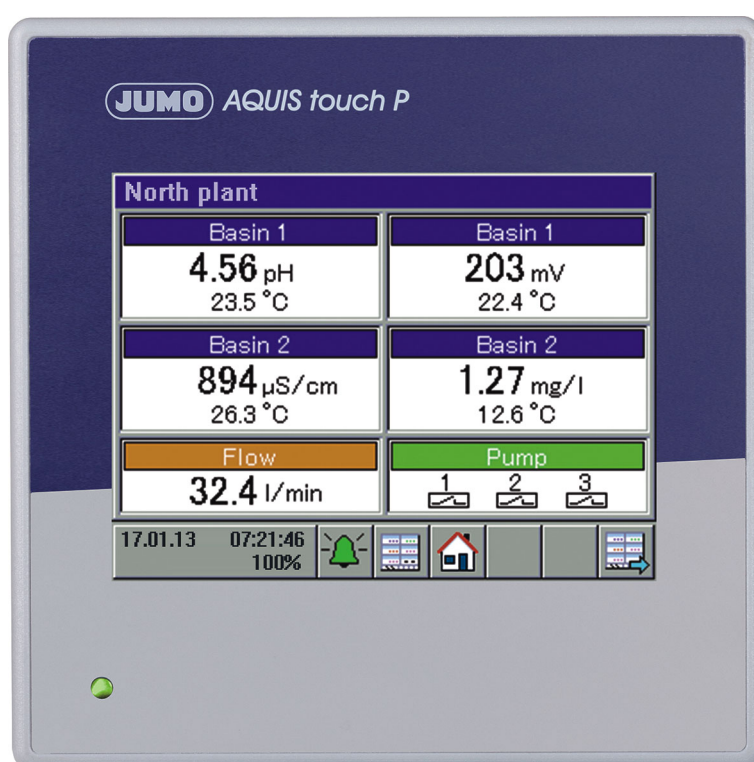


JUMO AQUIS touch P

Modular Multichannel Measuring Device for Liquid Analysis with Integrated Controller and Paperless Recorder



Installations Instructions Volume 2(2)



20258000T94Z201K000

V12.00/EN/00614180/2024-04-25

**Caution!**

If the device or a sensor connected to it fails abruptly, it is likely that a dangerous overdose has occurred!
For this case, appropriate precautionary measures must be taken.

**NOTE!**

Read this operating manual before putting the device into service.
Keep the operating manual at a location that is readily accessible to all users.

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Content

10.1 General information

This chapter explains in detail all submenus and **setting options** for **inputs/outputs** and **display functions** in the "Configuration" menu.

Complete configuration of the device is described in the operating manual.

⇒ JUMO AQUIS touch P operating manual

10.2 Notes



WARNING!

After every configuration change, the device restarts functions affected by the changes. Analog and digital outputs can assume undesired states during start-up.

Therefore, configuration changes must never be made while equipment is operating!



CAUTION!

Besides incorrect installation, incorrectly set values on the device can impair performance of the connected process or cause damage. Therefore, always provide safety devices independent of the device and allow only qualified personnel to make settings.



CAUTION!

When changing configuration data that are relevant for the data monitoring and recording function, data recording is terminated and a new recording session begun.



NOTE

Changes to the configuration settings described in this chapter can be made directly on the device or via the JUMO PC setup program.



NOTE

Settings in the "Configuration" menu can be changed only if a user with corresponding user rights is logged in.

⇒ Chapter 8.1.1 "Passwords and user rights", page 75



NOTE

Changes to the configuration go into effect only after you leave the configuration menu ("Exit" menu item or "Close window" button).

10 Configuration

10.3 Basic settings

Open: Device Menu > Configuration > Basic Settings

Configuration point	Selection/ setting option	Explanation
Device name	Up to 20 text characters	Device ID, e.g. for identification of exported measurement data in the JUMO PCA 3000 evaluation software
National language	German English	Setting the operating language Additional languages can be installed on the device using the setup program. ⇒ JUMO AQUIS touch P operating manual
Language select after power on	Yes No	Specifies whether a prompt for selecting the operating language should appear when the device is switched on
Power frequency	50 Hz 60 Hz	Supply frequency of the electric power grid serving the mounting site The supply frequency must be specified to suppress EMC interference caused by the mains voltage. Setting the correct supply frequency is thus also necessary when supplying the device with direct voltage.
Device temp.	Degrees Celsius Degrees Fahrenheit	Setting the default on the temperature unit for all temperature values in the device
Interface temperature	Degrees Celsius Degrees Fahrenheit	Setting the default on the temperature unit for all temperature values communicated via interfaces
Memory alarm limit	0 to 100 %	If the available memory display reaches this value, the memory alarm is triggered.

10.4 Display

10.4.1 General information

Open: Device Menu > Configuration > Display > General

Configuration point	Selection/ setting option	Explanation
Lock touchscreen	Selection from binary selector	Digital signal that blocks operation of the touch- screen (e.g. key switch for locking operation)
Simulation of inputs	Yes No	When this function is activated, alternating on/off signals are simulated automatically at the binary inputs and continuous value changes at the ana- log inputs This function is used for troubleshooting. Deacti- vate it during normal operation.
Main view	Selection of an operation screen from the operation loop	Selection of the operation screen as main screen The main screen appears after the device has been switched on or the "Home" button has been pressed.
Display 1 and 2 gen- eral screen	Yes No	Individual operation screens can be shown or hidden in the operation loop here.
Show detailed screen 1 to 6		
Show diagram 1 and 2		
Show process screen 1 to 8		
Show controller overview		
Show controller 1 to 4		
Show alarms	Yes No	Activation or deactivation of alarm visualization in the title bar of the operation screens
Window change	Active Inactive	Activation of automatic scrolling through the op- erator screens of the operating loop.
Window change wait- ing period	10 to 9999 s	Period that an operator screen is displayed until continued scrolling with an active window change

10 Configuration

10.4.2 Screen

Open: Device Menu > Configuration > Display > Screen

Configuration item	Selection/ setting option	Explanation
Activation of screen-saver	Inactive Time to switch off Control signal	Type of screensaver activation
Wait time for screen-saver	10 to 32767 s	only with activation of the screensaver after wait time: Time to wait before displaying the screensaver when there is no activity on the device
Signal screensaver	Selection from binary selector	only with control signal screensaver activation: Signal for activating the screensaver
Brightness	1 to 10	Display brightness (10 levels)

