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JUMO AQUIS 500 Ci

Transmitter/controller for inductive conductivity, concentration and temperature



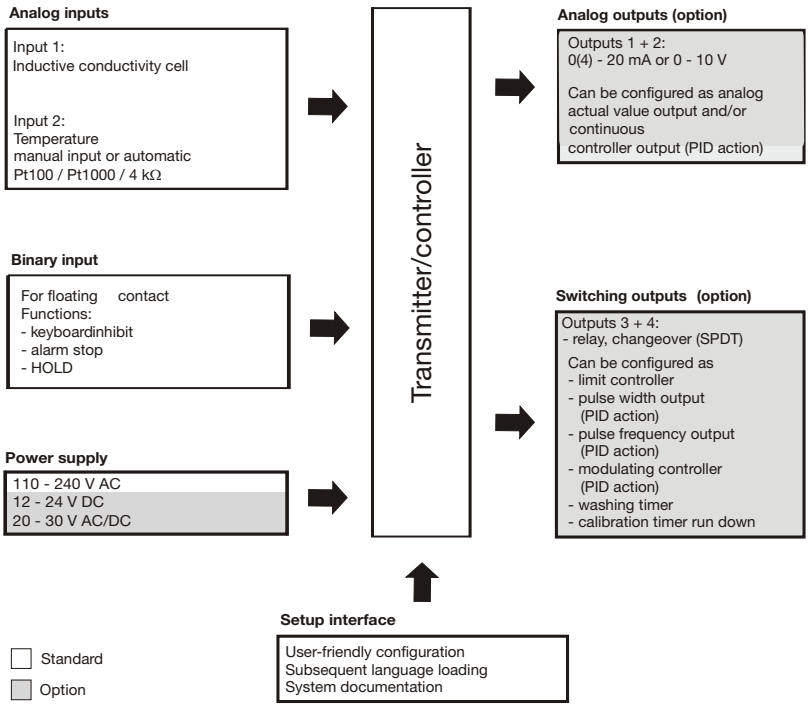
Type 202566

Brief description

The instrument is used for the inductive measurement and control of electrolytic conductivity, or concentration. The conductivity is converted into a specified unit by means of a customized table. Inductive JUMO conductivity cells can be connected to the instrument.
The instrument is particularly recommended for use in media in which heavy deposits from contaminants, oil and grease, or gypsum and lime precipitation are to be expected. Because temperature measurement is integrated, temperature compensation takes place quickly and precisely, which is particularly important when measuring conductivity.
Specific and automatic temperature compensation is possible, depending on the measurement variable.
The instrument is operated by keys and a large LC graphic display. The measurement value is easy to read on this display. The parameters are shown in plain text, making configuration easier for the user, and helping with the proper programming of the instrument.
Its modular configuration allows the instrument to be adapted to the requirements of the application. There are up to four outputs available (see block diagram for functions).

Typical areas of application:
Dairies, breweries, soft drinks manufacturing/bottling, mineral springs, drinking water, liquid food production, CIP/SIP systems, other rinsing and cleaning processes, measuring the concentration of acids, lyes and cleaning chemicals, etc.

Block diagram



Key features

- Direct selection option for
  - specific conductivity (µS/cm and mS/cm)
  - concentration, NaOH, HNO_3, H_2SO_4, HCl
  - a customized table
- Automatic temperature compensation: off, linear, natural water (EN 27888/ISO 7888), non-linear
- Large, backlit LC graphic display
- A choice of display visualizations: large numbers, bar graph or trend display
- Calibration options relevant to the measurement variable: cell constant and temperature coefficient
- Calibration logbook
- Option to connect inductive JUMO measuring cells
- IP67 enclosure protection for surface mounting
  IP65 enclosure protection for control cabinet mounting
- Selectable languages:
  German, English, French;
  additional languages can be loaded later through the setup program
- The setup program provides: user-friendly programming, system documentation, subsequent loading of additional languages

Approvals/Approval marks (see Technical data)

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Functional description

The instrument is designed for on-site use. A robust housing protects the electronics and electrical connections against aggressive environmental conditions (IP67). As an alternative, the instrument can also be installed in a panel; the front then has IP65 enclosure protection. Easily installed screw connectors are used for electrical connection. A ventilation screw with a PTFE membrane prevents condensation buildup.

