

JUMO digiLine O-DO H10/H20

Digital optical sensors for dissolved oxygen
in hygienic applications



Operating Manual



20261200T90Z001K000

V3.00/EN/30061595/2025-07-08

Further information and downloads



qr-202612-en.jumo.info

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1 About this documentation

1.1 Validity

This manual is valid for all device software versions and hardware versions.

1.2 Applicable documentation

This document is supplemented by the documents listed below:

Product group	Document type
202612	Modbus interface description
203599	JUMO DSM software operating manual

The documents listed are available online on our website **www.jumo.de**.

Enter the number of the product group or the title of the document in the search field.

1.3 Purpose

This documentation is part of the device and includes all information to ensure that it is used safely and as intended across all phases of the product lifecycle.

If you do not follow the documentation and safety information, this may result in risk to life and damage to property due to improper use.

- Read and follow the documentation and the safety information and warnings.
- Store the document in its entirety, in an easily accessible location, and so that it can be read in full at all times.
- Contact the manufacturer if you have any questions about the device and documentation.

1.4 Target group

This documentation is intended to be used by personnel trained in electrical, mechanical, and plant engineering across all phases of the product lifecycle.

1.5 Abbreviations

Abbreviation	Meaning
CIP	C leaning I n P lace (process for automated cleaning of process technology apparatus)
SIP	S terilization I n P lace (process for automated sterilization of process technology apparatus)

1.6 Trademark information

All trademarks and trade and company names used are the property of their rightful owners or authors.

1.7 Definition of terms

Use in document	Definition
Sensor, device	JUMO digiLine O-DO H10; JUMO digiLine O-DO H20
Medium, measurement medium	Liquid or gas (mixture), in which the oxygen content is measured
Product lifecycle	Overall consideration of product identification, acceptance of the goods, storage, mounting, connection, operation, troubleshooting, maintenance to disposal
Nameplate	Laser engraving on the sensor shaft

1.8 Symbols



DANGER!

The signal word **"DANGER"** indicates an immediate danger.

Non-observance will lead to death or serious injury.

- The instructions in the warning notice must be observed and followed!



WARNING!

The signal word **"WARNING"** indicates an imminent danger.

Non-observance can lead to death or serious injury.

- The instructions in the warning notice must be observed and followed!



CAUTION!

The signal word **"CAUTION"** indicates an imminent danger.

Non-observance can lead to minor or moderate injury.

- The instructions in the warning notice must be observed and followed!

NOTICE!

The signal word **"NOTICE"** indicates possible damage to property.

Non-observance can lead to damage to devices, systems or the environment.

- Observe the instructions in the note for avoiding damage!

NOTE!

This symbol is used in tables and indicates that further information is provided after the table.

REFERENCE!

This symbol refers to **further information** in other sections, chapters, or other manuals.



2 Safety

2.1 Intended use

The sensors are available in two versions with different measuring ranges:

- JUMO digiLine O-DO **H10** (wide measuring range)
- JUMO digiLine O-DO **H20** (trace sensor)

The sensors have a high-quality stainless steel body and are designed for measuring dissolved oxygen in hygienic applications in the

- Pharmaceutical industry
- Biotechnology
- Food industry
- Beverage industry
- General process technology

in particular. They can also be used for acquiring gaseous oxygen. The measurement method is based on the optical principle of luminescence quenching.

With the Pg 13.5 process connection, the sensors can be easily integrated into customary fittings. The standard insertion length is 120 mm. Versions with larger insertion lengths are also available upon request.

The sensor does not meet ATEX directives. It cannot be used in environments with ignitable liquids, gases, or dust.

The documentation is part of the device. The device is only intended for use according to this documentation.

2.2 Qualification of personnel

Qualified personnel with the following attributes are required to handle the device in all phases of the product lifecycle:

- Have completed their technical training and are qualified
- Have been authorized by the plant operator
- Are familiar with the operating manual and the safety information and warnings it contains
- Are familiar with national regulations

2.3 Disclaimer

It is the user's responsibility to assess whether the sensor usage is suitable for the intended purpose – with regard to the usage conditions and the safety precautions during the application.

The manufacturer is not liable for direct or indirect damage resulting from use of this sensor. In particular, it must be borne in mind that malfunctions can occur due to the naturally limited operating life of the sensor depending on the relevant application.

2.4 Use in critical applications

During use in critical applications, there is the risk of consequential damage in the event of sensor malfunction

- Install a suitable safety system for the event the sensor fails.
- Recommendation: set up backup measuring stations.

2.5 Hot surfaces

Hot media may result in the sensor surfaces becoming hot and presenting a risk of injury.

- Allow the sensor and plant to cool down.
- Wear suitable protective equipment.
- If required, install contact protection.

2.6 Substances that endanger the sensors

Do not use the sensor in fuel or strong solvents.

2.7 Seal tightness

Damaged threads or seals of the sensor may lead to the measurement medium leaking.

- Never use the sensor with damaged seals or damaged threads.

A sensor cap that has not been screwed on tight results in measurement errors and damage to the sensor due to measurement medium entering.

- Ensure that the optical sensor cap of the sensor is screwed tightly onto the sensor housing (no gap between sensor cap and sensor housing).

2.8 Internal storage

The sensor stores most settings in the internal flash memory. This internal storage memory has a maximum number of 10,000 write cycles.

- Avoid unnecessary write cycles. Only modify the settings if necessary.

2.9 Timing for write errors

After all write errors, the sensor has to remain switched on for at least 250 ms. If this value is fallen below, this results in permanent data loss.

2.10 Internal temperature probe

The internal temperature probe of the sensor is only intended for measurement temperature compensation.

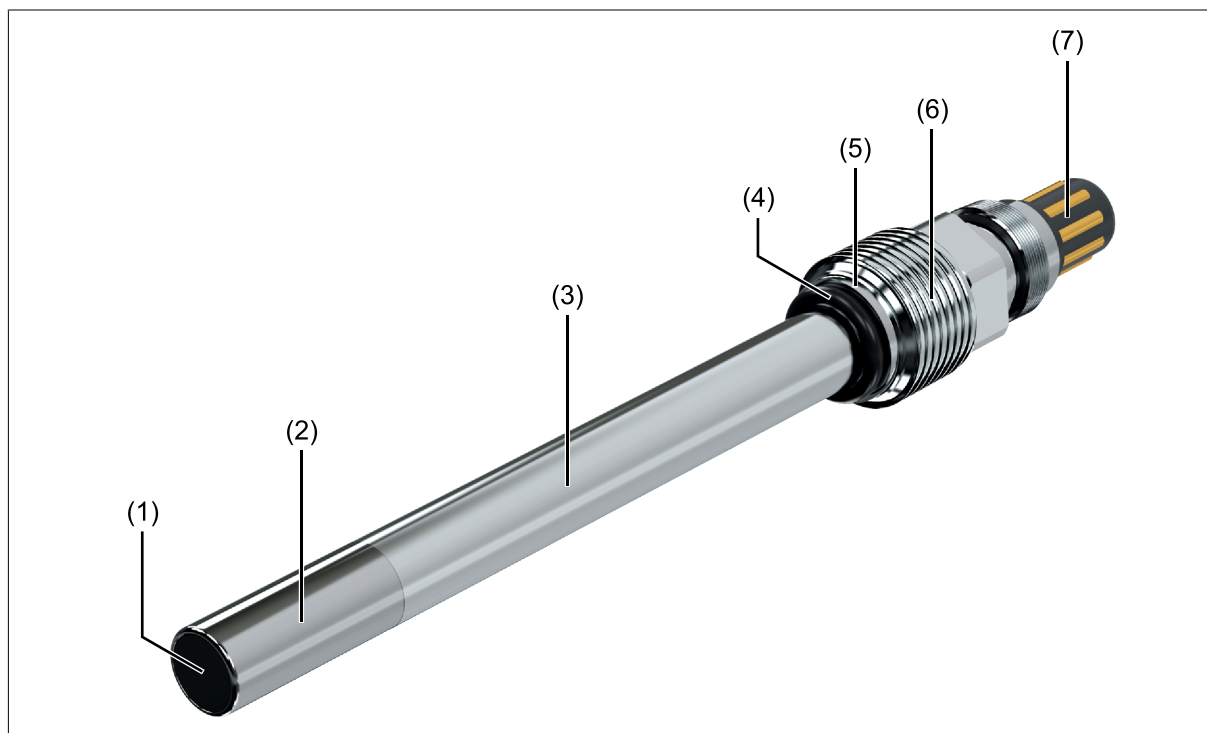
- Do not use the sensor's internal temperature probe for controlling processes.

2.11 Eye irritation due to LED light

The LED output power is below the limit values of DIN EN IEC 62471. Under normal conditions, there is no risk. To avoid eye irritation, do not look into the optics when the sensor cap is removed and the device is turned on.

3 Description

3.1 Structure



- | | |
|---|--------------------------------|
| 1 Sensor membrane with internal luminophore | 5 Flange (Ø 18 mm) |
| 2 Sensor cap | 6 Thread Pg 13.5 |
| 3 Sensor housing with optoelectronics | 7 VarioPin connection (8-pole) |
| 4 O-ring | |

3.2 Functions

A coloring agent (luminophore) is applied to the oxygen-permeable sensor cap. A LED located in the sensor body irradiates the luminophore. By absorbing energy, it changes from its basic state to an excited state. Following a time delay, it returns to its basic state as it loses heat and emits the remaining energy as red light (referred to as fluorescent radiation), which is detected by a photo diode in the sensor body.

If the luminophore comes into contact with an oxygen molecule in the excited state, the energy transmission occurs directly onto the oxygen molecule without emission of the red light. The intensity of the fluorescent radiation reduces as the oxygen concentration increases. The operating life of the fluorescent radiation also reduces as the oxygen concentration increases. The measuring electronics modulate the exciter radiation. The oxygen concentration can be calculated precisely from the phase difference between the exciter and fluorescence radiation.

