="list-style-type: none"> <li>– Signal transmission faulty</li> </ul>	<ul style="list-style-type: none"> <li>– For terminal components, check/correct their seating on the MIQ module.</li> <li>– Check the log book for error messages (for details on the log book, see section 4.5).</li> <li>– Check/correct the position of the SN terminator switches (for the correct settings, see section 3.10.1).</li> <li>– Check the total line length within the IQ SENSORNET. For a total line length of more than 1000 m, an MIQ/JBR signal amplifier module is required.</li> </ul>

Cause	Remedy
<ul style="list-style-type: none"> <li>– Component is defective</li> </ul>	<ul style="list-style-type: none"> <li>– Check the log book for error messages (for details on the log book, see section 4.5).</li> <li>– If no log book entry exists, send the component back.</li> </ul>

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

Cause	Remedy
IQ sensors	
<ul style="list-style-type: none"> <li>– IQ sensor connection cable is not correctly connected or defective</li> </ul>	<ul style="list-style-type: none"> <li>– Check the IQ sensor cable connection on the terminal strip.</li> <li>– Check the IQ sensor cable and, if necessary, replace it. Another IQ sensor can be used for the test.</li> </ul>
<ul style="list-style-type: none"> <li>– IQ sensor is defective</li> </ul>	<ul style="list-style-type: none"> <li>– Test the IQ sensor at another measurement location.</li> <li>– If the IQ sensor still does not work, contact Service.</li> </ul>

Cause	Remedy
Other components	
<ul style="list-style-type: none"> <li>– Component is defective</li> </ul>	<ul style="list-style-type: none"> <li>– If possible, test component at another measurement location.</li> <li>– If the IQ component still does not work, contact Service.</li> </ul>

### 9.3 Other errors

**Status LED of the MIQ/TC 2020 3G flashes**

Cause	Remedy
<ul style="list-style-type: none"> <li>– A fault is present</li> </ul>	Fault remedy according to the logbook: <ul style="list-style-type: none"> <li>– More detailed information on the current fault and its remedy is given in the logbook (see section 4.5.2)</li> </ul>

<b>The system no longer reacts to entries</b>	<b>Cause</b> <ul style="list-style-type: none"> <li>– System error</li> </ul>	<b>Remedy</b> Reset the system: <ul style="list-style-type: none"> <li>– Switch off the power supply and switch it on again after 10 s</li> </ul>
<b>"Error" in the measured value display</b>	<b>Cause</b> <ul style="list-style-type: none"> <li>– Communication with the IQ Sensor interrupted</li> </ul>	<b>Remedy</b> <ul style="list-style-type: none"> <li>– Check the cable connection</li> </ul>
	<ul style="list-style-type: none"> <li>– Error in the IQ sensor</li> </ul>	<ul style="list-style-type: none"> <li>– Disconnect the IQ sensor and reconnect it after 10 s</li> </ul>
<b>Local settings cannot be displayed</b>	<b>Cause</b> <ul style="list-style-type: none"> <li>– The contacts of two MIQ modules are not correctly connected to each other</li> </ul>	<b>Remedy</b> <ul style="list-style-type: none"> <li>– Clean the contacts</li> </ul>
<b>"no sensor" in the measured value display though an IQ sensor is connected</b>	<b>Cause</b> <ul style="list-style-type: none"> <li>– Local display has been set up and the IQ sensor is not included in the local display</li> </ul>	<b>Remedy</b> <ul style="list-style-type: none"> <li>– Add the sensor to the local display (see section 5.9)</li> <li>– Switch to the <i>All sensors</i> display with <i>Display local values or all values</i> (see section 4.4.6)</li> </ul>
<b>The selected system language was not activated for all components</b>	<b>Cause</b> <ul style="list-style-type: none"> <li>– A system language was selected that is not available in at least one component (sensor, controller, terminal, output module). The standard language, <i>English</i>, was activated instead of the selected system language.</li> </ul>	<b>Remedy</b> <ul style="list-style-type: none"> <li>– Contact the service department, as a software update is required for the relevant components.</li> </ul>

## 9.4 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.

### 9.4.1 Replacing passive components

Passive components include all components that the controller cannot recognize.

These include:

- MIQ power supply modules
- MIQ branching modules
- 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 SENSORNET system is switched off. Defective components are removed in the reverse order to the installation (see chapter 3 INSTALLATION).**

### 9.4.2 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 SENSORNET 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
- Sensor type
- 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 SENSORNET system 2020 3G. 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 data-base is updated. The following display appears (example):

CONTROLLER	30 July 2016	10:14			
Add/replace sensor					
New sensor recognized:					
Model	TriOxmatic700IQ				
Ser. no.	01349999				
Add new sensor					
Assign sensor as a substitute					
Select , confirm					

figure 9-3 510 - 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:

CONTROLLER	30 July 2016	10:14			
Assign sensor as a substitute					
No.	Model	Ser. no.	Sensor name		
716	TriOxmatic700IQ	01341000	01341000		
Substitute sensor					
	TriOxmatic700IQ	01349999			
Select sensor , confirm					

figure 9-4 520 - 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.