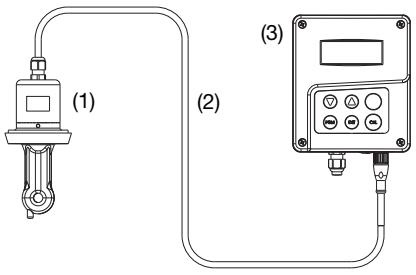
Transmitter

The transmitter receives the measurement signal from the inductive measuring cells of the JUMO tecLINE Ci series, see data sheet 202941.

With the inductive measurement method, acquisition of specific conductivity is largely maintenance-free, even in the most difficult of medium conditions. Unlike the conductive measurement method, there are practically no problems such as electrode breakdown and polarization.

By acquiring the temperature of the sample medium, the instrument can automatically perform temperature compensation.

Components of the measurement chain

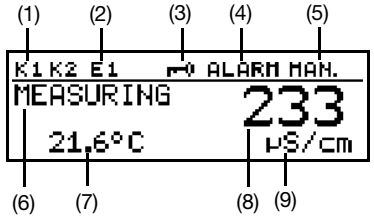


(1) JUMO tecLine Ci, inductive conductivity and temperature sensor

(2) Cable
(JUMO tecLine Ci component)

(3) JUMO AQUIS 500 Ci, transmitter/ controller for conductivity, concentration and temperature

Displays and controls



(1)Switching output 1 or 2 is active
(2)Binary input 1 is triggered
(3)Keyboard inhibited
(4)Alarm has been activated
(5)Instrument is in manual mode
(6)Instrument status
(7)Medium temperature
(8)Main measurement
(9)Unit of main measurement

The user can specify what is to appear in positions (7) and (8) of the display:

- No display
- Corrected or uncorrected measurement
- Temperature
- Output level 1 or 2
- Setpoint 1 or 2

Operation

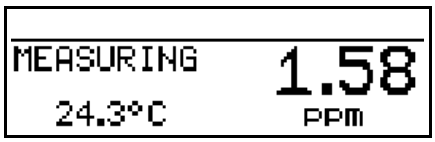
To make programming and operation easy, all parameters are clearly assigned to levels and displayed in plain text. Operation is protected by a code word. Operation can be adapted on an individual basis because parameters can be generally enabled or assigned to the protected area.

A setup program for the PC is available as a more convenient configuration option, rather than using the instrument keyboard.

Display modes

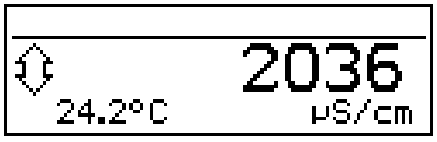
Three display modes are available:

Large numbers



Here the measurements are displayed in numbers, as usual.

Trend display



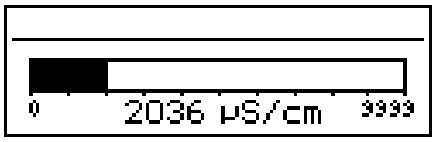
Here the numerical value is supplemented by a symbol to indicate the direction and speed of change for the measurement.
This can be very useful when the controller is being optimized, for example.



from left to right:

fast, medium and slow rise,
steady,
slow, medium and fast fall.

Bar graph



In this display mode, it only takes a glance to ascertain the range for the current measurement.
Any scale can be used for the bar graph.

Function modes

Electrolytic conductivity
µS/cm or mS/cm are the units used for display and control.

Concentration measurement
Caustic soda
NaOH0 to 12 % by weight
NaOH25 to 50 % by weight
Nitric acid
$HNO_3$0 to 25 % by weight
$HNO_3$36 to 82 % by weight
Sulphuric acid
$H_2SO_4$0 to 28 % by weight
$H_2SO_4$36 to 85 % weight
$H_2SO_4$92 to 99 % by weight
Hydrochloric acid
HCl 0 to 18 % by weight
HCl22 to 44 % by weight

Customized table
In this mode, the input value (specific conductivity) can be displayed in accordance with a table (max. 20 value pairs). This function can be used to implement simple concentration measurements, for example. Table values can only be entered using the optional setup program.

Calibration

Cell constant
Because of manufacturing constraints, the cell constant of a conductivity measuring cell may differ slightly from its nominal value. Wear or the accumulation of deposits during operation can also cause the cell constant to change. This changes the output signal from the measuring cell. With this instrument, the user has the opportunity to compensate for deviations in the nominal value of the cell constant by manual input, or by automatic calibration of the relevant cell constant.

Installation factor
This parameter can be used to compensate for unfavorable sensor mounting conditions.

