



Type 202630
Measuring Cell
for free chlorine,
chlorine dioxide,
ozone

B 20.2630.0
Operating Instructions

11.04/00394444

Contents

1	Typographical conventions	3
1.1	Warnings	3
1.2	Note signs	3
2	General	4
2.1	Preface	4
2.2	Application	5
3	Identifying the instrument	11
3.1	Nameplate	11
3.2	Type designation	11
3.3	Scope of delivery	11
4	Instrument description	12
4.1	Technical data	12
5	Assembly	13
5.1	General	13
5.2	Flow-through fitting, Type 202810/72-102-86	13
5.3	Mounting the cell	14
6	Flow monitoring (optional)	15
6.1	General	15
6.2	Installation	15
6.3	Connection	16
7	Installation	17
7.1	Electrical connection	17
7.2	Processing the cell output signal	18
7.3	Connecting a 202630 cell + flow monitor to dTRANS Az01	19

Contents

8	Commissioning	20
8.1	Screwing on or unscrewing the membrane cap	20
8.2	Setting up display format and range on the indicator	24
8.3	Settling times	25
9	Calibration	26
9.1	General	26
9.2	Calibration using a JUMO dTRANS Az01	26
9.3	Zero-point adjustment	27
10	Measuring	28
10.1	Special information for chlorine measuring cells	28
10.2	Special information for chlorine dioxide measuring cells	29
10.3	Special information for ozone measuring cells	29
11	Maintenance / storage / transport	30
11.1	Maintenance	30
11.2	Storage / transport	33
11.3	Consumables	34
12	Eliminating faults and malfunctions	35

1 Typographical conventions

1.1 Warnings



Danger

This symbol is used when there may be **danger to personnel** if the instructions are disregarded or not followed accurately!



Caution

This symbol is used when there may be **damage to equipment or data** if the instructions are disregarded or not followed accurately!

1.2 Note signs



Note

This symbol is used when your **special attention** is drawn to a remark.



Reference

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

abc¹

Footnote

Footnotes **refer to certain points** in the text. Footnotes consist of two parts: Marking in the text and the footnote text.

The text markings are arranged as continuous superscript numbers.

*

Action

This symbol indicates that an **action to be performed** is described.

The individual steps are marked by this asterisk.

Example:

* Remove crosspoint screws

2 General

2.1 Preface

Please read these Operating Instructions before commissioning the instrument. Keep the manual in a place which is accessible to all users at all times.

Please assist us to improve these operating instructions.

Your comments will be appreciated.

Phone +49 661 6003-0

Fax +49 661 6003-607



All necessary settings are described in this manual. However, if any difficulties should still arise during commissioning, you are asked not to carry out any unauthorized manipulations on the unit. You could endanger your rights under the instrument warranty!

Please contact the nearest subsidiary or the head office in such a case.



Danger

A sudden failure of a measuring cell can result in a dangerous overdosing of disinfectants (chlorine, chlorine dioxide or ozone).

Appropriate precautionary measures must therefore be taken!

Check the plant for the odor of chlorine, chlorine dioxide and ozone, and check the water for unusual coloring.

With considerable overdosing, the DPD measurement ⇒ Chapter "Reference methods", page 26, may fail to show any color, since the colorant is bleached by the disinfectant.

2.2 Application

General

These measuring cells are used to determine the chlorine, chlorine dioxide or ozone concentration in aqueous solutions (e.g. in drinking and swimming pool waters, service water, process/cooling water).

Instrument description

The JUMO measuring cells for free chlorine, chlorine dioxide and ozone are amperometric 2-electrode measurement systems, covered by a membrane.

The measuring electrode (cathode) is made from gold (Au). The anode, which has the combined functions of a reference and counter-electrode, is made from silver (Ag) and is covered by a layer of silver chloride (AgCl).

The JUMO cell for free chlorine with reduced pH dependence operates on the 3-electrode principle. In this case, two separate electrodes take on the reference and counter-electrode function. The reference electrode consists of Ag/AgCl, the counter-electrode is formed by a ring of stainless steel over the membrane cap.

The membranes of the standard cells are made of a hydrophobic, microporous PTFE material. These cells should only be used in water that has drinking or swimming pool quality. Under no circumstances must the water contain any tensides (tensides can be found in a number of detergents or disinfectants). Tensides destroy the hydrophobic characteristics of the membrane. If this is the case, fault-free operation can no longer be ensured.

In the case of cells for free chlorine with a reduced pH dependence, the membrane consists of hydrophilic, microporous material. This type, too, should only be used in water that has drinking or swimming pool quality. A check must be made here whether certain tensides can be tolerated for a particular application.

Measuring cells featuring a membrane that is insensitive to chemicals and tensides are available for chlorine dioxide and ozone (but not for free chlorine). These rugged cells can be used in any water quality.

On all measuring cells covered by these operating instructions, the membrane cap, which closes the electrode space, is filled with an aqueous electrolyte containing alkaline chloride.

Since the output signal from amperometric measurement cells is temperature-dependent, an NTC resistor is incorporated to provide automatic temperature compensation. The recommended operating temperature range is between 0 °C and 45 °C.

A 4 – 20 mA output signal is produced by the electronics that is integrated into the measuring cell.

Calibration is carried out in the subsequent apparatus (indicator, controller, recorder, PLC, etc.).

The measuring cells can be directly connected to a suitable indication and control instrument. The JUMO dTRANS Az 01 indicator/controller (Data Sheet 20.2550) is particularly suitable for use with the measuring cells. It provides the supply voltage to operate the cell and allows simple calibration of the measurement system.

2 General

Measuring cell for free chlorine

The measuring cell for free chlorine can be used to determine the levels of the following inorganic chlorination agents: chlorine gas (Cl_2), electrolytically produced chlorine, sodium hypochlorite (NaOCl , chlorine bleach), calcium hypochlorite (Ca(OCl)_2) or chlorinated lime (Ca(OCl)Cl). The pH value must be kept constant after calibration ($\Delta\text{pH} \leq 0.05$). If this is not possible, then the multiparameter data acquisition system JUMO LOGOSCREEN AQUA 500 (Data Sheet 20.2595) can be used to compensate the pH effect. The JUMO cell for free chlorine with reduced pH dependence provides an alternative solution here.

Measuring cell for free chlorine with reduced pH dependence

This cell can be used to determine the same inorganic chlorination agents as the cell mentioned above. In addition, cyanuric acid chlorine can also be measured, independent of the cyanuric acid concentration. Within the range pH 5 to 7, the measurement is pH-independent. Within the range pH 7 to 10.5, the signal loss is approx. 10% per 1 pH increase. The output signal for pH 10, for example, is thus only 70% of the output signal for pH 7. For pH 9, conventional measuring cells already produce only 5% of the signal for pH 7.

And, since there must be an electrical connection between the counter-electrode and the measured medium, the latter must have a minimum conductivity of approx. $10 \mu\text{S/cm}$. Consequently, the cell is not suitable for application in high-purity water or similar.

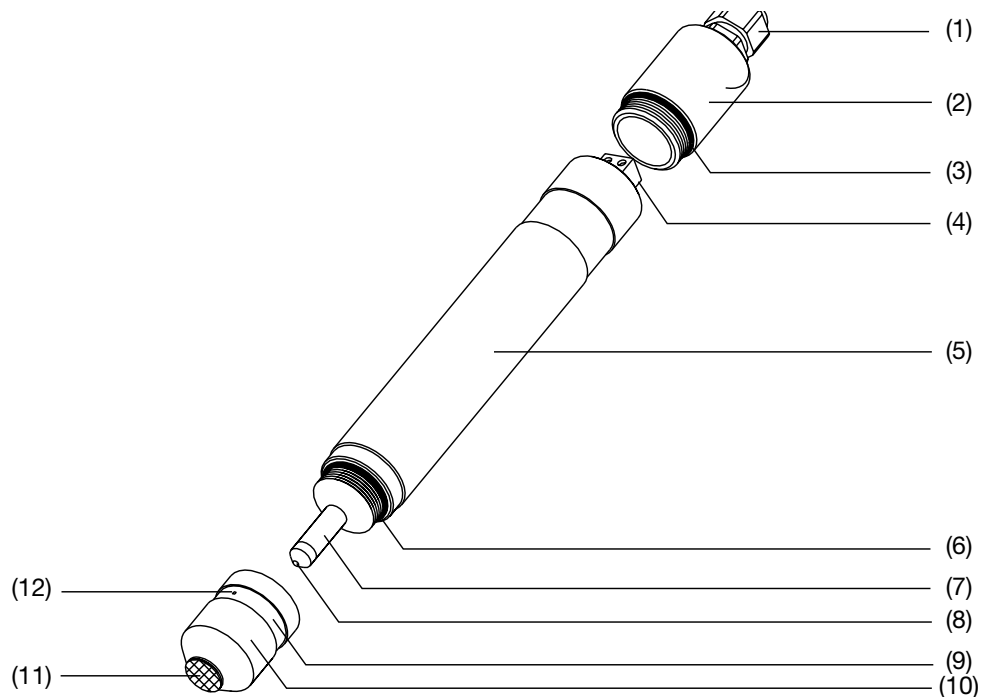
Measuring cell for chlorine dioxide

The cell for chlorine dioxide can be used to measure chlorine dioxide in chlorite/chlorine and chlorite/hydrochloric acid plants.

