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JUMO tecLine Cl2

Sensors for free chlorine



- Type 202630/40 Output signal 4 to 20 mA
- Type 202630/50 Output signal digital interface
- Type 202630/43 Output signal 4 to 20 mA, reduced pH dependence
- Type 202630/53 Output signal digital interface, reduced pH dependence

Brief description

These membrane-covered amperometric sensors are used to measure the concentration of free chlorine. The following anorganic chlorination agents can be measured: chlorine gas (Cl₂), electrolytically generated chlorine, sodium hypochlorite (NaOCl, chlorine bleaching solution), calcium hypochlorite (Ca(OCl)₂), or chlorinated lime (Ca(OCl)Cl).

The sensors are not suitable for detecting the absence of free chlorine.

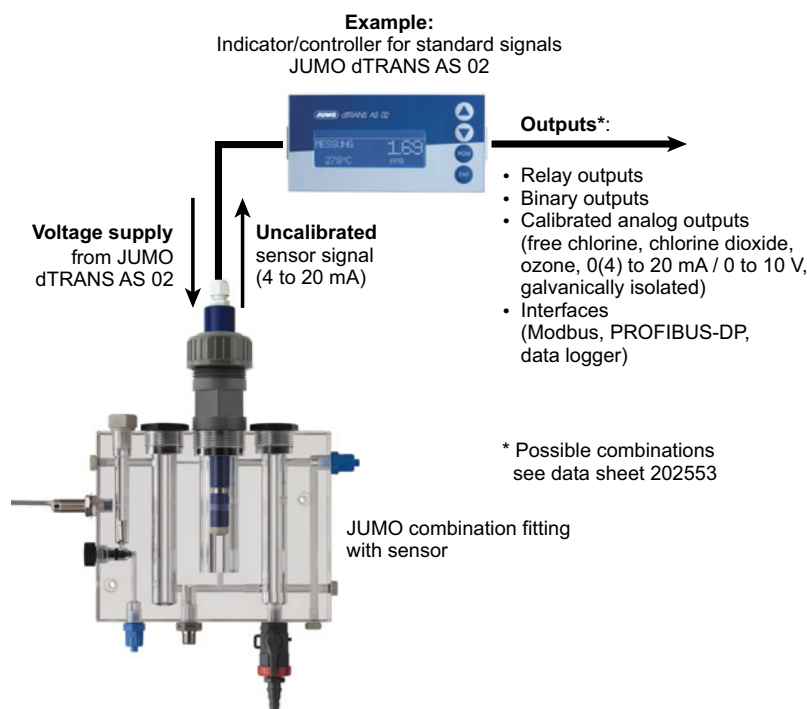
The sensors' integrated electronics provide a temperature-compensated current signal (4 to 20 mA) for the variant with an analog output signal, and a Modbus RTU signal for the variant with a digital interface. A downstream device (indicator, controller, recorder, PLC, etc.) is used for calibration.

The sensors can be connected directly to various indicating devices/transmitters/controllers (see "Suitable indicating devices/transmitters/controllers", page 10). They provide the voltage required for supplying the sensors and allow for easy calibration of the measuring system.

Application areas: measurements in drinking water, swimming pool water, service water, process water, cooling water, seawater (types 202630/43 and /53).

Type 202630/40... and type 202630/50...

Application example



Special features

- 2- and 3-electrode principle
- Easy calibration
- Integrated temperature compensation
- Proven measuring system
- Electrical connection analog or digital

Additional indicating devices/controllers: "Suitable indicating devices/transmitters/controllers", page 10

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Important information

Notes for all types

- Measuring is only possible in a suitable flow fitting (see accessories).
- The flow rate from the measurement medium must be at least 15 cm/s (0.5 l/min) in order for the sensor to work correctly. The minimum inflow can be guaranteed using the JUMO combination fitting or the JUMO individual fitting in connection with the JUMO flow monitor for disinfectant measured values (see accessories).
- For calibration, a test set is required to determine the free chlorine content using the DPD method; corresponding photo- or colorimetric test sets are commercially available.
- To make sure the sensor works correctly, only one disinfectant should be used at a time.
- The sensors for free chlorine are **not** suitable for determining organic chlorination agents (for example, cyanuric acid based products).
- To prevent contamination of the membrane, the measuring water must be of drinking water or swimming pool-like quality and must not contain **any** solids.
- More information on the setup and use of amperometric sensors can be found in our brochure "Information on amperometric measurement of free chlorine, chlorine dioxide and ozone in water".