Temperature coefficient
The conductivity of virtually all solutions is temperature dependent. To ensure correct measurement therefore, both the temperature and the temperature coefficient a [%/C] of the measurement solution must be known. The temperature can either be measured automatically with a Pt 100 or Pt 1000 temperature probe, or the user must set the

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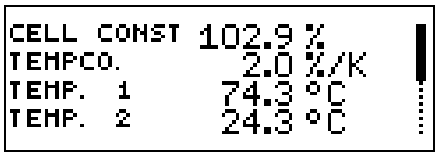
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temperature by hand.
The temperature coefficient can be automatically determined by the instrument, or it can be entered by hand.

Calibration logbook

The last five successful calibrations can be accessed in the calibration logbook. This allows the ageing of the connected sensor to be assessed.

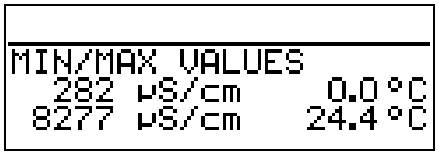


Calibration timer

The calibration timer indicates (on request) a required routine calibration. The calibration timer is activated by entering the number of days that must expire before there is a scheduled re-calibration (specified by the system or the operator).

Min/max value memory

This memory records the minimum and maximum input quantities that occur. This information can be used, for example, to assess whether the design of the connected sensor is suitable for the values that actually occur.



Binary input

The following functions can be accessed through the binary input:

- Key inhibit activation
  When this function is activated, operation is no longer possible via the keyboard.
- "HOLD" mode activation
  When this function is activated, the outputs (analog and relay) adopt the states previously defined.
- Alarm suppression (controller alarm only)
  With this function, it is possible to temporarily deactivate alarm generation via the relevantly configured relay.

The predefined function is activated using a floating contact (such as a relay) to bridge the relevant terminals.

Analog outputs

There are up to 2 analog outputs available.
The following functions can be selected:

Output	Analog process value output		Continuous controller main value
	Main variable	Temperature	
1	X	-	X
2	-	X	X

With the analog process value output, the range start and end values are freely selectable.
The response of the outputs to over/underrange, alarm and calibration is freely programmable.
Simulation function: The analog process value outputs can be freely set in the manual ("Hand") mode.
Application: "Dry run" start-up of the plant, troubleshooting, servicing.

Control functions

Functions that are configured by parameters can be assigned to the relay. P, PI, PD and PID structures can be freely programmed as control functions.

Relay outputs

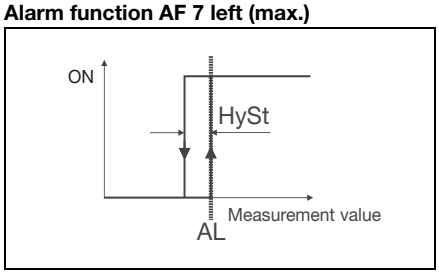
Two relay changeover contacts are available for the main measurement variable and/or the temperature.

The following functions can be programmed:

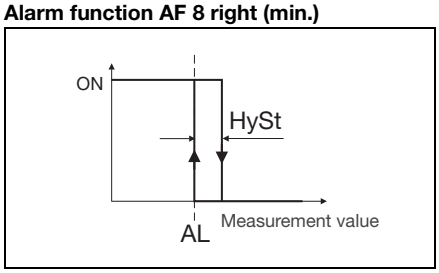
- Switching direction
  (min/max)
- Limit controller
  (switch-on/switch-off delay, hysteresis)
- Pulse width output
  (see Control functions)
- Pulse frequency output
  (see Control functions)
- Modulating function
  (see Control functions)
- Alarm functions
  (switch-on/switch-off delay, hysteresis)
- Pulse controls
  With this function, the output briefly switches on when the switching point is reached and then switches off again
- Alarm
- Sensor/range error
- Behavior in the event of an alarm, underrange or overrange measurement, calibration and "HOLD"

Contact functions

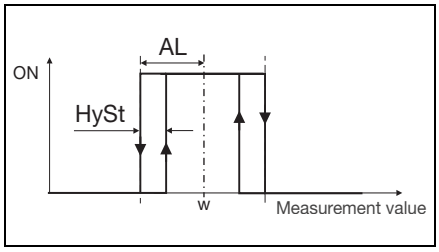
Alarm function AF 7 left (max.)



