

JUMO GmbH & Co. KG

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JUMO Process Control, Inc.

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JUMO digiLine O-DO H10/H20

Digital optical sensors for dissolved oxygen in hygienic applications

Areas of application

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

Special features

- Precise measurement of even the lowest oxygen concentrations with long-term stability
- Storage of sensor, process, and calibration data in the sensor's own electronic components
- CIP/SIP suitable, autoclavable
- Sensor caps for various applications
- FDA compliant and biocompatible materials according to USP Class VI available
- Sensor self-diagnosis with output of warning and error messages
- JUMO digiLine interface, Modbus interface, and analog 4 to 20 mA interface

Description

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. They are designed for temperature-compensated measurement of dissolved oxygen in hygienic applications, but 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.



Type 202612



Digital interface

JUMO digiLine protocol: operation with the JUMO AQUIS touch S/P.

In JUMO digiLine operation, the entire functionality of the sensor in conjunction with the master is available to the user in the field:

- Sensor startup is made easier thanks to Plug and Play on the digiLine bus
- Sensor and measuring point information
- Operating hour and sensor change counter with information on the operating life of the sensor and sensor cap for a replacement which is planned and predictable
- Operating and process data, e.g. for acquiring CIP/SIP cycles
- Calibration menu and calibration logbook
- Sensor error detection

Modbus RTU protocol: operation with the JUMO mTRON T.

Analog 4 to 20 mA interface

Alongside digiLine and Modbus RTU operation, analog operation with a 4–20 mA interface is available. The sensor acts a current sink and requires a voltage supply in this process. Either the oxygen or temperature value can be output. Activation, output scaling, selection of the signal, and behavior in the event of a malfunction are configured with the JUMO DSM software.

Configuration and calibration

The sensors are calibrated and ready for use straight away for initial startup ex works.

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

The sensor electronics have a calibration logbook for the last 10 calibration operations with the date, time, and calibration values. The calibration logbook can be extracted on either 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.

Compensation variables

Temperature	The value can be provided from the following sources: • Sensor-internal temperature probe • digiLine master device (external) • Fixed value (input via digiLine master device or DSM)
Air pressure	The value for the calculated units % sat. and % vol. can be provided from the following sources: • digiLine master device (external) • Fixed value (input via digiLine master device or DSM)
Salinity	The value is required for measurement in saline media. It is provided as a fixed value input via the digiLine master device or the DSM.

Properties

Counter for the sensor cap change (pulse counter)	The luminophore in the sensor cap is subject to constant wear in measurement operation. The counter acquires the number of light impulses emitted and enables the user to replace the sensor cap in good time.
CIP/SIP counter	Acquires both the total number of cycles and the number of cycles since the last calibration.
Self-diagnosis	Transmission of error states to the connected transmitter through status messages.
Operating hours counter	Acquires 3 types of operating hours: • Total operating hours • Operating hours outside the admissible temperatures for oxygen measurement • Operating hours outside the operating temperature of the sensor

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Technical data

Electrical data

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

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.)	±0.009 ppm (±0.02 % vol.)
At 9 ppm (20.9 % 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.)	±0.3 ppb (±0.0006 vol.)
At 20 ppb (0.2 % 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	Information on use of the sensor caps ⇒ 13
BP	< 30 s
FB	< 40 s
PTFE	< 100 s
FRT	< 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

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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

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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.

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.

