

JUMO AQUIS 500 RS

Display unit/controller for digital sensors with Modbus protocol

Brief description

The device has 1 digital interface, 1 analog temperature input, and 1 binary interface. The digital interface is suitable for connecting sensors with a Modbus RS485 interface. If the connected sensor does not have an integrated temperature sensor, an RTD temperature probe Pt100, Pt1000, or NTC/PTC (up to 4 kΩ) can be connected to the analog temperature input. The voltage supply for the digital sensor is integrated into the device.

The LCD graphic display allows input signals to be displayed as digits or as a bar graph. Displaying parameters in plain text ensures that operation is easily understandable and safe.

Two optional relay changeover contacts are used to implement simple switching or alarm functions as well as demanding control tasks with P, PI, PD, and PID behavior. Upon request, the device can also be supplied with 2 analog outputs (0 to 10 V or 0(4) to 20 mA) that can be freely parameterized and scaled.

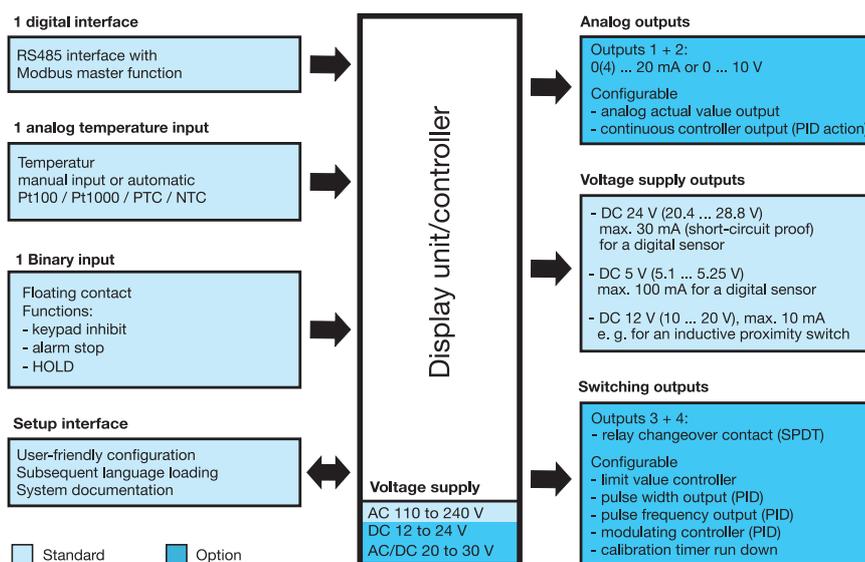
The device is suitable for tasks such as display, measurement, and control of:

- **Dissolved oxygen** in conjunction with sensors acc. to data sheet 202613
- **Free Chlorine** in conjunction with sensors acc. to data sheet 202630
- **Total Chlorine** in conjunction with sensors acc. to data sheet 202631
- **Chlorine Dioxide** and **Ozone** in conjunction with sensors acc. to data sheet 202634
- **Hydrogen Peroxide** and **Peracetic Acid** in conjunction with sensors acc. to data sheet 202636
- **Bromine** in conjunction with sensors acc. to data sheet 202637
- **Turbidity** in conjunction with sensors acc. to data sheet 202670



Type 202569/...

Block diagram



Special features

- Display: mg/l, ppm, % SAT, %, ‰, g/l, ppb, µg/l, NTU, FNU, etc. Others possible with use of the setup program
- Large LCD graphic display with backlight
- Display can be selected: large digits, bar graph, or trend display
- Integrated calibration routines: depending on sensor: zero point, end value, and 2-point
- Calib. logfile
- Protection type IP67 for surface mounting
Protection type IP65 for control cabinet mounting
- User languages (possible to switch): English, French, German
- Setup program (optional) allows easy programming, plant documentation, and download of additional user languages

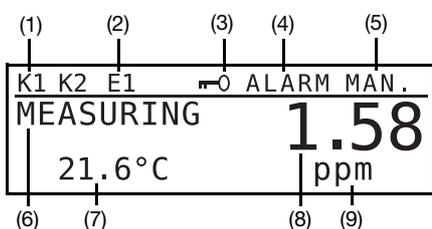
Approvals/Approval marks (see Technical data)



Functional description

The device is designed for on-site use. A robust case protects the electronics and electrical connections against aggressive environmental conditions (IP67). Alternatively, the device can also be installed in a panel, allowing frontal protection type IP65 to be achieved. The electrical connections are made with installation-friendly screw connectors. A ventilation screw with PTFE membrane prevents the formation of condensate.

Display and control elements



- (1) Switching output 1 or 2 is active
- (2) Binary output 1 is controlled
- (3) Keypad is locked
- (4) Alarm was activated
- (5) Device is in manual mode
- (6) Device status
- (7) Medium temperature
- (8) Main measured value
- (9) Unit of main measured value

The user can specify what should be displayed at positions (7) and (8) on the display:

- No display
- Compensated or uncompensated measured value
- Temperature
- Output level 1 or 2
- Setpoint value 1 or 2

Operation

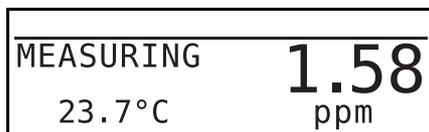
All parameters are displayed in clear levels and in plain text to ensure ease of programming and operation. Operation is protected with a code word. Individual modification is possible if parameters are generally approved and/or are assigned to the protected area.

The setup program (optionally available) for PC enables easy configuration of the device.

Display modes

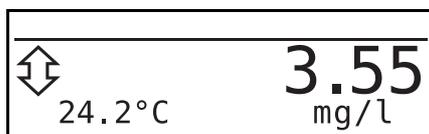
Three display modes are available:

Large digits



In this mode, the measured values are displayed as digits as usual.

Trend display



In this mode, the numerical value is supplemented by a symbol indicating the direction and speed at which the measured value is changing.