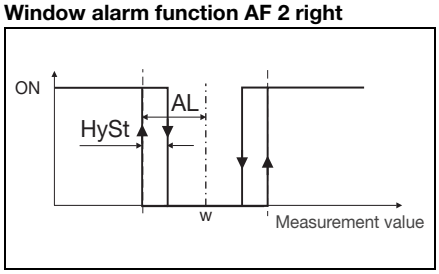
Alarm function AF 8 right (min.)



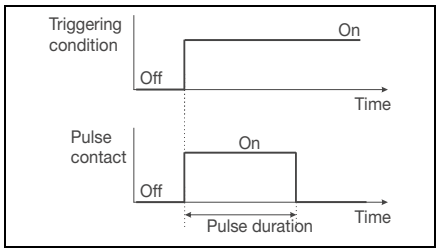
Window alarm function AF 1 left



Window alarm function AF 2 right



Pulse contact
Triggering condition longer than pulse duration

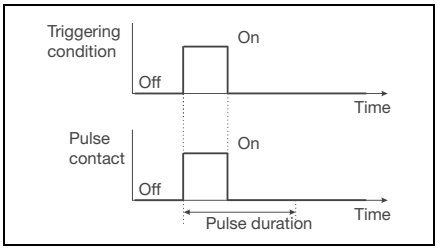


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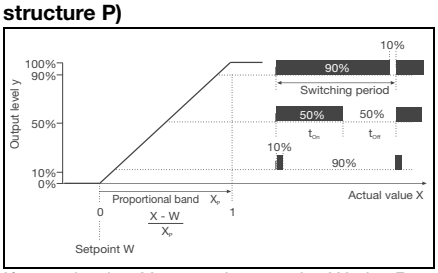
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Pulse contact
Triggering condition shorter than pulse duration

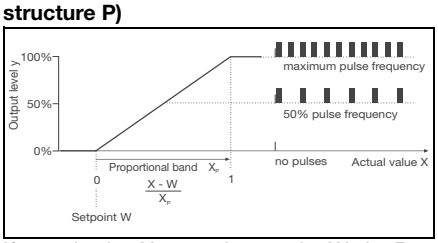


Pulse width controller
(output active with X > W and control structure P)



If actual value X exceeds setpoint W, the P controller will control in proportion to the control deviation. When the proportional band is exceeded, the controller operates with an output level of 100 % (100 % clock ratio).

Pulse frequency controller
(output active with X > W and control structure P)



If actual value X exceeds setpoint W, the P controller will control in proportion to the control deviation. When the proportional band is exceeded, the controller operates with an output level of 100 % (maximum switching frequency).

Technical data

Main input conductivity

Measuring range	0000 to 9999 µS/cm 0.000 to 9.999 mS/cm 0.00 to 99.99 mS/cm 0.0 to 999.9 mS/cm 0 to 2000 mS/cm
Accuracy[a] 0.000 to 1.000 mS/cm 1.01 to 500 mS/cm 501 to 2000 mS/cm	 1.5 % of the measuring range 1 % of the measuring range 1.5 % of the measuring range
Operating mode **Concentration measurement** NaOH caustic solution HNO_3 nitric acid H_2SO_4 sulphuric acid HCL hydrochloric acid	 Range 1: 0 to 12 % by weight Range 2: 20 to 50 % by weight Range 1: 0 to 25 % by weight Range 2: 36 to 82 % by weight Range 1: 0 to 28 % by weight Range 2: 36 to 85 % by weight Range 3: 92 to 99 % by weight Range 1: 0 to 18 % by weight Range 2: 22 to 44 % by weight
Operating mode **Customized table**	The compensated conductivity is converted to a new display value by means of a table. The table can contain as many as 29 value pairs. The display unit can also be adapted. Process sequence: Uncompensated conductivity > Temperature compensation > Linearization with table > Display value.

[a] Temperature error at JUMO AQUIS 500 Ci with inductive conductivity probe JUMO tecLINE Ci. Deviation of 22 °C relative to the output signal end value 0(4) to 20 mA and 0 to 10 V.