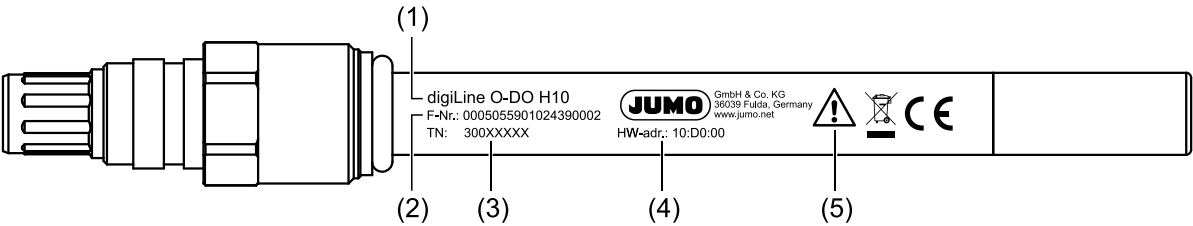
The measurement electronics of the sensor supply both the compensated oxygen concentration as well as the temperature value for the measurement medium, measured inside the sensor, to the connected measuring or automation device via the digital interface.

Alongside digital operation, analog operation with a 4 to 20 mA interface is possible. The sensor acts as a current sink and requires a voltage supply in this process. Optionally, either the oxygen value or the temperature value is output. The 4 to 20 mA interface is activated ex works. Output scaling, selection of the signal, and behavior in the event of a malfunction are configured with the JUMO DSM software.

3.3 Nameplate

Position

The nameplate is lasered onto the sensor housing.



- 1 Sensor type
- 2 Production number (F no.) of the sensor with **production date**
- 3 Part number
- 4 Hardware address
- 5 Observe device documentation!

Production date

Sensor example: F-Nr = 0005055901024390002

Here, we are looking at the **12th to 15th** digits (from the left).
The sensor was produced in the **39th** calendar week of **2024**.

3.4 Scope of delivery

Sensor in the ordered version
Operating manual
Final Inspection Protocol
Inspection certificate 3.1 material, surface roughness ≤ 0.4 µm (except weld seam), according to DIN EN 10204 ^a

^a Only for extra code 992.

4 Technical data

4.1 Electrical data

Voltage supply ^a	DC 7 to 24 V
Power consumption during active operation during standby operation	Max. 1 W 0.15 W
Electromagnetic compatibility Interference emission Interference immunity	According to DIN EN 61326-1:2013 Class B requirement according to DIN EN 55011 Industrial requirement
Protection rating	III according to DIN EN 61140

^a The voltage supply for the digiLine bus must be rated as SELV or PELV.

4.2 Inputs

4.2.1 Sensor technology

Dissolved oxygen JUMO digiLine O-DO H10 (wide measuring range)

Measuring ranges ^a	0 to 22.5 ppm (mg/l) 0 to 250 % sat. 0 to 50 % vol. 0 to 500 hPa 0 to 45 ppm (mg/l) 0 to 500 % sat. 0 to 100 % vol. 0 to 1000 hPa
Detection limit ^a	20 ppb (0.015 mg/l) 0.03 % vol. 0.3 hPa
Dissolution ^a At 0.4 ppm (1 % vol.) At 9 ppm (20.9 % vol.)	±0.009 ppm (±0.02 % vol.) ±0.04 ppm (±0.1 % vol.)
Accuracy	at 20 °C, measured with certified test gases ±3 % of the displayed value or ±0.1 % Vol, depending on which value is greater.
Sampling interval	Adjustable 1 s to 9 min 59 s

^a At 20 °C, 960–980 hPa; humidified gas mixture.

Dissolved oxygen JUMO digiLine O-DO H20 (trace sensor)

Measuring range ^a	0 to 2000 ppb (µg/l) 0 to 5 % vol. 0 to 50 hPa
Detection limit ^a	0.5 ppb 0.001 % vol. 0.01 hPa
Dissolution ^a At 1 ppb (0.002 % vol.) At 20 ppb (0.2 % vol.)	±0.3 ppb (±0.0006 vol.) ±0.4 ppb (±0.001 vol.)
Accuracy	at 20 °C, measured with certified test gases ±3 % of the displayed value or ±0.005 % Vol, depending on which value is greater.
Sampling interval	Adjustable 1 s to 9 min 59 s

^a At 20 °C, 960–980 hPa; humidified gas mixture.

Response time $t_{0.9}$ for dissolved oxygen^a

For sensor cap BP FB PTFE FRT	Information on use of the sensor caps ⇒47 < 30 s < 40 s < 100 s < 3 s
---	---

^a Determined by switching from air-saturated water to a freshly produced 2 % sodium sulphite solution.

Internal temperature probe

Sensor technology	NTC
Accuracy	±1 °C in the range 0 to +50 °C

4.3 Interfaces

RS485 interface

Protocol	JUMO digiLine ^a Modbus RTU ^b
Device address	1 to 247
Data formats ^c	8 - 1 - no parity 8 - 2 - no parity 8 - 1 - odd parity 8 - 1 - even parity
Baud rates	9600 baud 19200 baud 38400 baud
Initialization time	4.5 s

^a Automatic assignment of the network parameters during startup (Plug and Play).

^b Setting of the network parameters with the JUMO DSM software before initial startup, e.g. during operation of the sensor on a JUMO mTRON T CPU.

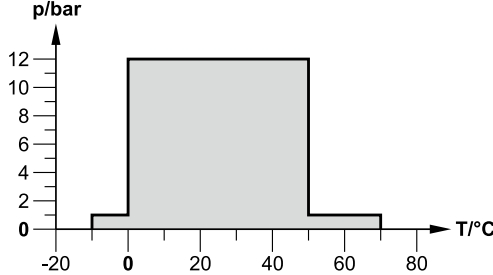
^c Specification in useful bit - stop bit - parity format.

Analog 4 to 20 mA interface

Signal range	4 to 20 mA
Voltage supply	DC 7 to 24 V
Initialization time	< 10 s
Default settings type H10	
Mode	Linear
Output	oxygen measurement
Error/Warning mode	Continuous operation, error only
20 mA equivalent	22.5000 mg/l
4 mA equivalent	0.0000 mg/l
Error threshold	3.6000 mA
Warning threshold	22.0000 mA
Default settings type H20	
Mode	Linear
Output	oxygen measurement
Error/Warning mode	Continuous operation, error only
20 mA equivalent	2000.0000 µg/l
4 mA equivalent	0.0000 mA
Error threshold	3.6000 mA
Warning threshold	22.0000 mA

4 Technical data

4.4 Environmental influences

Admissible operating temperature	
Optimal	0 to +50 °C
Maximum	-10 to +90 °C ^a
Admissible storage temperature	
Optimal	Room temperature (+20 °C ±5 °C)
Maximum	0 to +70 °C at 80 % rel. humidity
Pressure resistance ^b	Absolute pressure At -10 to 0 °C: 1 bar At 0 to 50 °C: 12 bar At 50 to 70 °C: 1 bar At 121 °C (SIP): 1.5 bar^c 
Storage life	5 years (requirement is that the sensor material is stored at room temperature in a dark and dry environment)
Not cross-sensitive for	pH 1 to 14, CO ₂ , SO ₂ , ionic species
Cross-sensitive for	Organic solvents such as acetone, toluene, chloroform or methylene chloride, chlorine gas
Cleaning process ^d	Cleaning in Place (CIP) with 2 % NaOH at +80 °C 3 % H ₂ O ₂ , acidic agents (HCl, H ₂ SO ₄) max. 4 to 5 % ethanol, methanol, cleaning agent at room temperature
Sterilization method ^d	Sterilization in Place (SIP) with max. +121 °C, 1.5 bar

^a -10 to +70 °C when using the FRT sensor cap.

^b With sensor cap screwed on.

^c Maximum 30 minutes. Higher temperatures/longer durations lead to faster aging of the sensor.

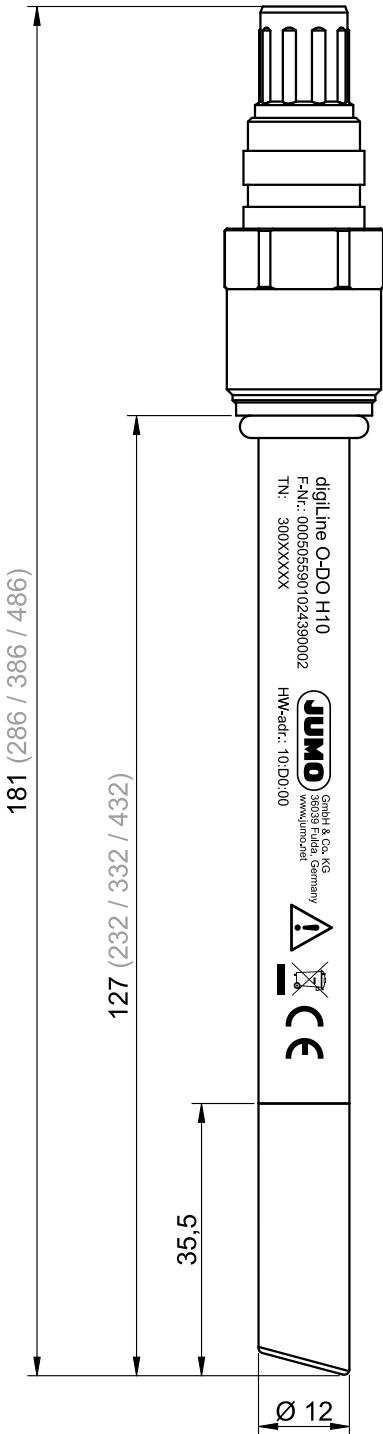
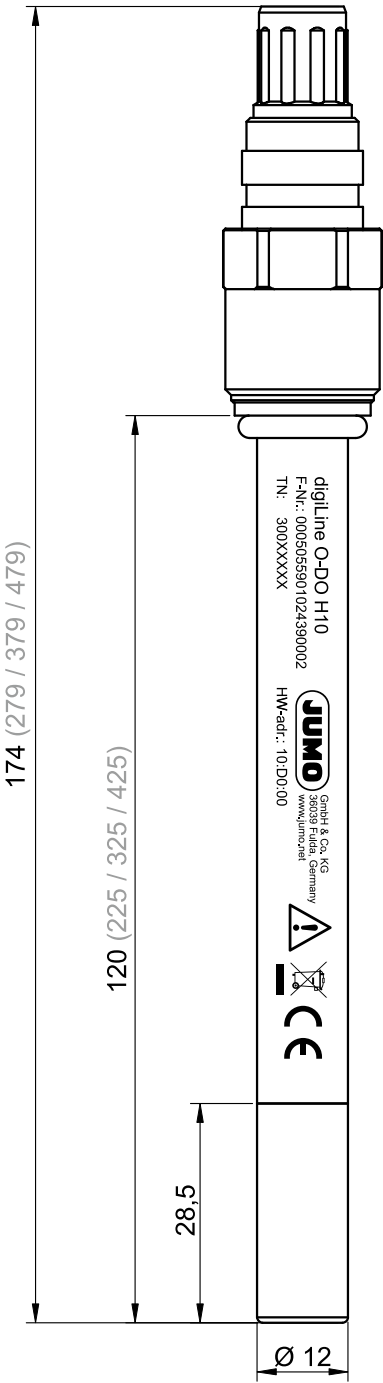
^d Not possible when using the FRT sensor cap.

