JUMO tecLine Lf-4P

Conductive 4-electrode conductivity cells Type 202930

B 202930.0

Operating Instructions

JUMO

2009-10-20/00502496

WARNING:

Incorrect measurement values or failure of the instrument or a transmitter connected to it, could potentially cause dangerous, imprecise dosing or a system malfunction!
Suitable preventive measures to stop this happening must be in place.

Note:

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

If any difficulties should arise during startup, please do not tamper with the instrument in any way. By doing so, you could endanger your rights under the instrument warranty! Please contact your supplier.

Contents

1 Typographical conventions 5
1.1 Warning signs 5
1.2 Reference signs 5

2 Description 6

3 Instrument identification 8
3.1 Nameplate 8
3.2 Type description 8
3.3 Accessories 9

4 Mounting 10
4.1 General 10
4.2 JUMO PEKA process connection adapter 11
4.3 Mounting suggestions 11

5 Installation 15
5.1 Electrical connection 15
5.2 Terminal assignment and wiring colors 15
5.3 Lf-4P cable 16
5.4 Connection example 16

6 Calibration 18
6.1 Notes 18
6.2 General 18
6.3 JUMO AQUIS 500 CR settings 18

7 Maintenance / troubleshooting 19
7.1 Cleaning the conductivity cell 19
7.2 Troubleshooting 20

8 Technical data 21

1.1 Warning signs

Danger

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

Caution

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

1.2 Reference signs

Note

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

abc[1]

Footnote

Footnotes are remarks that **refer to specific points** in the text. Footnotes consist of two parts:

A marker in the text and the footnote text.

The markers in the text are arranged as consecutive superscript numbers.

✱

Action instruction

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

The individual steps are marked by this asterisk.

Example:

✱ Connect the cable.

2 Description

General

Conductive conductivity cells are used in conjunction with suitable transmitters in industrial analysis measurement technology to determine the electrolytic conductivity of liquids.

The JUMO tecLine Lf-4P fills the gap between conductive conductivity measurement with two-electrode measuring cells, and inductive conductivity measurement.

Four-pin technology makes it possible to cover a very wide measuring range from about 1µS/cm to 600mS/cm, with just one measuring cell.

The hygienic design of the cell and the EHEDG-certified system for process connection (JUMO PEKA), mean that it can be used in pharmaceutical and food technology without difficulty. JUMO PEKA is an adapter system that combines the measuring cell with the process connection. All the materials are physiologically safe, and meet FDA standards.

Stainless steel electrodes are inserted into a circular, plastic body. The process seal provided as standard is an EPDM O-ring. A fast-response temperature probe delivers information about the process temperature to the measurement amplifier. Electrical connection is made via an M12 connector.

The measuring cell is available in three fitting lengths, for optimum installation in different pipe diameters. The measuring cell can also be installed in container walls. No incident flow is required to make it work, but is recommended for fast, stable measurement values and to prevent the accumulation of deposits.

A certificate of quality is included among the items supplied (exact cell constant, FDA approval for the material, typical surface roughness, etc.).

Operative range

Their vast measuring range of 1 µS/cm to 600 mS/cm, allows the cells to be used in washing processes in food and drink applications, pharmaceuticals and biotechnology, where the different conductivities have to be safely recorded by a measuring system (e.g. CIP/SIP applications, reverse processes in ion exchangers, phase separation, bottle cleaning plants, process water).