Secondary input temperature

Pt100 (automatic detection) Measuring range Accuracy Ambient temperature error	 -50 to 250 °C ±0,5 K up to 100 °C, ±0,8 K as of 100 °C 0.05 %/10 °C
Pt1000 (automatic detection) Measuring range Accuracy Ambient temperature error	 -50 to 250 °C ±0,5 K up to 100 °C, ±1,0 K as of 100 °C 0.05 %/10 °C
NTC / PTC Measuring range Accuracy Ambient temperature error	 max. 4 kΩ Table input with up to 20 value pairs via setup program ≤ 0.3 °C (dependent on interpolation points) 0.05 %/10 °C

Temperature compensation

Linear TC (α) setting range Temperature range	 0 to 5.5 %/C 0(to10) to 100 °C
Natural water (ISO 7888) TC (α) setting range Temperature range	 n/a 0 to 36 °C
Reference temperature	adjustable: 15 to 30 °C preset to 25 °C (standard)

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Measuring circuit monitoring

Conductivity input	
Overrange	yes
Short circuit	dependent on range
Broken lead	dependent on range
Temperature input	
Overrange/underrange	yes
Short circuit	yes

Cell constant

Adjustment range 1 **Adjustment range 2**	4 to 6 [1/cm] 6 to 8 [1/cm]
Setting range of the relative cell constant	80 to 120 %
Installation factor	80 to 120 %

Binary input

Activation	by floating contact
Function	key inhibit HOLD alarm suppression

Controller

Controller type	alarm functions, limit controllers, pulse width controllers, pulse frequency controllers, modulating controllers, continuous controllers
Controller structure	P/PI/PD/PID
A/D converter	dynamic resolution up to 14 bits
Sampling time	500 ms

Analog outputs (max. 2)

Output type	**Signal range**	**Accuracy**	**Temperature error**	**Permissible load resistance**
Current signal	0/4 to 20 mA	≤ 0.25 %	0.08 %/10 °C	≤ 500 Ω
Voltage signal	0 to 10 V	≤ 0.25 %	0.08 %/10 °C	≥ 500 Ω
The analog outputs respond in accordance with NAMUR recommendation NE43. The analog outputs are electrically isolated, AC 30 V/DC 50 V.				

Switching outputs (max. two (SPDT) changeovers)

Rated load	AC 3 A/250 V (resistive load)
Contact life	>2x10^5 operations at rated load

Setup interface

Interface for configuring the instrument with the available setup program option (for instrument configuration only).

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Electrical data

Power supply	AC 110 to 240 V; -15/+10 %; 48 to 63 Hz AC/DC 20 to 30 V; 48 to 63 Hz DC 12 to 24 V; +/-15 % (permissible only for connection to SELV/PELV circuits)
Power consumption	approx. 14 VA
Electrical safety	EN 61 010, Part 1 overvoltage category III[a], pollution degree 2
Data backup	EEPROM
Electrical connection Power supply, relay outputs, sensor inputs Analog outputs Inductive conductivity sensor	 Pluggable screw terminals, conductor cross-section max. 2.5 mm^2 Pluggable screw terminals, conductor cross-section max. 1.5 mm^2 M12 connection

[a] Not valid for power supply 30, DC 12 to 24 V

Display

Graphic LC display	120 x 32 pixels
Backlighting	Programmable: - off - on for 60 seconds during operation

Housing

Material	ABS
Cable entry	Cable glands, max. 2 x M16 and 2 x M12
Feature	Venting element to prevent condensation
Ambient temperature range (the specified accuracy is adhered to in this range)	-10 to +50 °C
Operating temperature range (instrument operational)	-15 to +65 °C
Storage temperature range	-30 to +70 °C
Climatic rating	Rel. humidity ≤ 90 % annual mean, no condensation (based on EN 60721 3-3 3K3)
Enclosure protection to EN 60529	Surface-mounted housing:IP67 Control cabinet mounting:at front IP65, at rear IP20
Vibration resistant	to EN 60068-2-6
Weight	Surface-mounted housing:approx. 900 g Control cabinet mounting:approx. 480 g
Dimensions	See dimensioned drawings on page 10