4.5 Mechanical features

Materials	
Sensor housing	Stainless steel 1.4435/AISI 316L, roughness ≤ 0.4 µm (N5)
Materials coming into contact with the medium	Stainless steel 1.4435/AISI 316L, silicone (membrane), EPDM (O-ring)
Weight	
For sensor length 120 mm ^a	100 g
For sensor length 225 mm	170 g
For sensor length 325 mm	230 g
For sensor length 425 mm	300 g

^a Standard length; all other lengths upon request.

4.6 Dimensions



5 Transport and storage

5.1 Transport

If the device is not protected properly against external influences, it may become damaged during transport.

- Transport the device in an impact-proof packaging solution that protects it against moisture and dirt.
- Also comply with the admissible storage temperatures while the device is being transported.
- Protect all electrical and mechanical connections from damage.

5.2 Storage

Improper storage may result in damage to the device.

- Store the device in a dry and dust-free environment.
- Observe the device storage temperature range.

6.1 Mounting site and environmental conditions

Preferably use the fitting mentioned in the next chapter chapter 6.4 "Sensor fittings", Page 19 to mount the sensor.

Select the mounting site for the fitting such that it enables easy access for any subsequent calibration. Ensure that the device is fastened safely and with low vibrations.

Avoid electromagnetic fields, caused by equipment such as motors and transformers. The environmental influences at the installation site must correspond to the specifications in chapter 4.4 "Environmental influences", Page 14.

NOTICE!

Risk of damage to the sensor membrane due to mechanical influences.

A damaged membrane can lead to incorrect measurement results.

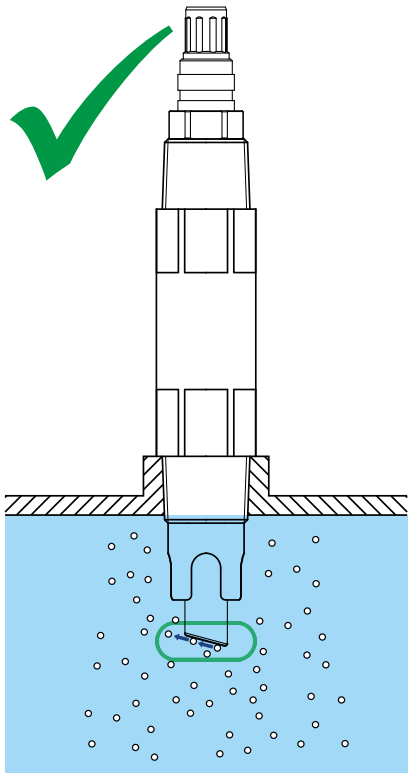
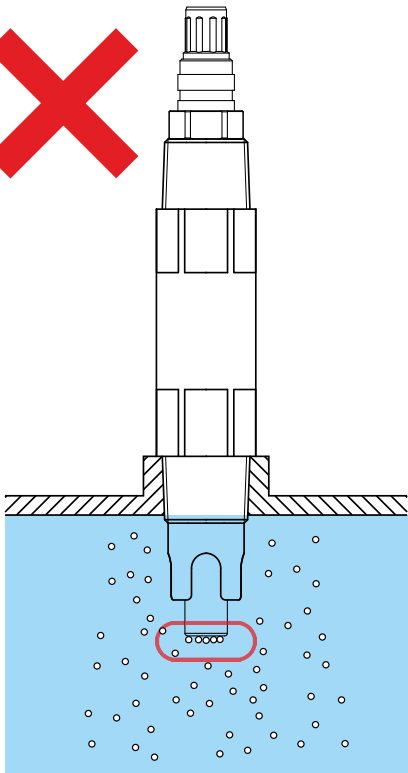
- ▶ Prevent mechanical load to the sensor membrane such as an abrasive particle stream in the measurement medium.

6.2 Installation position

For optimum, error-free measurement, no air bubbles should adhere to the sensor membrane.

- In the event of a vertical installation position of the sensor, use the beveled sensor cap.
- In the event of all other installation positions of the sensor, use the straight or beveled sensor cap

Example: vertical installation in a tank using an electrode holder

Correct	Incorrect
	
The air bubbles glide upward along the beveled surface of the sensor membrane.	The air bubbles adhere to the straight surface of the sensor membrane and falsify the measurement.

6 Installation

6.3 Grounding and potential equalization

NOTICE!

Risk of corrosion due to electrolysis

The housing of the sensor consists of stainless steel with a high level of corrosion resistance (material number 1.4435/AISI 316L). Nevertheless, electrical potential differences between the sensor and a tank or other peripheral devices cause immediate corrosion due to electrolysis.

- Ensure, e.g. through suitable grounding, that there are no electrical potential differences between the sensor and its environment.

We recommend ALWAYS connecting the sensor with the protective ground at the installation site, i.e. the device housing and shielding of the VarioPin cable with the protective ground.

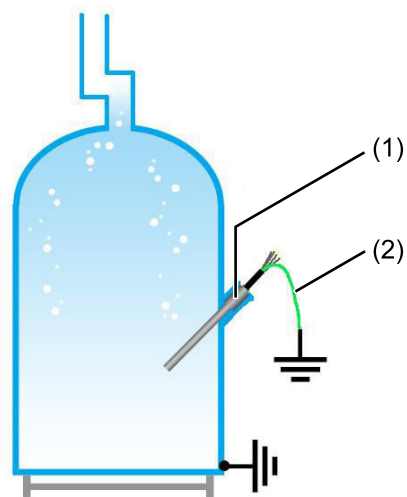
The length of the VarioPin cable in particular can affect the quality of the grounding.

Example: grounded tank

Installation of the sensor in a tank or bioreactor or similar which is connected to the protective ground.

The connection to the ground is established via the stainless steel screw connection Pg 13.5 (1).

The sensor is grounded via the cable shield (2) of the VarioPin connecting cable.

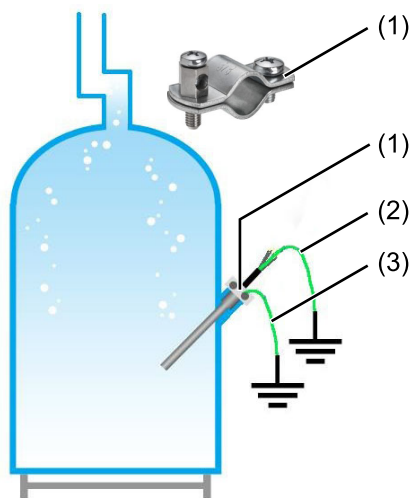


Example: non-grounded tank

Installation of the sensor in a tank or bioreactor or similar (e.g. made of plastic or glass) which is **not** connected to the protective ground.

The connection to the ground (3) is established via a ground terminal (1) which is mounted on the stainless steel screw connection Pg 13.5.

The sensor is grounded via the cable shield (2) of the VarioPin connecting cable.



6.4 Sensor fittings

6.4.1 Stainless steel process fittings

Description	Figure	Further information
These fittings are intended for fastening and protecting the sensors. They can be mounted directly into existing stainless steel pipe systems or in container walls. Fittings from type 202825 are mainly used in process technology plants in which increased hygienic standards are required. The surfaces coming into contact with the media and the sealing materials used meet the specifications of the FDA (Food and Drug Administration). Fittings of type 202831 are mainly used in water/process technology.		 qr-202825-en.jumo.info

6.4.2 Manual retractable fittings

Description	Figure	Further information
The manually operated retractable fittings type 202822 enable the sensors to be installed and removed under process conditions. The affected circuit or main circuit does not have to be interrupted. Typical fields of use are: • Measurements in closed liquid circuits, e.g. in cooling and wastewater plants • Measurements in closed containers and tanks • Final inspection in the outlet if no bypass is possible		 qr-202822-en.jumo.info

6 Installation

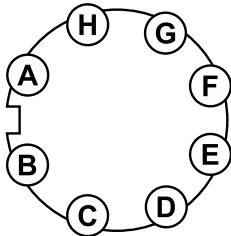
6.4.3 Electrode holder

Description	Figure	Further information
PVDF or stainless steel electrode holder for installation of the sensors in tanks or pipes with 3/4–14 NPT threaded coupling.		Upon request

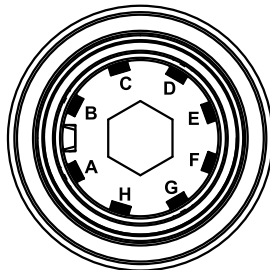
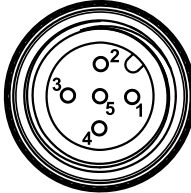
7 Electrical connection

7.1 Terminal assignment

7.1.1 Sensor

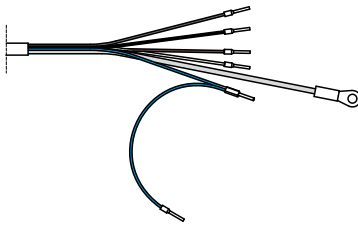
Function	Pin	Figure Sensor connection
NC	A	
4 to 20 mA current sink	B	
+24 V	C	
GND	D	
NC	E	
NC	F	
RS485 (RxD/TxD+)	G	
RS485 (RxD/TxD-)	H	

7.1.2 JUMO M12 digiLine O-DO H adapter cable (accessories)

Figure VP	Pin VP	Function	Pin M12	Figure M12
	C	+24 V	2	
	D	GND	3	
	H	RS485 (RxD/TxD-)	4	
	G	RS485 (RxD/TxD+)	5	
	Housing	Shielding	Thread	

7.1.3 JUMO M12 digiLine master connecting cable for JUMO AQUIS touch (accessories)

5-pole, A-coded, for connecting to the screw terminals of the serial interface.