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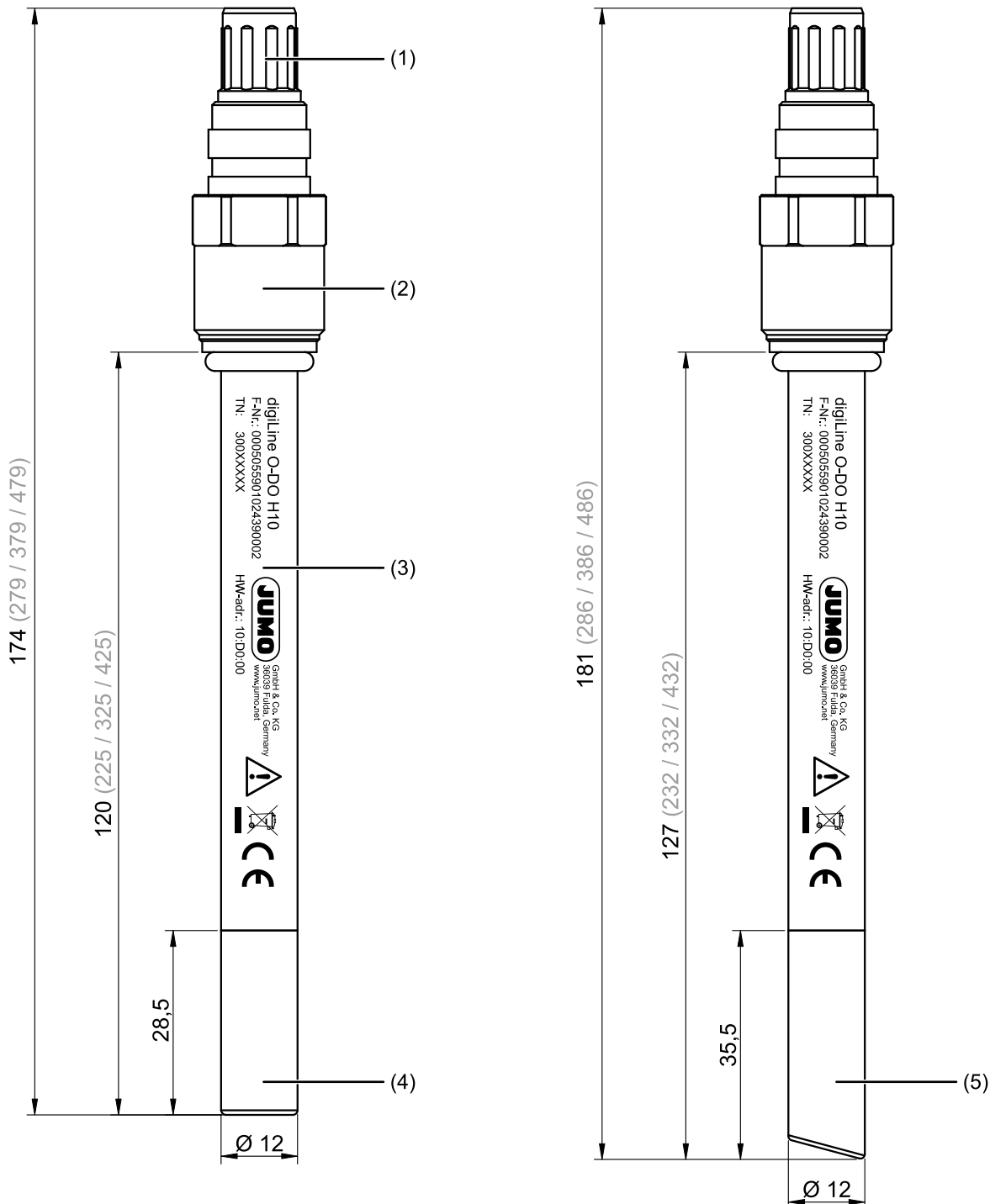
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**Dimensions**

- 1 VarioPin connection (8-pole)
- 2 Thread Pg 13.5
- 3 Sensor housing with optoelectronics
- 4 Straight sensor cap with internal luminophore
- 5 Beveled sensor cap with internal luminophore

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Connection diagram

The connection diagram in the data sheet provides information on product selection.

For the electrical connection, only use the installation instructions or the operating manual.

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	

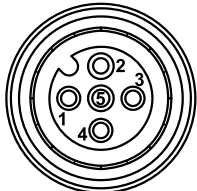
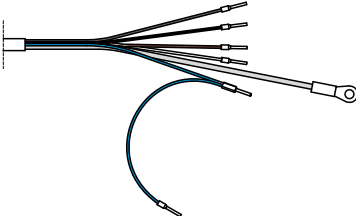
JUMO M12 digiLine O-DO H adapter cable (accessories)

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	

The connection to the serial interface of a master device or transmitter with screw or spring-cage terminals is established with the aid of the two JUMO M12 digiLine master connecting cables listed below.

JUMO M12 digiLine master connecting cable, 5-pole, A-coded, product group 203590 (accessories)

For connecting to the JUMO AQUIS touch S/P

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.			