Approvals/approval marks

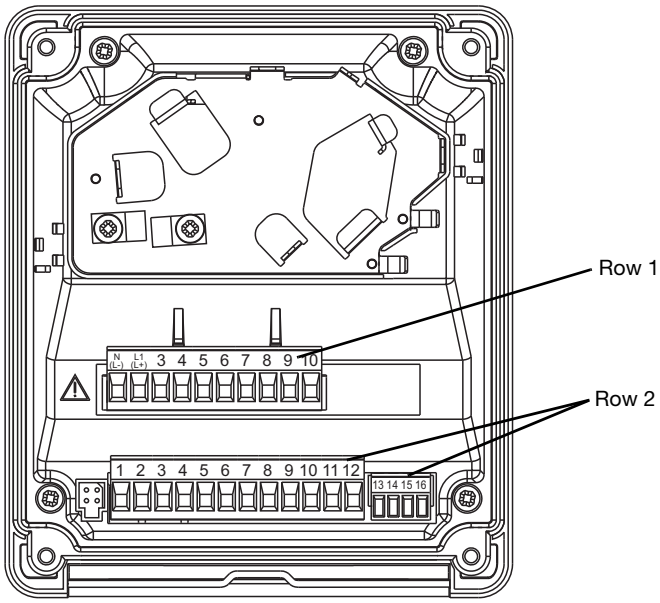
Mark of confirmity	Testing laboratory	Certifikates/certification numbers	Test basis	valid for
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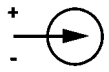
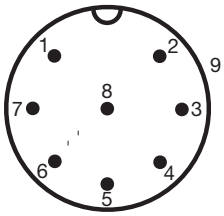
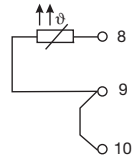
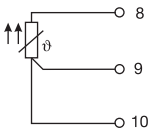
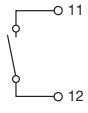
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Connection diagram



The connection diagram in the data sheet provides preliminary information about the connection options. For the electrical connection, only use the installation instructions or the operating manual. The knowledge and the correct technical execution of the safety information/instructions contained in these documents are mandatory for mounting, electrical connection, startup, and for safety during operation.

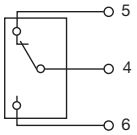
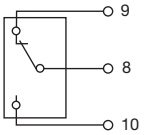
The JUMO AQUIS 500 Ci power supply is connected at the row 1 terminals.
The row 2 terminals are factory-wired for connecting a JUMO tecLINE Lf Ci inductive conductivity cell.

Connection		Terminal	Row
Inputs			
Power supply for transmitter/controller			
Power supply (23): AC 110 to 240 V, +10 %/-15 %, 48 to 63 Hz Power supply (25): AC/DC 20 to 30 V, 48 to 63 Hz Power supply (30): DC 12 to 24 V, ± 15 %		1 N (L-) 2 L1 (L+)	1
NC		3	
Do **not** change this wiring! Only JUMO tecLINE Lf Ci inductive conductivity cells must be operated at the M12 connector, see data sheet 202941!		1 2 3 4 5 6 7 8 9	2
Resistance thermometer in 2-wire circuit		8 9 10	
Resistance thermometer in 3-wire circuit		8 9 10	
Binary input		11 12	

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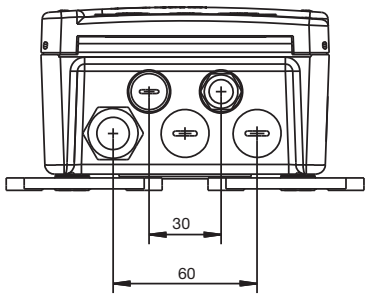
Connection		Terminal	Row
Outputs			
Analog output 1 0 to 20 mA and 20 to 0 mA or 4 to 20 mA and 20 to 4 mA or 0 to 10 V and 10 to 0 V (electrically isolated)		+ 13 - 14	2
Analog output 2 0 to 20 mA and 20 to 0 mA or 4 to 20 mA and 20 to 4 mA or 0 to 10 V and 10 to 0 V (electrically isolated)		+ 15 - 16	
Switching output K1 (floating)		4 pole 5 NC 6 NO	1
NC		7	
Switching output K2 (floating)		8 pole 9 NC 10 NO	