Figure M12	Pin M12	Function	Wire	Figure Wire ends
	2	+24 V	WH	
	3	GND	BU	
	4	RS485 (RxD/TxD-)	BK	
	5	RS485 (RxD/TxD+)	GY	

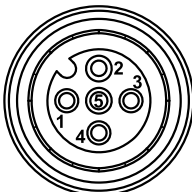
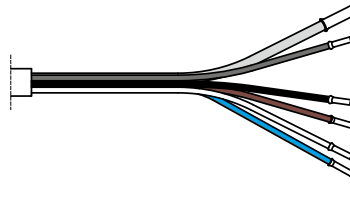
The wire with the ring cable lug (shielding of the cable) must be connected to PE (functional ground) in the connection area of the JUMO AQUIS touch.

⇒ JUMO AQUIS touch operating manual.

7 Electrical connection

7.1.4 JUMO M12 digiLine master connecting cable for JUMO mTRON T (accessories)

5-pole, A-coded, for connecting to the screw terminals of the serial interface.

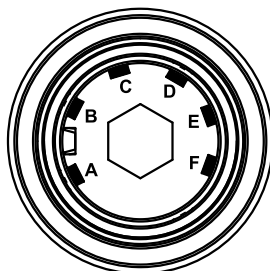
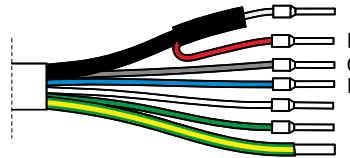
Figure M12	Pin M12	Function	Wire	Figure Wire ends
	2	+24 V	WH	
	3	GND	BU	
	4	RS485 (RxD/TxD-)	BK	
	5	RS485 (RxD/TxD+)	GY	

The wire with the shielding of the cable must be connected to PE (functional ground) in the connection area of the JUMO mTRON T.

⇒ JUMO mTRON T operating manual.

7.1.5 VarioPin connecting cable on exposed wire ends (accessories)

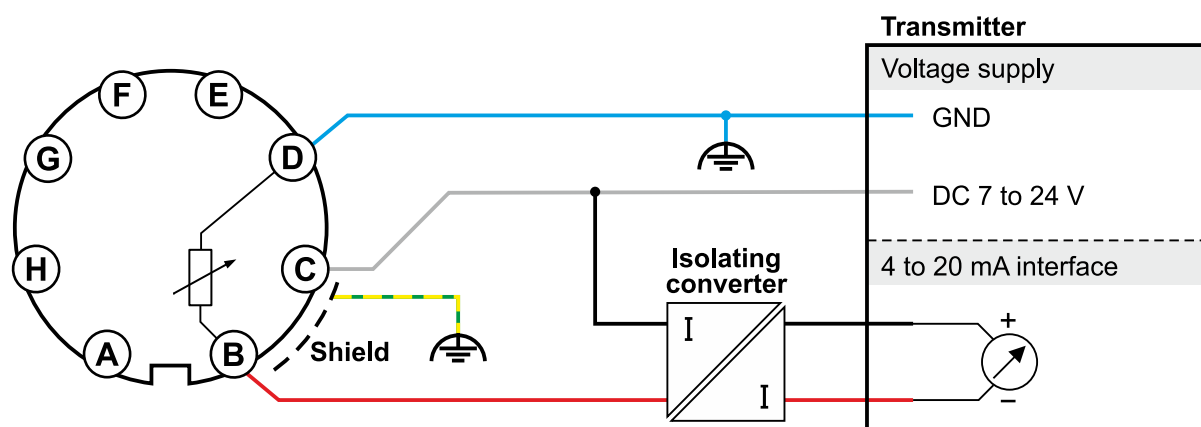
For connecting to the analog 4°to°20°mA interface of a transmitter with screw or spring-cage terminals.

Figure VP	Pin VP	Function	Wire	Figure Wire ends
	B	4 to 20 mA current sink	RD	
	C	+24 V	GY	
	D	GND	BU	
	Housing	Shielding	GN/YE	

The wire with the shielding of the cable must be connected to PE (functional ground) in the connection area of the transmitter.

⇒ Transmitter operating manual.

Schematic representation of the connection to a transmitter with 4 to 20 mA interface



Notes on using the 4 to 20mA interface

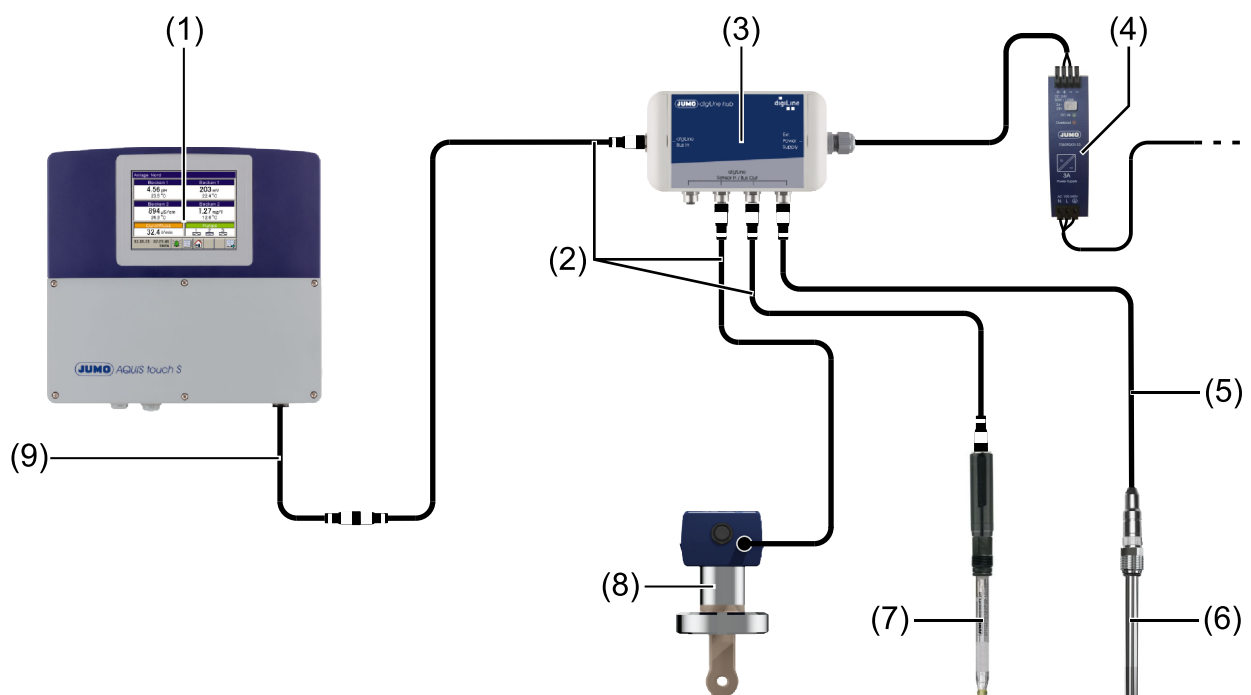
Despite the high reliability of the 4 to 20 mA signal, errors can occur. The current loop of the sensors is powered by the supply voltage of the transmitter, with the reference potential for the current output being the GND of the power supply. This can lead to unwanted ground loops caused by different earth potentials between the measuring device and the evaluation unit. These ground loops cause unwanted currents over the ground line, which can disturb the measurement signal and lead to fluctuating readings or signal distortions.

To avoid ground loops, the use of an isolating converter is recommended. An isolating converter ensures that the input signal is electrically isolated from the output signal, preventing interference from different ground potentials. This ensures a clean and interference-free transmission of the 4 to 20 mA signal, even with different ground potentials of the connected components.

7 Electrical connection

7.2 Connection examples (schematic)

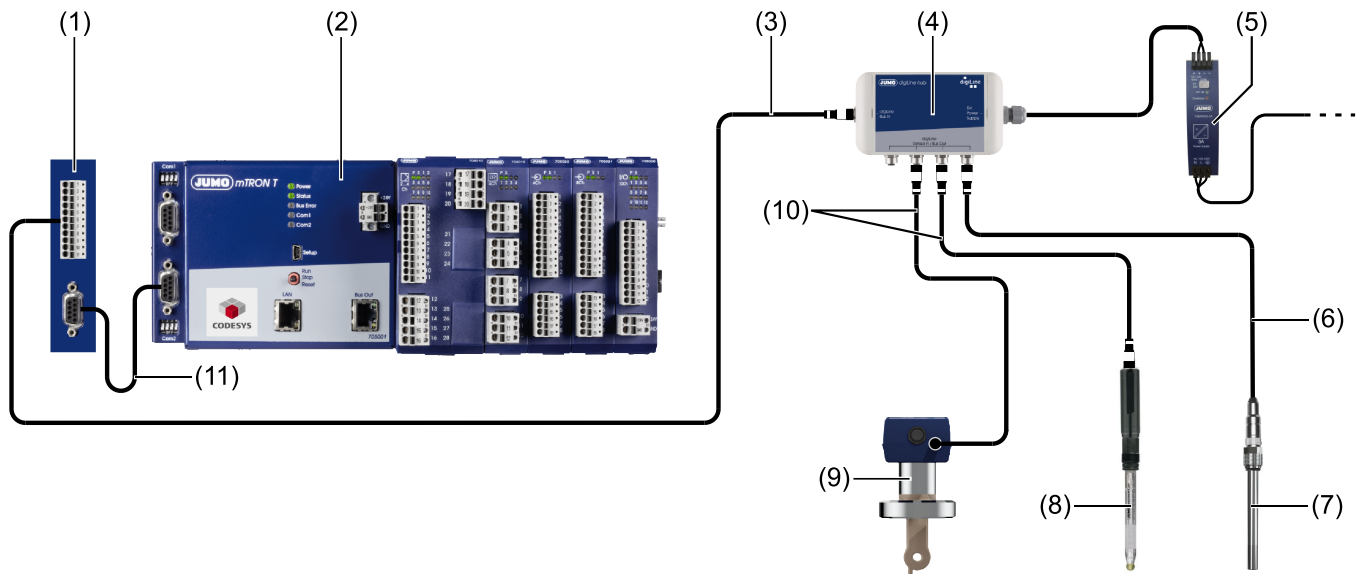
JUMO AQUIS touch S (digiLine operation with 3 digiLine sensors)



- 1 JUMO AQUIS touch S with RS485 bus termination in the device
- 2 JUMO M12 connecting cable, 5-pole and A-coded
- 3 JUMO digiLine hub
- 4 Separate DC 24 V power supply unit for the voltage supply to the JUMO digiLine bus system
- 5 VarioPin adapter cable to M12, 5-pole
- 6 JUMO digiLine O-DO H10/H20 – optical sensor for dissolved oxygen in hygienic applications
- 7 JUMO digiLine pH – sensor for hygienic applications
- 8 JUMO digiLine Ci – head transmitter for hygienic applications
- 9 JUMO M12 digiLine master connecting cable (product group 203590) with exposed wire ends at one end for connection to devices with screw or spring-cage terminals.