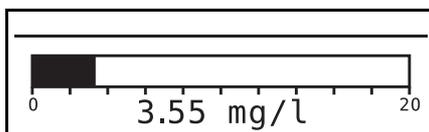
This can be useful for control optimization, for example.



Left to right:

Rising quickly, at moderate speed, and slowly, stable, falling slowly, at moderate speed, and quickly.

Bar graph



In this display, a cursory glance shows the range in which the current measured value is found.

The bar graph is freely scalable.

Measurement of dissolved oxygen

We recommend the use of the JUMO ecoLine O-DO sensor (type 202613) for measuring dissolved oxygen.

This sensor operates optically according to the principle of luminescence quenching. For displaying the measured value, the user can choose between % Sat, mg/l, and ppm. To improve the operating life of the sensor's luminescent layer, the sampling rate of the JUMO AQUIS 500 RS can be adjusted in the range 1 to 60 s, depending on the application.

To compensate the salinity and ambient pressure, these can be connected to the JUMO AQUIS 500 RS.

The temperature can be measured either internally, with the sensor, or using an external temperature sensor connected to the analog temperature input of the JUMO AQUIS 500 RS.

Measurement of free chlorine, total chlorine, chlorine dioxide, ozone, hydrogen peroxide, peracetic acid, bromine

For the measurement of the most important disinfectants, the following membrane-covered, amperometric sensors with digital interface are available:

- JUMO tecLine Cl2 (free chlorine), type 202630/50 and 202630/53
- JUMO tecLine TC (total chlorine), type 202631/52
- JUMO tecLine ClO2 (chlorine dioxide), type 202634/65 and 202634/66
- JUMO tecLine O3 (ozone), type 202634/60 and 202634/61
- JUMO tecLine H2O2 (hydrogen peroxide), type 202636/80
- JUMO tecLine PAA (Peracetic acid), type 202636/75
- JUMO tecLine Br (Bromine), type 202637/71

The sensors are designed for continuous measurement operation. The sampling rate of the AQUIS 500 RS is fixed at 500 ms when using these sensors.

The temperature of the measuring medium can be measured either internally, with the sensor, or using an external temperature sensor connected to the analog temperature input of the JUMO AQUIS 500 RS.

Turbidity measurement

We recommend using the JUMO ecoLine NTU sensor (type 202670) for measuring the turbidity to monitor water with low to medium turbidity.

This sensor operates based on the optical (nephelometric) measurement with 90° scattered light according to DIN EN ISO 7027 and covers a total range of 0 to 4000 NTU with 4 measuring range sections. The measured values are called up by the JUMO AQUIS 500 RS with a fixed sampling rate of 1 s with the sensor. For displaying the measured value, the user can choose between NTU and FNU.

The temperature of the measuring medium can be measured either internally, with the sensor, or using an external temperature sensor connected to the analog temperature input of the JUMO AQUIS 500 RS.

Measurement with freely configurable sensor

To enable measurement with Modbus sensors not included in the internal list of predefined sensors, the sensor type can be selected as "freely configurable sensor".

Using this sensor type allows the temperature and the compensated and uncompensated measured value to be read out. The sensor must be capable of continuous independent

measurement.

To allow the sensor to be connected, the Modbus addresses for the temperature value in °C, the compensated and uncompensated measured value, the byte sequence for transfer, and the transfer speed (2400 to 38400 Bd) must be set in the JUMO AQUIS 500 RS. The sampling rate for the sensor varies in the range 1 to 60 s.

Calibration

The following calibration options are available for the corresponding sensor types:

Measurement of dissolved oxygen with JUMO ecoLine O-DO

- End value calibration
- Two-point calibration

Measurement with membrane-covered JUMO tecLine 20263x series sensors

- Steepness calibration
- Two-point calibration

Turbidity measurement with JUMO ecoLine NTU

- Two-point calibration for each of the 4 measuring range sections

Measurement with freely configurable sensor

- Zero point calibration
- Steepness calibration
- Two-point calibration

Calibration logbook

A calibration logbook is available for all sensor types, allowing you to retrieve data concerning the last successful calibrations. The archive location and maximum number of entries varies as follows:

Measurement of dissolved oxygen with JUMO ecoLine O-DO

- Logbook in sensor
- Up to 10 records

Measurement with membrane-covered JUMO tecLine 20263x series sensors

- Logbook in sensor
- Up to 5 records

Turbidity measurement with JUMO ecoLine NTU

- Logbook in sensor
- Up to 10 records

Measurement with freely configurable sensor

- Logbook in the JUMO AQUIS 500 RS
- Up to 5 records

Calibration timers

The calibration timer can (optionally) notify of the need to conduct routine calibration. It is activated by entering the number of days after which recalibration should be scheduled (plant or operator-specified).

Wash timer

Cyclically-recurring actions (such as automatic sensor washing) can be triggered by actuation of a relay through a software function. The control is stopped while the washing process is being carried out.

Analog outputs

A maximum of two analog outputs (0(4) to 20 mA or 0(2) to 10 V programmable) are available. Depending on the user configuration, the outputs output either the actual value of one or both inputs or the current control signal of one or both controllers.

If actual values are output, output 1 always outputs the value of the main input and output 2 always outputs the value of the temperature input. The start and end values of the measuring range can be freely adjusted.

The behavior of the outputs for the calibration, fault (measuring range not met/exceed), and hold operating statuses can be programmed individually.

Simulation function:

The analog actual value outputs and the relay outputs can be freely adjusted in "manual" mode. This function can be used in dry-run start-up of a plant, during troubleshooting, or for servicing, for example.

Min/max value memory

This memory stores the minimum and maximum inputs. This information can be used to evaluate whether the connected sensor is suitable for the occurring values.

Digital input

The following functions can be activated with the binary input:

- Keypad lock
This function disables the operation of the keypad.
- "HOLD" mode
This function switches the outputs (analog and relay) to the previously defined states.
- Alarm suppression (controller alarm only)
This function enables temporary deactivation of the alarm via the corresponding relay.