10.4.3 Colors

Open: Device Menu > Configuration > Display > Colors

Configuration point	Selection/ setting option	Explanation
Alarm 1 to 2	Selection from color palette	Color setting for signaling alarms 1 to 2 of the measuring inputs Upon reaching the set alarm values, the measured value displays and bar graphs appear in the set colors.
Recording: Analog channel 1 to 4 Binary channel 1 to 3 Background, analogue Background, binary Color t-stamp diagr Color diag. traces	Selection from color palette	Color setting for the visualization elements of the individual recorder screens
Controller Background Setpoint value Actual value Output level Heating contact Cooling contact	Selection from color palette	Color setting for the visualization elements of the individual controller screens

10.5 Operation loop

10.5.1 General screens

Open: Device Menu > Configuration > Operation Loop > General Screen > General Screen 1 to 2

Configuration point	Selection/ setting option	Explanation
Gener. screen type	2-part screen 4-part screen	Selection of the type of overview screen; 2-part screen: Display of 2 main values, 2 second values, 1 additional value and 3 binary values; 4-part screen: Display of 4 main values, 4 second values, 1 additional value and 3 binary values
Screen title	Up to 31 text characters	Title of the overview screen
Value title 1 to 2(4)	Up to 20 text characters	Titles of the individual main value display fields
Signal main value 1 to 2(4)	Selection from analog selection	Signal source of the analog value for each main value displayed
Color main value 1 to 2(4)	Selection from color palette	Color of the measured value display for each main value
Signal sec. value 1 to 2(4)	Selection from analog selection	Signal source of the analog value for each second value displayed
Color sec. value 1 to 2(4)	Selection from color palette	Color of the measured value display for each second value
Title additional value	Up to 20 text characters	Title of the additional value display field
Signal add value	Selection from analog selection	Signal source of the analog value displayed as additional value
Color addit. value	Selection from color palette	Color of the measured value display for the additional value
Title binary value	Up to 20 text characters	Title of the binary value display field
Signal binary val. 1 to 3	Selection from binary selector	Signal sources of the binary values visualized in the binary value display field

10 Configuration

10.5.2 Detailed screens

Open: Device menu > Configuration > Operation Loop > Individual screen > Individual screen 1 to 6

Configuration point	Selection/ setting option	Explanation
Screen title	Up to 31 text characters	Title of the individual screen
Input signal main value	Selection from analog selection	Signal source of the analog value displayed as the main value and visualized as a bar graph
Color main value	Selection from color palette	Color of the measured value display and the bar graph for the main value
Second value input signal	Selection from analog selection	Signal source of the analog value displayed as the second value
Color sec. value	Selection from color palette	Color of the measured value display for the second value
Title additional value	Up to 20 text characters	Title of the additional value display field
Additional value	Selection from analog selection	Signal source of the analog value displayed as additional value
Color addit. value	Selection from color palette	Color of the measured value display for the additional value
Title binary value	Up to 20 text characters	Title of the binary value display field
Signal binary val. 1 to 3	Selection from binary selector	Signal sources of the binary values visualized in the binary value display field

10.6 Analog inputs

10.6.1 Base unit temperature inputs

Base unit temperature inputs: IN 4/5

Open: Device Menu > Configuration > Analog Inputs > Temperature Inputs 1 to 2

Configuration point	Selection/ setting option	Explanation
Designation	Up to 20 text characters	Designation for the input
Signal type	IN 4/5: Pt100 Pt1000 400 Ω 4000 Ω	Type of sensor connected For Pt100, Pt1000 and NTC , corresponding linearizations are provided.
	IN 5 : 100 k Ω NTC 8k55 NTC 22k Resistance potentiometer ^a	For 400 Ω, 4000 Ω and 100 kΩ , a customer-specific linearization must be configured. For resistance transmitters^a a customer-specific linearization can be configured if necessary. ⇒ "Customer-specific linearization" in this table
Connection type	2-wire, 3-wire	only for signal types Pt100, Pt1000, 400 Ω, 4000 Ω, 100 kΩ and NTC: Connection variants for the connected resistance thermometer
Customer-specific linearization	Selection of a linearization table	only for signal types 400 Ω , 4000 Ω , 100 kΩ or resistance transmitters^a: Linearization tables contain up to 40 value pairs in any measurement characteristic line. Each value pair assigns a display value (Y-column) to a measuring value (X-column). Up to 8 linearization tables can be stored. To create a linearization table, you need the JUMO PC setup program. ⇒ JUMO AQUIS touch P operating manual
Start of display range	-99999 to +99999 ^b	Upper/lower limit for labeling the scale when displaying measured values, e.g. in recorder diagrams and bar graphs
End of display range	-99999 to +99999 ^b	
Comma format	Auto, Fixed decimal place format	Decimal points in the display
Offset	-999 to +999 ^b	Correction value added to measuring value This value can be used, for instance, to compensate for measurement errors resulting from the resistance of wires.

10 Configuration

Configuration point	Selection/ setting option	Explanation
Filter time constant	0.0 to 25.0 s	Optimization of measuring value updating The higher the value of the filter time const., the slower the measured value is updated.
Ra	0 to 99999 Ω	only for IN 5: Resistance value between the slider (S) and start point (A) in a resistance transmitter/potentiometer ^a when the slider is at the start point.
Rs	6 to 99999 Ω	only for IN 5: Span of the variable resistance value between the slider (S) and start point (A)
Re	0 to 99999 Ω	only for IN 5: Resistance value between the slider (S) and end point (E) in a resistance transmitter/potentiometer ^a when the slider is at the end point.
Alarms 1/2	Analog input alarms are used to monitor measured values in relation to adjustable limit values. The alarm settings for all analog device functions are explained together. ⇒ Chapter 10.12.1 "Alarms for analog signals and digital sensors", page 66	

^a Resistance transmitter

^b The temperature unit specified in the basic settings appears in the entry field.
⇒ Chapter 10.3 "Basic settings", page 10