7 Electrical connection

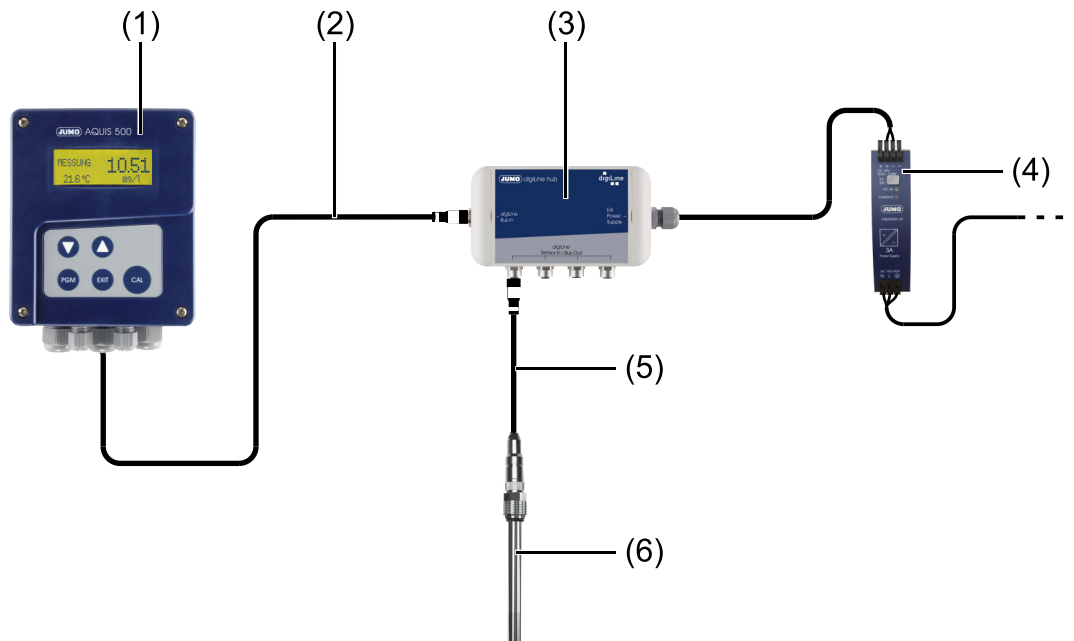
JUMO mTRON T (Modbus operation with 3 sensors)



- 1 Interface module for digiLine master connecting cable, with screw terminals and 9-pole D-sub pin header
- 2 mTRON T central processing unit with RS485 interface as digiLine master (Modbus master)
- 3 JUMO M12 digiLine master connecting cable **for 705001** with exposed wire ends at one end for connection to devices with screw or spring-cage terminals
- 4 JUMO digiLine hub
- 5 Separate DC 24 V power supply unit for the voltage supply to the JUMO digiLine bus system
- 6 VarioPin adapter cable to M12, 5-pole
- 7 JUMO digiLine O-DO H10/H20 – optical sensor for dissolved oxygen in hygienic applications
- 8 JUMO digiLine pH – sensor for hygienic applications
- 9 JUMO digiLine Ci – head transmitter for hygienic applications
- 10 JUMO M12 connecting cable, 5-pole and A-coded
- 11 D-sub connection cable

7 Electrical connection

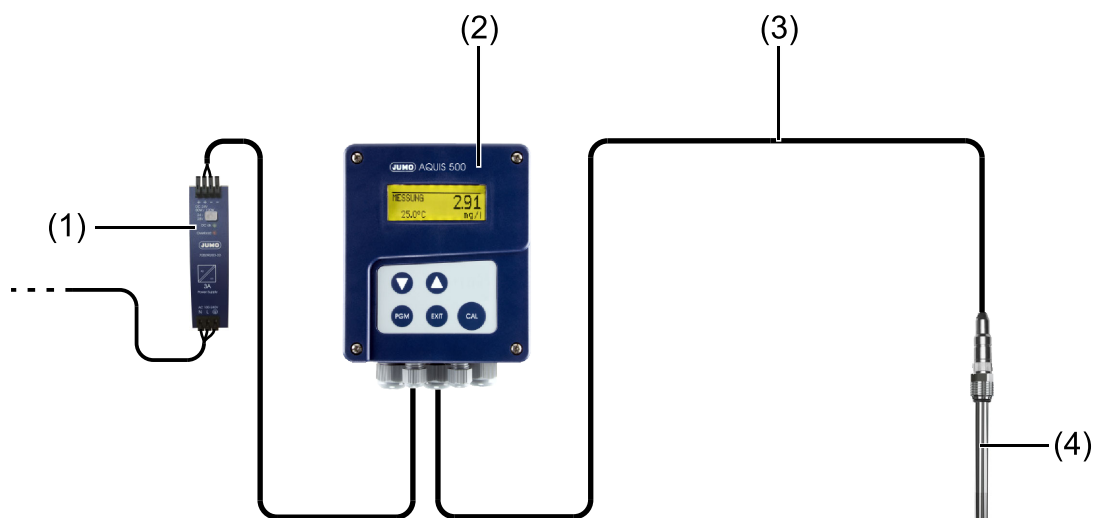
JUMO AQUIS 500 RS (Modbus operation)



- 1 JUMO AQUIS 500 RS – indicating device and controller for digital sensors
- 2 JUMO M12 digiLine master connecting cable **for 705001** with exposed wire ends at one end for connection to devices with screw or spring-cage terminals
- 3 JUMO digiLine hub
- 4 Separate DC 24 V power supply unit for the voltage supply to the JUMO digiLine O-DO H10/H20 sensor
- 5 VarioPin adapter cable to M12, 5-pole
- 6 JUMO digiLine O-DO H10/H20 – optical sensor for dissolved oxygen in hygienic applications

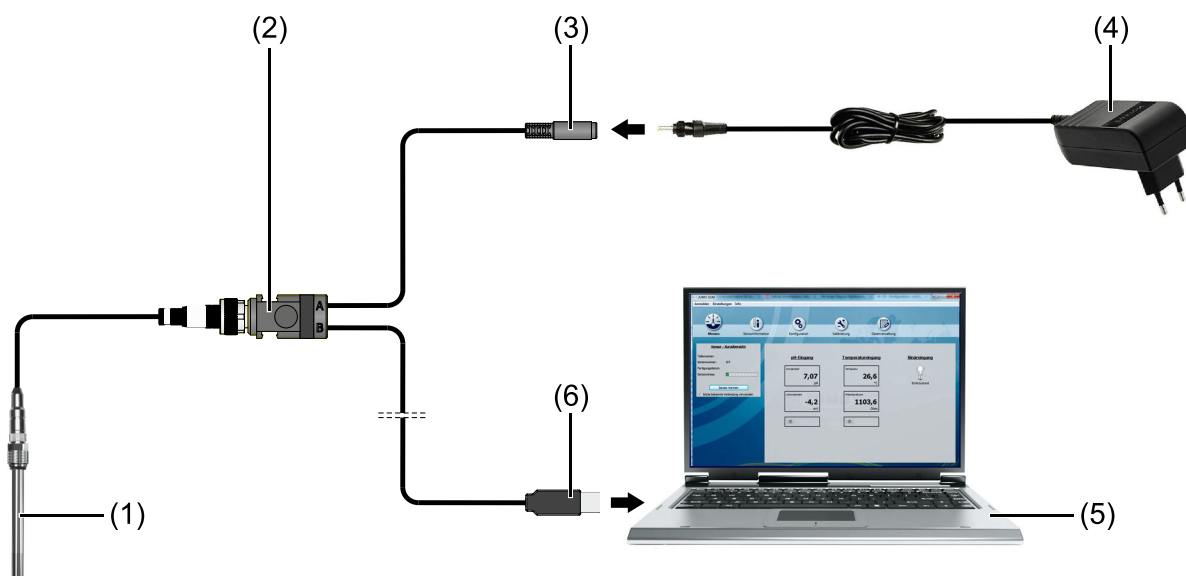
7 Electrical connection

JUMO AQUIS 500 AS (analog 4°to°20°mA interface)



- 1 Separate DC 24 V power supply unit for the voltage supply to the JUMO digiLine O-DO H10/H20 sensor
- 2 JUMO AQUIS 500 AS – indicating device and controller for standard signals
- 3 VarioPin connecting cable on exposed wire ends for connection to devices with screw or spring-cage terminals
- 4 JUMO digiLine O-DO H10/H20 – optical sensor for dissolved oxygen in hygienic applications

JUMO DSM



- 1 JUMO digiLine O-DO H10 – optical sensor for dissolved oxygen in hygienic applications
- 2 USB converter: Y distributor
- 3 USB converter: DC coupling
- 4 Plug-in power supply unit 24 V / 1 A
- 5 Laptop with JUMO DSM software for JUMO digiLine sensors
- 6 USB converter: USB connector

7 Electrical connection



NOTE!

When connecting to a laptop (with the DC power supply decoupled or battery supply) there is generally no protection conductor and therefore no equal potential between the sensor and the laptop. A fluctuating potential can disrupt the oxygen measurements.