Notes for types 202630/40 and 202630/50

- The measuring water must not contain surfactants due to the hydrophobic membrane of the sensor (ingredients made of detergents, cleaning agents and disinfectants).
- Following calibration, the pH value must be kept constant ($\Delta\text{pH} < 0.05$); if this is not possible, the sensor for free chlorine with reduced pH dependence (type 202630/43 or type 202630/53) must be used.

Notes for types 202630/43 and 202630/53 (reduced pH-dependence)

- In particular cases, it must be checked if the presence of surfactants will cause a significant reduction in the service life of sensors with hydrophilic membranes; however, in these cases the media must also have qualities similar to drinking or swimming pool water.
- The output signal of this sensor for free chlorine with reduced pH dependence is independent of the pH value in the range of pH 5 to 7; outside this range, the pH dependence is reduced (see technical data).
- To ensure that this sensor for free chlorine with reduced pH dependence functions correctly, the measurement medium must have a conductivity of at least 10 $\mu\text{S}/\text{cm}$.

Notes for types 202630/40 and 202630/43 (output signal 4 to 20 mA)

- The slope of these sensors can vary depending on the manufacture and application by between 65 % and 150 % of the nominal slope. To determine the appropriate measuring range or appropriate sensor, it is therefore recommended that the concentration to be measured be multiplied by a factor of 1.5.

Example: concentration to be measured 1.6 ppm \times factor 1.5 = 2.4 ppm \Rightarrow recommended sensor with measuring range 5 ppm

Required components for a measuring point

The following components are required to set up a measuring point for measuring free chlorine:

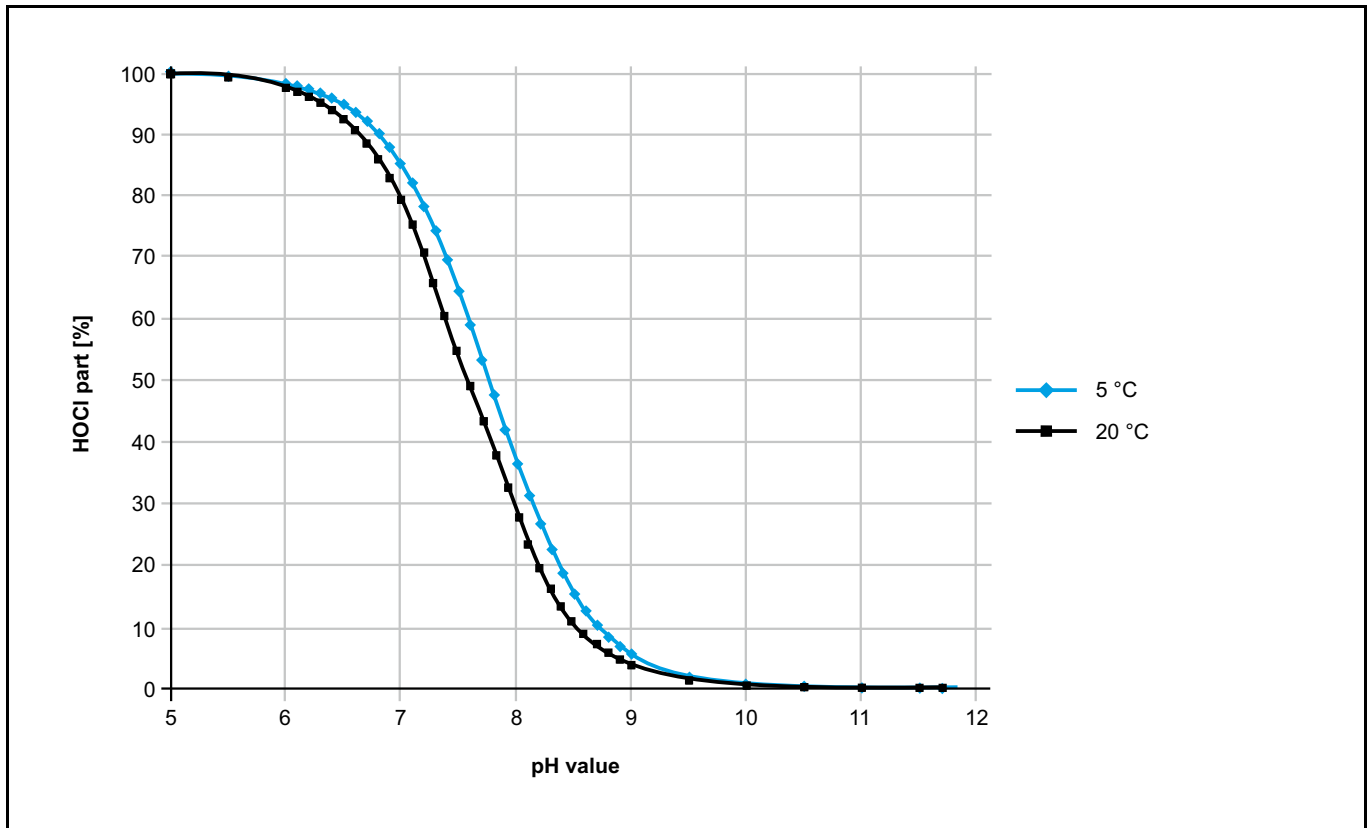
- amperometric sensor, membrane-covered
- transmitter /controller
- flow monitor (optional extra, recommended)
- fitting for membrane-covered sensors
- pH sensor (optional extra, for pH-compensated chlorine measurement)



Influence of the pH value on the chlorine measurement

The proportion of the hypochlorous acid (HOCl) is dependent on the pH value. The graphic below shows the existence ranges of hypochlorous acid and hypochlorite in relation to the pH value for 5°C and 20°C.

The percentage of HOCl is shown, the percentage of OCl⁻ is calculated by: 100-[HOCl]. Only the percentage of hypochlorous acid (HOCl) can be detected by the sensor 202630, whereas the corresponding anion OCl⁻ cannot.



Typical chlorine measurement without pH compensation

A typical chlorine measurement can, for example, be achieved using the sensor 202630/40 (pH-dependent version) and the single-channel transmitter/controller AQUIS 500 AS in connection with the JUMO individual fitting type 202811/30 and the JUMO flow monitor type 202811/20. This chlorine measurement is not pH-compensated, that is to say, the pH-value must be kept constant by the user.

Chlorine measurement using sensor with reduced pH dependence

If the pH value of the application moves within the range of 4 - 9 pH, there is the possibility of using the sensor type 202630/43. This is equipped with a special electrolyte with combined pH buffer. In this way, the pH-dependent slope loss of the sensor is minimized (see chapter "Technical data", page 4).

Chlorine measurement with pH compensation in the transmitter

For a pH-compensated chlorine measurement, the transmitters/controllers dTRANS pH 02, dTRANS AS 02 and AQUIS touch S (P) can be used. In these, the pH dependence is permanently stored according to the above graphic. The specified transmitters allow the additional connection of a pH electrode and can, in this way, record the pH value and the measured value for free chlorine. The pH compensation of the measured value occurs electronically in the transmitter. Suitable for sensor type 202630/40.