Measuring cell for ozone

The cell for ozone can be used to measure electrolytically produced ozone, for example.

Details for
Type 202630/40
Type 202630/45
Type 202630/50
(free chlorine,
chlorine
dioxide,
ozone)



- (1) Pg screwed gland
- (2) Cover
- (3) O-ring
- (4) 2-pole terminal for sensor cable connection
- (5) Electrode shaft with integral electronics
- (6) O-ring
- (7) Electrode finger (reference electrode)
- (8) Measuring electrode
- (9) Transparent cover
- (10) Membrane cap
- (11) Membrane
- (12) Valve opening



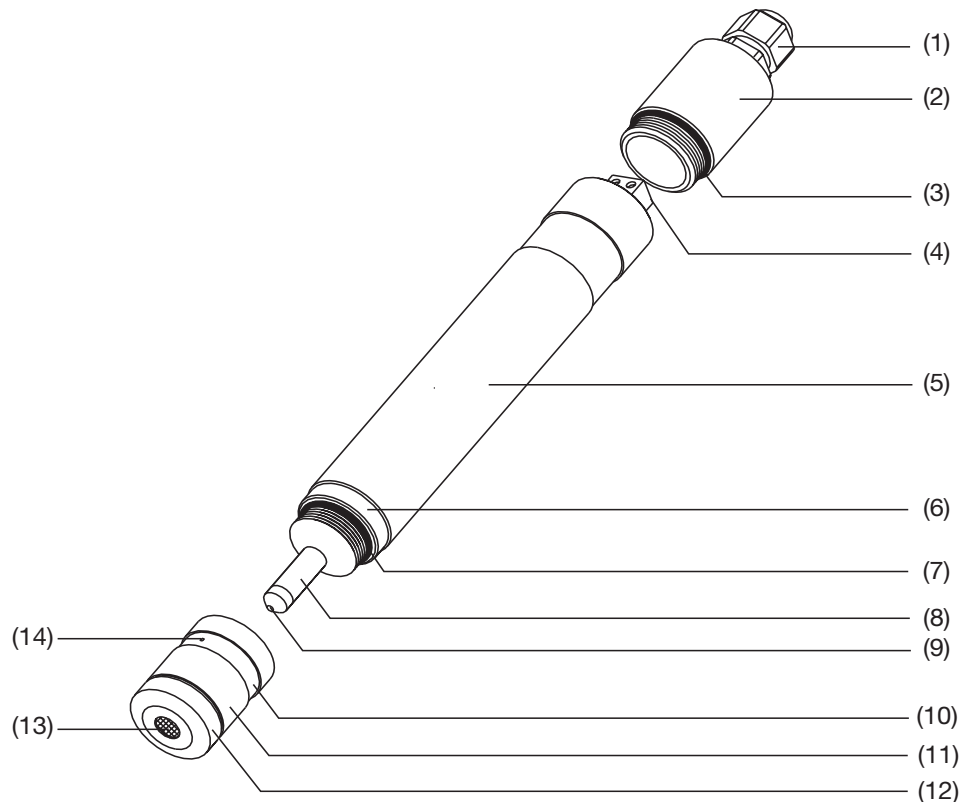
- Measurement can only be performed in a suitable flow-through fitting (JUMO Type 202810/72-102-86).
- The sample water must have a quality similar to drinking water or at least swimming pool water quality.
- The sample water must not contain any tensides (surface-active substances such as can be found in detergents or cleaning and disinfecting agents).
- The sample water must not contain any hydrophobic substances (e.g. oils and greases).

2 General



- When determining free chlorine, the following must be observed:
The pH of the sample water must be within the range 5.5 to 8.0 (note the effect of pH on the disinfecting properties, corrosion or dissociation curve!).
The pH must be kept constant ($\Delta\text{pH} \leq 0.05$) after calibrating the cell.
The cell is not suitable for determining organic chlorination agents (for example, products based on cyanuric acid). This measurement task can be covered by the Type 202630/41 cell (for free chlorine with reduced pH dependence).
 - Avoid touching the sensitive measuring components (7) and (8) with bare hands.
 - Only screw on the membrane cap (10) when the cell is put into operation.
-

Details for Type 202630/41 (free chlorine, with reduced pH dependence)



- (1) Pg screwed gland
 - (2) Cover
 - (3) O-ring
 - (4) 2-pole terminal for sensor cable connection
 - (5) Electrode shaft with integrated electronics
 - (6) Counter-electrode (stainless steel)
 - (7) O-ring
 - (8) Electrode finger (reference electrode)
 - (9) Measuring electrode
 - (10) Membrane cap
 - (11) Membrane cap O-ring
 - (12) Membrane cap gland
 - (13) Membrane cap O-ring
 - (14) Membrane cap gland
-

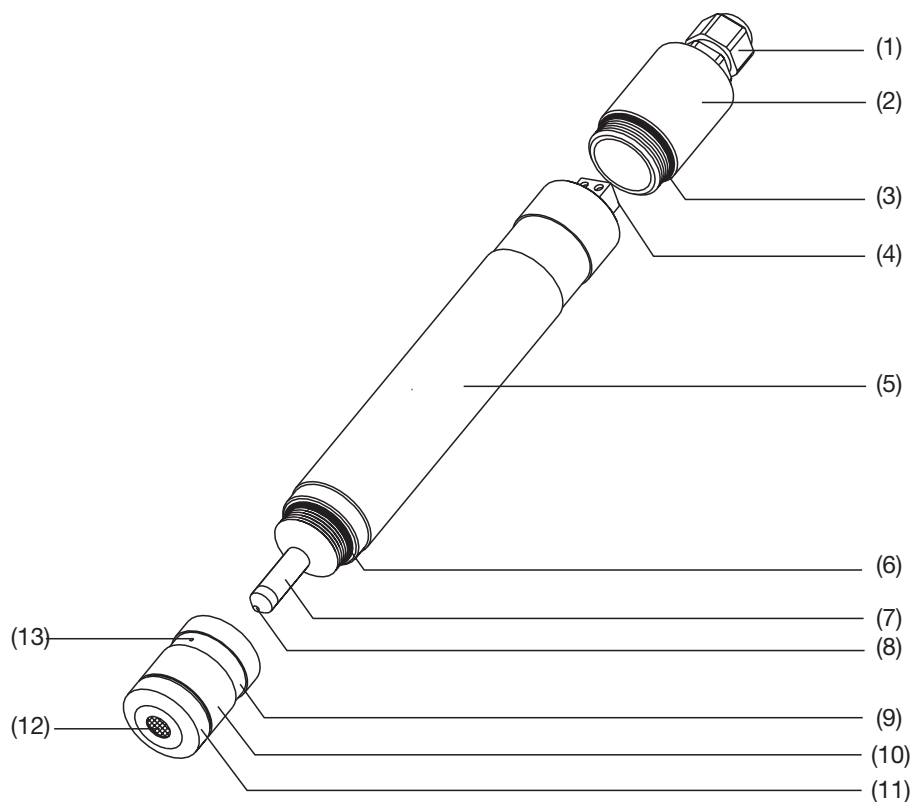
- (10) Transparent cover
- (11) Membrane cap
- (12) Membrane holder (stainless steel)
- (13) Membrane
- (14) Valve opening



- The cell can only be used for measurement when it is mounted in a suitable flow-through fitting (JUMO Type 202810/72-102-86).
- The sample water must have a quality similar to drinking water or at least swimming pool water quality.
- It must be checked for each individual application whether the tensides contained in the sample water can be tolerated.
- The sample water must not contain any hydrophobic agents, such as oils or greases.
- This cell is suitable for determining organic chlorination agents (e.g. products based on cyanuric acid).
- **Do not unscrew** the membrane holder! The membrane will otherwise become maladjusted or even damaged.

**Details for
Type 202630/46
(chlorine
dioxide,
insensitive to
chemicals and
tensides)**

**Type 202630/51
(ozone,
insensitive to
chemicals and
tensides)**



- (1) Pg screwed gland
- (2) Cover
- (3) O-ring

2 General

- (4) 2-pole terminal for sensor cable connection
- (5) Electrode shaft with integral electronics
- (6) O-ring
- (7) Electrode finger (reference electrode)
- (8) Measuring electrode
- (9) Transparent cover
- (10) Membrane cap
- (11) Membrane holder (stainless steel)
- (12) Membrane
- (13) Valve opening



- The cell can only be used for measurement when it is mounted in a suitable flow-through fitting (JUMO Type 202810/72-102-86).
- The cells can also be used in water containing chemicals and tensides.
- In the case of these particular cells, the pH of the sample water has no influence on the output signal.
- **Do not unscrew** the membrane holder!
The membrane will otherwise become maladjusted or even damaged.