### 9.4.3 Adding and replacing MIQ output modules



#### WARNING

There may be a danger of life threatening electric shock at the relay contacts of open MIQ output modules (such as MIQ/CR3, MIQ/R6) if (external) voltages subject to the danger of physical contact are used. 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 any MIQ output modules (all MIQ modules with relay contacts and/or electrical signal outputs) when the IQ SENSORNET 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 SENSORNET 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 and valves
- 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 SENSORNET system 2020 3G. 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 5.8.2.

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.
- be 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):



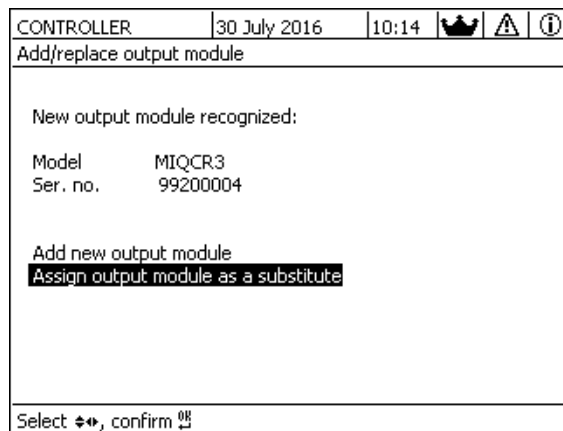


figure 9-5 410 - Add/replace output module

- 4 Select the required option with  $\langle \blacktriangle \blacktriangledown \blacktriangleleft \blacktriangleright \rangle$  and confirm with  $\langle \text{OK} \rangle$ .
  - 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:

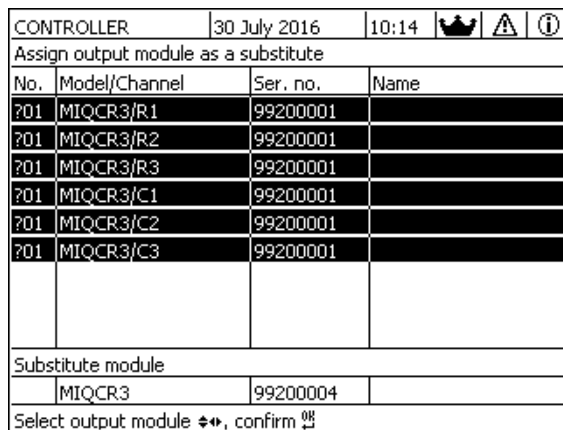


figure 9-6 420 - Assign output module as a substitute

- 5 Select the required inactive dataset with  $\langle \blacktriangle \blacktriangledown \blacktriangleleft \blacktriangleright \rangle$  and confirm with  $\langle \text{OK} \rangle$ . The system changes to the measured value display. The MIQ output module takes over all settings of the inactive dataset.

## 10 Technical data

### 10.1 General system data

Test certificates CE

#### Ambient conditions

Temperature

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

Relative humidity

Mounting/installation/maintenance	≤ 80 %
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 SENSORNET system	Up to 6 (MIQ/PS or MIQ/24V), depending on the total power requirement of the system (see section 3.5 DRAWING UP THE POWER RATING)
Voltage monitoring	<ul style="list-style-type: none"> <li>– Optically via 2 LEDs on each MIQ module</li> <li>– Additional monitoring of all components by the controller software</li> </ul>

**Internal voltage supply** Relationship between the supply voltage U, the LED status on the MIQ module and the log book entries (figure 10-1):