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Technical data

Sensors for free chlorine

Sensor type	202630/40	202630/50
Measurand	Free chlorine	
Area of application	Swimming pool water, drinking water, service water and process water	
Suitable chlorination agents	Inorganic chlorine compounds: NaOCl (sodium hypochlorite), Ca(OCl) ₂ , chlorine gas, chlorine produced by membrane electrolysis (not suitable: chlorine electrolysis without a membrane)	
Measuring principle	Membrane-covered, amperometric, two-electrode system with integrated electronics	
Membrane type	Hydrophobic PTFE membrane	
Measuring cable connection	2-pin terminal connection (2 × 1 mm ²)	5-pin flange connector, M12
Voltage supply	U _B DC 12 to 30 V (galvanic isolation required)	U _B DC 22.5 to 26 V (galvanically isolated from the sensor)
Electromagnetic compatibility ^a	Interference emission: class B ^b Interference immunity: to industrial requirements	
Output signal	4 to 20 mA	Modbus RTU
Load/current consumption	≤ (U _B - 7.5 V) ÷ 0.02 A	approx. 20 mA
Settling time	1 h	
Inflow speed	Approx. 15 cm/s corresponds to a flow of approx. 30 l/h when installed in the JUMO flow fitting (part no.: 00392611)	
Measuring ranges ^c	0.05 to 0.5 mg/l (ppm) 0.05 to 2 mg/l (ppm) 0.05 to 5 mg/l (ppm) 0.05 to 10 mg/l (ppm) 0.05 to 100 mg/l (ppm) 0.05 to 200 mg/l (ppm)	0.05 to 2 mg/l (ppm) 0.05 to 20 mg/l (ppm)
Resolution	0.01 mg/l with measuring range 0.5/2/5/10 mg/l 0.1 mg/l with measuring range 100/200 mg/l	0.001 mg/l with measuring range 2 mg/l 0.01 mg/l with measuring range 20 mg/l
Accuracy ^d Measuring range 2 mg/l	< 1 % with 0,4 mg/l < 1 % with 1,6 mg/l	
Slope drift ^e	Approx. < -1 % per month	
Response time t ₉₀	approx. 30 s	
Operating temperature Sample water temperature Ambient temperature	0 to 45 °C ^f 0 to 55 °C	
Temperature compensation	Automatic, using integrated temperature probe	
Zero point adjustment	Not required	
Slope adjustment	On evaluation unit/controller using analytical chlorine determination (DPD-1-method)	
pH value operating range	pH 6 to pH 8 Note the effect of the pH value on the disinfecting properties, corrosion and the dissociation curve.	
pH dependence (loss of slope)	with pH 8, approx. 65 % with pH 9, approx. 95 % (starting at pH 7)	
Disturbances	ClO ₂ : recorded with a concentration factor of 9 O ₃ : recorded Chlorine electrolysis without a membrane can cause disturbances	
Pressure resistance ^g	P _{abs} max. 2 bar P _{rel} max. 1 bar	
Materials	Semi-permeable membrane, PVC-U	
Dimensions	Dia. 25 mm, length 220 mm (housing with membrane cap)	Dia. 25 mm, length 205 mm (housing with membrane cap)
Weight	Approx. 125 g	

^a EN 61326-1, EN 61326-2-3.

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- b The product is suitable for industrial use as well as for households and small businesses.
- c Other measuring ranges upon request.
- d After calibration under replicable conditions (25 °C, pH 7.2 in drinking water) from the measuring range end value.
- e Under replicable conditions (25 °C, pH 7.2 in drinking water).
- f Prerequisite: no ice crystals in the measurement medium.
- g Pressure fluctuations are not admissible. Pressure-free operation (atmospheric pressure) recommended.