The predefined function can be activated by short-circuiting the corresponding terminals (such as with the floating contacts of a relay).

Controller functions

The device offers both simple switching functions (limit value function, alarm window, and alarm pulse contact) and high-order control functions.

P, PI, PD, and PID structures can be freely programmed as control functions.

The simple switching functions can be assigned to the main and auxiliary input. High-order control functions can only be assigned to the main input.

Relay outputs

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

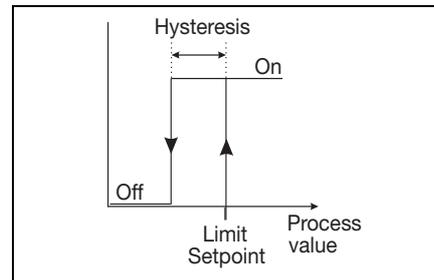
The following functions can be programmed:

- Limit value switch (min/max) with programmable hysteresis and ON/OFF-delay
- Pulse length controller¹ (main value only, see Control functions)
- Pulse frequency controller¹ (main value only, see Control functions)
- Modulating controller¹ (main value only, see Control functions)
- Pulse functions
(With this function, the output switches on and then off again when the defined switching point is reached after a defined time period)
- Alarm
(Measured value fault / out of range)

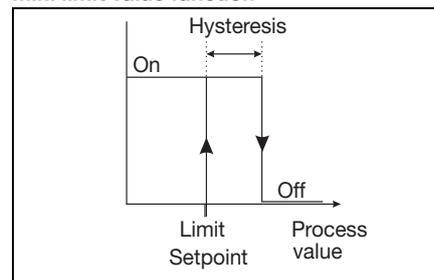
The behavior for the calibration and hold alarm (measuring range not met/exceeded) can be configured individually for both outputs.

Contact functions

Max. limit value function

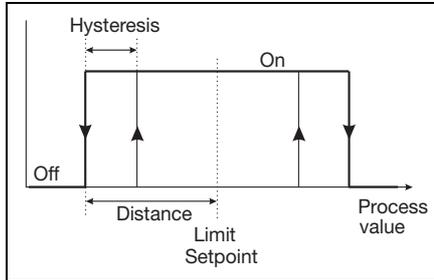


Min. limit value function

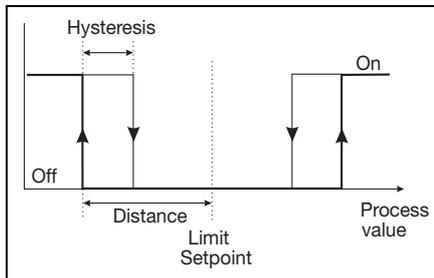


¹ Can be assigned to the main measurand only.

Alarm window 1

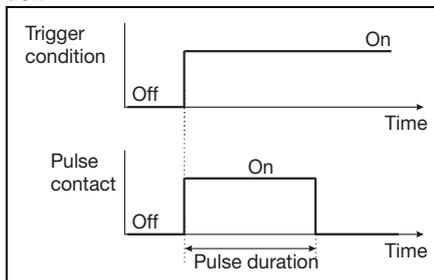


Alarm window 2



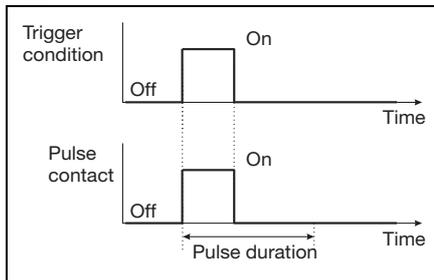
Alarm pulse contact

Trigger condition longer than pulse duration



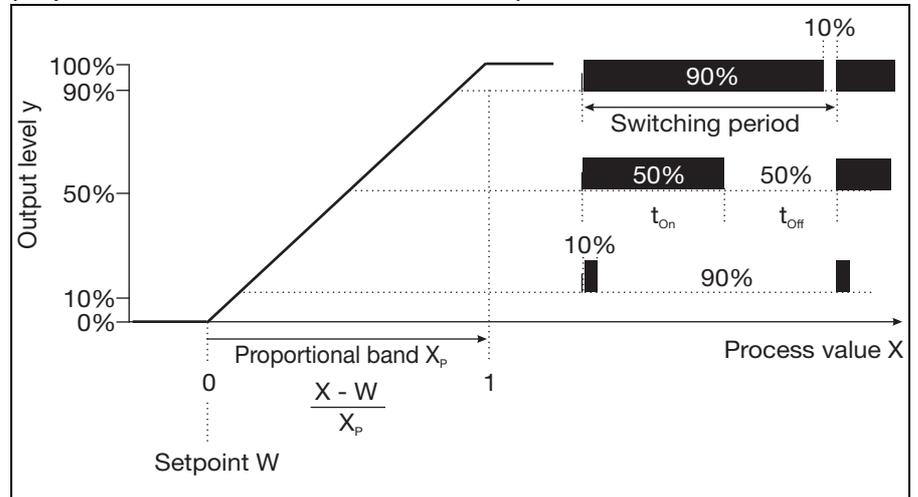
Alarm pulse contact

Trigger condition shorter than pulse duration



Pulse length controller

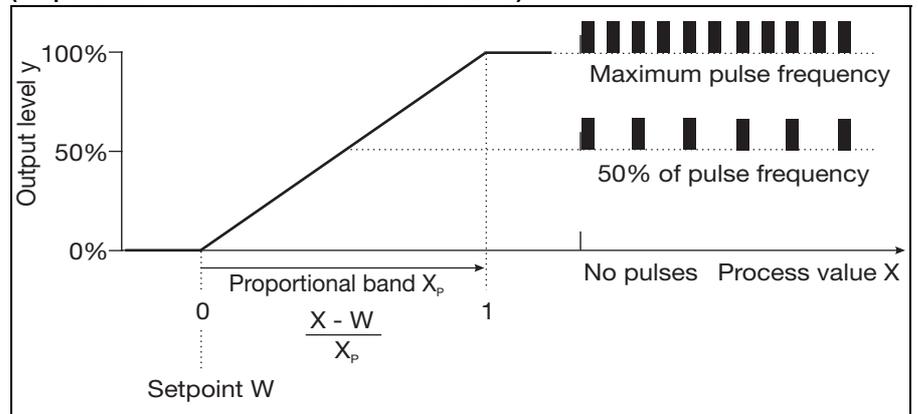
(Output active when $x > w$ and control structure P)



If the actual value x exceeds the setpoint value w , the P-controller controls in proportion to the control deviation. When the proportional range is exceeded, the controller operates with an output level of 100 % (100 % cycle ratio).