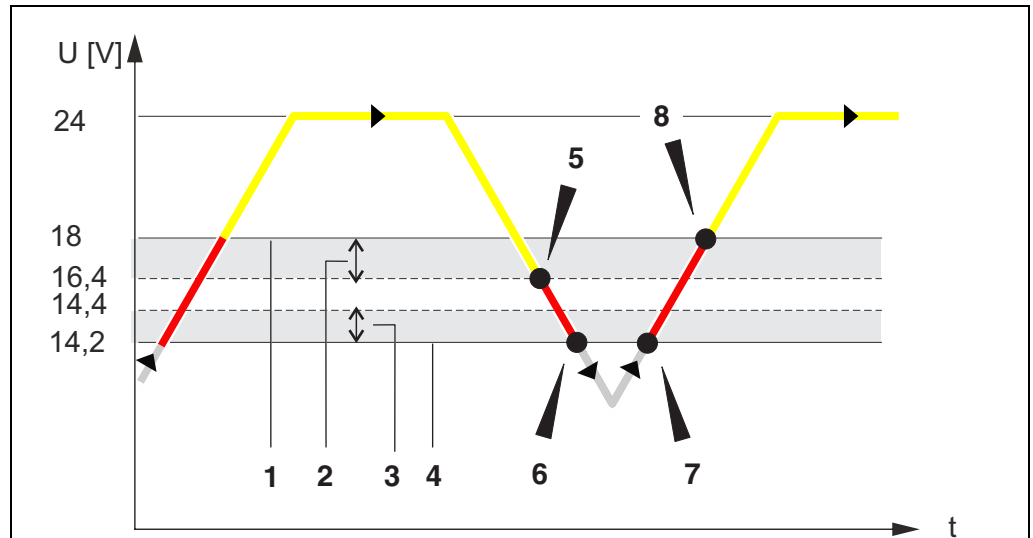


figure 10-1 Relationship of supply voltage - LED states - log book

- 1 Upper limit value
- 2 Hysteresis for upper limit value
- 3 Hysteresis for lower limit value
- 4 Lower limit value

	Voltage U [V]	LED	Log book
5	Hysteresis for upper limit value undercut	red	error message
6	Lower limit value undercut	Off	2nd error message (or switch-off)
7	Hysteresis for lower limit value undercut	red	error message
8	Upper limit value exceeded	Yellow	No log book entry



Instructions of how to measure the actual supply voltage on individual IQ SENSORNET components are given in this operating manual in section 9.2 DIAGNOSING FAULTS IN THE VOLTAGE SUPPLY.

<b>Meter safety</b>	Applicable norms	<ul style="list-style-type: none"> <li>- EN 61010-1</li> <li>- UL 61010-1</li> <li>- CAN/CSA C22.2#61010-1</li> </ul>
<b>EMC product and system characteristics</b>	EN 61326	<p>EMC requirements for electrical resources for control technology and laboratory use</p> <ul style="list-style-type: none"> <li>- Resources for industrial areas, intended for indispensable operation</li> <li>- Interference emission limits for resources of class A</li> </ul>
	System lightning protection	Significantly extended qualitative and quantitative protective characteristics as opposed to EN 61326
	FCC	class A



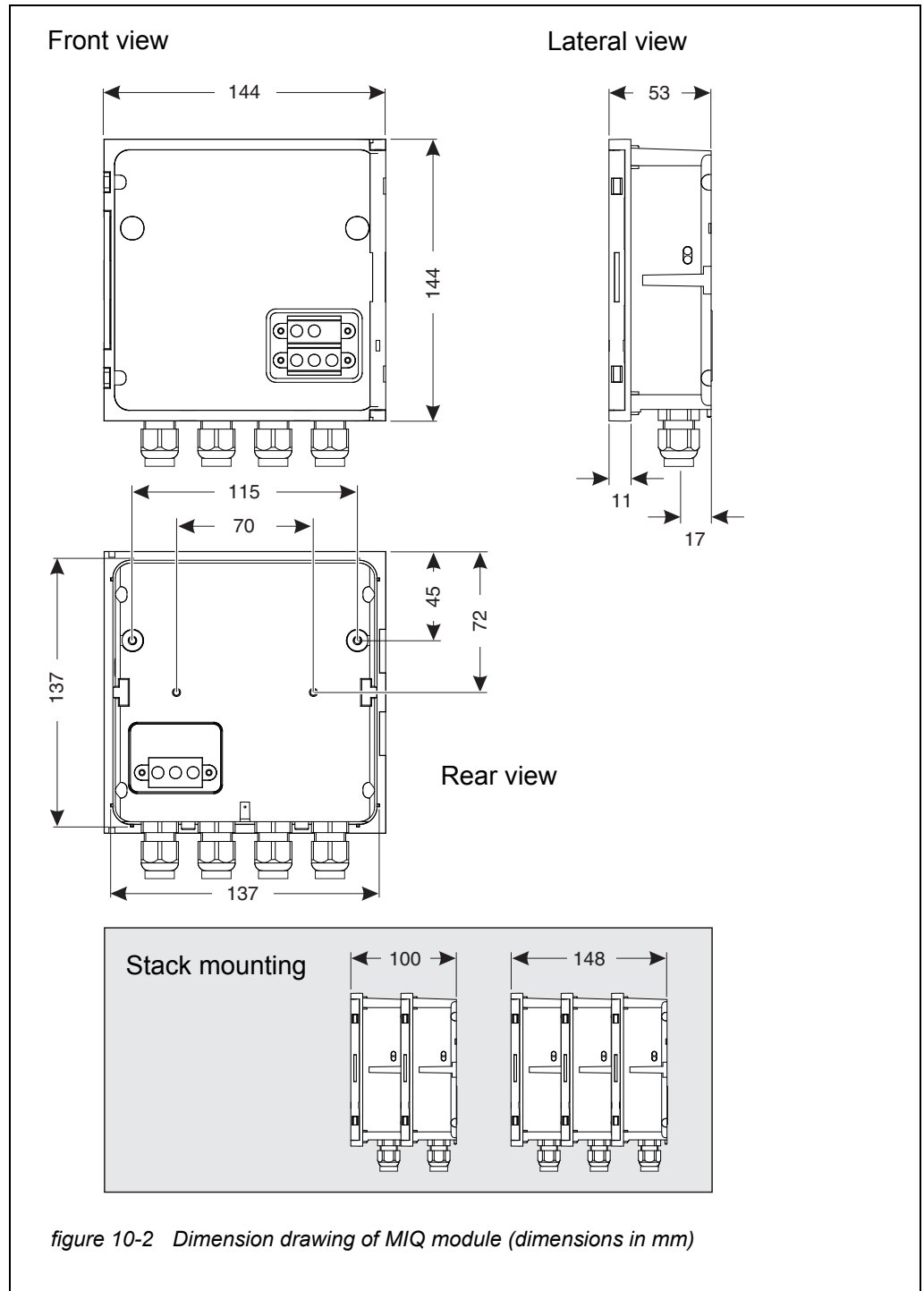
Any combination of IQ SENSORNET products in a user-specific system fulfills these listed EMC characteristics.