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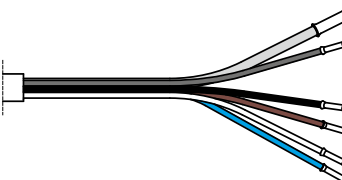
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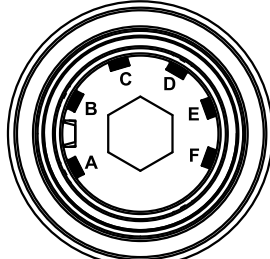
JUMO M12 digiLine master connecting cable for 705001, 5-pole, A-coded (accessories)

For connecting to the JUMO mTRON T system

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

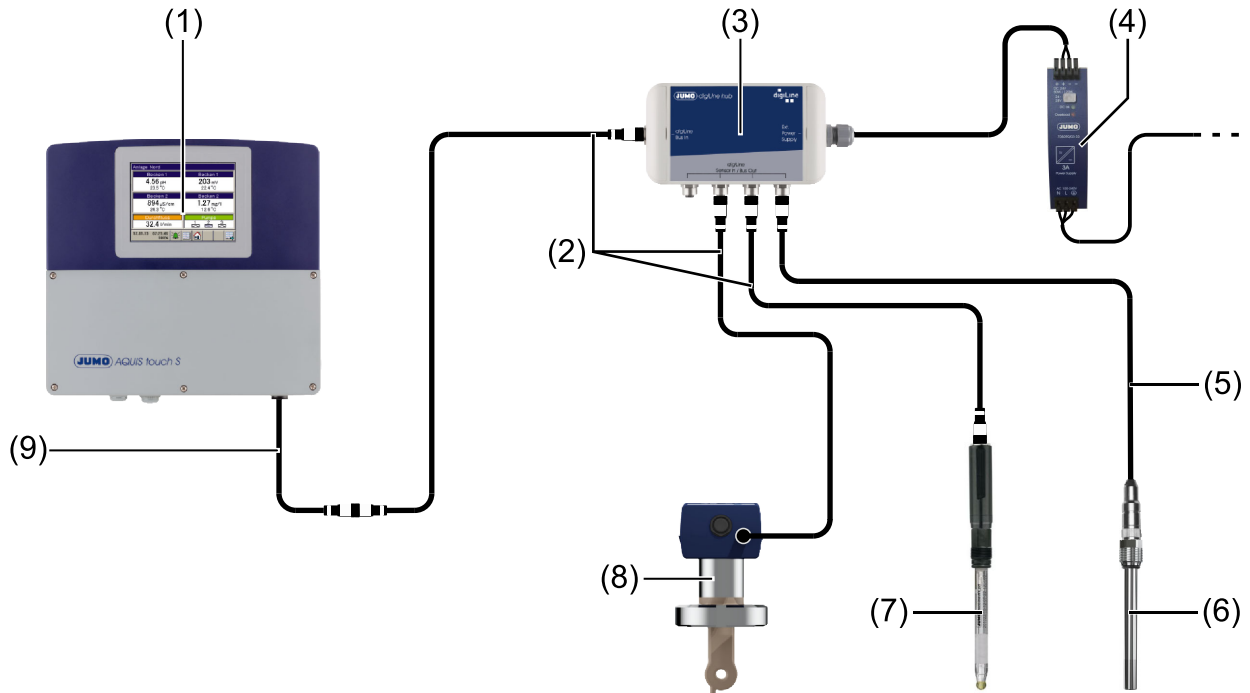
The connection to the analog 4 to 20 mA interface of a transmitter with screw or spring-cage terminals is established with the aid of the cable listed below.

VarioPin connecting cable on exposed wire ends (accessories)

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	

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.