10.6.2 Universal inputs of base unit and optional boards

Base unit universal input: IN 6

Optional board universal inputs: IN 11/12

Open: Device Menu > Configuration > Analog Inputs >
Universal Input 1 to 3 > Configuration

Configuration point	Selection/ setting option	Explanation
Designation	Up to 20 text characters	Designation for the input
Operating mode	Linear scaling, Temperature measurement, pH-value measurement, Conductivity measurement, Free chlorine pH/T-compensated	Type of measuring Linear scaling: Standard signals (for IN 11/12 and resistance transmitter^a) with linear measurement characteristic line or customer-specific linearization For standard signals the scale start point, scale end point and unit must be specified. Temp. measurement: Measurement made with a resistance thermometer The type of sensor is selected in the "Signal type" configuration item. The unit for the temperature is specified in the "Basic Settings" menu. ⇒ Chapter 10.3 "Basic settings", page 10 pH value, conductivity, and free chlorine: The values measured by the individual analysis sensors are received in the form of a standard signal. Outside factors affecting the individual analysis process variables are compensated. It is thus necessary to make appropriate compensation settings in the configuration of the universal input.
Signal type	IN 6/11/12: 0 to 20 mA 4 to 20 mA 20 to 0 mA 20 to 4 mA only IN 11/12: 0 to 10 V 10 to 0 V Pt100 Pt1000 400 Ω 4000 Ω Resistance potentiometer	Type of sensor connected Correct scale settings are required for the standard signals. ? "Scale start/end" in this table. Appropriate linearizations are available for Pt100, Pt1000 and resistance transmitters^a. For 400 Ω and 4000 Ω, a customer-specific linearization must be configured. ⇒ "Customer-specific linearization" in this table

10 Configuration

Configuration point	Selection/ setting option	Explanation
Connection type	2-wire, 3-wire	only for signal types Pt100, Pt1000, 400 Ω and 4000 Ω: Connection variants for the connected resistance thermometer
Customer-specific linearization	Selection of a linearization table	Linearization tables contain up to 40 value pairs in any measurement characteristic line. Each value pair assigns a display value (Y-column) to a measuring value (X-column). Up to 8 linearization tables can be stored. To create a linearization table, you need the JUMO PC setup program. ⇒ JUMO AQUIS touch P operating manual
Unit	Up to 5 text characters	Process variable unit not adjustable for pH measurement The temperature unit is specified in the basic settings. ⇒ Chapter 10.3 "Basic settings", page 10
Scaling start	-99999 to +99999 ^b	only for standard signals: Measured value from sensor (uncomp.) that corresponds to the lower limit of the standard signal range [0 V or 0(4) mA]; Refer to the technical data for the sensor.
Scaling end	-99999 to +99999 ^b	only for standard signals: only for standard signals: Measured value from sensor (uncomp.) that corresponds to the upper limit of the standard signal range [10 V or 20 mA] Refer to the technical data for the sensor.
Start of display range	-99999 to +99999 ^b	Upper/lower limit for labeling the scale when displaying measured values, e.g. in recorder diagrams and bar graphs
End of display range	-99999 to +99999 ^b	
Comma format	Auto Fixed decimal place format	Decimal points in the display
Offset	-999 to +999 ^b	only for temperature and conductivity measurement: Correction value added to measured value
Filter time constant	0.0 to 25.0 s	Optimization of measured value updating The higher the value of the filter time const., the slower the measured value is updated.

10 Configuration

Configuration point	Selection/ setting option	Explanation
Ra	0 to 4000 Ω	only for IN 11/12: Resistance value between the slider (S) and start point (A) in a resistance potentiometer when the slider is at the start point
Rs	6 to 4000 Ω	only for IN 11/12: Span of the variable resistance value between the slider (S) and start point (A)
Re	0 to 4000 Ω	only for IN 11/12: Resistance value between the slider (S) and end point (E) in a resistance potentiometer when the slider is at the end point.
Manual compensation	Yes No	Activation of manual temperature compensation With manual temperature compensation (setting "yes"), the temperature value set in the configuration item "Manual compensation temperature" is used for temperature compensation. The configuration item "Compensation temperature" is grayed out. With the "no" setting, the temperature value of the signal selected in the configuration item "Compensation temperature" is used and the configuration item "Manual compensation temperature" is grayed out.
Manual compensation temperature	-25.00 up to 150 °C	Temperature value for manual temperature compensation (see configuration item "Manual compensation")
Compensation temperature	Selection from analog selection	Analog input of the compensation thermometer for temperature-compensated measurement of pH value, free chlorine or conductivity (see configuration item "Manual compensation")
Compensation	TC linear, TC-curve, Natural water, Natural waters with expanded temperature range, ASTM neutral, ASTM acid, ASTM alkaline, NaOH 0 to 12 %, NaOH 25 to 50 %, HNO ₃ 0 to 25 %, HNO ₃ 36 to 82 %, H ₂ SO ₄ 0 to 28 %, H ₂ SO ₄ 36 to 85 %, H ₂ SO ₄ 92 to 99 %, HCL 0 to 18 %, HCL 22 to 44 %	Type of temperature compensation for conductivity measurement

10 Configuration

Configuration point	Selection/ setting option	Explanation
Reference temperature	15 to 30 °C	required only for conductivity measurement with "TC linear" or "TC curve" temperature compensation: Temperature at which the (temperature-compensated) conductivity value displayed was set
Compensation pH value	Selection from analog selection	Analog input of the pH-value sensor for pH-compensated measurement of free chlorine
Alarms 1/2	Analog input alarms are used to monitor measured values in relation to adjustable limit values. The alarm settings for all analog device functions are explained together. ⇒ Chapter 10.12.1 "Alarms for analog signals and digital sensors", page 66	

^a Resistance transmitter

^b The unit for the particular sensor value appears in the entry field.

10.6.3 Calibration timer

Open Calibration Timer Settings Universal Inputs:

Device Menu > Configuration > Analog Inputs >

Universal Input 1 to 3 > Calibration Timer

Calibration timers prompt the user to calibrate sensors on a regular basis. The settings for all analysis inputs and the universal inputs are explained together.