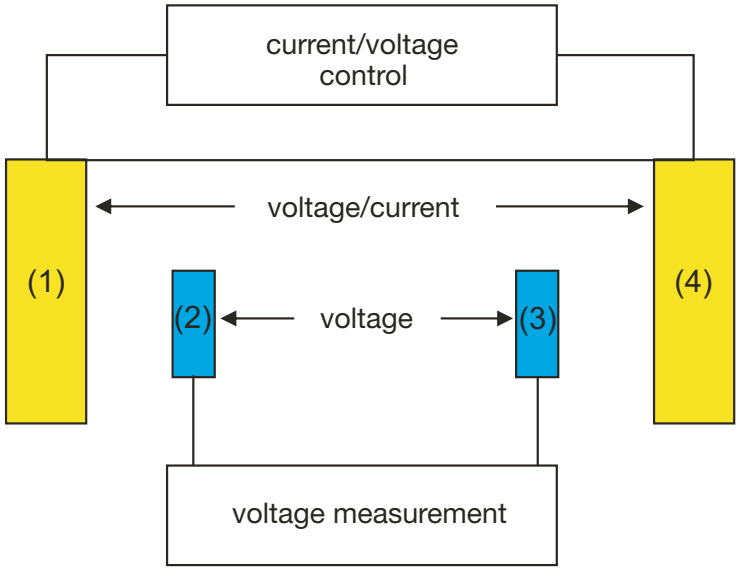
Note

Used in combination with the JUMO AQUIS 500 CR transmitter/controller, as per JUMO data sheet 202565 and JUMO PEKA process connection adapters as per data sheet 409711.

Key features

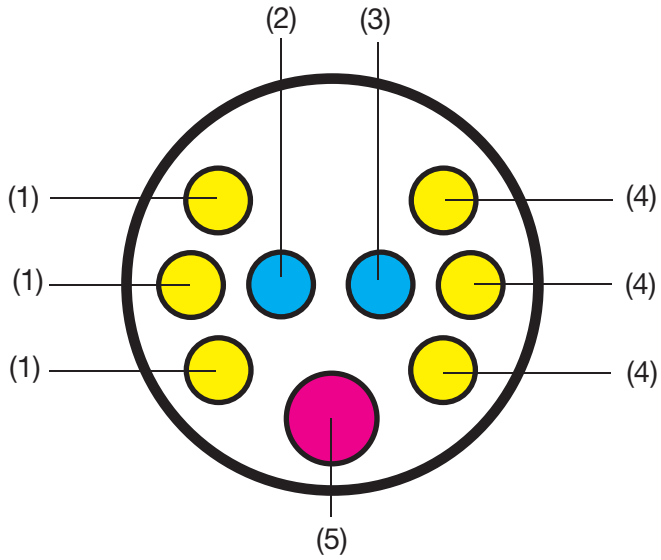
- ❏ Vast measuring range
- ❏ EHEDG-certified process connections (clamp, Varivent©, aseptic NKS)
- ❏ CIP/SIP capability
- ❏ Design complies with EHEDG and FDA standards
- ❏ Certificate of quality included

Function



The measuring cells have two pairs of electrodes. The transmitter applies alternating current at the outer pair of electrodes. A voltage is released at the inner electrodes - subject to the conductivity of the measuring material. The transmitter acquires the voltage and uses it to calculate the electrolytic conductivity value. Functionally, excitation and measurement are kept separate. This has some advantages compared to 2-electrode measuring cells, as the effects of polarization recede into the background. To a large extent, incoming resistances are automatically compensated. Measurement errors as a result of contamination or deposits, are reduced.

Measuring cell sensors



	Description	M12 connector pin
(1)	Current supply, outer electrode 1	6
(2)	Voltage tap, inner electrode 1	7
(3)	Voltage tap, inner electrode 2	3
(4)	Current supply, outer electrode 2	4
(5)	Pt 1000 temperature probe	1, 2 and 5

3 Instrument identification

3.1 Nameplate

on the measuring cell

JUMO GmbH & Co. KG
Fulda, Germany www.jumo.net

Typ: 202930/10-1005-997-83/000
VARTN: 20/00123456
F-Nr.: 01234567 01 0 0942 0002
Cell M: 0,30 1/cm

The date of manufacture is encoded in "F-Nr." (serial number):
0942 means year of manufacture 2009 / calendar week 42.

3.2 Type description

(1) Basic type
202930 JUMO tecLine Lf-4P
Conductive 4-electrode conductivity cells

(2) Basic type extension
10 Short design
20 Medium design
30 Long design

(3) Temperature compensation
1005 Pt1000

(4) Electrode material
31 Stainless steel 1.4435 (316L)

(5) Process connection[1]
997 JUMO PEKA

(6) Electrical connection[2]
83 M12 connector

(7) Extra codes
000 none

	(1)		(2)		(3)		(4)		(5)		(6)		(7)
Order code		/		-		-		-		-		/	
Sample order	202930	/	10	-	1005	-	31	-	997	-	83	/	000

[1] Process connection adapters (see Accessories) must be ordered separately.
[2] The Lf-4P cable is required for electrical connection (see Accessories)!