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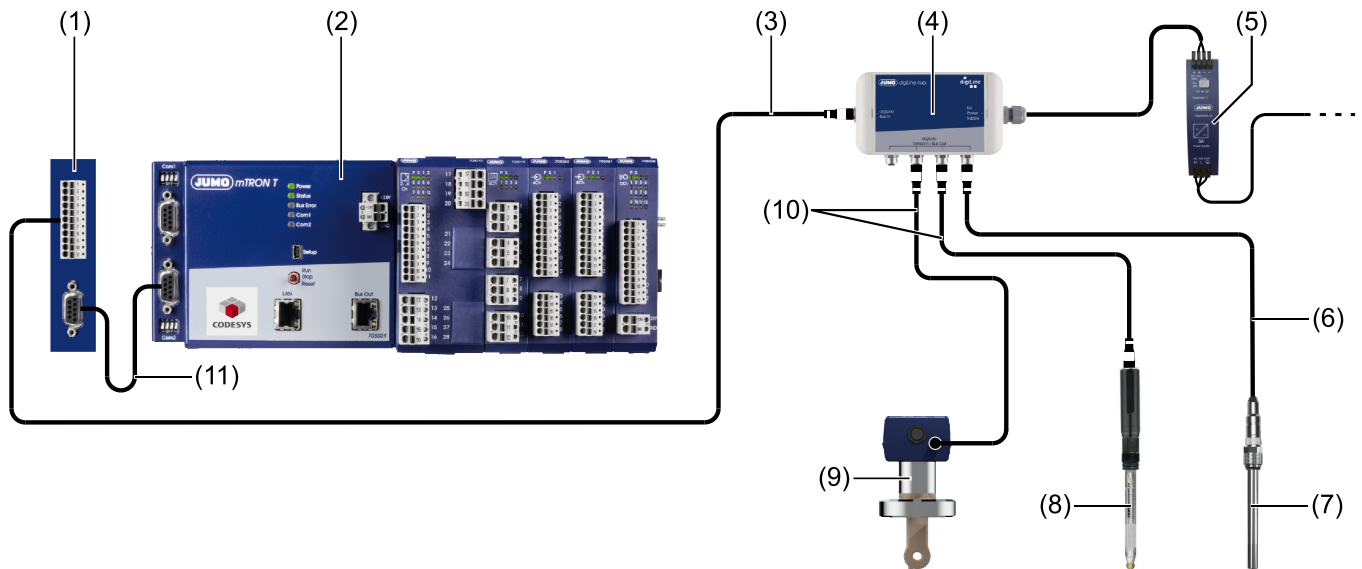
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**JUMO mTRON T (Modbus operation with 3 sensors)**