### 10.2 General data of MIQ modules



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

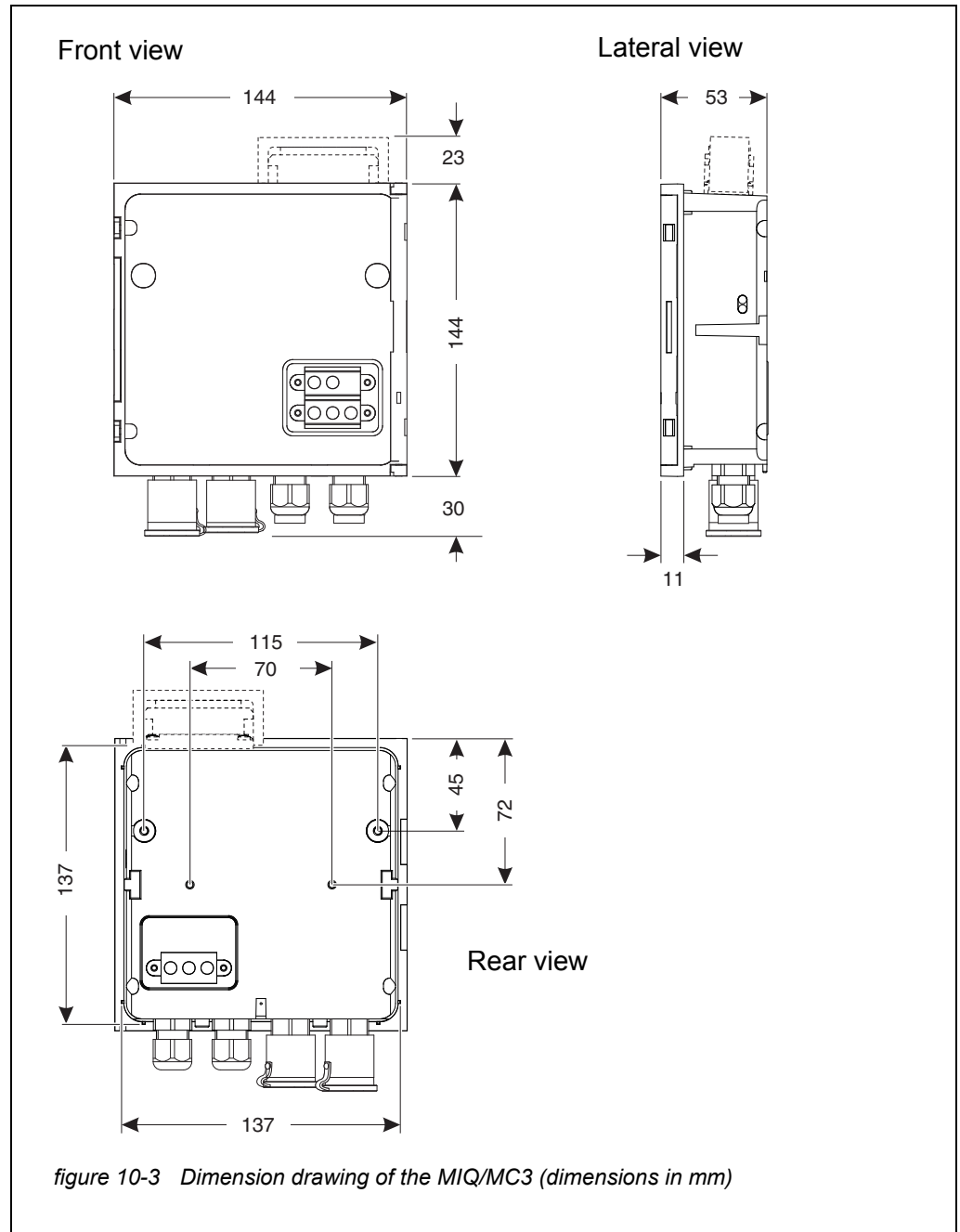
#### Dimensions



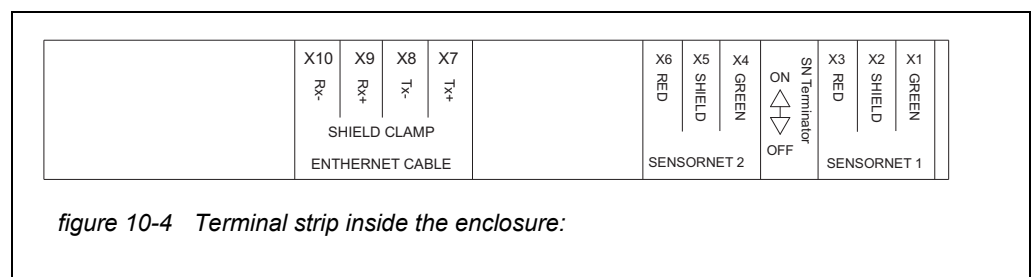
<b>Mechanical structure</b>	Maximum number of MIQ modules in a module stack	3 plus terminal component
	Enclosure material	Polycarbonate with 20 % glass fiber
	Weight	Approx. 0.5 kg
	Type of protection	IP 66 (not suitable for conduit connection)
<b>Electrical data</b>	Nominal voltage	Max. 24 VDC via the IQ SENSORNET (for details, see section 10.1 GENERAL SYSTEM DATA)
	Power consumption	Module-dependent (see section 3.5 DRAWING UP THE POWER RATING)
<b>Terminal connections</b>	IQ SENSORNET 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 raising the lid
	Terminal ranges	Solid wires: 0.2 ... 4.0 mm <sup>2</sup> AWG 24 ... 12 Flexible wires: 0.2 ... 2.5 mm <sup>2</sup>
	Cable feeds	4 cable glands M16 x 1.5 on the underside of the module
<b>Cable glands</b>	Suitable for cable sheath diameter	4.5 - 10 mm or 9.0 - 13 mm

### 10.3 MIQ/MC3

#### Dimensions



#### Terminal strip



<b>Electrical data</b>	Supply voltage	Max. 24 VDC via the IQ SENSORNET (for details, see section 10.1 GENERAL SYSTEM DATA)					