Pulse frequency controller

(Output active when $x > w$ and control structure P)



If the actual value x exceeds the setpoint value w , the P-controller controls in proportion to the control deviation. When the proportional range is exceeded, the controller operates with an output level of 100 % (maximum switching frequency).

Technical data

Digital interface

Main input	Display range	Accuracy	Temperature influence	Baud rate
RS485 interface with Modbus master function ^a	0.000 to 9.999 00.00 to 99.99 000.0 to 999.9 0000 to 9999	Depends on the sensor used	Depends on the sensor used	2400 Bd 4800 Bd 9600 Bd 19200 Bd 38400 Bd

^a No bus operation possible with several sensors.

Analog temperature input

Auxiliary input	Measuring range	Accuracy	Temperature influence	A/D converter
Temperature with Pt100 (automatic detection)	-50 to +250 °C ^a	±0,5 K (up to 100 °C) ±0,8 K (as of 100 °C)	0.05 %/10 K	Dynamic resolution up to 14 Bit
Temperature with Pt1000 (automatic detection)		±0,5 K (up to 100 °C) ±1,0 K (as of 100 °C)		
Temperature NTC/PTC	Max. 4 kOhm Input via table with 20 pairs of values via setup program	≤ 0.3 % ^b	0.05 %/10 K	

^a Can be changed to °F.

^b Depending on the supporting points.

Sampling rate

Analog temperature input	Digital interface with JUMO ecoLine O-DO	Digital interface with JUMO tecLine 20263x	Digital interface with JUMO ecoLine NTU	Digital interface with freely configurable sensor
500 ms	Adjustable, 1 to 60 s	500 ms	1 s	Adjustable, 1 to 60 s

Measuring circuit monitoring

Input	Measured value not met/exceeded	Short-circuit	Open circuit
Temperature	Yes	Yes	Yes

Binary input

Activation function	Via floating contact Keyboard lock / HOLD / alarm stop
---------------------	---

Controller

Controller type	Limit value controller, pulse length controller, pulse frequency controller, modulating controller, continuous controller
Controller structure	P, PI, PD, PID

Analog outputs (maximum 2)

Output type	Signal range	Accuracy	Temperature influence	Admissible load resistance
Current signal	0(4) to 20 mA	≤ 0.25 %	0.08 %/10 K	≤ 500 Ω
Voltage signal	0 to 10 V	≤ 0.25 %	0.08 %/10 K	≥ 500 Ω

The analog outputs behave acc. to NAMUR NE43 pursuant to the recommendation.
They are galvanically isolated, AC 30 V / DC 50 V.

Switching outputs (maximum 2 changeover contacts)

Rated load	3 A / AC 250 V (resistive load)
Contact life	> 2 × 10 ⁵ switching operations at rated load.

Voltage supply for sensors

Voltage supply for digital sensors	DC 24 V (20.4 to 28.8 V), max. 30 mA
	DC 5 V (5.1 to 5.25 V), max. 100 mA; max. pulse load 500 mA for 20 ms ED 5 %, not short-circuit-proof
Voltage supply for inductive proximity switch ^a	DC 12 V (10 to 20 V), max. 10 mA

^a e.g., type EI1808 NPOSS.

Setup interface

Interface for configuration of the device with setup program (optionally available) (for device configuration only).

Electrical data

voltage 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 % (connection only to SELV/PELV circuit admissible)
Power consumption	approx. 14 VA
Electrical safety	DIN EN 61010, part 1 Overvoltage category III ^a , pollution degree 2
Electrical connection	Screw terminals Conductor cross section max. 2.5 mm ² (voltage supply, relay outputs, sensor inputs) Conductor cross section max. 1.5 mm ² (analog outputs, voltage supply for sensors)
Electromagnetic compatibility (EMC)	DIN EN 61326-1
Interference emission	Class B
Interference immunity	Industrial requirements

^a Not valid for protective extra-low voltage of power supply unit variants DC 12 to 24 V.

Display

LCD graphic display	120 × 32 pixels
Background lighting	Programmable: • Off • 60 seconds "ON" during operation

Case

Material	ABS
Cable inlet	Cable glands, max. 3× M16 and 2× M12
Special feature	Ventilation element for prevention of condensation (on IP67 surface-mounting case version)
Ambient temperature range	-10 to +50 °C (Accuracy figures are adhered to in this range)
Operating temperature range	-15 to +65 °C (Device functioning)
Storage temperature range	-30 to +70 °C
Resistance to climatic conditions	Annual mean rel. humidity ≤ 90 % without condensation (derived from DIN EN 60721 3-3 3K3)
Protection types acc. to EN 60529	Surface-mounting case: IP67 Panel installation: Front IP65, rear IP20
Resistant to vibration	Acc to. DIN EN 60068-2-6
Weight	Approx. 900 g