⇒ Chapter 10.13 "Calibration timer", page 70

10 Configuration

10.6.4 pH/Redox/NH₃ analysis inputs

Open: Device Menu > Configuration > Analog Inputs >
Analysis Input 1 to 4 > Configuration

Configuration point	Selection/ setting option	Explanation
Designation	Up to 20 text characters	Designation for the input
Electrode type	pH standard pH antimony pH ISFET redox ammonia	Type of electrode connected
Redox unit	mV percent	mV: unit for the redox potential Percent: concentration percentage that can be derived from the redox measurement. This requires a two-point calibration. ⇒ Chapter 13.2.1 "Calibration methods for Redox sensors", page 89
Filter time constant	0.0 to 25.0 s	Optimization of measured value updating The higher the value of the filter time const., the slower the measured value is updated.
Start of display range	-99999 to +99999 ^a	Upper/lower limit for labeling the scale when displaying measured values, e.g. in recorder diagrams and bar graphs
End of display range	-99999 to +99999 ^a	
Manual compensation	Yes No	Activation of manual temperature compensation With manual temperature compensation (setting "yes"), the temperature value set in the configuration item "Manual compensation temperature" is used for temperature compensation. The configuration item "Compensation temperature" is grayed out. With the "no" setting, the temperature value of the signal selected in the configuration item "Compensation temperature" is used and the configuration item "Manual compensation temperature" is grayed out.
Manual compensation temperature	-25.00 up to 150 °C	Temperature value for manual temperature compensation (see configuration item "Manual compensation")
Compensation temperature	Selection from analog selection	Analog input of the temperature sensor for compensation of the effect of temperature on the pH-value measurement (see configuration item "Manual compensation")

10 Configuration

Configuration point	Selection/ setting option	Explanation
Glass electrode monitoring	Off Minimum impedance Maximum impedance Min./max. impedance	configurable monitoring of pH glass electrodes without impedance converter minimum impedance: monitoring for soft short/sensor failure maximum impedance: monitoring for aging/pollution/wire break
Reference electrode monitoring	On Off	Activation of reference electrode impedance monitoring A high-impedance symmetrical connection is required.
max. reference impedance	0 to 100 kΩ	upper impedance limit for monitoring a reference electrode
Alarm/Event list	Off Event Alarm	Assignment of sensor failure notification to alarm list or event list
Sensor alarm delay	0 to 999 s	The sensor alarm is suppressed for the set duration of the alarm delay.
Text sensor alarm	Up to 21 text characters	Text for the alarm/event list in case of sensor error
Alarms 1/2	Analog input alarms are used to monitor measured values in relation to adjustable limit values. The alarm settings for all analog device functions are explained together. ⇒ Chapter 10.12.1 "Alarms for analog signals and digital sensors", page 66	
Calibration timer	Calibration timers prompt the user to calibrate sensors on a regular basis. The settings for all analysis inputs and the universal inputs are explained together. ⇒ Chapter 10.13 "Calibration timer", page 70	

^a The entry field units depend on the configuration items "Electrode type" and "Redox unit".

10.6.5 Calibration timer

Open Calibration Timer Settings Analysis Inputs pH/Redox/NH3:

Device Menu > Configuration > Analog Inputs >
Analysis Input 1 to 4 > Calibration Timer

Calibration timers prompt the user to calibrate sensors on a regular basis. The settings for all analysis inputs and the universal inputs are explained together.
⇒ Chapter 10.13 "Calibration timer", page 70

**NOTE**

The following points must be observed for correct operation of glass electrode monitoring via impedance measurement (see preceding table):

- Impedance measurements are possible only with glass-based sensors.
- Sensors must be connected directly to an analysis input for pH/Redox/ NH_3 on the device.
- Impedance converters must not be installed in the measuring circuit.
- The maximum admissible cable length between sensor and device is 10 m.
- Fluid resistances have a direct impact on the measurement result. It is therefore advisable to activate the impedance measurement in liquids at a minimum conductivity of approx. 100 $\mu\text{S}/\text{cm}$.

10 Configuration

10.6.6 CR/Ci analysis inputs (conductive/inductive conductivity)

Open: Device Menu > Configuration > Analog Inputs >
Analysis Input 1 to 4 > Configuration

Configuration point	Selection/ setting option	Explanation
Designation	Up to 20 text characters	Designation for the input
Manual compensation	Yes No	Activation of manual temperature compensation With manual temperature compensation (setting "yes"), the temperature value set in the configuration item "Manual compensation temperature" is used for temperature compensation. The configuration item "Compensation temperature" is grayed out. With the "no" setting, the temperature value of the signal selected in the configuration item "Compensation temperature" is used and the configuration item "Manual compensation temperature" is grayed out.
Manual compensation temperature	-25 to 150 °C	Temperature value for manual temperature compensation (see configuration item "Manual compensation")
Compensation temperature	Selection from analog selection	Analog input of the compensation thermometer for temperature-compensated conductivity measurement (see configuration item "Manual compensation")
Reference temperature	15 to 30 °C	required only for conductivity measurement with "TDS", "TC linear" or "TC curve" temperature compensation: The temperature at which the conductivity value displayed was set
Filter time constant	0.0 to 25.0 s	Optimization of measured value updating The higher the value of the filter time const., the slower the measured value is updated.
nominal cell constant	For CR: 0.01 to 10 cm ⁻¹ For Ci: 4.00 to 8.00 cm ⁻¹	nominal cell constant of the conductivity sensor (can be read from the sensor nameplate) If an ASTM test certificate showing precisely-measured cell constants is available, in addition to entering the nominal cell constants the relative cell constants of all measuring ranges in the calibration values must be manually entered (⇒ Chapter "Manual entry of calibration values", page 76).
Cell type	2 electrodes 4 electrodes	For conductivity sensors with 4 electrodes, pollution detection is made available.