3.3 Accessories

Sales No.	Designation	
20/00528699	Lf-4P cable, 5 m, made up, with M12 connector	
20/00528700	Lf-4P cable, 10 m, made up, with M12 connector	
	JUMO PEKA process connection adapter for	**Material**
40/00445046	Varivent DN40-125	Stainless steel 1.4435 / 316L
40/00445047	Clamp DN25 / 32 / 40	
40/00445037	Clamp DN50	
40/00446458	Aseptic DN40	
40/00445035	Aseptic DN50	
40/00447555	Aseptic NKS DN40	

4 Mounting

4.1 General

Mounting location

Find a location that ensures easy accessibility for the later calibration.

The fastening must be secure and must ensure low vibration for the instrument.

The operating conditions (temperature, pressure, chemical composition of the measuring material, etc.,) must not be allowed to damage the measuring cell.

The measuring cell must not be modified mechanically (e.g. shortened, drilled, ground).

A **minimum distance** of at least two meters must be maintained when installing several JUMO tecLine Lf-4P type conductivity cells.

Installation position

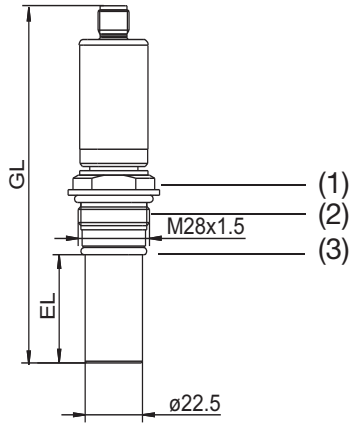
The conductivity cell can be mounted in any position. But it is essential to make sure that the measuring cell electrodes are fully immersed in the measuring material.

Incident flow

No incident flow is required to make the conductivity cell work, but is recommended for fast, stable measurement values and to prevent the accumulation of deposits. Structural measures must be taken to prevent flow separation or gas bubbles in the measuring material.

Immersion length

The immersion length (EL) of the conductivity cell must be in keeping with the installation situation.



(1)	Width across flats 27
(2)	JUMO PEKA process connection A suitable process connection adapter is an essential requirement of installation, see below.
(3)	21x2.5 O-ring (EPDM)

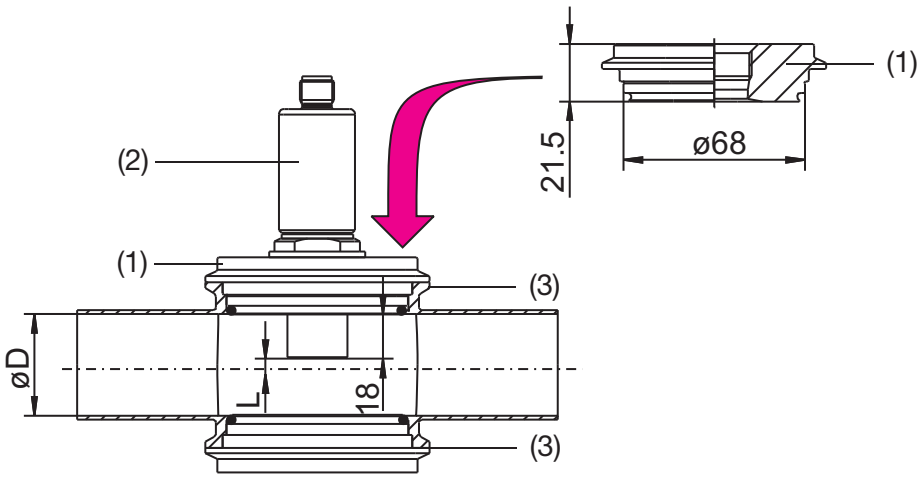
Immersion length EL	Total length GL	Type
18	126	202930/10
38	146	202930/20
48	156	202930/30

4.2 JUMO PEKA process connection adapter

The EHEDG-certified system for process connection - JUMO PEKA - allows it to be used in pharmaceutical and food technology without difficulty. JUMO PEKA is an adapter system that combines the measuring cell with the process connection. All the materials are physiologically safe, and meet FDA standards.