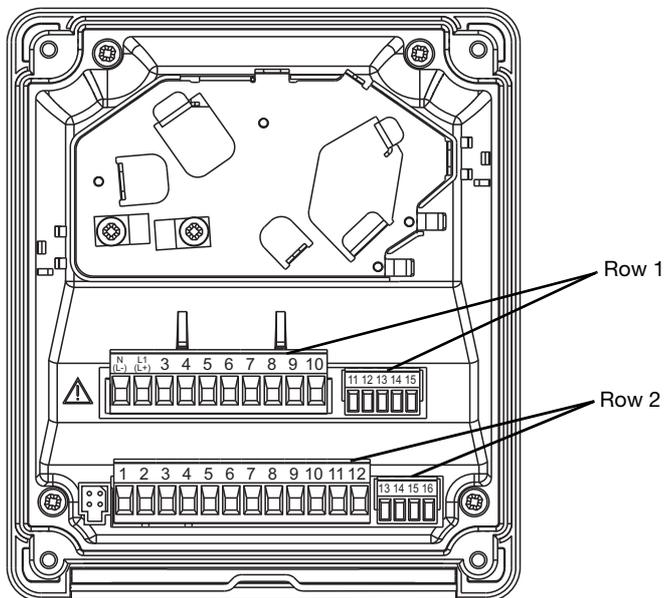
Standard accessories

Cable glands
Mounting material
Operating manual

Approvals/approval marks

Mark of conformity	Testing laboratory	Certificates/certification numbers	Test basis	valid for
c UL us	Underwriters Laboratories	E 201387	UL 61010-1 CAN/CSA C22.2 No. 61010-1	all versions

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.

A screened cable with a maximum 8 mm diameter must be used as the transmitter cable between the sensor and transmitter.

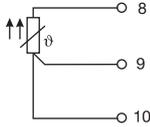
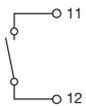
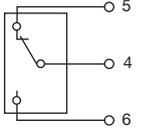
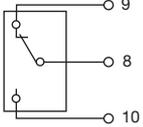
The device is equipped with a guide plate for optimum cable conduit.

Sensor cables are fed, with strain relief, through the plug-in terminals, where they are then connected (solder-free).

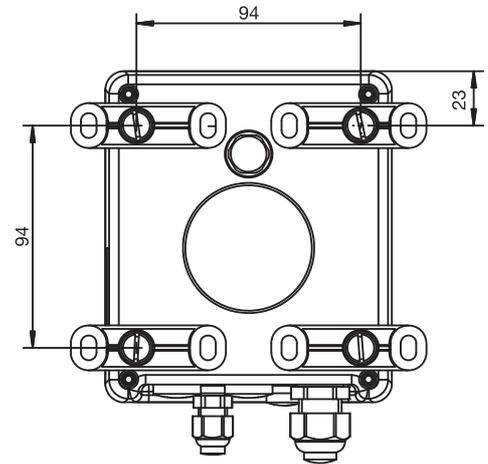
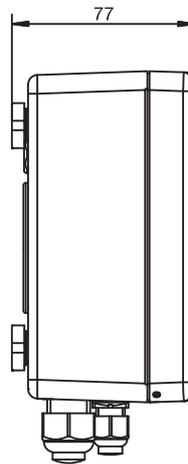
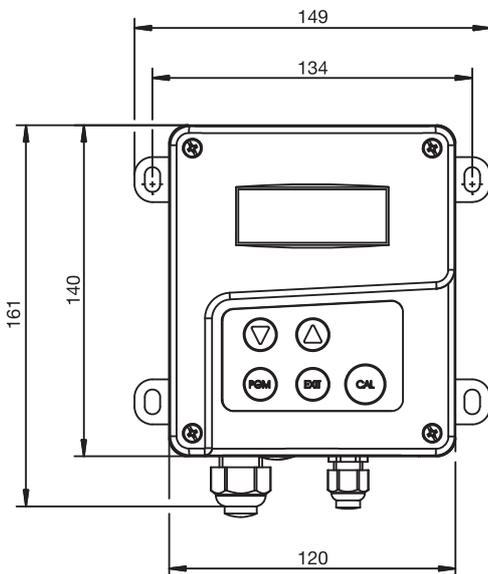
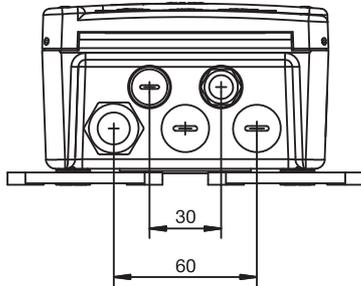
Connection		Terminal	Row
Voltage supply for transmitter/controller			
Voltage supply (23):	AC 110 to 240 V; -15/+10 %; 48 to 63 Hz		1
Voltage supply (25):	AC/DC 20 to 30 V; 48 to 63 Hz		
Voltage supply (30):	DC 12 to 24 V; +/-15 %		
NC		3	
Voltage supply for proximity switch			
DC 12 V (10 to 20 V)		 11 + 12 -	1
Voltage supply 24 V for digital sensors^a			
DC 24 V (20.4 to 28.8 V)		 14 + 15 -	1
Voltage supply 5 V for digital sensors^b			
DC 5 V (5.1 to 5.25 V)		 1 - 2 +	2
Inputs			
NC		5 6	2
Modbus RS485 interface		3 Data - 4 Data + 7 Shield	
RTD temperature probe in 2-wire circuit		8 9 10	

^a For type 20263x/...

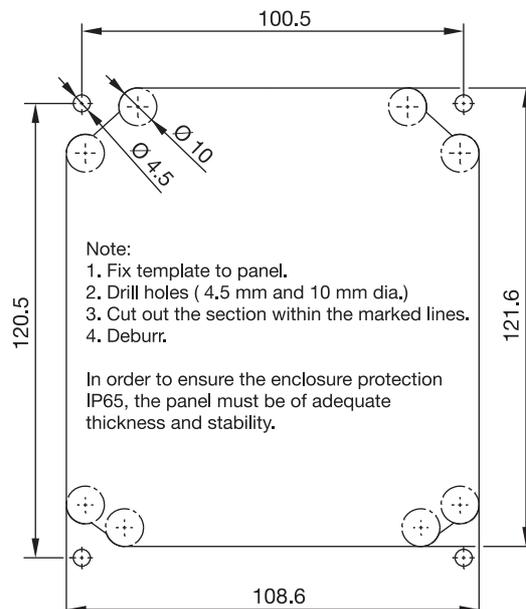
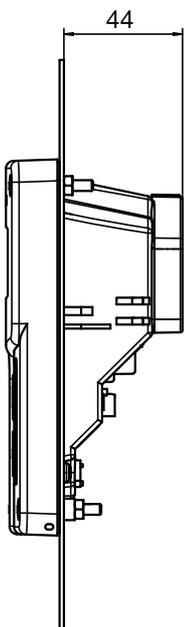
^b For type 202613/... and type 202670/...