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Configuration point	Selection/ setting option	Explanation
Pollution detection	Off On	possible only for conductive conductivity measurement in a 4-wire circuit: When this function is activated, a sensor alarm is triggered in case of soiling.
Wire break detection	Off On	possible only for conductive conductivity measurement: When this function is activated, a sensor alarm is triggered in case of a sensor wire break.
Alarm/Event list	Off Event Alarm	possible only for conductive conductivity measurement: Assignment of the sensor failure notification to alarm list or event list
Sensor alarm delay	0 to 999 s	possible only for conductive conductivity measurement: The sensor alarm is suppressed for the set duration of the alarm delay.
Text sensor alarm	Up to 21 text characters	possible only for conductive conductivity measurement: Text for the alarm/event list in case of sensor error
Measuring range selection 1	Selection from binary selector	Measuring range selection permits selection of the measuring ranges 1 to 4 by controlling the binary signals. ⇒ Chapter "CR/Ci measuring range switching", page 26
Measuring range selection 2	Selection from binary selector	
Measuring ranges 1 to 4	-	Four ranges each can be configured for conductive/inductive (CR/Ci) conductivity measurements. The settings for all CR-/Ci analysis inputs are explained together. ⇒ Chapter "CR/Ci measuring range configuration", page 27
Alarms 1/2 per measuring range 1 to 4	Analog input alarms are used to monitor measured values in relation to adjustable limit values. The alarm settings for all analog device functions are explained together. ⇒ Chapter 10.12.1 "Alarms for analog signals and digital sensors", page 66	

10.6.7 Calibration timer

Open Calibration Timer Settings Analysis Inputs CR/Ci:

Device Menu > Configuration > Analog Inputs >
Analysis Input 1 to 4 > Calibration Timer

Calibration timers prompt the user to calibrate sensors on a regular basis. The settings for all analysis inputs and the universal inputs are explained together.
⇒ Chapter 10.13 "Calibration timer", page 70

10.6.8 CR/Ci measuring ranges

Four configurable measuring ranges are available for each CR/Ci analysis input

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for measuring electrolytic conductivity. The measuring range is switched by means of 2 selectable digital signals. These signals are specified in the configuration of the individual conductivity measurement inputs.

⇒ Chapter 10.6.6 "CR/Ci analysis inputs (conductive/inductive conductivity)", page 24

CR/Ci measuring range switching

The following table shows which binary value combinations activate the individual measuring ranges:

Active measuring range	Binary signal Measuring range selection 1	Digital signal Measuring range switching 2
Measuring range 1	0	0
Measuring range 2	1	0
Measuring range 3	0	1
Measuring range 4	1	1

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CR/Ci measuring range configuration

Open: Device Menu > Configuration > Analog Inputs >
Analysis Input 1 to 4 > Measuring Range 1 to 4

Configuration point	Selection/ setting option	Explanation
TDS factor	0.01 to 2.00	only for conductive conductivity with TDS compensation: Conversion factor from measured conductivity to display unit (see configuration item "Unit" in this table)
Compensation	For CR/Ci analysis inputs: Off, TC linear, Natural water, Natural water with expanded temperature range For CR analysis input only: TDS, ASTM neutral, ASTM acid, ASTM alkaline For Ci analysis input only: TC curve, NaOH 0 to 12 %, NaOH 25 to 50 %, HNO ₃ 0 to 25 %, HNO ₃ 36 to 82 %, H ₂ SO ₄ 0 to 28 %, H ₂ SO ₄ 36 to 85 %, H ₂ SO ₄ 92 to 99 %, HCL 0 to 18 %, HCL 22 to 44 %	Type of temperature compensation for conductivity measurement
Unit for calculation	For CR/Ci: $\mu\text{S/cm}$ mS/cm For CR only: $\text{k}\Omega\times\text{cm}$ $\text{M}\Omega\times\text{cm}$	Unit in which the conductivity is displayed
Unit	Up to 5 text characters	only for conductive conductivity measurement with TDS compensation: Unit for the process variable to be displayed for TDS measurements or when using customer-specific linearization (e.g. ppm or mg/l)

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Configuration point	Selection/ setting option	Explanation
Customer-specific linearization	Selection of a linearization table	Linearization tables contain up to 40 value pairs in any measurement characteristic line. Each value pair assigns a display value (Y-column) to a measuring value (X-column). Up to 8 linearization tables can be stored. To create a linearization table, you need the JUMO PC setup program. ⇒ JUMO AQUIS touch P operating manual
Start of display range	-99999 to +99999 ^a	Upper/lower limit for labeling the scale when displaying measured values, e.g. in recorder diagrams and bar graphs
End of display range	-99999 to +99999 ^a	
Comma format	Auto Fixed decimal place format	Decimal points in the display
Offset	-99999 to +99999 ^a	Correction value added to measured value
Alarms 1/2 per measuring range 1 to 4	Analog input alarms are used to monitor measured values in relation to adjustable limit values. The alarm settings for all analog device functions are explained together. ⇒ Chapter 10.12.1 "Alarms for analog signals and digital sensors", page 66	

^a The unit set for the conductivity measurement input appears in the entry field.

10.7 Analog outputs of base unit and optional boards

Open: Device Menu > Configuration > Analog Outputs >
Analog Output 1 to 9

Configuration point	Selection/ setting option	Explanation
Designation	Up to 20 text characters	Designation for the output
Signal output value	Selection from analog selection	Analog signal source of the output
Analog signal	0 to 10 V 0 to 20 mA 4 to 20 mA 10 to 0 V 20 to 0 mA 20 to 4 mA	Type of standard signal to be generated
Enable manu. mode	Yes No	The manual mode for the specific output is enabled/locked here. The manual mode permits fixed analog values to be set for the output for testing purposes. ⇒ Chapter 8.2.3 "Functional level", page 91
Safety value 1 to 4	0 to 10.7 V or 0 to 22 mA	Specifies an analog value that the output assumes at hold, at calibration or in case of a fault If an analysis input for conductivity measurement is set as "Signal output value", the safety values 1 to 4 are assigned to the conductivity measuring ranges 1 to 4. Pairs with the same number belong together. Pairs with the same number belong together. Otherwise, the safety value 1 applies.
Scale start 1 to 4	-99999 to +99999 ^a	Analog value of the analog signal source (see configuration item "Signal output value") that corresponds to the lower limit of the standard signal range generated [0 V or 0(4) mA]
Scale end 1 to 4	-99999 to +99999 ^a	Analog value of the analog signal source (see configuration item "Signal output value") that corresponds to the upper limit of the standard signal range generated (10 V or 20 mA)
Digital signal for hold	Selection from binary selector	Digital signal for activating the hold function When the hold function is activated, the analog output assumes the state defined in the "Response at hold" setting.