Maintenance and storage

Maintenance	
Inspection of the measuring signal	Regularly, at least once a week
Replacing the membrane cap	Once a year (depending on the quality of the water)
Replacing the electrolyte	Every 3 to 6 months
Storage	
Sensor	Can be stored indefinitely in a frost-free and dry place, without electrolyte and between +5 and 40 °C
Membrane cap	Used membrane caps cannot be stored.
Electrolyte	In original bottle, away from sunlight, and at a temperature between +5 and 35 °C

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Sensors for free chlorine (reduced pH dependence)

Sensor type	202630/43	202630/53
Measurand	Free chlorine (reduced pH dependence)	
Area of application	Swimming pool water, drinking water and seawater	
Suitable chlorination agents	Inorganic chlorine compounds: NaOCl (sodium hypochlorite), Ca(OCl) ₂ , chlorine gas, chlorine produced by electrolysis	
Measuring principle	Membrane-covered, amperometric, potentiostatic three-electrode system with integrated electronics	
Membrane type	Hydrophilic membrane	
Measuring cable connection	2-pin terminal connection (2 × 1 mm ²)	5-pin flange connector, M12
Voltage supply	U _B DC 12 to 30 V (galvanic isolation required)	U _B DC 22.5 to 26 V (galvanically isolated from the sensor)
Electromagnetic compatibility ^a	Interference emission: class B ^b Interference immunity: to industrial requirements	
Output signal	4 to 20 mA	Modbus RTU
Load/current consumption	≤ (U _B - 7.5 V) ÷ 0.02 A	approx. 20 mA
Settling time	2 h	
Inflow speed	Approx. 15 cm/s corresponds to a flow of approx. 30 l/h when installed in the JUMO flow fitting (part no.: 00392611)	
Measuring ranges ^c	0.05 to 2 mg/l (ppm) 0.05 to 5 mg/l (ppm) 0.05 to 10 mg/l (ppm) 0.05 to 200 mg/l (ppm)	0.05 to 2 mg/l (ppm) 0.05 to 20 mg/l (ppm) 0.05 to 200 mg/l (ppm)
Resolution	0.01 mg/l with measuring range 2/5/10 mg/l 0.1 mg/l with measuring range 200 mg/l	0.001 mg/l with measuring range 2 mg/l 0.01 mg/l with measuring range 20 mg/l 0.1 mg/l with measuring range 200 mg/l
Accuracy ^d	Measuring range 2 mg/l < 1 % with 0.4 mg/l < 1 % with 1.6 mg/l Measuring range 20 mg/l < 1 % with 4 mg/l < 3 % with 16 mg/l	
Slope drift ^e	Approx. < -1 % per month	
Response time t ₉₀	Approx. 2 min	
Operating temperature	Sample water temperature 0 to 45 °C ^f Ambient temperature 0 to 55 °C	
Temperature compensation	Automatic, using integrated temperature probe	
Zero point adjustment	Not required	
Slope adjustment	On evaluation unit/controller using analytical chlorine determination (DPD-1-method)	
pH value operating range	pH 4 to pH 9	
pH dependence (loss of slope)	Between pH 5 and 7: no loss of slope with pH 8, approx. 10 % with pH 9, approx. 30 % (starting at pH 7)	
Conductivity of the measurement medium	10 µS/cm to 50 mS/cm (seawater)	
Disturbances	ClO ₂ : recorded with a concentration factor of 0.75 O ₃ : recorded with a concentration factor of 0.8 Combined chlorine may increase the measured value	
Pressure resistance ^g	P _{abs} max. 4 bar P _{rel} max. 3 bar	
Materials	Microporous, hydrophilic membrane, PVC-U, stainless steel 1.4571	
Dimensions	Dia. 25 mm, length 220 mm (housing with membrane cap)	Dia. 25 mm, length 205 mm (housing with membrane cap)
Weight	Approx. 125 g	

^a EN 61326-1, EN 61326-2-3.

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- d After calibration under replicable conditions (25 °C, pH 7.2 in drinking water) from the measuring range end value.
- e Under replicable conditions (25 °C, pH 7.2 in drinking water).
- f Prerequisite: no ice crystals in the measurement medium.
- g Pressure fluctuations are not admissible. Pressure-free operation (atmospheric pressure) recommended.