Connection		Terminal	Row
RTD temperature probe in 3-wire circuit		8 9 10	2
Binary input		11 12	
Outputs			
Analog output 1 0 to 20 mA or 20 to 0 mA or 4 to 20 mA or 20 to 4 mA or 0 to 10 V or 10 to 0 V (galvanically isolated)		13 + 14 -	2
Analog output 2 0 to 20 mA or 20 to 0 mA or 4 to 20 mA or 20 to 4 mA or 0 to 10 V or 10 to 0 V (galvanically isolated)		15 + 16 -	
Switching output K1 (floating)		4 Pole 5 Normally closed contact 6 Normally open contact	1
NC		7	
Switching output K2 (floating)		8 Pole 9 Normally closed contact 10 Normally open contact	

Dimensions



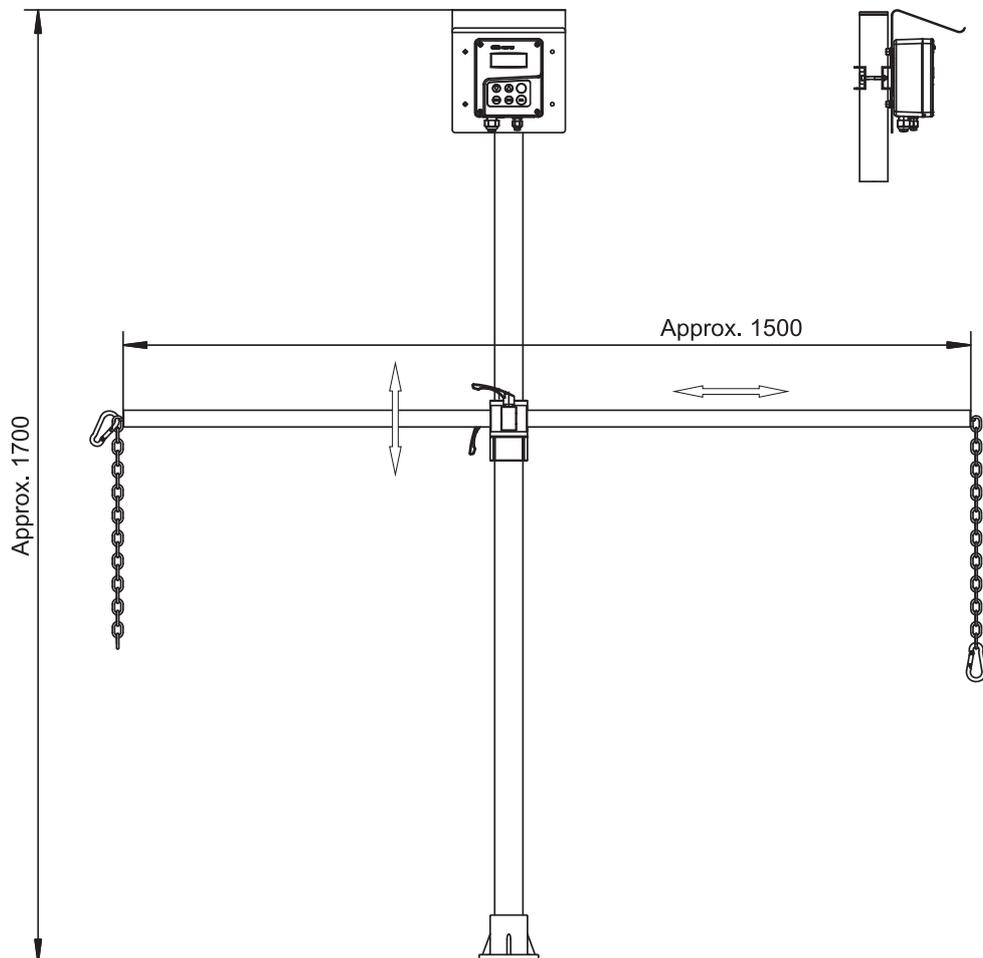
Panel installation/drilling diagram



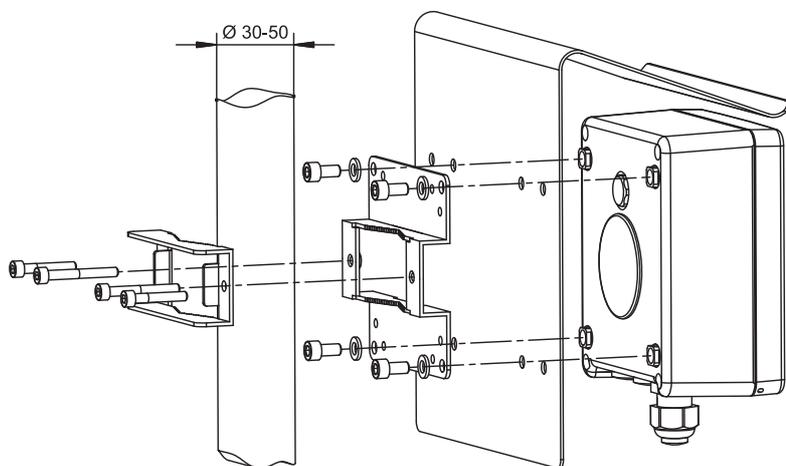
Important information:

The drilling template is shown in the operating manual B 202569.0 in original size.