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Configuration point	Selection/ setting option	Explanation
Response at hold	Low High NAMUR low NAMUR high Frozen Safety value	Specification of the analog output value when the hold function is activated, during calibration of one of the sensors for the particular output or at error (overrange/underrange) low: lower limit of the standard signal value range [0 V or 0(4) mA]
Response during calibration	Moving Frozen Safe value	high: upper limit of the standard signal value range (10 V or 20 mA)
Response in case of a fault	Low High NAMUR low NAMUR high Frozen Safety value	NAMUR low: lower NAMUR limit of the standard signal [0 V or 0(3.4) mA] NAMUR high: upper NAMUR limit of the standard signal (10.7 V or 22 mA) hold: unchanging analog value Safety value: see configuration item "Safety value" in this table

^a The unit for the value set for the "Signal output value" appears in the entry field.

10.8 Digital inputs of base unit and optional boards

Open: Device Menu > Configuration > Digital Inputs > Digital Input 1 to 9

Configuration point	Selection/ setting option	Explanation
Designation	Up to 21 text characters	Designation for the input
Inverting	Yes No	Invert/do not invert state
Contact	Base unit: Potential-free contact, External voltage source Optional boards: Potential-free contact	Type of digital signal connected
Alarm	Binary inputs alarms are used to monitor input-side switching signals. The alarm settings for all digital device functions are explained together. The alarm settings for all digital device functions are explained together. The alarm settings for all digital device functions are explained together. ⇒ Chapter 10.12.2 "Digital signal alarms", page 69	

10.9 Digital outputs of base unit and optional boards

Open: Device Menu > Configuration > Digital Outputs >
Digital Output 1 to 17

Configuration point	Selection/ setting option	Explanation
Designation	Up to 21 text characters	Designation for the output
Signal output value	Selection from binary selector	Digital signal source for the output
Inverting	Yes No	Invert/do not invert state
Enable manu. mode	Yes No	The manual mode for the specific output is enabled/locked here. Manual mode permits fixed binary values (switching states) to be set for the output for testing purposes. ⇒ Chapter 8.2.3 "Functional level", page 91

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10.10 Salinity



NOTE

The 4 salinity functions are based on the "Practical Salinity Scale" (PSS-78, UNESCO 1981) and are valid for the temperature range of -2 to 35 °C and the salinity range of 0 to 42 g/kg or PSU.

Configuration point	Selection/ setting option	Explanation
Function	Inactive Active	Activation/deactivation of the salinity function
Designation	Up to 20 text characters	Plain text designation of the salinity function This designation is displayed in menus, e. g. analog or binary selection.
Unit	PSU ^a g/kg	Selection of the unit in which the salinity is displayed.
Comma format	Auto Fixed decimal place format	Decimal points in the display
Start of display range	-99999 to +99999 ^b	Upper/lower limit for labeling the scale when displaying measured values, e.g. in recorder diagrams and bar graphs
End of display range	-99999 to +99999 ^b	
Signal conductivity	Selection from Analog selection	Selection of an uncompensated conductivity measurement as a signal source for the salinity function
Compensation	Fixed temperature analog selector	Selection of the signal source for temperature compensation in the salinity function Fixed temperature: Compensation using a fixed temperature value that is entered in the configuration item "Compensation temperature". Analog selector: Selection of the signal source from the Analog selector of the JUMO AQUIS touch P for temperature compensation of the salinity function
Compensation temperature	Selection from Analog selection	only if "Compensation" is set to "Analog selector": Selection of the signal source from the Analog selector of the JUMO AQUIS touch P for temperature compensation of the salinity function

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Configuration point	Selection/ setting option	Explanation
fixed compensation temp.	-2 to 35 °C	only if "Compensation" is set to "Fixed compensation temperature": constant temperature value, for temperature compensation of the salinity function

^a PSU stands for **P**ractical **S**alinity **U**nit. The value of the "PSU" unit corresponds to the "g/kg" unit.

^b The unit displayed in the entry field corresponds to the setting in the "unit" parameter.

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10.11 Digital sensors

**NOTE**

For operation of digital sensors, you need the extra code "JUMO digiLine protocol activated" (⇒ Chapter 4.2 "Order details", page 16)

**NOTE**

Only one serial interface of the device can be configured for operation of digital sensors. If your device has 2 serial interfaces (base unit and possibly an optional board), select 1 interface for connection of digital sensors and configure it appropriately.

**NOTE**

Correct functioning of digital sensors depends on correctly setting the interface to which the digital sensors are connected and are to be operated. Make sure the selected serial interface is configured correctly.

10.11.1 General settings for digital sensors

The inputs for digital sensors 1 to 6 are prepared for startup in the general settings for digital sensors. The type of digital sensor is selected here. Only then can the JUMO digiLine electronics recognized on a JUMO digiLine bus be assigned to an input for digital sensors.

⇒ Chapter 7.3 "Digital sensors", page 67

⇒ Chapter 8.2.7 "Digital sensors", page 95

Open General Settings Digital Sensors:

Device Menu > Configuration > Digital Sensors > Digital Sensors 1 to 6 > General

Configuration point	Selection/ setting option	Explanation
Parameter	No sensor pH ORP Temperature O-DO Turbidity Free chlorine pH-dependent Free chlorine pH-neutral Total chlorine Ozone tenside-dependent Ozone tenside-neutral Peracetic acid Hydrogen peroxide Chlorine dioxide tenside-dependent Chlorine dioxide tenside-neutral Bromide Free chlorine, open CR (conductive conductivity) Ci (inductive conductivity) Flow	Sensor type selection Digital sensors can only be linked if these settings match the type information of the sensor to be linked. If this setting is changed during operation of a linked sensor, the sensor involved loses its link and must be put into operation anew.
with temperature input	Yes No	The setting "with temperature input" is only available upon selection of pH sensors.
VDN number	0 to 999	Specification that only certain variants of a sensor type are accepted.
O-DO subtype	O-DO ecoLine O-DO H10 O-DO H20 O-DO S10	For oxygen sensors only: select the oxygen sensor type
	W02 dL temp W02 dL temp and pressure	Only for flow sensor: Selection of the flow sensor type