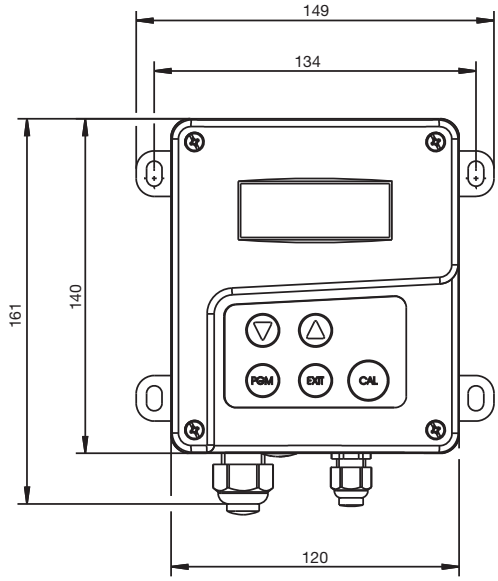
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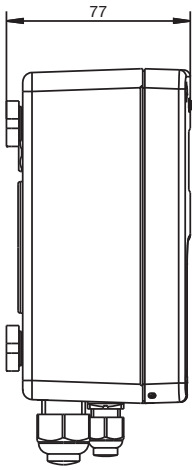
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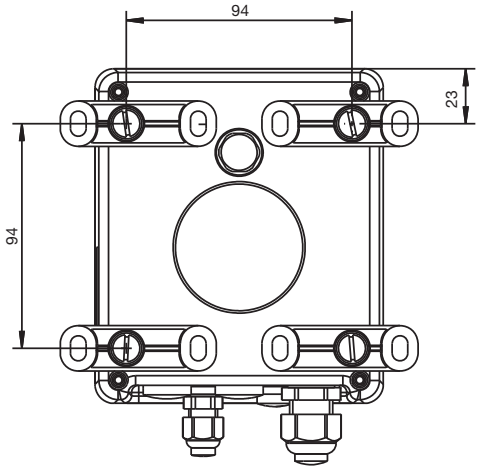
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Dimensions

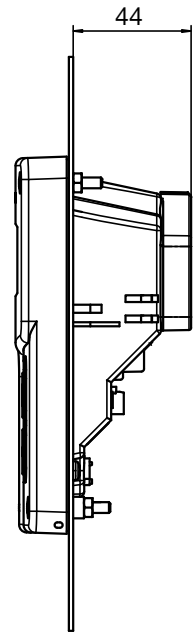


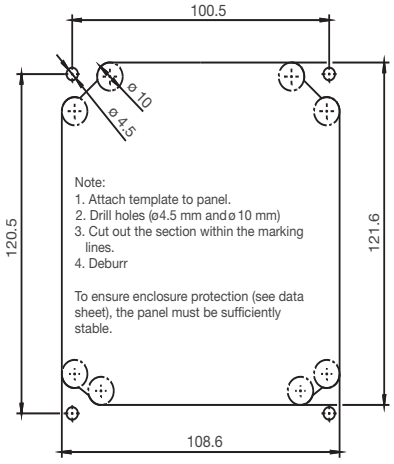






Panel mounting/drilling diagram





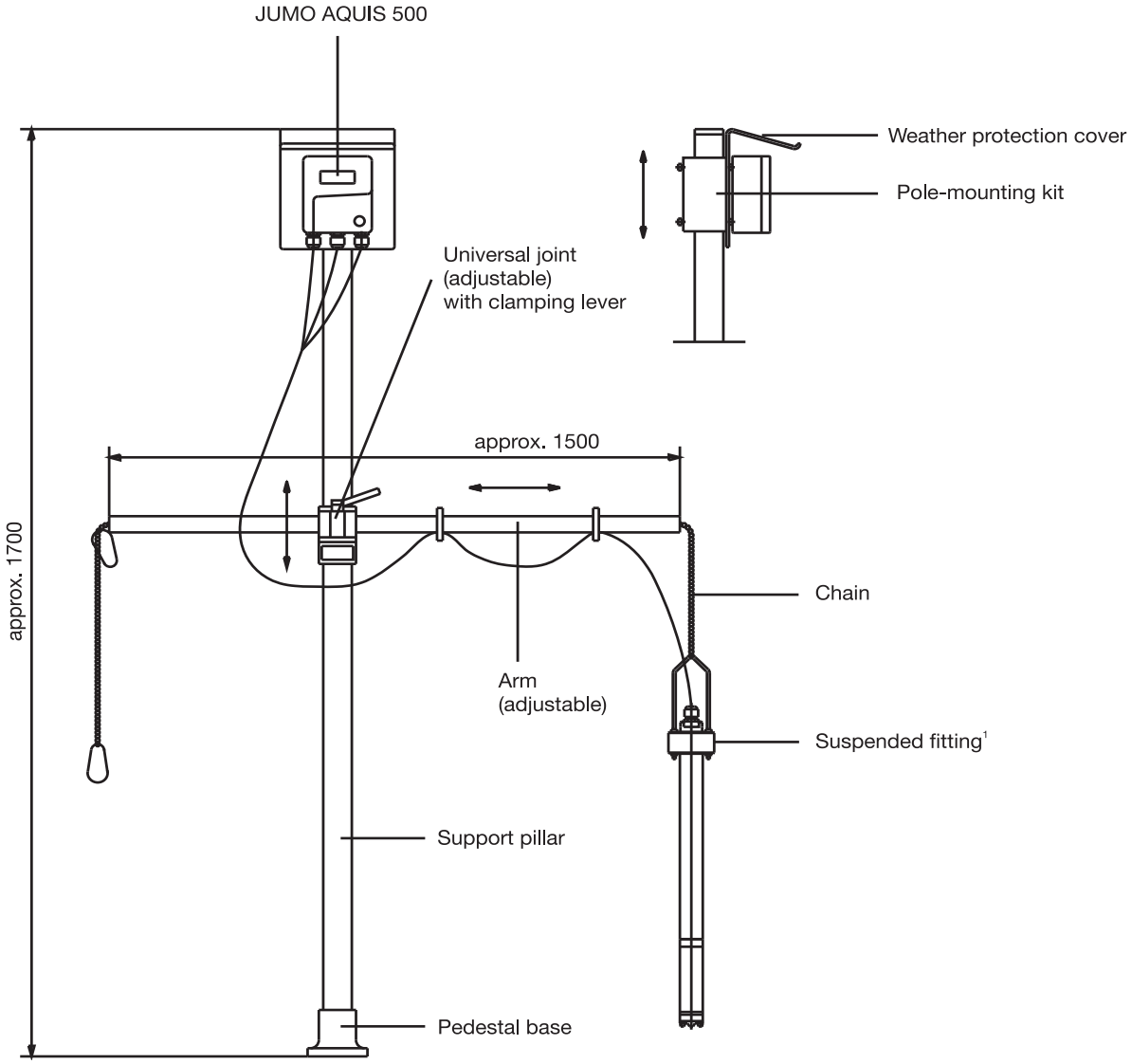
Note:
The drilling template is shown actual size in operating manual B 202566.0.