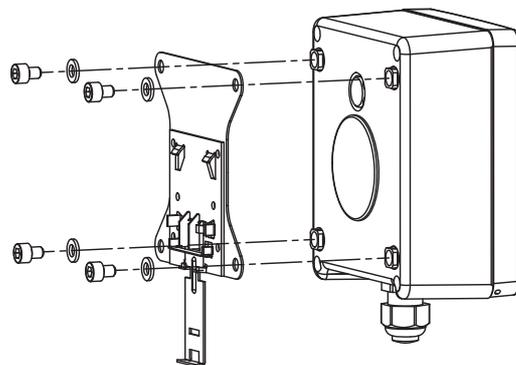
Accessories



Support pillar with pedestal, cantilever arm, and chain
Part no.: 00398163



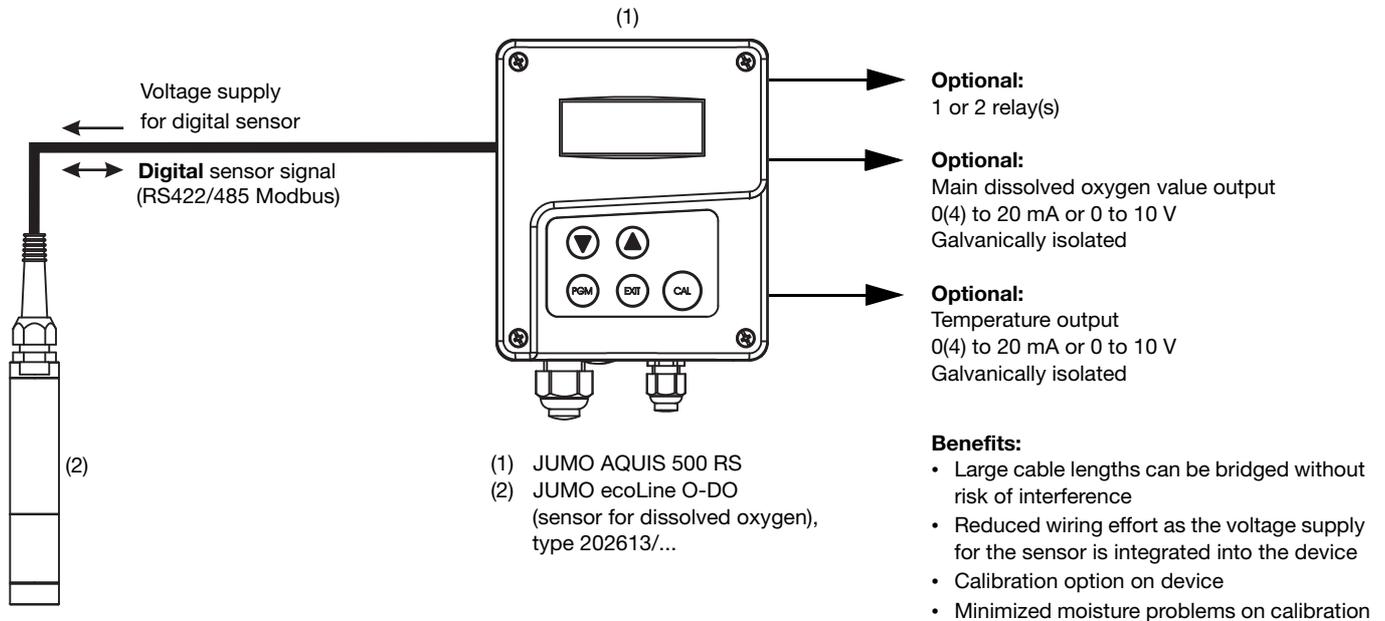
Pipe mounting kit for JUMO AQUIS 500
Part no.: 00483664
Protective roof for JUMO AQUIS 500
Part no.: 00398161



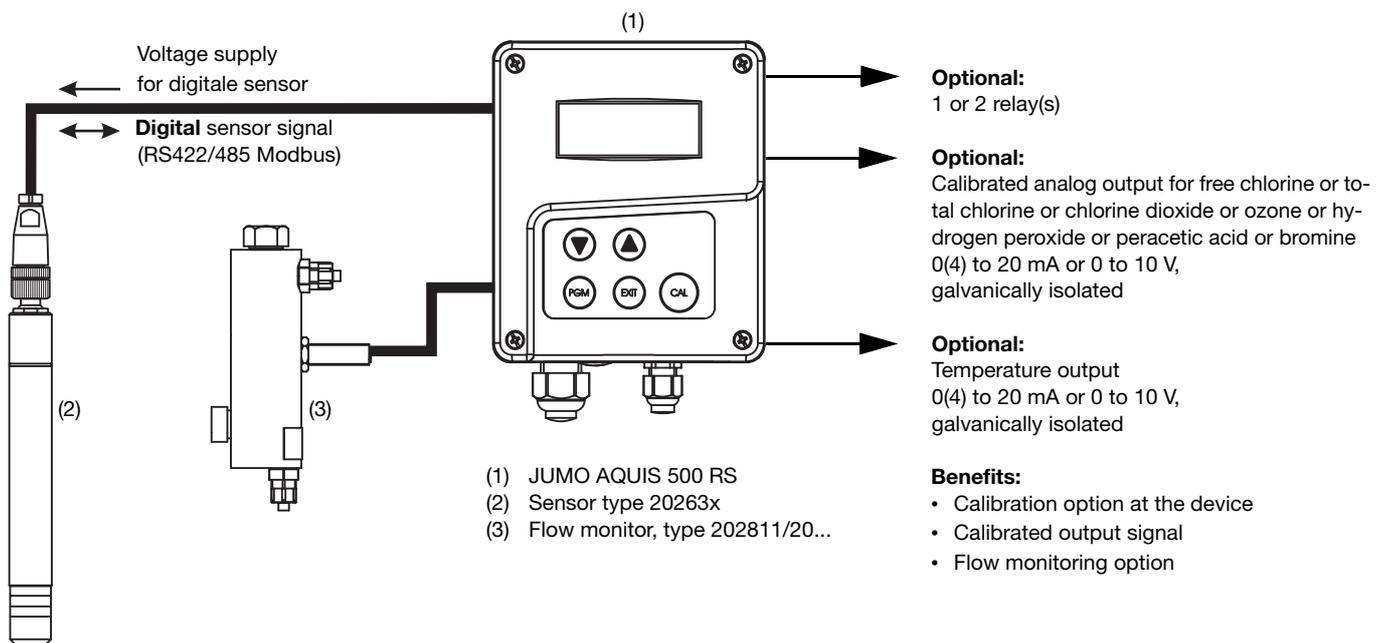
DIN-rail mounting kit for JUMO AQUIS 500
for installation of the device on a DIN-rail of
35 mm x 7.5 mm acc. to DIN EN 60715 A.1
Part no.: 00477842