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10.11.2 Configuration of digital sensors

Open Configuration Digital Sensors:

Device Menu > Configuration > Digital Sensors > Digital Sensors 1 to 6 > Configuration

Gen. settings for all types of digital sensors

Configuration point	Selection/ setting option	Explanation
Designation	Up to 20 text characters	Plain text designation for the digital sensor input This designation is displayed in menus, e. g. analog or binary selection.
Alarms 1/2	Alarms for measured values from digital sensors are used for monitoring the measured values with respect to adjustable limits. Except for JUMO digiLine CR/Ci, the alarm settings for all digital sensors can be found in the configuration of the individual digital sensor (see above). For the JUMO digiLine CR/Ci, the alarm settings can be found in the measuring range configuration: Device Menu > Configuration > Digital Sensors > Digital Sensors 1 to 6 > Configuration > Measuring Range 1 to 4 The alarm settings for all measured values from digital sensors are explained together. ⇒ Chapter 10.12.1 "Alarms for analog signals and digital sensors", page 66	

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10.11.3 Configuration for sensors with JUMO digiLine electronics

Only for JUMO sensors with JUMO digiLine electronics pH/ORP/T

Configuration point	Selection/ setting option	Explanation
TAG checking	Inactive Active	If desired, this function can be activated to assign JUMO digiLine electronics to measuring points. When it is activated, the "TAG number" of the sensor is compared with the entry in the "Sensor Tag" field of the digital sensor inputs on connection of a sensor to a master device. If these differ, the JUMO digiLine electronics are not linked. The "TAG number" of the JUMO digiLine electronics can be entered and edited in the JUMO digiLine electronics only with the JUMO-DSM software.
Sensor TAG	Up to 20 text characters	
Redox unit	mV percent	mV: unit for the redox potential Percent: concentration percentage that can be derived from the redox measurement This requires a two-point calibration. ⇒ Chapter 13.2.1 "Calibration methods for Redox sensors", page 89
Filter time constant ^a	0 to 25 s	Optimization of measured value updating in the JUMO digiLine electronics The higher the value of the filter time const., the slower the measured value is updated.
Start of display range	-99999 to +99999 ^b	Upper/lower limit for labeling the scale when displaying measured values, e.g. in recorder diagrams and bar graphs
End of display range	-99999 to +99999 ^b	

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Configuration point	Selection/ setting option	Explanation
Compensation ^a	Fixed compensation temperature Sensor temperature Interface	For pH sensors only: Selection of the signal source for temperature compensation in the JUMO digiLine electronics Fixed compensation temperature: Compensation with a fixed temperature value that is entered in the configuration item "Compensation temperature". Sensor temperature: The integrated temperature probe of the pH sensor supplies the compensation temperature. Interface: The AQUIS touch P transmits the compensation temperature to the JUMO digiLine electronics via the serial interface. The source of the compensation temperature is set in the configuration point "Compensation temperature".
fixed compensation temp. ^a	-25 to +150 °C	only if "Compensation" is set to "Fixed compensation temperature": constant temperature value, for temperature compensation of the pH value measurement in the JUMO digiLine electronics
Compensation temperature	Selection from Analog selection	only if "Compensation" is set to "Interface": Selection of the signal source from the Analog selection of the JUMO AQUIS touch P for temperature compensation of the pH value measurement in the JUMO digiLine electronics
Temperature input filter time ^a	0 to 25 s	Optimization of measured temperature value updating in the JUMO digiLine electronics The higher the value of the filter time const., the slower the measured value is updated.
Temperature offset ^a	-10 to +10 °C	Correction value that is added to the measured temperature value

^a This setting is saved in the configuration of the JUMO digiLine electronics.

^b The unit for the item set in "Parameter" appears in the entry field.

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Only for sensors with JUMO digiLine CR/Ci

Configuration point	Selection/ setting option	Explanation
TAG checking	Inactive Active	If desired, this function can be activated to assign JUMO digiLine electronics to measuring points. When it is activated, the "TAG number" of the sensor is compared with the entry in the "Sensor Tag" field of the digital sensor inputs on connection of a sensor to a master device. If these differ, the JUMO digiLine electronics are not linked. The "TAG number" of the JUMO digiLine electronics can be entered and edited in the JUMO digiLine electronics only with the JUMO-DSM software.
Sensor TAG	Up to 20 text characters	
Compensation ^a	Fixed compensation temperature Sensor temperature Interface	Selection of the signal source for temperature compensation in the JUMO digiLine electronics Fixed compensation temperature: Compensation with a fixed temperature value that is entered in the configuration item "Compensation temperature". Sensor temperature: The integrated temperature probe of the conductivity sensor supplies the compensation temperature. Interface: The AQUIS touch P transmits the compensation temperature to the JUMO digiLine electronics via the serial interface. The source of the compensation temperature is set in the configuration point "Compensation temperature".
Compensation temperature	Selection from Analog selection	only if "Compensation" is set to "Interface": Selection of the signal source from the Analog selection of the JUMO AQUIS touch P for temperature compensation of the conductivity measurement in the JUMO digiLine electronics

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Configuration point	Selection/ setting option	Explanation
fixed compensation temp. ^a	-50 to +150 °C	only if "Compensation" is set to "Fixed compensation temperature": constant temperature value, for temperature compensation of the conductivity measurement in the JUMO digiLine electronics
Reference temperature ^a	15 to 30 °C	required only for conductivity measurement with "TC linear", "TC curve" or TDS temperature compensation: Temperature at which the (temperature-compensated) conductivity value displayed was set
Wire break detection ^a	Off On	for CR sensors only: A sensor alarm is activated in the event of a sensor wire break when this function is activated.
Conductivity filter time constant ^a	0 to 25 s	Optimization of measured value updating in the JUMO digiLine electronics The higher the value of the filter time const., the slower the measured value is updated.
nominal cell constant ^a	For CR: 0.01 to 10 cm ⁻¹ For Ci: 4.00 to 8.00 cm ⁻¹	nominal cell constant of the conductivity sensor (can be read from the sensor nameplate) If an ASTM test certificate showing precisely-measured cell constants is available, in addition to entering the nominal cell constants the relative cell constants of all measuring ranges in the calibration values must be manually entered (⇒ Chapter "Manual entry of calibration values", page 76).
rel. cell constant (mode) ^a	For all MR One per MR	This parameter can be used to specify whether one relative cell constant should be used for all 4 measuring ranges, or whether each measuring range should have its own cell constant and that is used for the measured value calculation. ⇒ Chapter "Manual entry of calibration values", page 76