4.3 Mounting suggestions

Varivent®

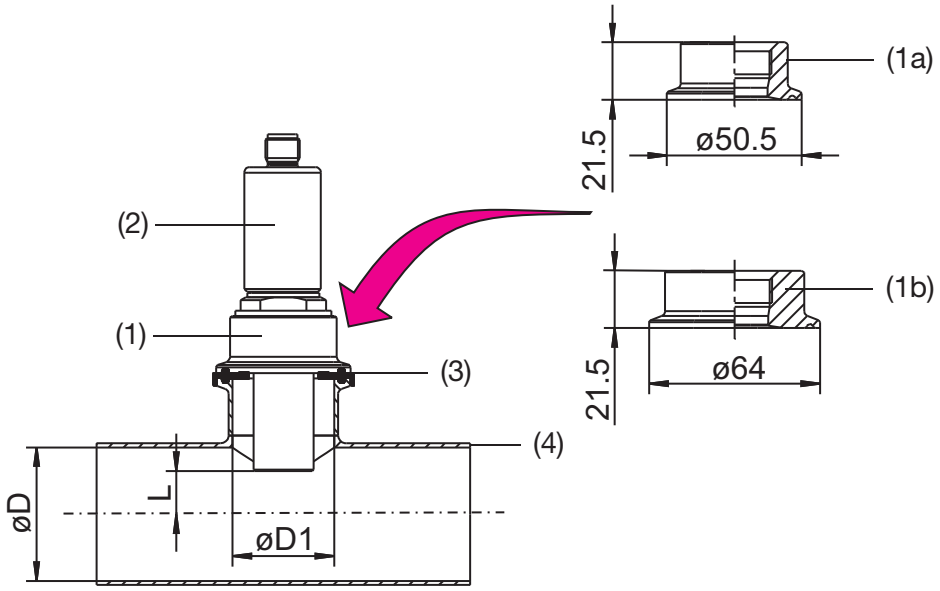


(1)	JUMO PEKA process connection adapter Varivent® DN40-125, sales no.: 40/00445046
(2)	JUMO tecLine Lf-4P conductivity cell.
(3)	The Varivent® housing DNxx is **not** supplied by JUMO and must be provided by the customer!

Varivent housing DN	Diameter D	L	Measuring cell type
40	38	3	202930/10
50	50	9	
65	66	18	
80	81	24.5	
100	100	34	

4 Mounting

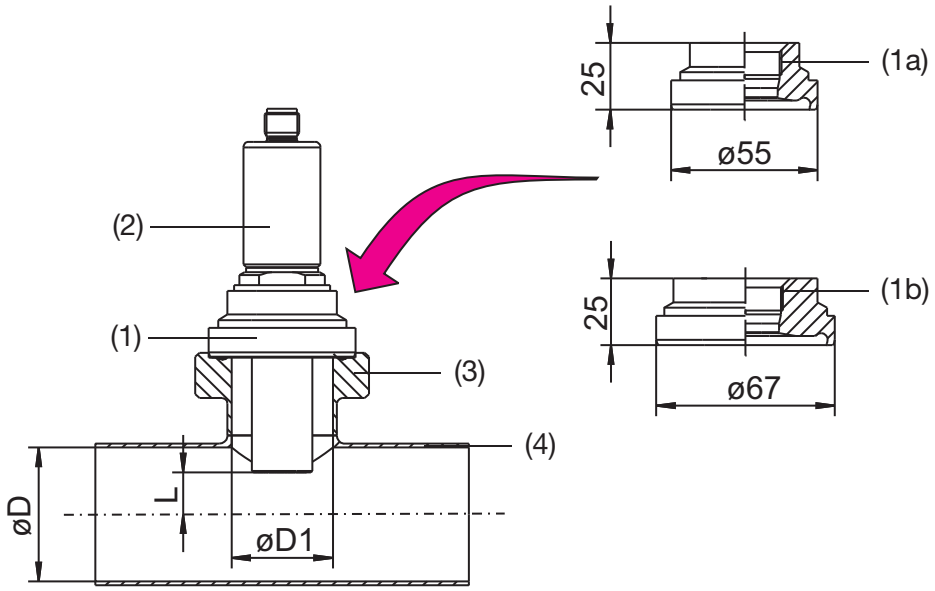
Clamp



(1)	JUMO PEKA process connection adapter (1a) Clamp DN25 / 32 / 40, sales no.: 40/00445046 (1b) Clamp DN50, sales no.: 40/00445037
(2)	JUMO tecLine Lf-4P conductivity cell.
(3)	The DNxx clamp adapter, DIN 32676 is **not** supplied by JUMO and must be provided by the customer!
(4)	The clamp DNxx T-piece, DIN short, similar to DIN 11852 is **not** supplied by JUMO and must be provided by the customer!