	Power consumption	<table border="0"> <tr> <td>MIQ/MC3</td> <td>2.5 W</td> </tr> <tr> <td>MIQ/MC3-PR</td> <td>3.0 W</td> </tr> <tr> <td>MIQ/MC3-MOD</td> <td>3.0 W</td> </tr> </table>	MIQ/MC3	2.5 W	MIQ/MC3-PR	3.0 W	MIQ/MC3-MOD
MIQ/MC3	2.5 W						
MIQ/MC3-PR	3.0 W						
MIQ/MC3-MOD	3.0 W						

<b>USB-A interface</b>	Version	USB 2.0
	Usage	Download of measurement data, software updates, electronic key



Immediately close the USB connection with the protective cover when you have removed the USB device. When the USB connection is open, there is a danger of corrosion.

<b>Ethernet interface</b>	Type	RJ45 socket
---------------------------	------	-------------

For permanent outside operation, you can convert the Ethernet interface to a climate resistant connection by means of fixed wiring to the main PCB via the LSA terminal strip.



Immediately close the RJ45 connection with the protective cover after you have disconnected the RJ45 cable. When the RJ45 connection is open, there is a danger of corrosion.

<b>Fieldbus interface</b>	MIQ/MC3	-
	MIQ/MC3PR	PROFIBUS DP
	MIQ/MC3-MOD	Modbus RTU/RS 485