If problems are observed during measurement, take the following measures:

- Operate the laptop with the power supply unit
- Ground the V- of the sensor supply voltage.
- Ground the sensor housing

The following requirements must be met before startup:

- The sensor was installed in a fitting.
- The sensor has been electrically connected to a suitable transmitter (JUMO AQUIS touch S/P, JUMO mTRON T, Modbus master device, or JUMO AQUIS 500 RS).
- The sensor has been configured either on a JUMO digiLine master device or using the JUMO DSM.

The following points must be observed when starting up the sensor:

- The sensor may be damaged by penetrating moisture. Therefore screw the sensor cap tightly onto the sensor shaft. The black O-ring located between the shaft and cap must not be visible.



- For optimum, error-free measurement, air bubbles adhering to the sensor membrane must be avoided.
- Following insertion into the measurement medium, you should wait until a constant temperature has been reached (isothermal conditions).

9 Configuration

There are the following options for configuring the sensor, regardless of the operating mode:

JUMO digiLine operation	Configuration and (re)calibration directly in the field on the JUMO AQUIS touch S/P
Modbus RTU operation	Configuration, measuring point management, and (re)calibration on the PC with the JUMO DSM software
Two-wire current interface operation	

This chapter describes the general calibration procedure. The precise instructions for calibrating the sensors with the modular multichannel measuring device JUMO AQUIS touch S/P are described in detail in its operating manual.

Calibration and configuration of the sensors for use with the JUMO mTRON T automation system as well as the JUMO AQUIS 500 AS transmitter/controller is simple and convenient with the JUMO DSM PC software.

The sensors are calibrated using zero-point, end-value, or two-point calibration, either in a dry or humid environment.

Reference sources for the calibration gases used in the following calibration instructions are Air Liquide, Linde, and Westfalen AG, for example.



NOTE!

Successful calibration, particularly zero-point calibration, requires time and care to prevent measurement errors.

10.1 Pre-calibration

During initial startup of the sensors and when changing a sensor cap, the calibration values of the sensor cap from the default pre-calibration can be used.

These values and sensor constants are in the supplied "Final Inspection Protocol" and are highlighted in gray there.

Final Inspection Protocol

Type of sensor: BP 201

Part number sensor cap: 30055319

Batch number: 240920-001_H10-1443-01

Date: 18 Sep 2024

Reference device: SAEM0004000046

Device: JUMO digiLine O-DO H10

Type: 202612/10-20-1-1-18-120/992

Part number device: 00730258

F-Nr.: 0005055901024390003

Dear customer,

Data are specific for the test instrumentation used in our laboratory. Your instrument in combination with the sensors might show different signal amplitude and phase angles.

Data

Atmospheric Pressure:

980 hPa

Calibration Mode

Humid

	Phase signal	Valide range	Temperature	Valid range	Amplitude	QC-passed?
	[°]	[°]	[C°]	[C°]	[µV]	(ok / failed)
cal 0 0 %a.s.	56.04	52.00 - 58.00	18.9	18.0 - 22.0	234373.4	OK
cal 2nd 97.77 %a.s.	21.88	18.00 - 26.00	18.9	18.0 - 22.0	90991	OK

Response time [t90]: < 60 s

Valid range: < 60 s

Please type in these values into the software for "manual calibration"

Sensor Constants:

f1 = 0.820	dPhi1 = -0.02500	dKSV1 = 0.000200
m = 10.50	dPhi2 = -0.00008	dKSV2 = 0.000000

Sensor is within the accepted tolerance window
Sensor is visually inspected.

10 Calibration

10.2 Recalibration

10.2.1 Calibration interval

Recommendations for JUMO digiLine O-DO H10/H20:

- Calibrate once per year, depending on the operating conditions.
- Calibrate after 10 to 20 cycles in the case of CIP/SIP applications.
- After each time a sensor cap is replaced, use the data for the new sensor cap from its Final Inspection Protocol or perform a calibration.
- Regularly clean the sensors.
- After cleaning, check the zero point (0 % saturation) in a sodium sulphite solution with a sulphite concentration of < 2 %.
- If the zero point is moved, perform a complete two-point calibration.

10.2.2 Zero-point calibration type H10 and H20

Humid calibration mode in oxygen-free water (only type H10)

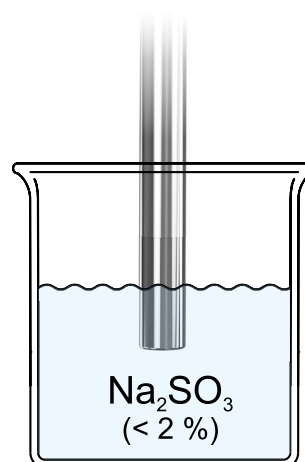


NOTE!

To prevent the formation of air bubbles, ensure that the water and ambient air have the same temperature.

Aids	Tap water at room temperature
	Slim, tall beaker
	Sodium sulphite
	Holder for the sensor (not essential)

1. Produce an aqueous solution with maximum 2 % sodium sulphite.
The solution becomes free from oxygen after approx. 1 minute due to a chemical reaction of oxygen with the sodium sulphite. Additional oxygen which diffuses into the water from the air is removed by excess sodium sulphite for a certain period of time.
2. Immerse the sensor in the solution.
 - a) If necessary, use a holding device for the sensor.
3. Perform the calibration if the oxygen measured value is stable.



Humid calibration mode in humidified oxygen-saturated atmosphere

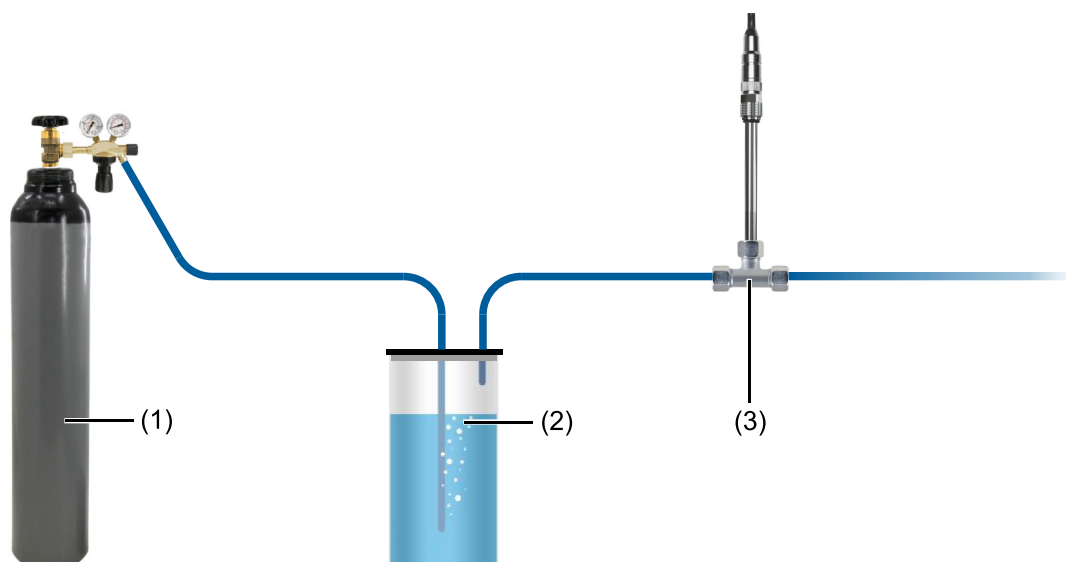


NOTE!

To prevent measurement errors, ensure that the temperature in the measurement chamber remains constant during calibration.

Aids	Nitrogen gas 5.0 (1)
	Container with distilled water (2)
	Measurement chamber or flow cell (3)

1. Install the sensor in a suitable measurement chamber or flow cell.
2. Guide the calibration gas (nitrogen 5.0) through a container of distilled water into the measurement chamber for humidification.
3. Perform the calibration if the oxygen measured value is stable.



10 Calibration

Dry calibration mode in dry oxygen-saturated atmosphere

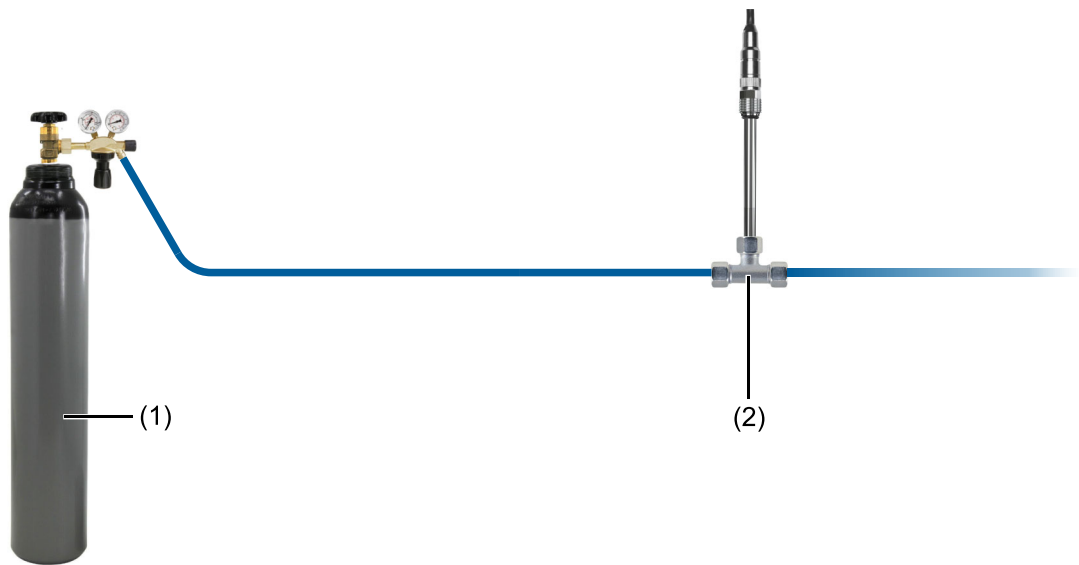


NOTE!

To prevent measurement errors, ensure that the temperature in the measurement chamber remains constant during calibration.

Aids	Nitrogen gas 5.0 (1)
	Measurement chamber or flow cell (2)

- 1. Install the sensor in a suitable measurement chamber or flow cell.
- 2. Guide the calibration gas (nitrogen 5.0) into the measurement chamber.
- 3. Perform the calibration if the oxygen measured value is stable.