Clamp adapter DN	T-piece DN	Diameter D	Diameter D1	L	Measuring cell type
25	32-25	32	26	5	202930/20
	40-25	38		0	202930/30
	50-25	50		7	
	65-25	66		15	
	80-25	81		20	
	100-25	100		30	
50	65-50	66	50	15	
	80-50	81		20	
	100-50	100		30	

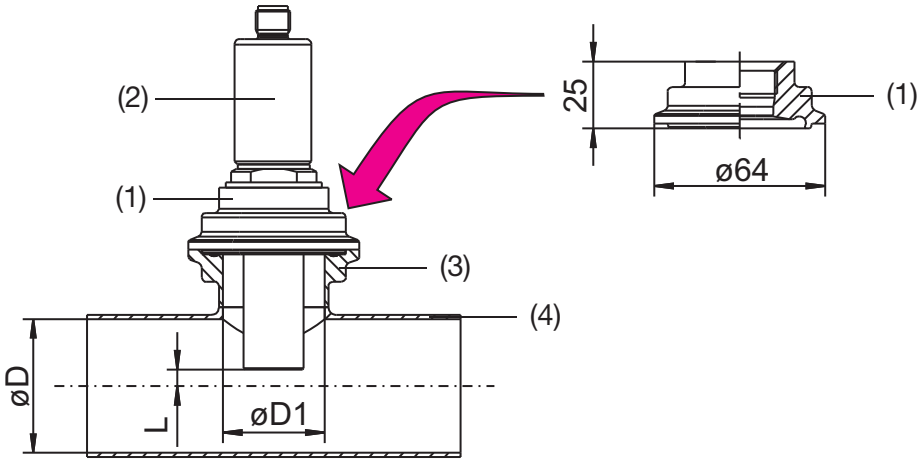
Aseptic



(1)	JUMO PEKA process connection adapter (1a) Aseptic DN40, sales no.: 40/00446458 (1b) Aseptic DN50, sales no.: 40/00445035
(2)	JUMO tecLine Lf-4P conductivity cell.
(3)	The DNxx threaded adapter, DIN 11864 is **not** supplied by JUMO and must be provided by the customer!
(4)	The DNxx T-piece is **not** supplied by JUMO and must be provided by the customer!

Threaded adapter	T-piece DN	Diameter D	Diameter D1	L	Measuring cell type
40	50-40	50	38	10	202930/30
	65-40	66		18	
	80-40	81		27	
	100-40	100		37	
50	65-50	66	50	18	
	80-50	81		27	
	100-50	100		37	

Aseptic NKS



(1)	JUMO PEKA process connection adapter Aseptic NKS DN40, sales no.: 40/00447555
(2)	JUMO tecLine Lf-4P conductivity cell.
(3)	Collar clamp adapter NKS DN40, Form A, DIN 11864-3 is **not** supplied by JUMO and must be provided by the customer!
(4)	The DNxx T-piece is **not** supplied by JUMO and must be provided by the customer!

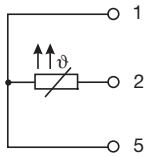
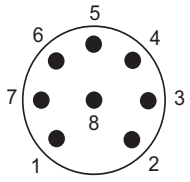
Collar clamp adapter	T-piece DN	Diameter D	Diameter D1	L	Measuring cell type
NKS DN40 Form A	50-40	50	38	10	202930/30
	65-40	66		18	
	80-40	81		27	
	100-40	100		37	

5.1 Electrical connection

- ❏ Lay the input, output, and supply lines so they are physically separated from each other and are not parallel.
- ❏ If possible, use the Lf-4P cable (see Accessories) to connect the conductivity cell. Do not lay the connecting cable close to components or lines through which current is flowing.
- ❏ The cables must have an uninterrupted run (do not route them via terminal blocks or similar arrangements).
- ❏ No other consumers can be connected to the power terminals of the instrument.
- ❏ The conductivity cell is not suitable for installation in areas with an explosion hazard.
- ❏ It is essential to comply with the electrical connection instructions in the operating manual of the transmitter that is being used!
- ❏ Apart from faulty installation, incorrect settings on the transmitter may also affect the proper functioning of the subsequent process or lead to damage. You should therefore always provide safety equipment that is independent and it should only be possible for qualified personnel to make settings.