Maintenance and storage

Maintenance	
Inspection of the measuring signal	Regularly, at least once a week
Replacing the membrane cap	Once a year (depending on the quality of the water)
Replacing the electrolyte	Every 3 to 6 months
Storage	
Sensor	Can be stored indefinitely in a frost-free and dry place, without electrolyte and between +5 and 40 °C
Membrane cap	Used membrane caps cannot be stored.
Electrolyte	In original bottle, away from sunlight, and at a temperature between +5 and 35 °C

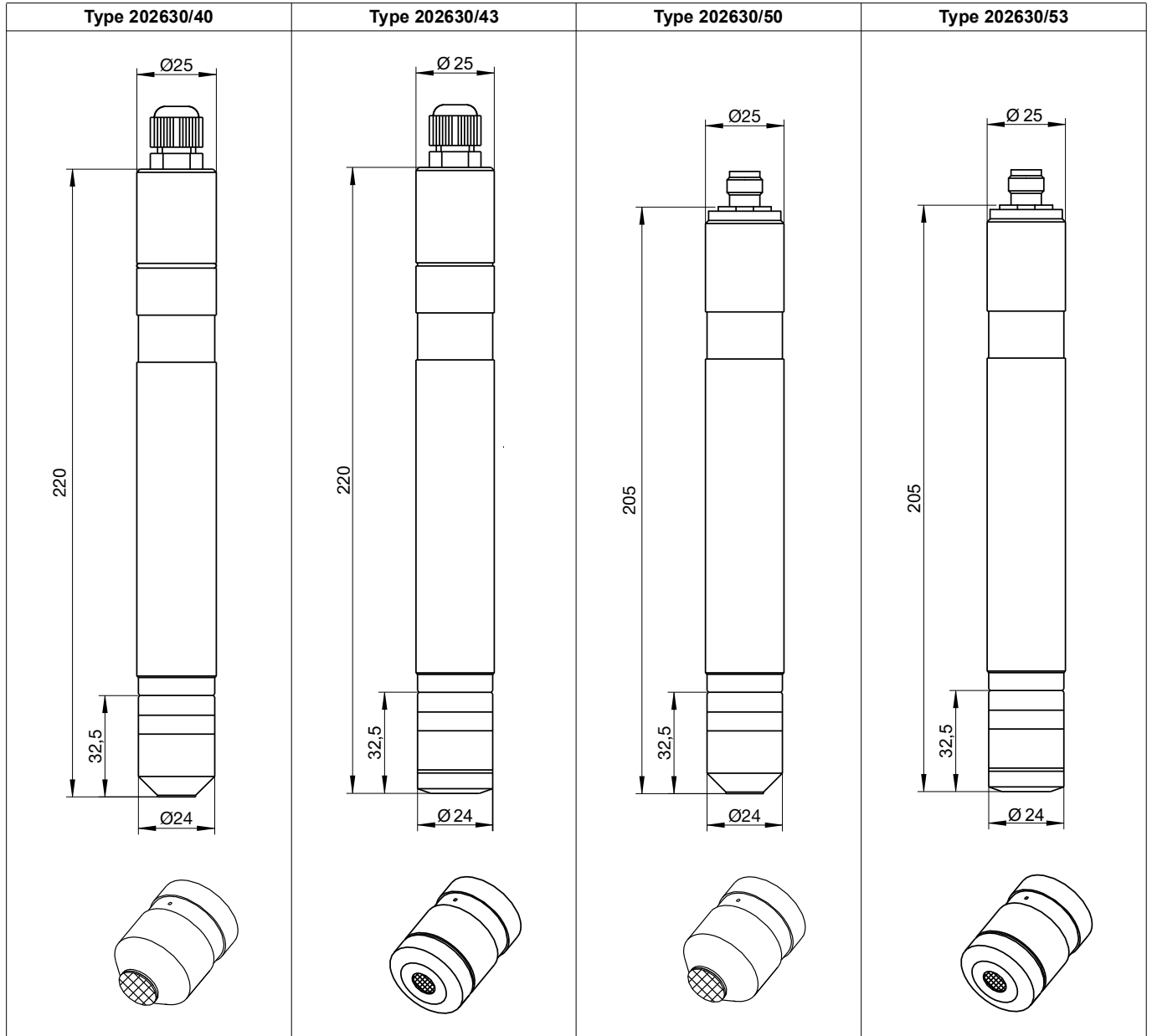
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Dimensions