General notes



- Depending on the pH (high pH), precipitations (of chalk, for instance) may result in the membrane becoming blocked!
 - A test set is required to determine the concentration of free chlorine, chlorine dioxide or ozone (according to the DPD method, for example). Appropriate test sets are available (e.g. Spectroquant or Microquant chlorine tests from Merck).
 - To ensure fault-free sensor operation, only one disinfectant should be used at a time.
-

3 Identifying the instrument

3.1 Nameplate

M.K. JUCHHEIM GmbH & Co, Fulda Germany Messzelle für freies Chlor Typ: 202630/40-0200-000 Messbereich: 0...2 mg/l F-Nr.: 00000000 00 0 0103 0005 Serien Nr.: 01 01 0002

3.2 Type designation

	(1) Basic type
202630	Measuring cell for free chlorine, chlorine dioxide, or ozone
	(2) Basic type extensions
40	for free chlorine
41	for free chlorine (reduced pH dependence)
45	for chlorine dioxide
46	for chlorine dioxide (insensitive to chemicals and tensides)
50	for ozone
51	for ozone (insensitive to chemicals and tensides)
	(3) Measuring range
0050	0.000 to 0.500 mg/liter
0200	0.00 to 2.00 mg/liter
	(4) Extra codes
000	none

	(1)	(2)	(3)	(4)
Order code	202630	/		000
Order example	202630	/	40	- 0200 - 000

3.3 Scope of delivery

2-wire measuring cell, including membrane cap, electrolyte and special abrasive paper to clean the electrode finger.

4 Instrument description

4.1 Technical data

Analyte	Free chlorine		Chlorine dioxide (ClO ₂)		Ozone (O ₃)	
Membrane type	hydrophobic PTFE membrane	hydrophilic membrane	hydrophobic PTFE membrane	membrane insensitive to chemicals and tensides	hydrophobic PTFE membrane	membrane insensitive to chemicals and tensides
	Type 202630/40	Type 202630/41	Type 202630/45	Type 202630/46	Type 202630/50	Type 202630/51
Measurement cable connection	2-pole terminal, Pg7 gland in polyamide core cross-section 2 x 0.25 mm ² , cable diameter approx. 4 mm					
Supply	U _B 12 to 30 V DC (electrical isolation is recommended)					
Output signal	4 – 20 mA					
Burden	$\leq \frac{U_B - 11 V}{0.02 A}$					
Settling time	approx. 30 min					
Incident flow velocity	approx. 15 cm/sec When the cell is installed in a JUMO flow-through fitting, Type 202810/72-102-86-80-55, this corresponds to a flow rate of approx. 30 liters/hr					
Measuring ranges (other ranges on request)	0 – 0.5 mg/liter or 0 – 2.0 mg/liter (ppm)	0 – 2.0 mg/liter (ppm)				
Resolution	0.001 mg/liter, for the 0 – 0,5 mg/liter range 0.01 mg/liter, for the 0 – 2.0 mg/liter range					
Measurement accuracy	± 2% of indicated value					
Signal stability / loss of slope	< 1% per month	< 3% per month	< 1% per month			
Response time	t ₉₀ < 30 sec	t ₉₀ < 2 min	t ₉₀ < 15 sec			t ₉₀ < 1 min
Operating temperatures / temperature compensation	> 0 to 45°C		> 0 to 55°C		> 0 to 45°C	> 0 to 55°C
pH application range	5.5 to 8 pH Note the effect of pH on the disinfecting properties, corrosion or dissociation curve!	4 to 12 pH	1 to 14 pH			
pH dependence (loss of slope)	with pH 8: approx. 65% with pH 9: approx. 95% with pH 10: > 99% (starting from pH7)	within the range 5 to 7 pH: no loss of slope with pH 8: approx. 10% with pH 9: approx. 20% with pH 10: approx: 30% (starting from pH7)	no pH dependence			
Safe pressure	1 bar Variations in pressure are not permissible for pressurized operation. We recommend unpressurized operation (atmospheric pressure)					
Material	shaft, cover, cap: PVC	shaft, cover, cap: PVC membrane holder: stainless steel	shaft, cover, cap: PVC	shaft, cover, cap: PVC membrane holder: stainless steel	shaft, cover, cap: PVC	shaft, cover, cap: PVC membrane holder: stainless steel
Dimensions	diameter: 25 mm, length: 220 mm					
Weight	approx. 125 g					

5.1 General

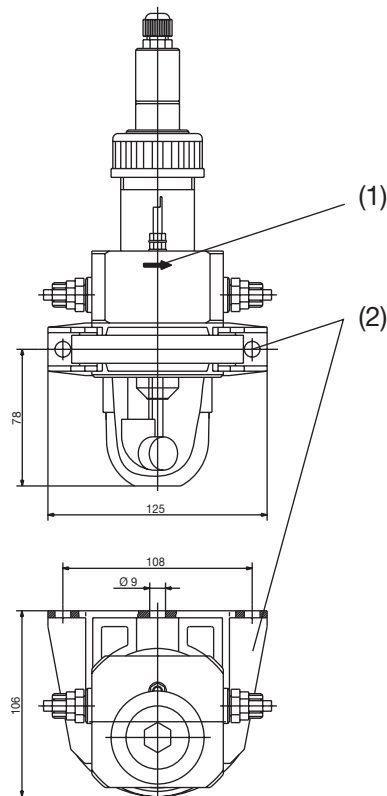
Notes

- Measurement can only be carried out in a suitable flow-through fitting (such as the JUMO flow-through fitting, Type 202810/72-102-86, see Data Sheet 20.2630).
- If at all possible, the measuring cell should be operated pressure-free, with the sample water flowing out freely. If this is not possible, the cell can also be operated under a constant pressure of up to 1 bar. Pressure variations must be avoided!
- When operating under pressure, there must be **no air bubbles** in the flow of water.
- In unpressurized operation with a free outflow of the water under test, air bubbles will not cause any trouble, as long as they do not cover the membrane. Air bubbles on the membrane will falsify the measurements.
- The transmitter and the attached measuring cell must be permanently in operation. The cell must not run dry.

5.2 Flow-through fitting, Type 202810/72-102-86

Mounting the fitting

A DN65 fixing (2) can be used to mount the flow-through fitting (1) on a wall or panel.

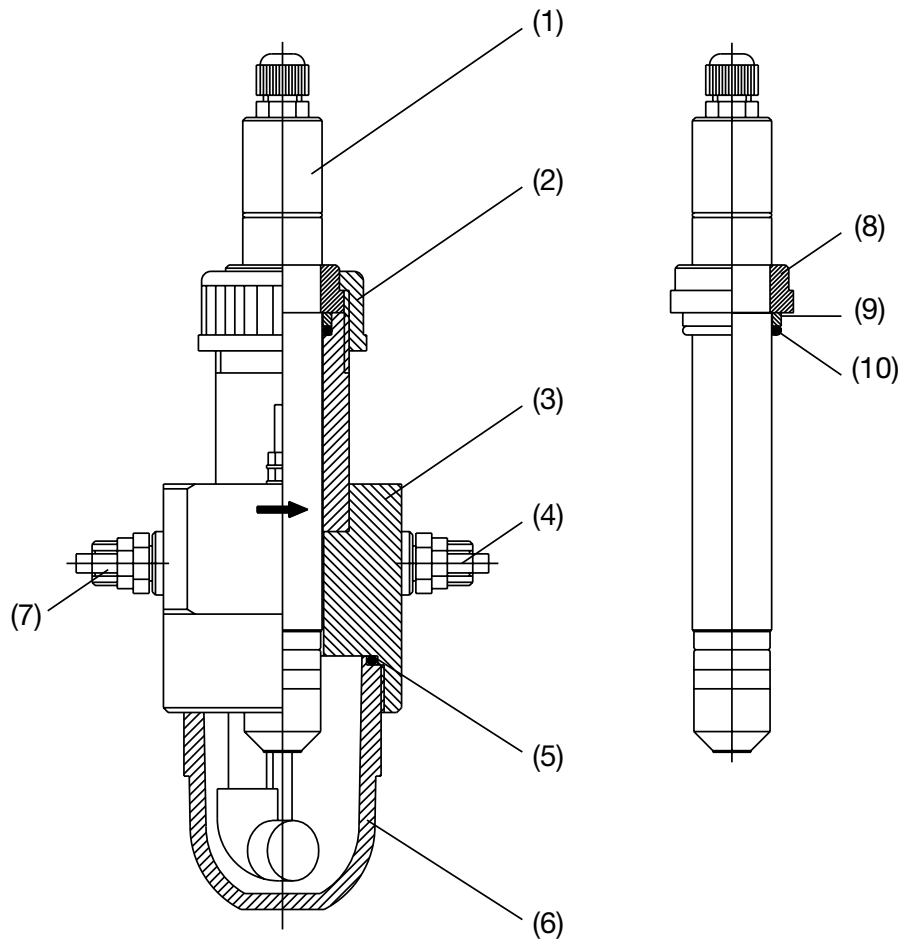


5 Assembly

5.3 Mounting the cell

Overview

Type 202810/72-102-86



- | | |
|-------------------------------|------------------------------|
| (1) Measuring cell | (6) Inspection glass |
| (2) Cap nut | (7) Inlet: 1/4" pipe or DN10 |
| (3) Flow-through fitting | (8) Stepped seating 1" |
| (4) Outlet: 1/4" pipe or DN10 | (9) Pressure ring |
| (5) O-ring | (10) O-ring |

Mounting



When assembling or mounting the cell (1), take care that the O-ring and screw thread are clean and can fulfil their function properly!