10.2.3 End value calibration type H10 and H20

Humid calibration mode in humidified oxygen calibration gas

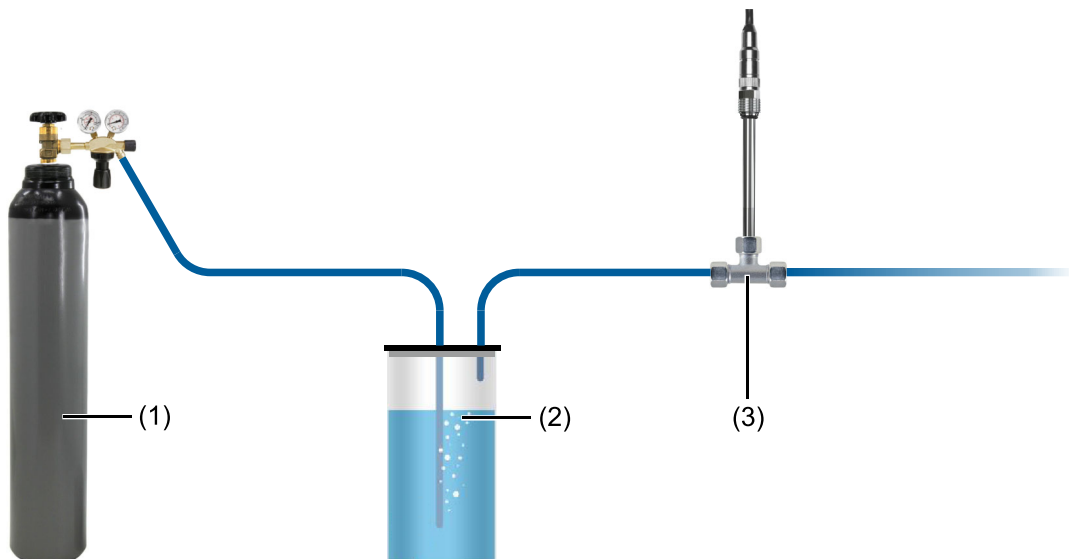


NOTE!

To prevent measurement errors, ensure that the temperature in the measurement chamber remains constant during calibration.

Aids	Oxygen calibration gas (1)
	• Oxygen content 20.9 % for sensor type H10 • Oxygen content 1 to 2 % for sensor type H20
	Container with distilled water (2)
	Measurement chamber or flow cell (3)

1. Install the sensor in a suitable measurement chamber or flow cell.
2. Guide the calibration gas through a container of distilled water into the measurement chamber for humidification.
3. Perform the calibration if the oxygen measured value is stable.



10 Calibration

Dry calibration mode in dry oxygen calibration gas

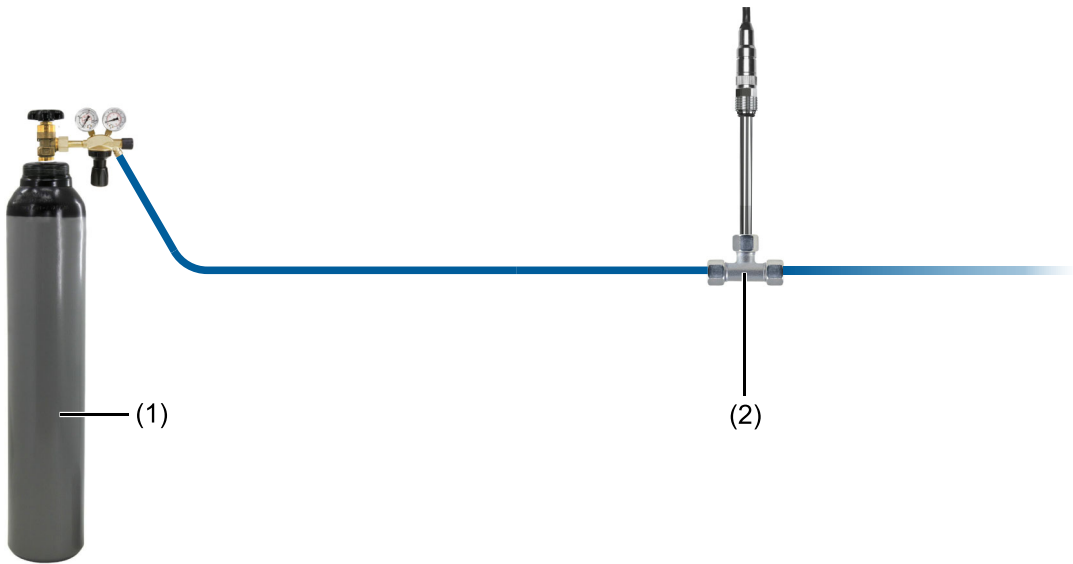


NOTE!

To prevent measurement errors, ensure that the temperature in the measurement chamber remains constant during calibration.

Aids	Oxygen calibration gas (1) • Oxygen content 20.9 % for sensor type H10 • Oxygen content 1 to 2 % for sensor type H20
	Measurement chamber or flow cell (2)

1. Install the sensor in a suitable measurement chamber or flow cell.
2. Guide the calibration gas into the measurement chamber.
3. Perform the calibration if the oxygen measured value is stable.



10.2.4 End value calibration type H10

You can also use the two calibration methods described below for the standard sensor (type H10).

Humid end value calibration in water vapor-saturated air

Aids	Tap water at room temperature
	Slim, tall beaker
	Holder for the sensor

1. Pour tap water into a beaker and leave to stand for at least 30 minutes.

Once the time has elapsed, an equilibrium in the gas exchange and the temperature between water and ambient air has been established.

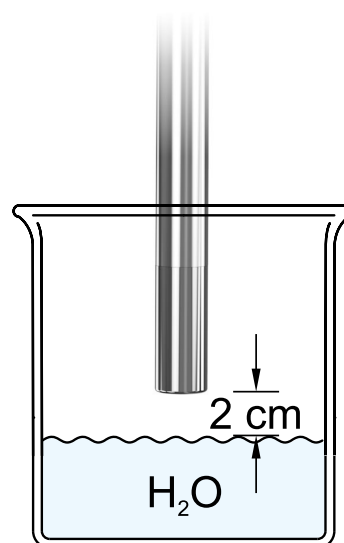
2. Position the sensor using a holder approx. 2 cm above the surface of the water.



NOTE!

The sensor must be kept dry during the calibration process. Drops of water adhering to the sensor membrane could distort the measurement result.

3. Ensure that the air pressure and temperature remain constant during the calibration.
4. Ensure that there is no draft in the direct surroundings of the beaker.
5. Perform the calibration if the oxygen measured value is stable.

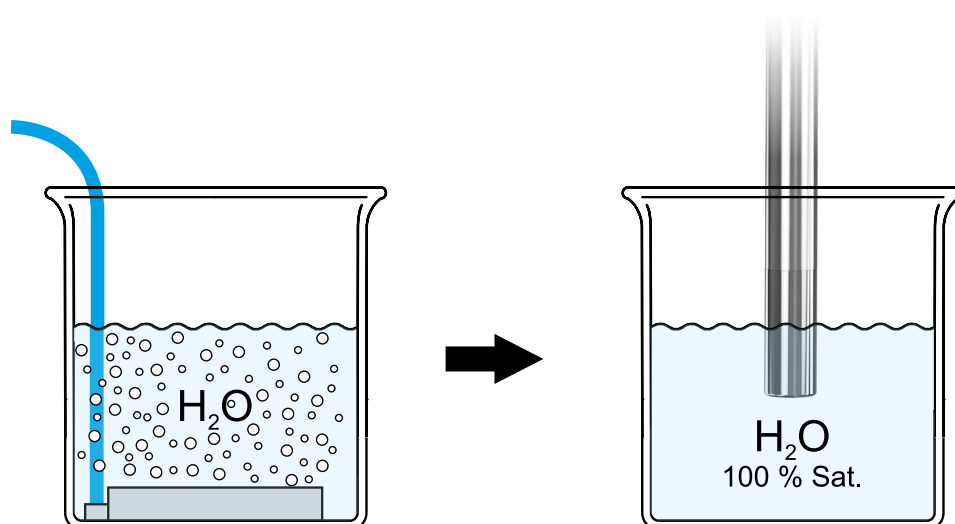


10 Calibration

Humid end value calibration in oxygen-saturated water

Aids	Tap water at room temperature
	Beaker for at least 100 ml of water
	Air stone (diffuser stone)
	Air pump
	Holder for the sensor (not essential)

1. Pour at least 100 ml of water into a suitable beaker.
2. Place a diffuser stone (air stone) with an air pump connected into the beaker to blow air into the water while producing a large number of air bubbles.
3. Blow air into the water for around 20 minutes while stirring the water.
4. Once the time has elapsed, switch off the air pump and remove the air stone from the water.
5. Stir the solution for another 10 minutes.
This ensures that the water is not supersaturated.
6. Place the sensor in the water.
 - a) If necessary, use a holding device for the sensor.
7. Ensure that the membrane is covered with water.
8. Ensure that the water keeps moving.
This reduces the sensor reaction time.
9. Perform the calibration if the oxygen measured value is stable.



10.3 Calibration logbook

A calibration logbook is kept in the sensor electronics which stores the last 10 calibrations with the date, time, and calibration values and offers an overview of the sensor's calibration history. For example, the calibration logbook can be extracted using the JUMO AQUIS touch S/P or using the JUMO DSM software. There is no limit to the number of calibration logbook entries in the DSM database.

11 Troubleshooting

Error	Possible cause	Remedy
The sensor does not respond.	The power supply unit is not connected.	
	The power supply unit is not working.	
	The connecting cable is not connected correctly.	
	The COM Port Nummer is not correct.	
	The settings of the digital interface are not correct.	Check the interface settings. JUMO digiLine and Modbus differ.
The sensor communicates only sporadically.	The digital interface is not connected correctly.	Check connecting cable.
The sensor measures the temperature but not the oxygen value.	The setting for the maximum temperature is unsuitable.	
The analog 4 to 20 mA interface only delivers a fixed value.	The mode is set to "fixed value".	
	The fixed value corresponds to a defined error value.	
The oxygen value (phase) has a high noise ratio.	The grounding potential of the components involved in the measurement is not standardized.	Ensure a standardized potential through grounding. ⇒ "Laptop with JUMO DSM software for JUMO digiLine sensors ", Page 27

12.1 Removal



WARNING!