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

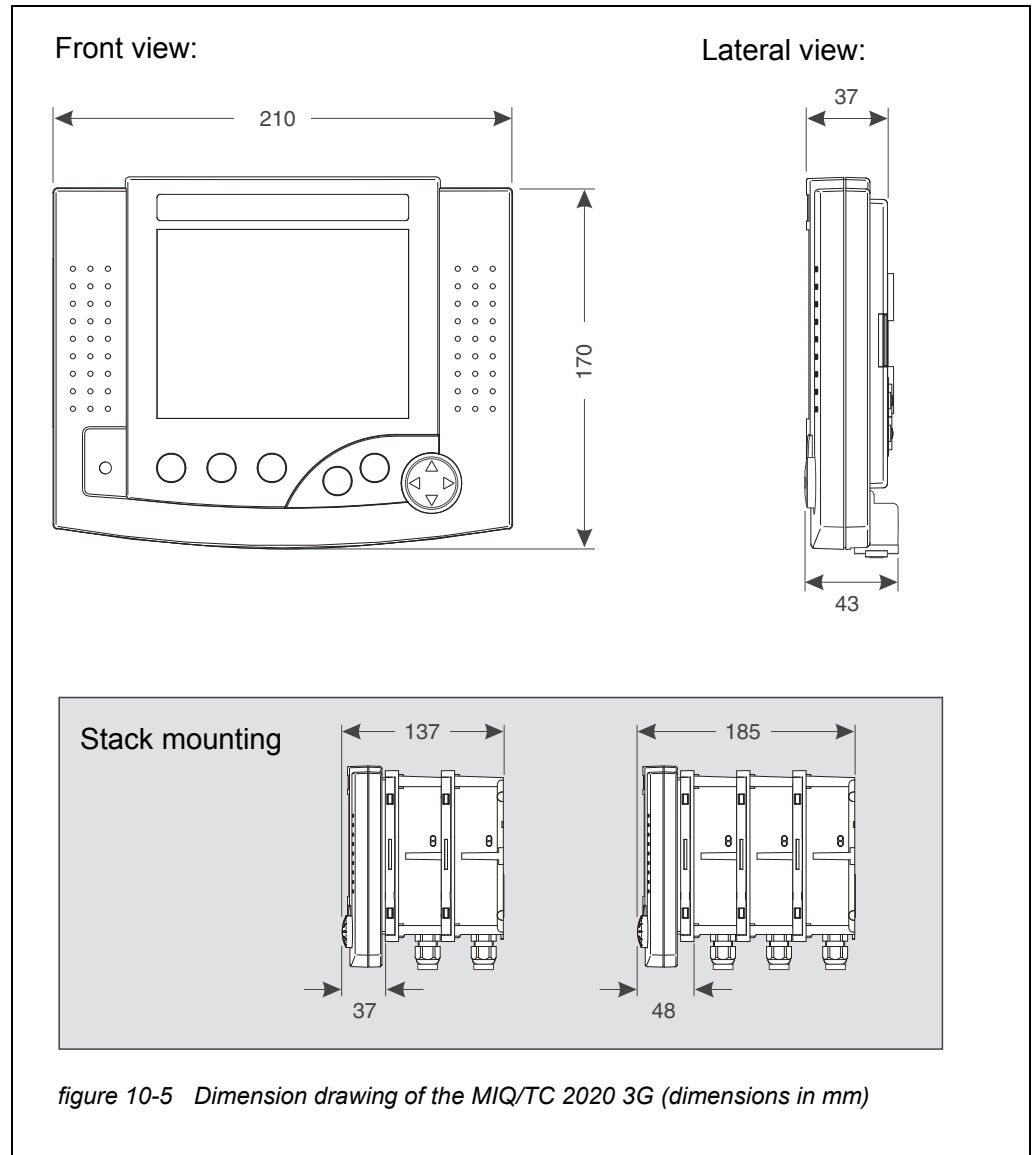
**Air pressure measurement** Automatic air pressure compensation when measuring with galvanic D.O. sensors.

Measuring range	500 mbar ... 1100 mbar
-----------------	------------------------



### 10.4 Terminal/Controller MIQ/TC 2020 3G

**Dimensions**



**Mechanical structure**

Enclosure material	ASA (Acrylonitrile Styrene Acrylesterpolymer)
Weight	Approx. 0.9 kg
Type of protection	IP 66

**Electrical data**

Supply voltage	Max. 24 VDC via the IQ SENSORNET (for details, see section 10.1 GENERAL SYSTEM DATA)
Power consumption	3.5 W

<b>USB-A interface</b>	Version	USB 2.0
	Usage	Download of measurement data, software updates, electronic key

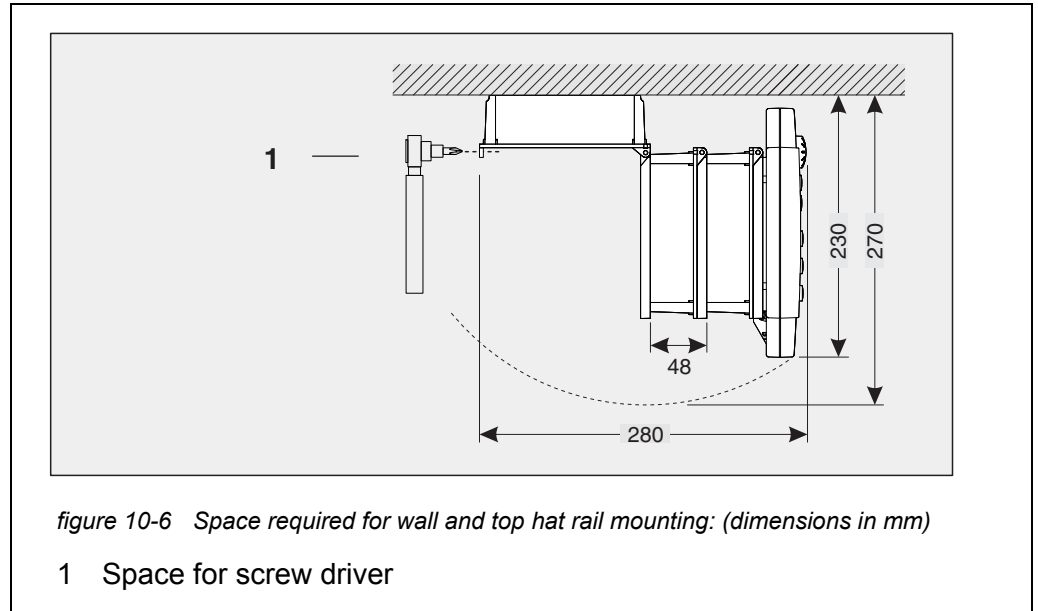


Immediately close the USB connection with the protective cover when you have removed the USB device.  
When the USB connection is open, there is a danger of corrosion.