The transparent inspection glass (6) can be unscrewed from the housing of the fitting for maintenance purposes.

- * First push the O-ring (10) onto the cell (1) from the pressure-gland end, followed by the pressure ring (9) and the 1" stepped seating (8). The stepped seating (8) must snap into the slot.
- * When the cell has been prepared in this way, push it into the fitting (3) and secure it by screwing up the cap nut (2).

6 Flow monitoring (optional)

6.1 General

Minimum incident flow



The chlorine measurement cell must be placed in a medium with a flow velocity of at least 15 cm/sec in order to function properly.

This corresponds to a minimum flow rate of 30 liters/hour through the JUMO flow-through fitting.

If the flow is below this minimum level, the chlorine measuring cell will indicate values that are too low. This could result in a dangerous overdose in an attached control system that relies on this measurement.

As long as the flow velocity is above the minimum velocity, it will only have a minor effect on the measurement.

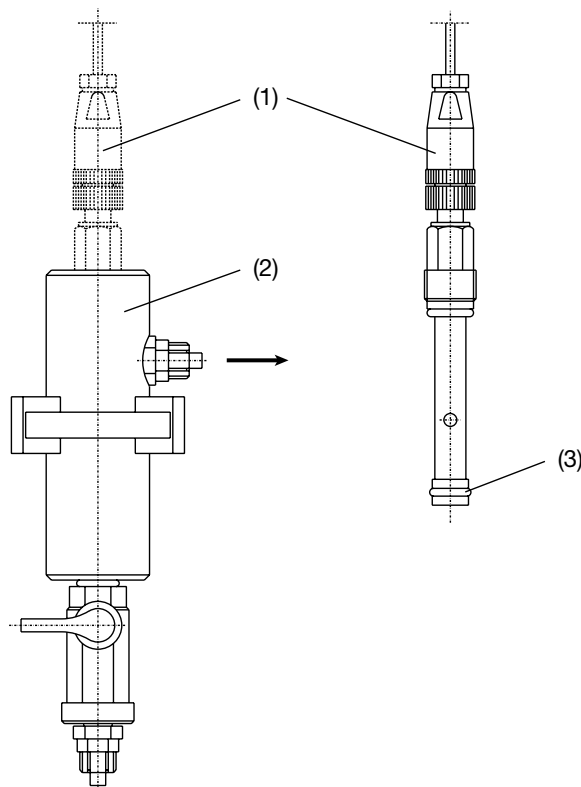
Assembly

The JUMO flow monitor consists of the flow-through fitting (1) – Sales No. 00396470 – and the flow monitor proper (2) – Sales No. 00396471.

Function

This device is used to monitor the minimum flow velocity of 15 cm/sec.

6.2 Installation



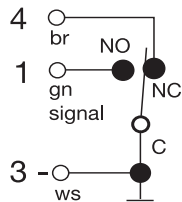
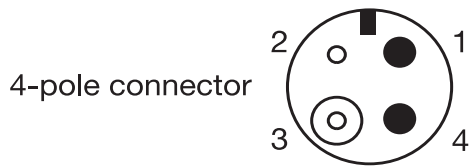
The O-ring (3) must sit in the slot of the flow monitor (1).

* Screw the flow monitor (1) into the fitting (2)

6 Flow monitoring (optional)

6.3 Connection

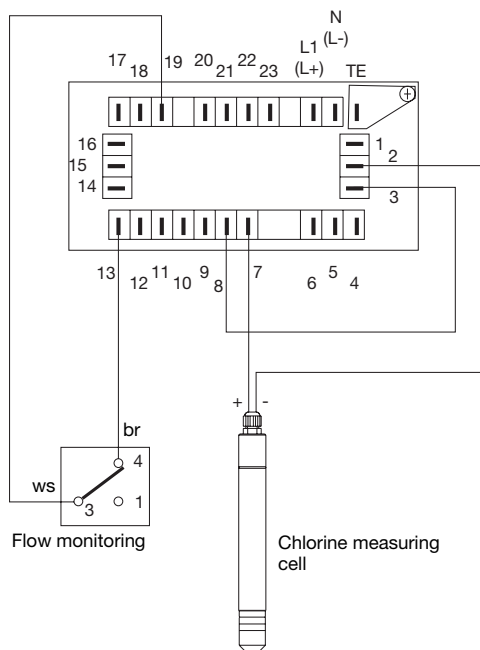
Pin assignment The contact (3+4) opens at flow velocities above 15 cm/sec.



Connection to indicating instrument dTRANS AZ 01, Type 202550

For Type 202550/xx-665-888-140-23-00/000, see Data Sheet and Operating Instructions 20.2550.

If the flow is inadequate, the logic input of the dTRANS Az 01 indicator is switched over – the instrument goes into the “Hold” condition and generates an alarm.



Terminal assignment for the Jumo dTRANS AZ 01



Terminal	Connection	
2	Supply voltage for 2-wire transmitter	-
3		+
7	Standard signal input	-
8		+
13	Logic input 1	
19		

7.1 Electrical connection

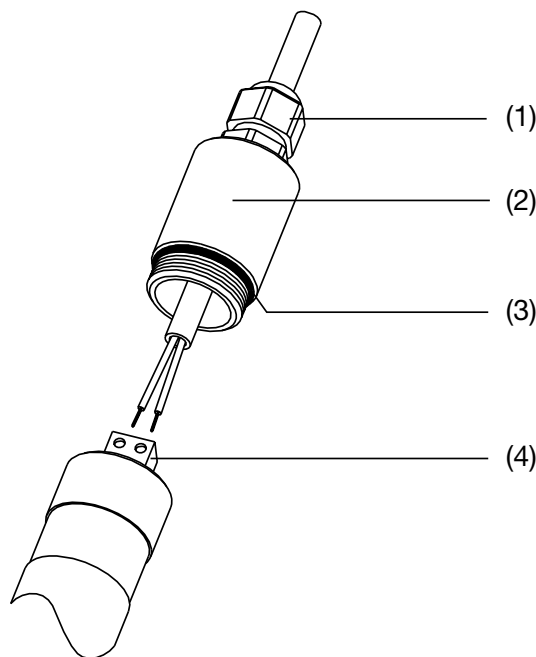
General notes

- Cable diameter approx. 4 mm
- Core cross-section 2 x 0.25mm²
- Route signal cables separately from cables carrying voltages > 60 V
- Use shielded, twisted-pair cables
- Keep clear of large electrical apparatus

Terminal assignment

Connection		Screw terminal
Supply voltage 12 – 30 V DC		1 L+ 2 L-
Output 4 – 20 mA, 2-wire Output signal is a proportional 4 – 20 mA current in the supply		1 L+ 2 L-

Connection



- * Push the cover (2) over the connecting cable.
- * Connect the cores to the terminals (4), see above, and ⇒ Chapter 7.3 "Connecting a 202630 cell + flow monitor to dTRANS Az01", page 19.
- * Screw on the cover (2) by hand, until the O-ring (3) seals properly.
- * Tighten up the Pg gland (1).



When disconnecting, first loosen the Pg gland (1) !