- 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

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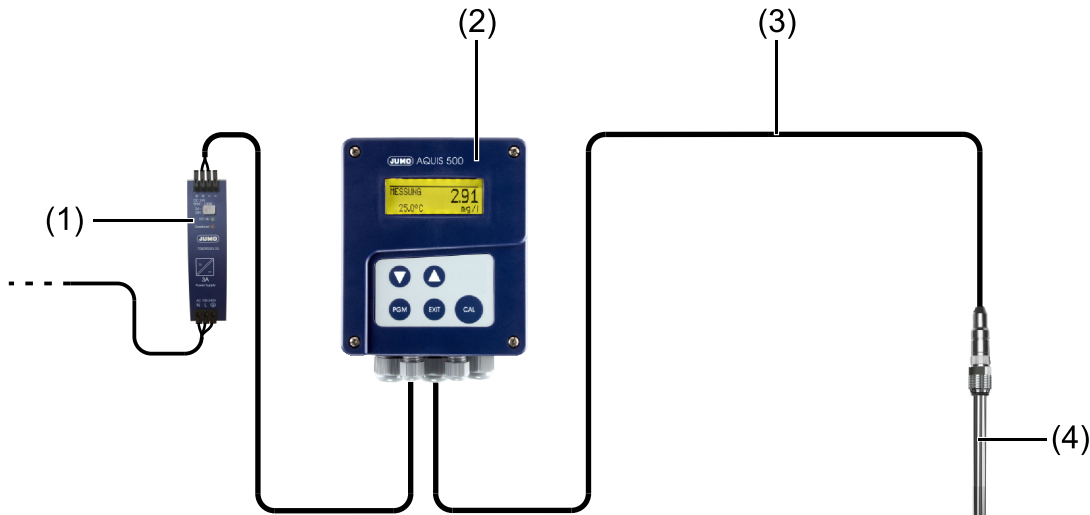
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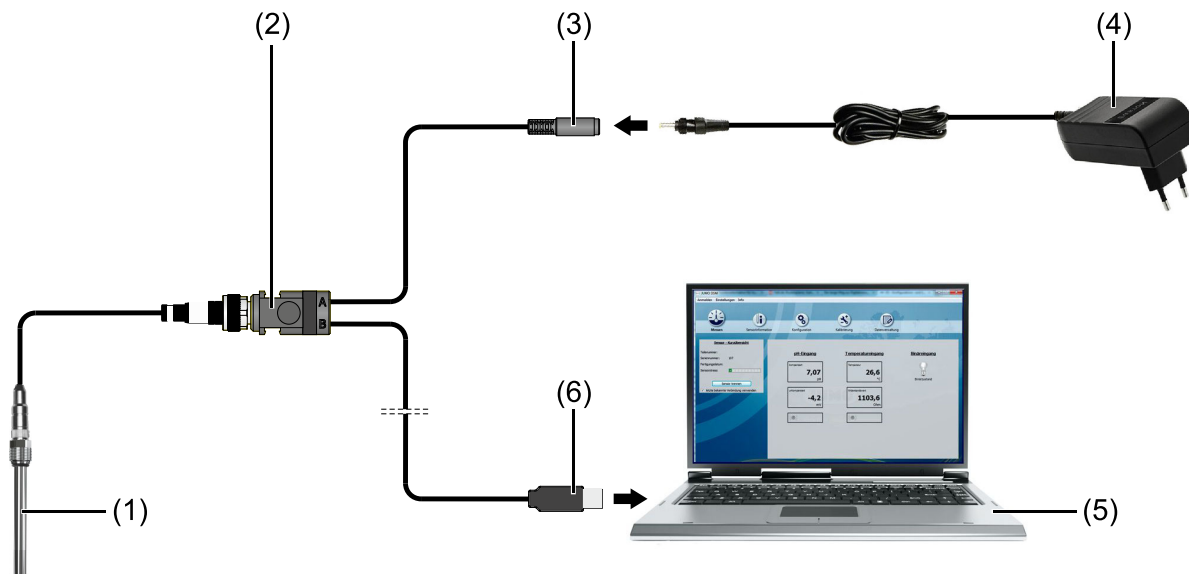
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**JUMO AQUIS 500 AS (analog 4°to°20°mA interface)**

- 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

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Order details

(1) Basic type	
202612	JUMO digiLine O-DO
(2) Basic type extension	
10	H10 (wide measuring range)
20	H20 (trace sensor)
(3) Measuring range	
02	0 to 2000 ppb (µg/l) ^a
20	0 to 22.5 ppm (mg/l) ^b
45	0 to 45 ppm (mg/l) ^b
(4) Sensor membrane type	
1	BP (Bioprocess & Pharmaceutical)
2	FB (Food & Beverage)
3	PTFE
4	FRT (Fast Response Time)
(5) Sensor cap	
1	Standard cap (flat)
2	Beveled cap
(6) Electrical connection	
18	With VP plug head Pg 13.5
(7) Insertion length	
120.00	120 mm ^c
(8) Extra codes	
000	None
992	Inspection certificate 3.1 material, surface roughness ≤ 0.4 µm (except weld seam), according to DIN EN 10204

^a Available for the JUMO digiLine O-DO H20 sensor.

^b Available for the JUMO digiLine O-DO H10 sensor.

^c Other installation lengths upon request.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)							
Order code		/		-		-		-		/					
Order example	202612	/	10	-	20	-	1	-	1	-	18	-	120	/	000

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Scope of delivery

Sensor in the ordered version
Operating manual
Final Inspection Protocol
Inspection certificate 3.1 material, surface roughness $\leq 0.4 \mu\text{m}$ (except weld seam), according to DIN EN 10204 ^a

^a Only for extra code 992.

Accessories

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
FB		Measuring range: 0 to 22.5 ppm, flat front side
FB		Measuring range: 0 to 45 ppm, flat front side
PTFE		Measuring range: 0 to 22.5 ppm, flat front side
FB	for 202612/20	Measuring range: 0 to 2000 ppb, flat front side

^a Usual versions. Additional versions upon request.

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

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Designation	Figure	Part no.
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

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

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Designation	Figure	Part no.
JUMO power supply unit 705090/03-33		00747263
Plug-in power supply unit 24 V / 1 A		00743955

Software

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

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

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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

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