5.2 Terminal assignment and wiring colors

Incorrect connection of the conductivity cell will produce inaccurate measurement results!

Connection for		M12 measuring cell connector		Lf-4P cable
		Pin	Assignment	Color
Pt1000 temperature probe for temperature compensation		1 2 5		GN YE BN
Voltage tap, inner electrode 2		3		PK
Current supply, outer electrode 2		4		BL
Current supply, outer electrode 1		6		RD
Voltage tap, inner electrode 1		7		GR
NC				

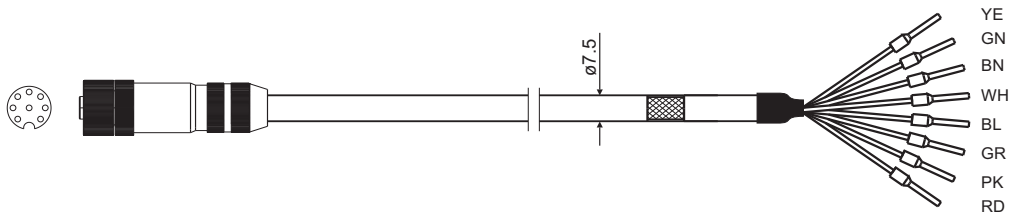
5 Installation

5.3 Lf-4P cable

Use only the Lf-4P cable for conductivity cell connection:

Lf-4P cable, 5 m, made up, with M12 connector
Sales no.: 20/00528699

Lf-4P cable, 10 m, made up, with M12 connector
Sales no.: 20/00528699

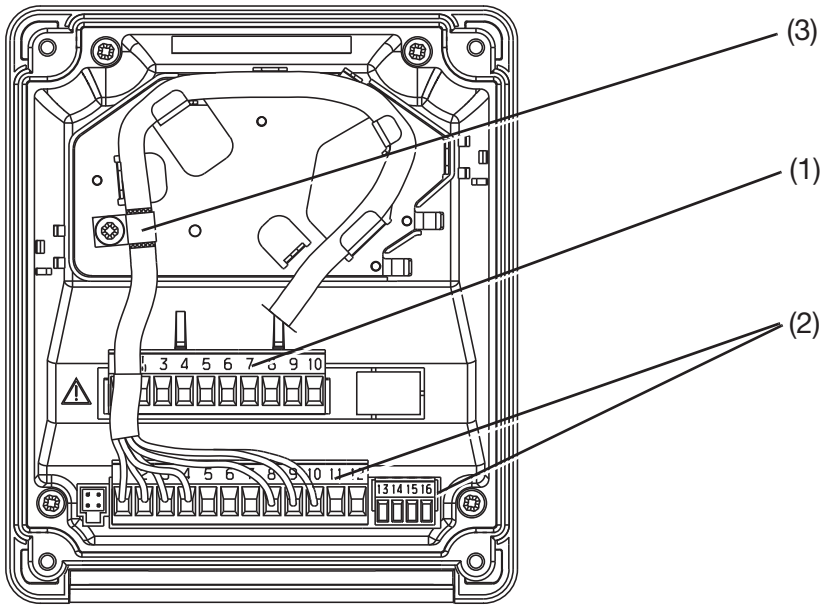


M12 cable socket:	metal, 8-pin
Cable diameter:	7.5 mm
Cable material:	PUR, blue
Ambient temperature:	-30 to +80°C
Cable length:	5 m or 10 m For metrological reasons, the maximum cable length is limited to 10 m!

5.4 Connection example

This example is **only** valid for connecting the JUMO tecLine Lf-4P conductivity cell to a JUMO AQUIS 500 CR transmitter/controller for conductivity!