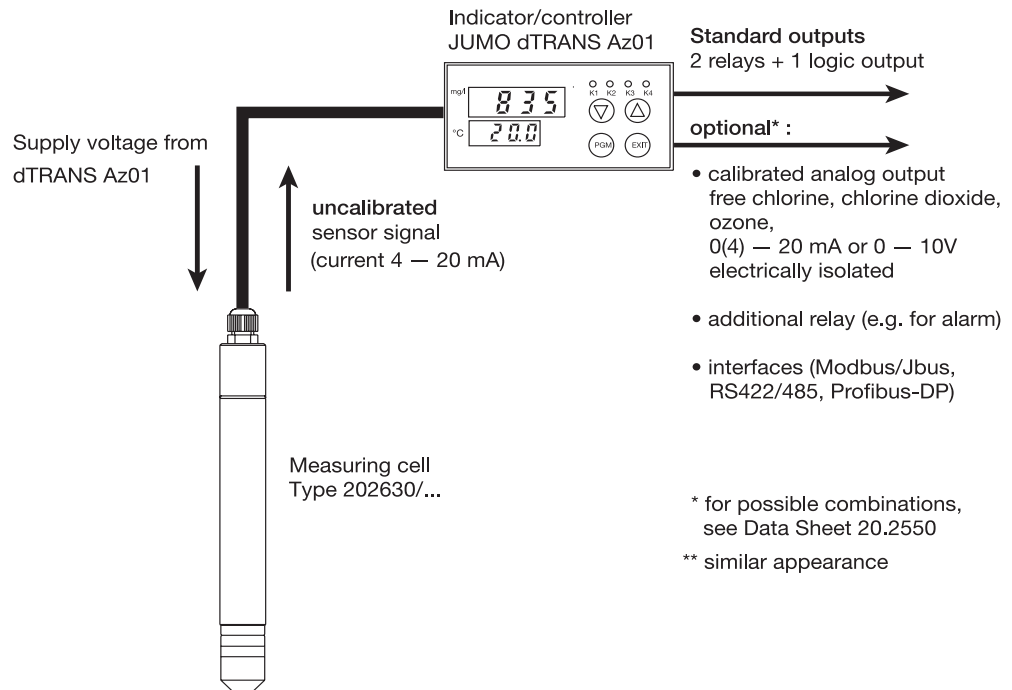
7 Installation

7.2 Processing the cell output signal

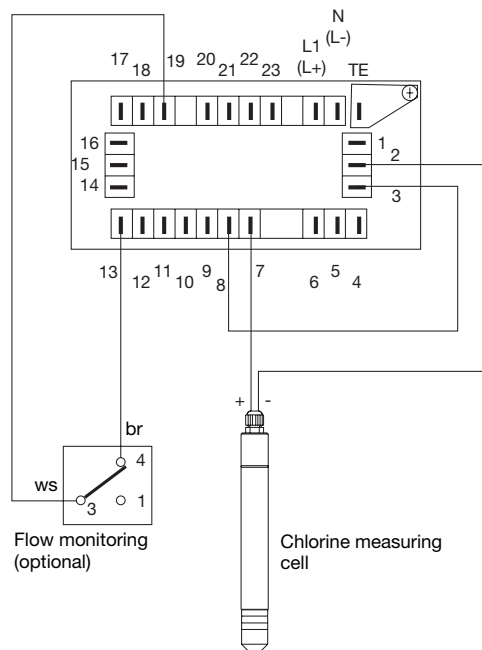
The electronics that is integrated into the shaft of the measuring cell produces an uncalibrated 4 – 20 mA output signal.

This signal can be processed by the indicator/controller JUMO dTRANS Az 01 (Data Sheet 20.2550).

The JUMO dTRANS Az 01 performs two functions: it provides the supply voltage to operate the system, and permits easy calibration. The cells can also be connected to other controller, recorder or PLC systems, provided that these provide the supply voltage and calibration facilities.



7.3 Connecting a 202630 cell + flow monitor to dTRANS Az01



Terminal assignment for the Jumo dTRANS AZ 01, Type 202550

Terminal	Connection
2	-
3	+
7	-
8	+
13	
19	

8 Commissioning

8.1 Screwing on or unscrewing the membrane cap



The electrolyte can spray out of the valve opening (5) when the membrane cap is screwed on. Wear goggles for protection!

If liquid sprays out (it is an aqueous solution of an alkaline halogenide) wash it off under running water.



Do not touch the electrode finger (3/4) or make it dirty!

Follow the steps precisely as described below!

The cell membrane is extremely sensitive! When screwing on or unscrewing the membrane cap, make sure that the membrane does not get destroyed by low or high pressures.

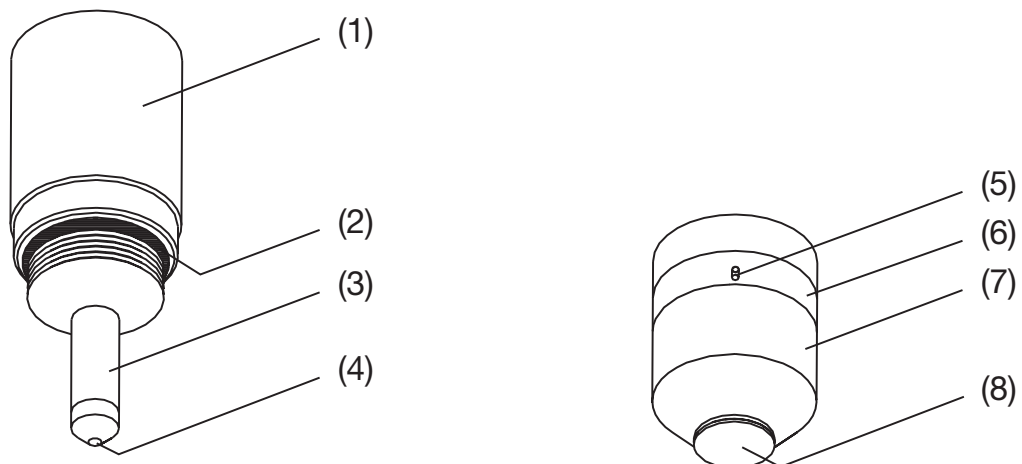
Do not unscrew the membrane holder on Types 202630/41, /46 or /51 (not illustrated)!

Service life of the electrolyte

about 1 year for Types 202630/40, /45, /46, /50 or /51)

about 3 months for Type 202630/41 (less with a high chlorine concentration).

8.1.1 Type 202630/40, Type 202630/45, Type 202630/50 (free chlorine, chlorine dioxide, ozone)



- * Slightly lift the transparent covering (6) of the valve opening (5) close to the valve opening, using a small screwdriver or similar tool, and push it a little to one side. This exposes the valve opening (5).
 - * Unscrew the membrane cap (7) from the shaft (1) of the cell.
 - * Now push the transparent covering (6) back into position, until it lies in the slot again and closes the valve opening.
 - * Discard the used electrolyte. Clean the membrane cap in clear water, then dry it.
-

8 Commissioning

- * Fill the membrane cap (7) right up with the electrolyte that is provided, making sure that there are **no air bubbles**. Holding the shaft (1) of the cell upright, screw it **firmly** onto the filled membrane cap (7), taking care that any surplus electrolyte can flow freely out of the valve opening (5).

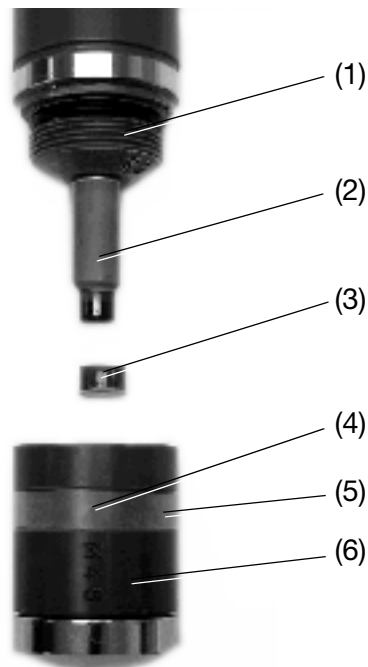


Screw on the membrane cap (7) **completely** (up to the stop).

An initial resistance to the screwing action is caused by the O-ring (2) which creates the seal. The membrane cap (7) must be screwed in further, until it touches the shaft (1) of the measuring cell.

When the membrane cap is completely screwed on, the measuring cell must not knock against the membrane (8). This would damage it and make it unusable!

8.1.2 Type 202630/41 (free chlorine, with reduced pH dependence)



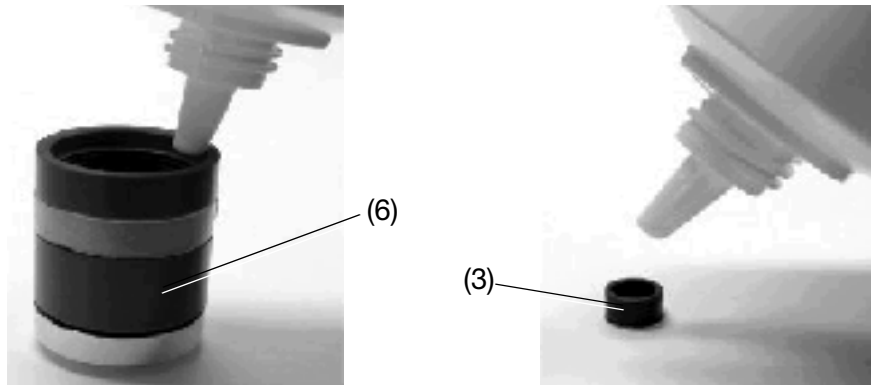
- * Slightly lift the transparent covering (5) of the valve opening (4) close to the valve opening, using a small screwdriver or similar tool, and push it a little to one side. This exposes the valve opening (4).