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Accessories



[1] The suspension fitting comprises a holder for suspension fitting 00453191 (see Accessories) and a measuring cell with a suitable fitting (see data sheet 202922, for example):

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Order details: JUMO AQUIS 500 Ci

	(1)	**Basic type**
202566		JUMO AQUIS 500 Ci - transmitter/controller for inductive conductivity, concentration and temperature
	(2)	**Basic type extension**
10		for panel mounting
20		in surface-mounted housing
	(3)	**Output 1 (for main value or continuous controller)**
000		no output
888		analog output 0(4) to 20 mA and 0 to 10 V
	(4)	**Output 2 (for temperature or continuous controller)**
000		no output
888		analog output 0(4) to 20 mA and 0 to 10 V
	(5)	**Output 3**
000		no output
310		relay with changeover contact
	(6)	**Output 4**
000		no output
310		relay with changeover contact
	(7)	**Power supply**
23		AC 110 to 240 V, +10 %/-15 %, 48 to 63 Hz
25		AC/DC 20 to 30 V, 48 to 63 Hz
30		DC 12 to 24 V, ± 15 %
	(8)	**Extra codes**
000		none

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
Order code		/		-		-		-		-		-		/		, ...
Order example	202566	/	20	-	888	-	000	-	310	-	000	-	23	/	000	

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Stock versions (delivery 3 days after receipt of order)

Type	Part no.
202566/20-888-888-310-310-23/000	00542691

Accessories (delivery 10 days after receipt of order)

Type	Part no.
Protective roof for JUMO AQUIS 500[a]	00398161
Pipe installation set for JUMO AQUIS 500[b]	00483664
DIN rail installation set for JUMO AQUIS 500[c]	00477842
Support pillar with base clamp, arm and chain	00398163
Holder for suspension fitting	00453191
Back panel set 202560/65/66/68	00506351
PC setup software	00483602
PC interface cable including USB/TTL converter and two adapters (USB connecting cable)	00456352
Calibration adapter for inductive conductivity measurement, type 202711/21	00543395

[a] The pipe installation set is needed for fitting the protective roof.
[b] With the pipe installation set, the JUMO AQUIS 500 can be attached to a pipe (e. g. a support pillar or a railing).
[c] With the DIN rail installation set, the JUMO AQUIS 500 can be attached to a 35 mm x 7.5 mm DIN rail as per EN 60715 A.1.

Note

The following are required for the initial commissioning of the sensor and transmitter/controller or when replacing components:

- transmitter/controller e. g. JUMO AQUIS 500 Ci, data sheet 202566
- JUMO tecLine Ci inductive conductivity and temperature sensor, data sheet 202941
- Calibration adapter for inductive conductivity measurement, type 202711/21, data sheet 202711