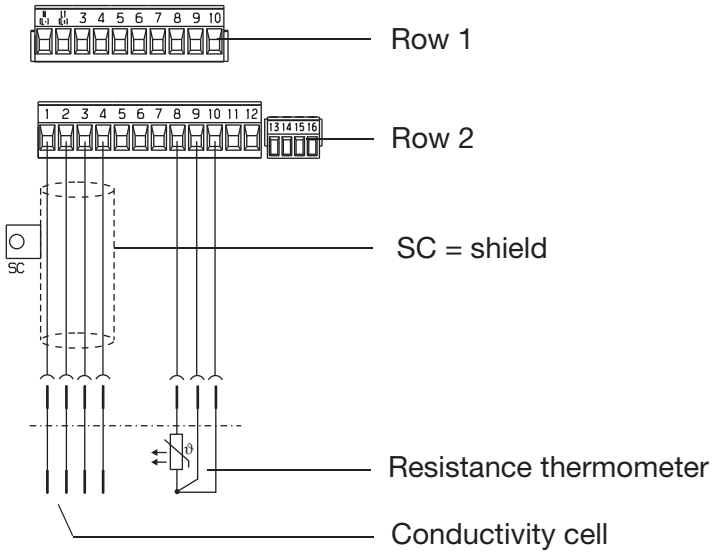
Cable routing in the transmitter



✱ Run the connecting cables through the JUMO AQUIS 500 CR cable glands.

* Locate the measuring lead as shown in the diagram. Fasten the measuring lead to the screen with the clip (3).
* Connect the wires, as shown below.
* Connect the pluggable screw terminals of row 1 (1) and row 2 (2) to the instrument slots.

Measuring cell connection



Terminal assignment

Terminal 1	- RD
Terminal 2	- GR
Terminal 3	- PK
Terminal 4	- BL
Terminal 8	- YE
Terminal 9	- GN
Terminal 10	- BN

6 Calibration

6.1 Notes

Ageing and contamination (deposits) can cause the cell constant of the conductivity cell to change.

The transmitter should therefore be calibrated to the connected conductivity cell at regular intervals (subject to the measuring material and the operating conditions)!

6.2 General

JUMO tecLine Lf-4P conductivity cells are exactly gaged at the factory. The cell constant of every measuring cell is documented both on the cell stem and on the calibration certificate that is also supplied.

This cell constant should be entered directly into the connected transmitter (e. g. JUMO AQUIS 500 CR).

In combination with the JUMO AQUIS 500 CR, measuring accuracy in the 20 µS/cm to 600 mS/cm range is better than 5%. To achieve far greater measuring accuracy, calibrate the transmitter close to its later working point.

To monitor and increase the quality of measurement, the conductivity measurement chain (conductivity cell + connecting cable + transmitter) should be regularly calibrated.

Reference solutions

It is advisable to use one of the following reference solutions for calibration:

- ASTM D 1125, reference solution B: 0.1 N KCl with 12856 µS/cm
- DIN 38404, Part 8, Section 8.3: 0.1 mol/l KCl with 12.95×10^3 µS/cm

However, any calibration solution in the medium conductivity range can also be used.

6.3 JUMO AQUIS 500 CR settings

It is essential to comply with the JUMO AQUIS 500 CR operating instructions (B202565.0)!

The following settings are the minimum that have to be made:

- Cell type (type of connection): 4-electrode or 4-wire
- Nominal cell constant 1.0 1/cm
- Relative cell constant as % (see cell nameplate or certificate)

7.1 Cleaning the conductivity cell

Conductive conductivity cells are not authorized for use in highly adherent, oily or glutinous media - we recommend using our inductive conductivity measuring instruments here!

After cleaning the conductivity cell, always rinse it with water!

The conductive conductivity cell electrodes are in direct contact with the measurement medium. **Regular cleaning must therefore be performed, relative to the contamination susceptibility of the measuring material!**

Abrasive cleaners have limited suitability! The measurement electrodes must not be damaged!