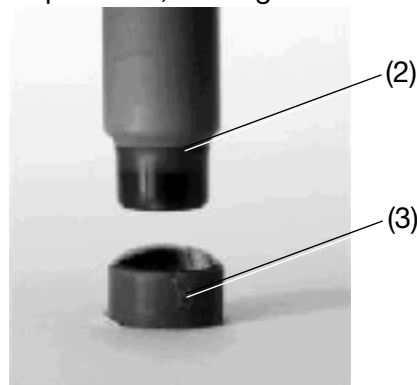
Unscrewing the membrane cap (6) without having exposed the valve opening (4), will destroy the membrane!

- * Unscrew the membrane cap (6) from the shaft (1) of the cell.
- * Now push the transparent covering (5) back into position, until it lies in the slot again and closes the valve opening.
- * Discard the used electrolyte. Clean the membrane cap (6) and G-holder (3) in clear water, then dry them.

8 Commissioning



- * Fill membrane cap (6) and G-holder (3) right up with the electrolyte provided, making sure that there are **no air bubbles**.



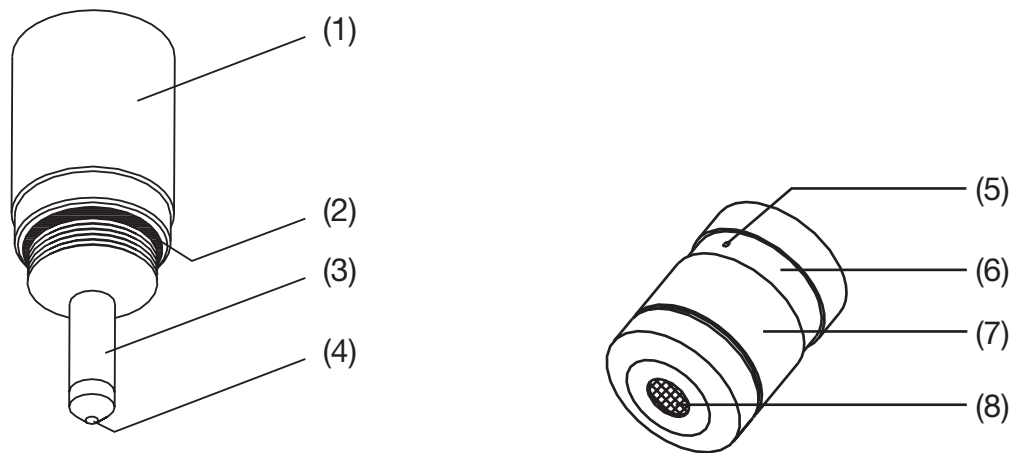
- * Holding the electrode shaft upright, carefully push the electrode finger (2) into the filled G-holder (3).
- * Holding the cell shaft (1) upright, screw it **slowly and firmly** onto the filled membrane cap (6), taking care that any surplus electrolyte can flow freely out of the valve opening.



Screw on the membrane cap (6) **completely** (up to the stop). An initial resistance to the screwing action is caused by the O-ring (2) which creates the seal. The membrane cap (6) must be screwed in further, until it touches the shaft of the measuring cell. When the membrane cap is fully screwed on, the measuring cell must not knock against the membrane. This would damage it and make it unusable!

8 Commissioning

8.1.3 Type 202630/46, Type 202630/51 (chlorine dioxide, ozone, insensitive to chemicals and tensides)



Before initial commissioning, pull off the black protective tubing from the electrode finger.

The membrane cap comes in a liquid-filled box, so that it can be handled better. This liquid can be poured away.

- * Slightly lift the two covers (6) of the valve opening (5) close to the valve opening, using a small screwdriver or similar tool, and push them a little to the side. This will expose the valve opening (5).
- * Screw the membrane cap (7) off the cell shaft (1).
- * Push **one** transparent cover (6) back again, until the cover lies in the slot again and closes the valve opening.
- * Discard the used electrolyte. Clean the membrane cap with clear water, then dry it.
- * Fill the membrane cap (7) right up with the electrolyte that is provided, making sure that there are **no air bubbles**.
Holding the cell shaft (1) upright, screw it **firmly** onto the filled membrane cap (7), taking care that any surplus electrolyte can flow freely out of the valve opening.
- * Now push the second transparent cover (6) over the first. This will seal the valve opening (5) tightly.




Screw on the membrane cap (7) **completely** (up to the stop). An initial resistance to the screwing action is caused by the O-ring (2) which creates the seal. The membrane cap (7) must be screwed in further, until it touches the shaft (1) of the measuring cell. When the membrane cap is fully screwed on, the measuring cell must not knock against the membrane (8). This would damage it and make it unusable!


8 Commissioning

8.2 Setting up display format and range on the indicator

Before commissioning the cell, the measurement range limits and the desired display format must be set up on the dTRANS Az01.

- * On the dTRANS Az 01: change to the configuration level.
Press the  key twice, for longer than 2 seconds.

Display format







- * Press  repeatedly for less than 1 second, until **rAng** (range) is displayed. The **rAng** parameter defines the display format. The following display formats are usual for measuring free chlorine, chlorine dioxide and ozone:

rAng	Display format	Comment
27	0	no decimal place
28	0.0	one decimal place
29	0.00	two decimal places
30	0.000	three decimal places

- * Select the desired **rAng** with the  or  key, and confirm with the  key.

Measurement range

(also in the configuration level)

- * Press  repeatedly for less than 1 second, until **SIL** is displayed.
- * Use the  or  key to set the display to the lower range limit for the chlorine measuring cell.
- * Press  once, for less than 1 second – **SIH** will now be displayed.
- * Use the  or  key to set the display to the upper range limit for the chlorine measuring cell.

Example

Chlorine measuring cell with **rAng** = 29 i.e. range 0 – 2 mg/liter

SIL setting => 0.00

SIH setting => 2.00

Other adjustments

Parameters C111 and C211 (at the configuration level) should have the following settings:

C111: x1xx (x = any value)

C211: xx2x

8.3 Settling times

The settling time for the measuring cells is about 30 minutes. Depending on the conditions prevailing on site, the settling time may also be longer. When the settling time has ended and a constant value is displayed, the cell can be calibrated.

Repeat calibration

The calibration procedure should be repeated one day after commissioning.

9 Calibration

9.1 General

Depending on the requirements, the measuring cell should be regularly checked and calibrated at fixed intervals.

Recommendation: weekly, or even more frequently if higher accuracy is required.

9.2 Calibration using a JUMO dTRANS Az01

Reference methods



Suitable reference methods for calibration can be found in the following standards:

Chlorine (EN ISO 7393-2)

Chlorine dioxide (DIN 38408-5)

Ozone (DIN 38408-3)

The **DPD** photometric method is often used for calibration (DPD = N,N-diethyl-1,4-phenylenediamine).

Suitable test systems are commercially available, from suppliers such as VWR International (formerly: Merck) (Spectroquant®), Macherey-Nagel (Nanocolor®) and others.

Initial situation

The necessary settings have already been made on the indicator.

⇒ Chapter 8.2 "Setting up display format and range on the indicator", page 24.

The cell is mounted in a suitable flow-through fitting.

⇒ Chapter 5 "Assembly", page 13 ff.

The settling time for the cell has elapsed **and** the measurement is stable.

⇒ Chapter 8.3 "Settling times", page 25.

Procedure

* Take a water sample from the outlet of the flow-through fitting, or close to it.

* Without delay, use a suitable reference method to determine the concentration of the substance being analyzed (free chlorine, chlorine dioxide or ozone) in the sample.

* Adjust the dTRANS Az 01 to match the reference value, as follows:

* Press repeatedly for less than 1 second, until **Code** is displayed.

* Use the and keys to enter 0110. Press the key. The operating level, **Cal** and the manual activation of **Hold** are unlocked.


* Press the key.

* Press and simultaneously. This starts the calibration.




After calibration has started, the display of the dTRANS Az 01 shows a value which is derived from the ideal slope (100%).

* Use and keys to set the display to the established reference value.






- * Press . The set value is now accepted, and the dTRANS Az 01 returns to the measuring mode.





If you want to interrupt the calibration and keep the old value for the slope:

- * Press  instead of the  key.

If you want to interrupt the calibration and set 100% as the slope:

- * Press  and  simultaneously (this starts the calibration).
- * Do not use the  or  keys to make any changes.
- * Press .

Checking the stored slope






- * On dTRANS Az 01: change to the configuration level.
Press  twice for longer than 2 seconds.
- * Press  repeatedly for less than 1 second, until **SLOP** (slope) appears.
The slope is indicated in %.



If the slope has fallen below 40%, then the membrane cap and the electrolyte must be replaced, and the electrode tip must be cleaned.

⇒ Chapter 11.1.1 "Cleaning the electrode finger tip / replacing the membrane cap and electrolyte", page 30.

Manual setting of the slope

- * Unlock the dTRANS Az 01 by using code 0300.
- * On the dTRANS Az 01: change to the configuration level.
Press  twice for longer than 2 seconds.
- * Press  repeatedly for less than 1 second, until **SLOP** (slope) appears.
Use the  or  keys to alter the **SLOP** (slope) parameter.
- * Press the  key – the altered parameter is now accepted.