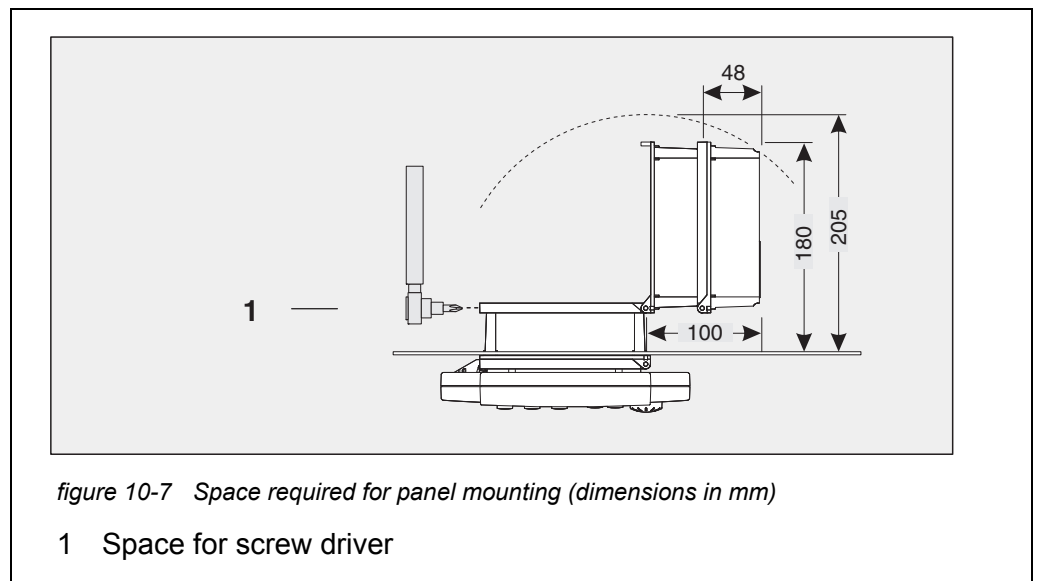
<b>Air pressure</b>	Setting range (e.g. in a system without automatic air pressure compensation)	500 mbar ... 1100 mbar
---------------------	---	------------------------

### 10.5 Space required by mounted components

#### Wall mounting and top hat rail mounting



#### Panel mounting



## 11 Accessories and options

Description	Model	Order no.
IQ SENSORNET cable - please specify required length in m when ordering	- SNCIQ - SNCIQ/UG	- 480 046Y - 480 047Y
IQ sensor connection cable		
- 1.5 m	- SACIQ-1.5	- 480 040Y
- 7.0 m	- SACIQ-7.0	- 480 042Y
- 15.0 m	- SACIQ-15.0	- 480 044Y
- Special length up to max. 100 m	- SACIQ-SO	- 480 041VY
- 20 m (seawater version)	- SACIQ-20.0 SW	- 480 045Y
- 25 m (seawater version)	- SACIQ-25.0 SW	- 480 066Y
- 50 m (seawater version)	- SACIQ-50.0 SW	- 480 060Y
- 75 m (seawater version)	- SACIQ-75.0 SW	- 480 067Y
- 100 m (seawater version)	- SACIQ-SO SW	- 480 062Y
- Special length (seawater version)	- SACIQ-SO SW	- 480 064VY
Set of 4 cable glands M20 for cable sheaths with an outer diameter greater than 10 mm	EW/1	480 051Y
Sun shield for a unit of up to three stacked MIQ modules plus docked terminal	SSH/IQ	109 295Y
Sun shield for a single MIQ module plus docked terminal	SD/K 170	109 284Y
Mounting kit for fixing the SD/K 170 sun shield on horizontal or vertical pipes	MR/SD 170	109 286Y
Kit for wall mounting of a MIQ module	WMS/IQ	480 052Y
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 048Y
Kit for mounting of MIQ modules on a 35 mm top hat rail in accordance with EN 50022	THS/IQ	480 050Y
Flexible conduit adapter for IQ SENSORNET components	CC-Box	900 120Y
Flexible conduit adapter for fieldbus plugs	CC-PM	900 125Y



Other accessories for the IQ SENSORNET are given in the YSI catalog or on the Internet.