Risk of burning due to hot surfaces

In the CIP/SIP cleaning process, the sensor's surfaces are subjected to hot temperatures of up to 140 °C. Contact with these surfaces could result in burns to the skin.

- ▶ When maintaining and cleaning the sensor, check its surface temperature and, if necessary, wait until it has cooled.

Before removing the sensor from the process (the fitting), ensure that no process medium can escape during the removal.

12.2 Cleaning

CIP/SIP cleaning

Only clean or sterilize the sensor with the means specified in chapter chapter 4.4 "Environmental influences", Page 14, taking into consideration the conditions specified there.

NOTICE!

Sensor caps of the type FRT (Fast Response Time) are not suitable for CIP/SIP!

The sensor detects CIP/SIP cycles and counts them internally. However, the sensor does not trigger an alarm if a critical number of cycles has been reached.

When operating on a JUMO AQUIS touch, a limit value monitoring function for the maximum tolerated CIP and SIP cycles can be set up and an alarm can be activated.

Cleaning in the process at room temperature

Only clean the sensor with the means specified in chapter chapter 4.4 "Environmental influences", Page 14, taking into consideration the conditions specified there.

Manual cleaning

The presence of a biofilm on the membrane of the sensor cap can lead to measurement errors.

- Always keep the sensor clean, especially in the area of the optical membrane.
- If the measured value moves during operation, you should first check the sensor for any deposits and contamination, clean it, and recalibrate it if necessary.
- Clean a dirty sensor cap membrane with a soft sponge using warm water containing detergent. **Do not use an abrasive scouring pad with grinding effect!**

12 Maintenance and cleaning

12.3 Sensor cap change

Auxiliary equipment	New sensor cap with protective cap
	New O-ring

1. Unscrew and disconnect the sensor's connecting cable.
2. Remove sensor from the process (the fitting).
3. Unscrew used sensor cap from the sensor housing.
4. Replace the old O-ring on the sensor with a new O-ring.
5. Screw on the new sensor cap with protective cap.



NOTE!

The sensor may be damaged by penetrating moisture. Therefore tightly screw the new sensor cap onto the sensor shaft. The black O-ring located between the shaft and cap must not be visible.



6. Remove the protective cap.
7. Install sensor in the process (the fitting).
8. Attach the sensor connecting cable and screw on.
9. Acquire features of the new sensor cap (from the supplied Final Inspection Protocol).
 - a) digiLine operation on the JUMO AQUIS touch: enter on the device.
 - b) Modbus operation: acquire with the JUMO DSM software.
10. Alternatively, perform calibration.

13.1 Dismounting

1. Disconnect the sensor's electrical connection.
2. Remove the sensor.
3. Clean the sensor ⇒ "Manual cleaning ", Page 41.
4. Mount the protective caps (for sensor cap and electrical connection) from the scope of delivery.
5. Store the sensor according to the specifications for admissible storage temperature chapter 4 "Technical data", Page 12.

13.2 Returns

Procedure:

1. The [supplementary sheet for product returns](#) must first be completed correctly and signed. Then enclose it with the shipping documents and attach it to the packaging, ideally on the outside.
2. Use the original packaging or a suitably secure container for sending the device.

13.3 Disposal

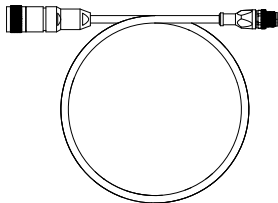
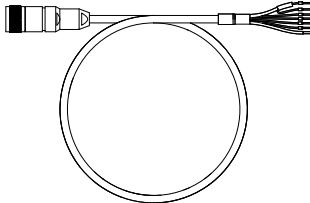
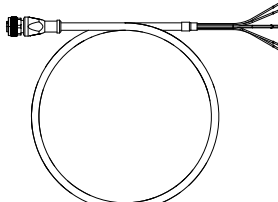
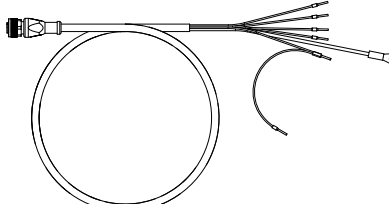
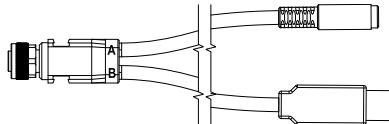


- Do not dispose of the device or replaced parts in the trash after use.
- Delete programs and data stored on the device.
- Remove batteries, if any, if this can be done without damaging the device.
- Dispose of the device and the packaging material in a responsible and environmentally friendly manner.
- Observe the country-specific laws and regulations for waste treatment and disposal.

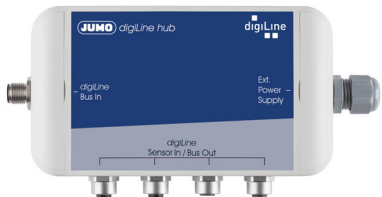
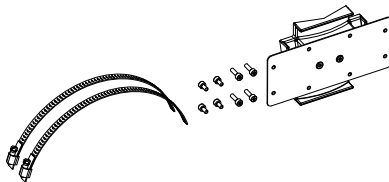
In accordance with Directive 2012/19/EU on Waste from Electrical and Electronic Equipment, manufacturers are obliged to offer the option of returning waste equipment. Request the return from the manufacturer.

14 Accessories

14.1 Connecting cable

Designation	Figure	Part no.
JUMO M12 digiLine O-DO H adapter cable 10 m		00720157
JUMO M12 digiLine O-DO H adapter cable 1.5 m		00720144
JUMO VarioPin connecting cable on exposed wire ends, length 5 m		00372919
JUMO VarioPin connecting cable on exposed wire ends, length 10 m		00373029
JUMO VarioPin connecting cable on exposed wire ends, length 15 m		00451481
JUMO VarioPin connecting cable on exposed wire ends, length 20 m		00373688
JUMO M12 digiLine master connecting cable for 705001, 5-pole, A-coded, length 10 m		00665547
JUMO M12 digiLine master connecting cable for 705001, 5-pole, A-coded, length 5 m		00665539
JUMO M12 digiLine master connecting cable for 705001, 5-pole, A-coded, length 1.5 m		00665529
JUMO M12 digiLine master connecting cable, 5-pole, A-coded, length 10 m (product group 203590)		00638341
JUMO M12 digiLine master connecting cable, 5-pole, A-coded, length 5 m (product group 203590)		00638337
JUMO M12 digiLine master connecting cable, 5-pole, A-coded, length 1.5 m (product group 203590)		00638333
JUMO M12 connecting cable, 5-pole, A-coded, length 15 m		00638324
JUMO M12 connecting cable, 5-pole, A-coded, length 10 m		00638322
JUMO M12 connecting cable, 5-pole, A-coded, length 5 m		00638315
JUMO M12 connecting cable, 5-pole, A-coded, length 1.5 m		00638313
JUMO M12 connecting cable, 5-pole, A-coded, length 0.5 m		00638312
USB converter (Y distributor M12, USB, DC coupling)		00746250

14.2 Electronics

Designation	Figure	Part no.
JUMO digiLine hub		00646871
Pipe-mounted kit for JUMO digiLine hub		00648759
JUMO power supply unit for digiLine hub IP67 protection type		00661597
JUMO power supply unit 705090/03-33		00747263
Plug-in power supply unit 24 V / 1 A		00743955

14.3 Software

Designation	Part no.
digiLine DSM setup program	00655787
Setup program digiLine DSM including data management	00663703

14 Accessories

14.4 Fittings

Use in substances with higher hygienic requirements

Designation	Part no.
Stainless steel process fittings, product group 202825	⇒ Data sheet 202825

Use in general water technology

Designation	Part no.
Stainless steel process fittings, product group 202831	⇒ Data sheet 202825
Manual retractable fittings	⇒ Data sheet 202822
Stainless steel electrode holder for installation of the sensor in tanks or pipes with 3/4–14 NPT threaded coupling	00674618
PVDF electrode holder for installation of the sensor in tanks or pipes with 3/4–14 NPT threaded coupling	00673945

14.5 Suitable transmitters/controllers

Designation	Figure	Part no.
Modular multichannel measuring devices for liquid analysis with integrated controller and paperless recorder JUMO AQUIS touch S/P		⇒ Data sheets 202580/ 202581
Scalable measurement, control, and automation system JUMO mTRON T		⇒ Data sheets 705000/ 705001
Indicating device/controller JUMO AQUIS 500 RS		⇒ Data sheet 202568

15.1 Sensor caps

Measuring and operating ranges for the sensors are determined by the sensor caps. Sensor caps with the following combinable features are available:

- **BP** (USP Class VI biocompatible, suitable for SIP and CIP)
- **FB** (safe for food applications, suitable for SIP and CIP)
- **PTFE** (hydrophobic Teflon coating, suitable for SIP and CIP)
- **FRT** (fast response time, not suitable for SIP and CIP)
- Measuring range 0 to 22.5 ppm or 0 to 45 ppm (for JUMO digiLine O-DO H10 sensor)
- Measuring range 0 to 2000 ppb (for JUMO digiLine O-DO H20 sensor)
- Flat or beveled front side for reduced air bubble formation
- With or without inspection certificate 3.1 material, surface roughness $\leq 0.4 \mu\text{m}$ (except weld seam), according to DIN EN 10204

Certificate of conformity according to FDA and declaration of manufacturer concerning biocompatibility of the sensor caps are available to download on our website's product page.

Designation		Description	Part no. ^a
BP	for 202612/10	Measuring range 0 to 22.5 ppm, flat front side, including inspection certificate 3.1 material	30055319
FB		Measuring range: 0 to 22.5 ppm, flat front side	30055285
FB		Measuring range: 0 to 45 ppm, flat front side	30055286
PTFE		Measuring range: 0 to 22.5 ppm, flat front side	30055287
FB	for 202612/20	Measuring range: 0 to 2000 ppb, flat front side	30055284

^a Usual versions. Additional versions upon request.

15 Spare parts



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