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Electrical connection

Types 202630/40 and 202630/43

Function		Screw terminals
Voltage supply DC 12 to 30 V		1 L+ 2 L-
Two-wire output of 4 to 20 mA, load-independent current of 4 to 20 mA in voltage supply		1 L+ 2 L-

Types 202630/50 and 202630/53

Function	Pin on M12 flange connector
not connected	1
+24 V voltage supply from transmitter/controller	2
GND	3
RS 485 B (RxD/TxD-)	4
RS 485 A (RxD/TxD+)	5

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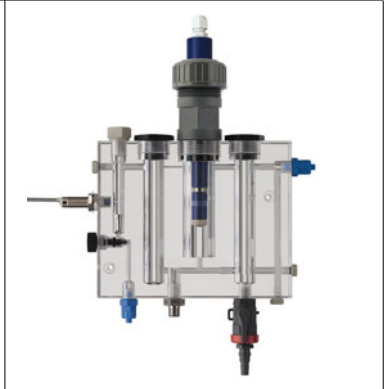


Accessories

Combination fitting type 202811/10

The combination fitting is intended to hold several electrochemical sensors. It is typically used for disinfection monitoring of drinking and swimming pool water as well as slightly polluted process and cooling water. Thanks to its compact design, the fitting allows for the space-saving consolidation of several sensors and is usually operated in a bypass or downstream of a tap in the main line. The sensors are easily visible through the fitting's crystal-clear design and can be visually inspected for pollutants.

In the maximum version, 2 sensors with Pg13.5 thread (for example for pH value and redox), 1 membrane-covered sensor Ø 25 mm for disinfectant monitoring and one temperature probe with thread M14 x 1.5 can be installed. Furthermore, the inflow of the measuring water contains flow monitoring with an inductive proximity switch for monitoring the inflow of the membrane-covered sensor. A ground pin can also be installed to discharge any electrostatic charges.



Flow monitor type 202811/20

The flow monitor is integrated in the measuring water supply, in line with the disinfection sensor, and monitors the required minimum flow speed to the sensor.

It consists of a flow unit, a needle valve insert for flow control, and an inductive proximity sensor, the contact of which can control a binary input of a controller (for example JUMO AQUIS 500 AS/RS). If the inflow is too low, the controller is moved to the "HOLD" status. This helps to avoid incorrect dosages.



Flow fitting type 202811/30

The flow fitting is intended to hold an individual membrane-covered sensor. The fitting is generally mounted in the bypass and, thanks to its special design type, provides the correct inflow for the sensor. The flow monitor type 202811/20 is recommended as an extension for monitoring the minimum inflow speed of a sensor.

The standard ground rod of the fitting enables the discharge of undesired electrical and electrostatic voltage potentials, which occur in complex plants and can distort the measured values.



Suitable indicating devices/transmitters/controllers

Type	Features	Suitable sensors
JUMO AQUIS 500 AS	1-channel (4 to 20 mA) indicating device/controller, additional temperature input, binary input, up to two analog and switching outputs	Types 202630/40 and /43 (Output signal 4 to 20 mA)
JUMO AQUIS 500 RS	1-channel (Modbus RTU) indicating device/controller, additional temperature input, binary input, up to two analog and switching outputs	Types 202630/50 and /53 (Digital interface)
JUMO dTRANS AS 02	Modular multichannel transmitter/controller for standard signals, PROFIBUS-DP, RS422/485, data logger using optional boards	Types 202630/40 and /43 (Output signal 4 to 20 mA)
JUMO AQUIS touch S/P	Modular multichannel measuring devices for liquid analysis with integrated controller and paperless recorder, USB host, USB device, Modbus, PROFIBUS-DP and Ethernet using optional boards	All types 202630