Application examples

Indicator/controller for dissolved oxygen

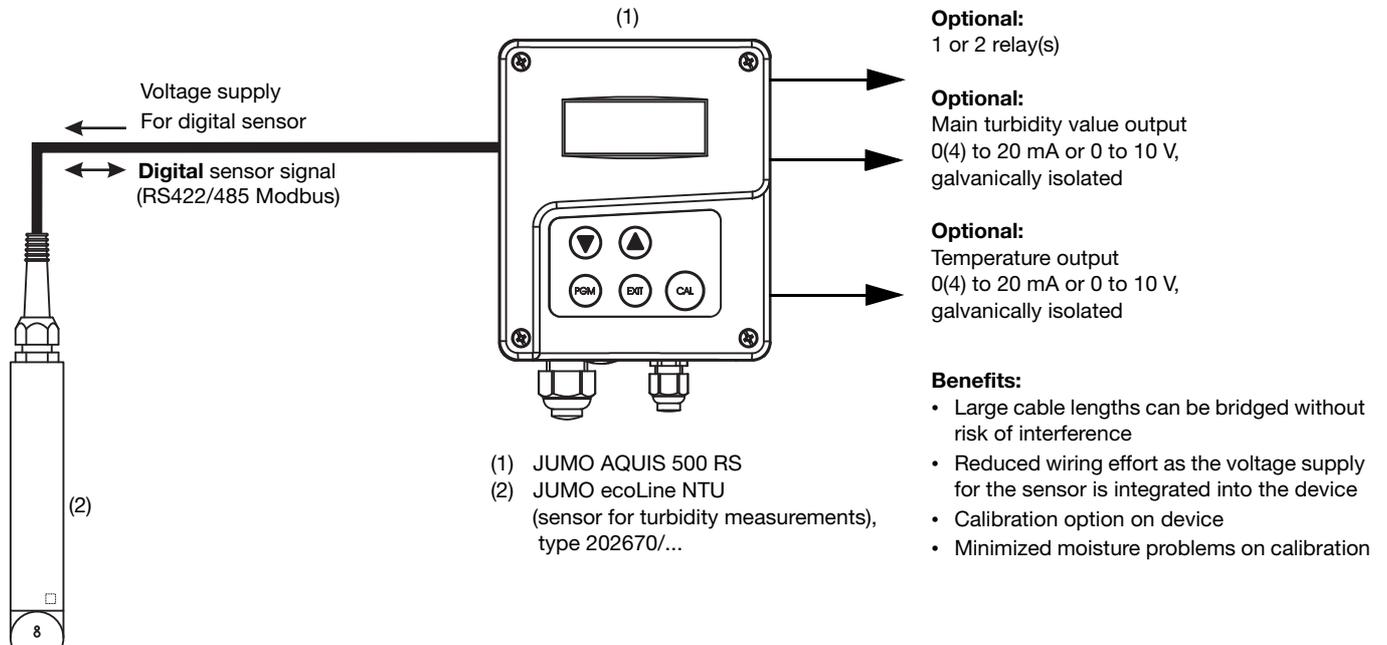


Indicator/controller for free chlorine or total chlorine or chlorine dioxide or ozone or hydrogen peroxide or peracetic acid or bromine



Application examples

Indicator/controller for turbidity



Order details

(1) Basic type	
202569	JUMO AQUIS 500 RS Display unit/controller for digital sensors with Modbus protocol
(2) Basic type extension	
10	For panel installation
20	Surface-mounted case
(3) Input	
654	RS422/485 Modbus master
(4) Output 1 (for main value or continuous controller)	
000	No output
888	Analog output 0(4) to 20 mA or 0 to 10 V
(5) Output 2 (for temperature or continuous controller)	
000	No output
888	Analog output 0(4) to 20 mA or 0 to 10 V
(6) Output 3	
000	No output
310	Relay with changeover contact
(7) Output 4	
000	No output
310	Relay with changeover contact
(8) voltage 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 %
(9) Extra code	
000	None

Order code	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)								
Order example	202569	/	20	-	654	-	888	-	000	-	310	-	000	-	23	/	000

Stock versions

(Delivery within 3 working days of order receipt)

Type	Parts no.
202569/20-654-888-000-000-000-23/000	00613453

Accessories

(Delivery within 10 working days of order receipt)

Item	Parts no.
Protective roof for JUMO AQUIS 500 ^a	00398161
Pipe mounting kit for JUMO AQUIS 500 ^b	00483664
DIN-rail mounting kit for JUMO AQUIS 500 ^c	00477842
Support pillar with pedestal base, cantilever arm, and chain	00398163
Holder for suspended fitting	00453191
Rear case wall kit for JUMO AQUIS 500	00506351
PC setup program	00483602
PC interface cable with USB/TTL converter and two adapters (USB transmitter cable)	00456352

^a The pipe mounting kit is required for installation of the protective roof.

^b The JUMO AQUIS 500 can be fitted to a pipe (such as a support pillar or rail) with the pipe mounting kit.

^c The JUMO AQUIS 500 can be fitted to a DIN-rail of 35 mm x 7.5 mm (acc. to DIN EN 60715 A.1) with the DIN-rail mounting.