9.3 Zero-point adjustment

It is **not** necessary to make a zero-point adjustment of a cell fitted with a membrane cap. If the substance being analyzed is not present in the sample water, the reading will be almost zero. The zero-point is **unaffected** by changes in the flow rate, the conductivity, the temperature or the pH.

10 Measuring



Warning:

A sudden failure of a measuring cell can result in a dangerous overdose of disinfectant (chlorine, chlorine dioxide or ozone).

Appropriate safety measures must be implemented to deal with this possibility.

Check the system for chlorine, chlorine dioxide or ozone odors, and check the water for unusual coloration.

With considerable overdosing, the DPD measurement (⇒ Chapter "Reference methods", page 26) may fail to show any color, since the colorant is bleached by the disinfectant.

10.1 Special information for chlorine measuring cells

The measuring cell measures the concentration of free chlorine.

Free chlorine is produced when inorganic chlorine chemicals are used (chlorine gas, sodium hypochlorite solution, calcium hypochlorite solution etc.). The chemical species in which the free chlorine appears (HOCl , OCl^- or $\text{Cl}_2(\text{aq.})$) alters with the pH value.

The Type 202630/40 cell for free chlorine responds differently to the individual forms of free chlorine, because of differences in the oxidation capability. For this reason, the pH value must be kept constant after calibration. The pH is frequently set in the range 7.2 and 7.4.

The standard cell, Type 202630/40, can generally be used over the pH range from 5.5 to pH 8.0. However, it is important that the same pH value is used for the calibration as for the later measurement, because the cell will indicate different chlorine values as the pH varies. In such a case, the DPD measurement for free chlorine will not show any variation in the chlorine content.

One possibility of mathematically compensating the effect of the pH value on the chlorine measurement is provided by the multiparameter data acquisition system JUMO LOGOSCREEN AQUA 500.

JUMO also supplies a special cell for free chlorine with a reduced pH dependence, Type 202630/41. This cell can be used within the range 4 to 12 pH.

When using organic chlorine agents or chlorine stabilizers (usually based on (iso)-cyanuric acid), appreciable differences may appear between the DPD measurement and the signal from the standard cell for free chlorine, Type 202630/40. For this application, the special cell for free chlorine with reduced pH dependence, Type 202630/41, must be used. It produces a signal which is unaffected by the cyanuric acid concentration.

For further information, please consult the relevant specialist literature or the JUMO technical publication "Information on the amperometric measurement of free chlorine, chlorine dioxide and ozone in water".

10.2 Special information for chlorine dioxide measuring cells

The chlorine dioxide measuring cell is almost completely insensitive to chlorine, indicating only about 3 % of the actual chlorine level (at 15 °C with pH 7.2). The chlorine sensitivity is even less with increasing pH or falling temperature.

This cell can be used at pH levels below 5 down to the stability limit of chlorine dioxide in alkaline surroundings.

10.3 Special information for ozone measuring cells

The ozone measuring cell is almost completely insensitive to chlorine. It only indicates about 3 % of the actual chlorine level (at pH 7.2 and 25 °C).

This cell can be used over a pH range from 1 to 14.

11 Maintenance / storage / transport

11.1 Maintenance

11.1.1 Cleaning the electrode finger tip / replacing the membrane cap and electrolyte



The brown coating on the combined measuring/reference electrode (3) must not be rubbed off!

Do not touch the electrode finger (3/4) or make it dirty!

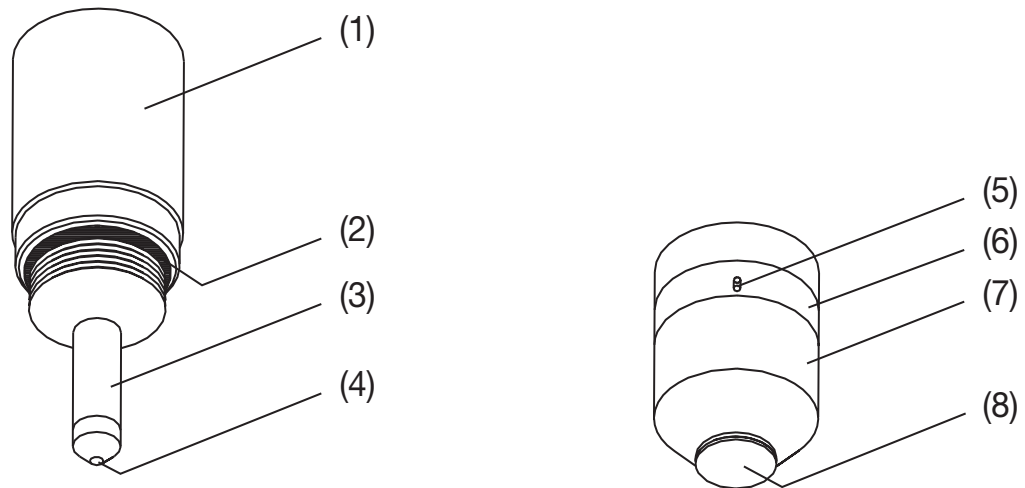
Follow the steps precisely as described below!

Do not unscrew the membrane holder on Types 202630/41, /46 or /51 (not illustrated)!

General

If calibration is no longer possible, because the indication is too low, then the tip of the electrode finger (measuring electrode) should be lightly sanded down, and the electrolyte, and possibly the membrane cap too, should be replaced.

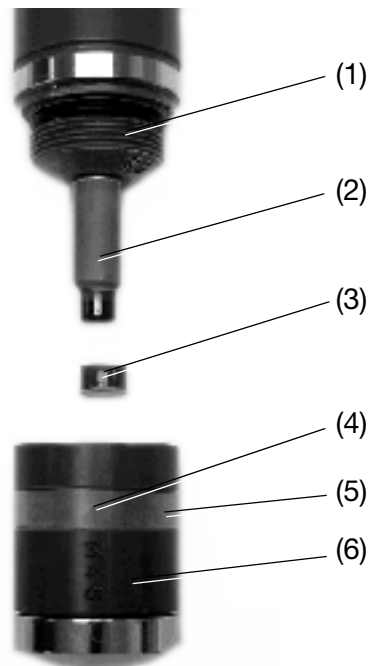
Type 202630/40
Type 202630/45
Type 202630/50
(free chlorine,
chlorine
dioxide,
ozone)



- * Screw the membrane cap off the cell shaft,
⇒ Chapter 8.1.1 "Type 202630/40, Type 202630/45, Type 202630/50 (free chlorine, chlorine dioxide, ozone)", page 20.
- * Clean and dry the electrode finger (3) and the membrane cap (7)
⇒ Chapter 8.1.1 "Type 202630/40, Type 202630/45, Type 202630/50 (free chlorine, chlorine dioxide, ozone)", page 20.
- * Use the special abrasive paper that comes with the delivery to clean just the tip of the dry electrode finger (4). To do this, place the special abrasive paper on a paper towel, hold it by one corner, and, holding the measuring cell upright, drag the tip of the electrode over the abrasive paper two or three times.
- * Use a new membrane cap, if necessary.
- * Fill the membrane cap (7) right up with the electrolyte provided, making sure that there are **no air bubbles**.
- * Screw the membrane cap onto the cell shaft,
⇒ Chapter 8.1 "Screwing on or unscrewing the membrane cap", page 20.

11 Maintenance / storage / transport

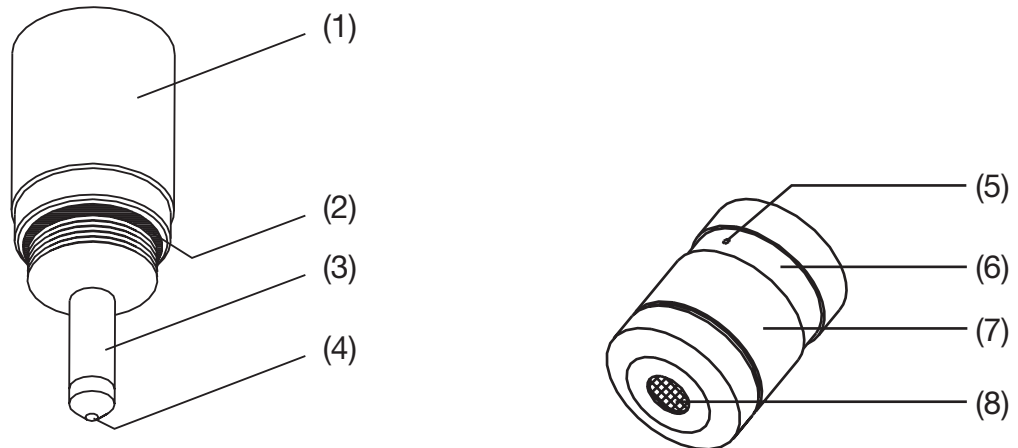
Type 202630/41
(free chlorine,
with reduced
pH
dependence)



- * Screw the membrane cap off the cell shaft,
⇒ Chapter 8.1.2 "Type 202630/41 (free chlorine, with reduced pH dependence)", page 21.
- * Discard the used electrolyte. Clean the membrane cap (6) and G-holder (3) with clear water, then dry them.
- * Clean the tip of the dry electrode finger (2) with the fine abrasive paper that is provided:
 - Place the abrasive paper on a paper towel and hold it by one corner.
 - Holding the measuring cell upright, drag the tip of the electrode over the abrasive paper two or three times.
- * Use a new membrane cap, if necessary.
- * Screw the membrane cap onto the shaft of the measuring cell,
⇒ Chapter 8.1.2 "Type 202630/41 (free chlorine, with reduced pH dependence)", page 21.