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Order details

(1) Basic type	
202630	JUMO tecLine Cl2 Sensor for free chlorine
(2) Basic type extension	
40	Output signal 4 to 20 mA
43	Output signal 4 bis 20 mA, reduced pH dependence
50	Digital output signal
53	Digital output signal, reduced pH dependence
(3) Measuring range^a	
10	0 to 0.5 mg/l (ppm)
20	0 to 2 mg/l (ppm)
25	0 to 5 mg/l (ppm)
35	0 to 10 mg/l (ppm)
37	0 to 20 mg/l (ppm)
40	0 to 100 mg/l (ppm)
45	0 to 200 mg/l (ppm)

^a When selecting the measuring range, please refer to the note on the slope of the sensors on page 2.

Order code	(1)	/	(2)	-	(3)
Order example	202630	/	40	-	20

Important information:

The order code is not modular. When placing orders, if possible please select the items listed under **"Stock versions"**. We must check the technical feasibility of and approve freely chosen combinations of individual code parts.

Scope of delivery

Type 202630/40	Two-wire sensor including membrane cap, electrolyte, special abrasive paper for cathode cleaning and operating manual
Type 202630/43	
Type 202630/50	Modbus RTU sensor including membrane cap, electrolyte, special abrasive paper for cathode cleaning and operating manual
Type 202630/53	

Stock versions

(Delivery within 3 working days after receipt of order)

Type	Part no.
202630/40-10 (4 to 20 mA, 0 to 0.5 mg/l)	00391395
202630/40-20 (4 to 20 mA, 0 to 2 mg/l)	00391396
202630/50-20 (digital, 0 to 2 mg/l)	00649742
202630/50-37 (digital, 0 to 20 mg/l)	00649745

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Accessories

Fittings

Description	Part no.
Combination fitting for mounting several electrochemical sensors ^a	00607325
Individual fitting for mounting a membrane-covered sensor	00392611
Mounting bracket for individual fitting	00455706
Flow monitor for monitoring the minimum inflow ^b	00605507

^a With integrated flow monitor, mini ball valve included.

^b For monitoring the flow in connection with the individual fitting.

Spare part sets and electrolytes

Description	Part no.
Spare part set for 202630/40 and /50 (1x membrane cap, fine abrasive paper)	00392331
Spare part set for 202630/41 and /51 (1x membrane cap, device holder, fine abrasive paper) (until 09/2016)	00402292
Spare part set for 202630/43 and /53 (1x membrane cap, fine abrasive paper) (from 10/2016)	00687804
Special electrolyte (100 ml) for 202630/40 and /50	00438122
Special electrolyte (100 ml) for 202630/41, 202630/43, 202630/51 and 202630/53	00438123

Connecting cables for sensors with a digital interface

Description	Part no.
1.5 m connecting cable, 5-pin M12 connector, A-coded on the ferrules	00638333
5 m connecting cable, 5-pin M12 connector, A-coded on the ferrules	00638337
10 m connecting cable, 5-pin M12 connector, A-coded on the ferrules	00638341

Suitable transmitters/controllers

Description	Part no.
JUMO AQUIS 500 AS ^a , type 202568/20-888-888-888-310-310-23/000 (for further versions, please refer to data sheet 202568)	00528718
JUMO AQUIS 500 RS ^b , type 202569/20-654-888-888-310-310-23/000 (for further versions, please refer to data sheet 202569)	00602275
JUMO dTRANS AS 02 ^a , type: 202553/01-8-01-4-0-00-23/000 (for further versions, please refer to data sheet 202553)	00550842
JUMO AQUIS touch S/P ^c	Refer to data sheet 202580/81



^a For types 202630/40 and 202630/43.

^b For types 202630/50 and 202630/53.

^c For all types 202630.