- Light contamination can be wiped off with a soft, cleansing tissue, or similar.
- Wash off sticky contamination or greasy and oily contamination with a hot rinsing agent solution and a soft cloth or soft brush.
  Ethanol can also be used to clean the cell, if necessary.
- Diluted hydrochloric acid (3 % by weight) can also be used to dissolve the contamination in the event of calciferous coatings or precipitated metal hydroxides or metal oxides.
- If none of the methods mentioned above remove the contamination, other solvents, acids or caustic solutions may be used, with the aid of ultrasonic baths where required.
  In this case, it is necessary to ensure that the conductivity cell components are resistant to the cleaning agents being used, See section 8 "Technical data", page 21!

7 Maintenance / troubleshooting

7.2 Troubleshooting

Troubleshooting must always consider all the components of the conductivity measurement chain! The transmitter and the connecting cable must also be tested, as well as the conductivity cell.

Error	Possible cause	Remedy
Measurement value is too high or too low.	Conductivity cell is dirty.	Clean the conductivity cell.
The transmitter does not display conductivity. (e.g. display shows "0")	Broken lead or incorrect electrical connection. Measuring cell exposed to air (not fully immersed).	Check the electrical connection. Check the measuring cell installation location. Is measuring material present?
Conductivity displayed by transmitter is too high or too low.	The measuring cell electrical connection is incorrect: poles are inverted or "right - left" assignment is incorrect.	Check the electrical connection.
The transmitter does not display temperature.	Broken lead or incorrect electrical connection.	Check the electrical connection.
Display value unstable, fluctuating.	Malfunction caused by incorrectly / insufficiently shielded connecting cable. Malfunction caused by gas bubbles.	Use Lf-4P cables for connection. Check cable connection and cable routing. Check installation location and position of the measuring cell.

The conductivity cell can also be tested for short-circuits or internal contact problems. A continuity tester (such as the diode tester of a multimeter) is needed for this.

Typical measuring range[1]	1 µS/cm to approx. 600 mS/cm
Cell constant[2]	typically, K = 0.3 - 0.4 cm^{-1}
Operating temperature	-10 to +120°C, briefly +140°C (sterilization)
Maximum pressure	16 bar at 25°C 6 bar at -10°C and +140°C
Temperature measurement	With Pt1000, DIN EN60751 Class A
Electrical connection[3]	M12 connector
Protection	IP65
Fitting length	18 mm 38 mm 48 mm (see Dimensions)
Materials in contact with the measuring medium Cell housing Electrodes Probe pocket Seal	FDA compliant PEEK Stainless steel 1.4435 (316L) Stainless steel 1.4435 (316L) EPDM (other material on request)
Process connection	JUMO PEKA[4] (EHEDG-certified) Available process connection adapters: Varivent DN40-125, stainless steel 1.4435 (316L) Clamp DN25/32/40 and DN50, stainless steel 1.4435 (316L) Aseptic DN40 and DN50, stainless steel 1.4435 (316L) Aseptic NKS DN40, stainless steel 1.4435 (316L)
Measuring cell installation	Only possible in conjunction with JUMO PEKA process connection adapters![3]
Surface quality (roughness)	Stainless steel components ≤ 0.6 µm Plastic components ≤ 0.8 µm

1 Measuring ranges are also dependent on the transmitter being used.
2 The measured cell constant is recorded on the stem of the conductivity cell.
A cell constant deviation can be adjusted at the transmitter.
3 The Lf-4P cable is required for connection (see See section 5.3 "Lf-4P cable", page 16)!
4 See See section 4.2 "JUMO PEKA process connection adapter", page 11 and data sheet T 40.9711.

JUMO GmbH & Co. KG
Street address:
Moritz-Juchheim-Straße 1
36039 Fulda, Germany
Delivery address:
Mackenrodtstraße 14
36039 Fulda, Germany
Postal address:
36035 Fulda, Germany
Phone: +49 661 6003-0
Fax: +49 661 6003-607
E-mail: mail@jumo.net
Internet: www.jumo.net

JUMO Instrument Co. Ltd.
JUMO House
Temple Bank, Riverway
Harlow - Essex CM20 2DY, UK
Phone: +44 1279 63 55 33
Fax: +44 1279 63 52 62
E-mail: sales@jumo.co.uk
Internet: www.jumo.co.uk

JUMO Process Control, Inc.
8 Technology Boulevard
Canastota, NY 13032, USA
Phone: 315-697-JUMO
1-800-554-JUMO
Fax: 315-697-5867
E-mail: info@jumo.us
Internet: www.jumo.us