11 Maintenance / storage / transport

Type 202630/46
Type 202630/51
(chlorine dioxide, ozone,
insensitive to
chemicals and
tensides)



- * Screw the membrane cap off the cell shaft,
⇒ Chapter 8.1.3 "Type 202630/46, Type 202630/51 (chlorine dioxide, ozone, insensitive to chemicals and tensides)", page 23.
 - * Clean the tip of the dry electrode finger (2) with the fine abrasive paper that comes with the delivery:
 - Place the abrasive paper on a paper towel and hold it by one corner.
 - Holding the measuring cell slightly tilted, drag the tip of the electrode over the abrasive paper.
 - Rotate the measuring cell slightly and drag the electrode tip over the abrasive paper again.
 - Repeat this procedure several times.
 - * Use a new membrane cap, if necessary.
 - * Screw the membrane cap onto the cell shaft,
⇒ Chapter 8.1.3 "Type 202630/46, Type 202630/51 (chlorine dioxide, ozone, insensitive to chemicals and tensides)", page 23.
-

General notes



Is the membrane cap (7) completely screwed on (up to the stop)?
An initial resistance to the screwing action is caused by the O-ring (2) which creates the seal. The membrane cap (7) must be screwed in further, until it touches the shaft (1) of the measuring cell.
When the membrane cap is completely screwed on, the measuring cell must not knock against the membrane (8). This would damage it and make it unusable!

11 Maintenance / storage / transport

Service life of the electrolyte



For Types 202630/40 /45 /50: approx. 1 year.
For Type 202630/41: approx. 3 months (possibly less with a high chlorine concentration).
The service life of the membrane largely depends on the water quality.
Heavy contamination of the membrane must be avoided!
If, after cleaning the tip of the electrode finger, the cell still indicates values that are too low, then a new membrane cap must be used.

11.1.2 Removal of lime deposits (furring) on the membrane cap

- * Screw the membrane cap off the cell shaft,
⇒ Chapter 8.1 "Screwing on or unscrewing the membrane cap", page 20 and subsequent ones.
 - * Pour away the electrolyte.
 - * Immerse the membrane cap (7) for several hours in an approx. 1% hydrochloric acid solution.
 - * Flush thoroughly with clean water before re-using.
 - * Screw the membrane cap onto the cell shaft,
⇒ Chapter 8.1 "Screwing on or unscrewing the membrane cap", page 20 and subsequent ones.
-

11.2 Storage / transport

Preparation

- * Screw the membrane cap off the cell shaft,
⇒ Chapter 8.1 "Screwing on or unscrewing the membrane cap", page 20 and subsequent ones.
 - * Pour away the electrolyte.
 - * Rinse the membrane cap and electrode finger (3) with clean water and dry them, dust-free.
 - * Screw the dry membrane cap (7) loosely onto the electrode shaft (1).
The membrane (8) must not touch the electrode tip (4).
-

Recommissioning

- * Clean the tip of the electrode (4) with the special abrasive paper that is provided:
⇒ "Cleaning the electrode finger tip / replacing the membrane cap and electrolyte", Page 30.
 - * Use a new membrane cap (7).
-

11 Maintenance / storage / transport

11.3 Consumables

Designation	Sales No.
Replacement kit for chlorine / chlorine dioxide / ozone (1 membrane cap, fine abrasive paper)	20/00392331
Replacement kit for chlorine (reduced pH dependence) (1 special membrane cap, G-holder, fine abrasive paper)	20/00402292
Replacement kit for chlorine dioxide, insensitive to chemicals and tensides (1 membrane cap, fine abrasive paper)	20/00409344
Replacement kit for ozone, insensitive to chemicals and tensides (1 membrane cap, fine abrasive paper)	20/00441309
100 ml special electrolyte for chlorine	20/00438122
100 ml special electrolyte for chlorine (reduced pH dependence)	20/00438123
100 ml special electrolyte for chlorine dioxide	20/00392332
100 ml special electrolyte for chlorine dioxide, insensitive to chemicals and tensides	20/00441316
100 ml special electrolyte for ozone	20/00392333
100 ml special electrolyte for ozone, insensitive to chemicals and tensides	20/00441311
Flow monitor	20/00396471
Fitting for flow monitor	20/00396470

12 Eliminating faults and malfunctions

Fault/malfunction	Possible cause	Elimination	Preventive measures
(1) Output signal from the cell is too low or too high.	Incorrect calibration	Repeat the calibration according to the DPD method ⇒ "Initial situation", page 26.	Calibrate the cell more frequently.
(2) Cell output signal is too low. Measuring cell cannot be calibrated to the DPD value.	The pH value during measurement is higher than for calibration (for chlorine only).	Keep the pH value constant for both calibration and measurement, $\Delta\text{pH} \leq 0.05$. Exception: Type 202630/41	Improve pH control.
	Deposits on the point at the end of the electrode finger (measuring electrode).	Clean the tip of the electrode finger ⇒ "Cleaning the electrode finger tip / replacing the membrane cap and electrolyte", page 30.	Reduce the servicing interval.
	The incident flow on the cell is inadequate.	Increase the flow.	Monitor to ensure adequate flow ⇒ Chap. 6 "Flow monitoring (optional)", page 15ff.
(3) Cell output signal is too low. Measuring cell cannot be calibrated to the DPD value - or sinking or constant output signal with a rising DPD value - or an unstable signal.	Damaged membrane: electrolyte is leaking out and the water under test is leaking in.	Replace the membrane cap ⇒ "Cleaning the electrode finger tip / replacing the membrane cap and electrolyte", page 30.	Avoid damage to the membrane. Do not jolt the sensor when the membrane cap is screwed on. Avoid debris or glass splinters in the flow passing the sensor.
	Tensides from detergents and cleaning agents have affected the membrane. The hydrophobic characteristics of the membrane have been lost, ions and water can penetrate the membrane.	Replace the membrane cap ⇒ "Cleaning the electrode finger tip / replacing the membrane cap and electrolyte", page 30. Change the water again before re-using the chlorine measuring cell (to remove any trace of the tensides).	Avoid tensides spoiling the membrane. After cleaning the system, thorough flushing is required to remove all traces of detergents and disinfectants.

12 Eliminating faults and malfunctions

Fault/malfunction	Possible cause	Elimination	Preventive measures
(4) Cell output signal is too high. Measuring cell cannot be calibrated to the DPD value.	Other oxidizing agents are present in the water under test, in addition to the substance being analyzed, e.g. Cl ₂ , ClO ₂ , O ₃ , H ₂ O ₂ , cyanuric-based chlorine ...	Avoid adding these substances. Change the water.	Remove any detergent or disinfectant completely after use. Only use NaOCl, Ca(OCl) ₂ , CaCl(OCl), Cl ₂ (also electrolytically produced), ClO ₂ or O ₃ independently (not in combination).
(5) DPD and sensor values do not match. The trend of redox measurement is correct, but the intended value is not achieved.	Incorrect control parameter.	Optimize control parameter.	
	The disinfectant dosage rate is too high. An excessive concentration arises before the water under test reaches the measuring cell.	Reduce the dosage rate. Reduce the disinfectant concentration in the additive solution.	
	Flow rate through the system is inadequate.	Improve the mixing.	The installation of the plant must ensure better mixing.
(6) Sensor and DPD values do not match. The sensor values wander: too high / too low. The trend of redox measurement matches the sensor value.	Wrong parameters for the acidic dosing (chlorine-specific).	Optimize the controller parameters.	
	The acid dosage rate is too high. Excessive acidity arises before the water under test reaches the pH electrode (chlorine-specific).	Reduce the rate of acid feed. Reduce the acid concentration in the additive solution.	
	Flow rate in the system is too low.	Improve the mixing.	The installation of the plant must ensure better mixing.
(7) Unusually sluggish response of the sensor	Membrane is partially clogged by contamination such as lime or oil. Disinfectant does not penetrate to the sensor.	Replace the membrane cap ⇨ "Cleaning the electrode finger tip / replacing the membrane cap and electrolyte", page 30. Change the water again before re-using the chlorine measuring cell (to remove any traces of contamination).	Measures must be undertaken to improve the water quality.