## 12 Messages

### 12.1 Explanation of the message codes

The log book contains a list with all the messages from all modules. Each message consists of message code, date and time. You can obtain more detailed information by opening the full message text (see section 4.5).

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

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

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

General explanations on the subjects of messages, message codes and log book are given in section 4.5 of this system operating manual.

Module code	Component
152	MIQ/MC3
153	MIQ/TC 2020 3G

#### 12.1.1 Error messages

Message code	Message text
EI4152	<i>Max. components of this component type exceeded Danger of system overload * Check and adapt the components for this type</i>
EI5152	<i>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</i>
EI6152	<i>Incompatible terminal software * Contact service</i>
EI7152	<i>Incompatible controller software * Contact service</i>

<b>Message code</b>	<b>Message text</b>
EI8152	<i>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</i>
EI9152	<i>Power failure occurred * Check date and time and, if necessary, adjust them</i>
EA8152	<i>Error at automatic air pressure measurement An air pressure value of 1013 mbar is used for air pressure compensation * Contact service</i>

### **12.1.2 Informative messages**

<b>Message code</b>	<b>Message text</b>
II2152	<i>New IQ Sensor Net component identified</i>
II3152	<i>New IQ Sensor Net component recorded * See component lists</i>
II4152	<i>IQ Sensor Net component recorded as replacement component * See component lists</i>
II5152	<i>Link sensor - output has been erased * if necessary, link sensor again</i>
II9152	<i>Date and time have been set</i>

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## 14 Appendix

### 14.1 Forgotten the password? (store separately if required)

#### Extended access control

The administrator can view and change all stored passwords (see section 5.3). If the IQ SENSORNET is locked and the administrator password lost, you can unlock the system with a master password. The master password is available from your instrument manufacturer.

The master password is valid for 7 days.

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

#### Simple access control

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

- 1 Open the *Settings* menu with **<S>**.
- 2 Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *Access control -> Change password*. The *Change password* dialog box opens.

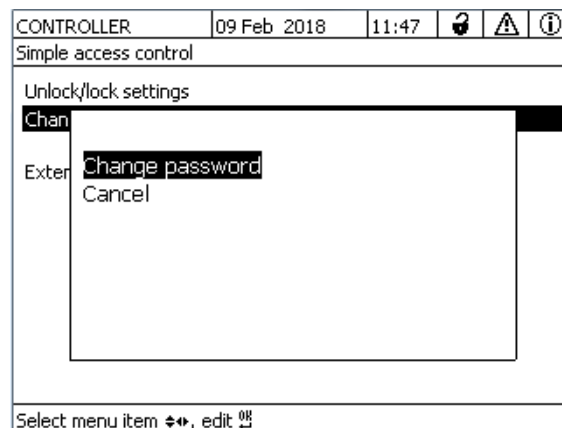


figure 14-1 System settings -> Change password

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

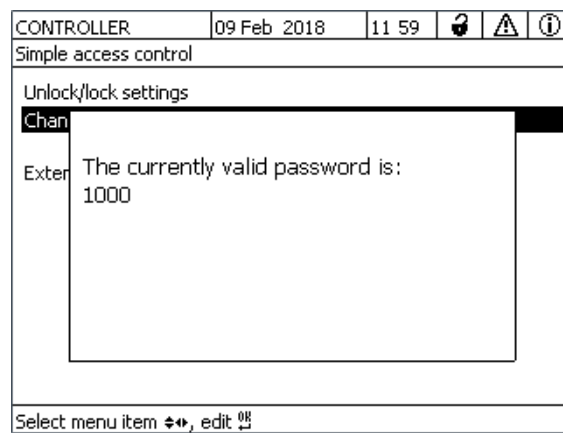


figure 14-2 System settings -> Display password

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

## 14.2 Default password

### Simple access control

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

## 15 Contact Information

### 15.1 Ordering & Technical Support

Telephone: (800) 897-4151  
(937) 767-7241  
Monday through Friday, 8:00 AM to 5:00 PM ET

Fax: (937) 767-1058

Email: [info@ysi.com](mailto:info@ysi.com)

Mail: YSI Incorporated  
1725 Brannum Lane  
Yellow Springs, OH 45387  
USA

Internet: [www.ysi.com](http://www.ysi.com)

When placing an order please have the following information available:

- YSI account number (if available)
- Model number or brief description
- Quantity
- Name and Phone Number
- Billing and shipping address
- Purchase Order or Credit Card

### 15.2 Service Information

YSI has authorized service centers throughout the United States and Internationally. For the nearest service center information, please visit [www.ysi.com](http://www.ysi.com) and click 'Support' or contact YSI Technical Support directly at 800-897-4151.

When returning a product for service, include the Product Return form with cleaning certification. The form must be completely filled out for an YSI Service Center to accept the instrument for service. The Product Return form may be downloaded at [www.ysi.com](http://www.ysi.com) and clicking on the 'Support' tab.





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