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Configuration point	Selection/ setting option	Explanation
Install. factor	80 to 120 %	for Ci sensors only: This factor helps to correct for measurement errors by the sensor when the sensor cannot be mounted as indicated in the installation instructions for the particular sensor. Always refer to the documentation for the sensor type associated with your device for the setting. You can identify the sensor type for your device from the order code on the nameplate of the device. ⇒ Chapter 4.2 "Order details", page 16
Measuring range selection 1	Selection from binary selector	Measuring range selection permits selection of the measuring ranges 1 to 4 by controlling the binary signals. ⇒ Chapter "CR/Ci measuring range switching", page 42
Measuring range selection 2	Selection from binary selector	
Temperature input function	On Off	only for hardwired device versions: Activation of the temperature input
Filter time Temperature input ^a	0 to 25 s	Optimization of measured temperature value updating in the JUMO digiLine electronics The higher the value of the filter time const., the slower the measured value is updated.
Temperature offset ^a	-10 to +10 °C	Correction value that is added to the measured temperature value
Connection type ^a	2-wire, 3-wire	only for device versions with a separate CR sensor Connection variants for the connected resistance thermometer

^a This setting is saved in the configuration of the JUMO digiLine electronics.

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CR/Ci measuring ranges

Four separately configurable measuring ranges are available for the JUMO digiLine CR/Ci for measuring electrolytic conductivity. The measuring range is switched by means of 2 selectable digital signals. These are specified in the configuration of the individual input of the digital sensor, which is configured for the JUMO digiLine CR/Ci concerned.

⇒ Chapter "Only for sensors with JUMO digiLine CR/Ci", page 39

CR/Ci measuring range switching

The following table shows which binary value combinations activate the individual measuring ranges:

Active measuring range	Binary signal Measuring range selection 1	Digital signal Measuring range switching 2
Measuring range 1	0	0
Measuring range 2	1	0
Measuring range 3	0	1
Measuring range 4	1	1

CR/Ci measuring range configuration

Opening JUMO digiLine CR/Ci: Device Menu > Configuration > Digital Sensors >

Digital Sensor 1 to 6 > Measuring Range 1 to 4

Configuration point	Selection/ setting option	Explanation
TDS factor	0.01 to 2.00	only for TDS compensation: Conversion factor from measured conductivity to display unit (see configuration item "Unit" in this table)
Compensation	For JUMO digiLine CR/Ci: Off, TC linear, TC curve, Natural water, Natural water with expanded temperature range, TDS	Type of temperature compensation for conductivity measurement
	For JUMO digiLine CR: ASTM neutral, ASTM acidic, ASTM alkaline	

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Configuration point	Selection/ setting option	Explanation
Compensation	For JUMO digiLine Ci: NaOH 0 to 12 % NaOH 25 to 50 % HNO ₃ 0 to 25 % HNO ₃ 36 to 82 % H ₂ SO ₄ 0 to 28 % H ₂ SO ₄ 36 to 85 % H ₂ SO ₄ 92 to 99 % HCl 0 to 18 % HCl 22 to 44 % NaCl 0 to 25 % MgCl ₂ 0 to 17.5 % MgCl ₂ 18.5 to 25 %	Type of temperature compensation for conductivity measurement
Start of display range	-99999 to +99999 ^a	Upper/lower limit for labeling the scale when displaying measured values, e.g. in recorder diagrams and bar graphs
End of display range	-99999 to +99999 ^a	
Unit for calculation	µS/cm mS/cm kΩ×cm MΩ×cm	Unit in which the conductivity is displayed
Unit for table and TDS	Up to 5 text characters	only for conductivity measurement with TDS compensation: Unit for the process variable to be displayed for TDS measurements or when using customer-specific linearization (e.g. ppm or mg/l)
Customer-specific linearization	Selection of a linearization table	Linearization tables contain up to 40 value pairs in any measurement characteristic line. Each value pair assigns a display value (Y-column) to a measuring value (X-column). Up to 8 linearization tables can be stored. To create a linearization table, you need the JUMO PC setup program. ⇒ JUMO AQUIS touch P operating manual
Comma format	Auto Fixed decimal place format	Decimal points in the display
Offset	-99999 to +99999 ^a	Correction value added to measured value

^a The unit for the item set in the parameter "Unit for calculation" appears in the entry field.

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Only for sensors of the JUMO digiLine O-DO H10/H20 types

Configuration point	Selection/ setting option	Explanation
TAG checking	Inactive Active	If desired, this function can be activated to assign JUMO digiLine electronics to measuring points. When it is activated, the "TAG number" of the sensor is compared with the entry in the "Sensor Tag" field of the digital sensor inputs on connection of a sensor to a master device. If these differ, the JUMO digiLine electronics are not linked. The "TAG number" of the JUMO digiLine electronics can be entered and edited in the JUMO digiLine electronics only with the JUMO-DSM software.
Sensor TAG	Up to 20 text characters	
Measurement mode	Humid Dry	Selection depends on the humidity content of the measurement medium. "Humid" = Measurement medium with humidity content > 50 %, , "Dry" = Measurement medium with humidity content < 50 %.
Oxygen unit	% vol % SAT ppb ppm hPa	Selection of the unit in which the oxygen content is displayed. The "ppm" and "ppb" units are not available when selecting the "Dry" measurement mode. If the unit "hPa" is selected, the oxygen partial pressure is measured in hectopascals.
Start of display range	-99999 to +99999	Upper/lower limit for labeling the scale when displaying measured values, e.g. in recorder diagrams and bar graphs. The unit set as the unit in the parameter "Oxygen unit" appears in the entry field.
End of display range	-99999 to +99999	
Comma format	Auto Fixed decimal place format	Decimal points in the display
Sampling time	1 to 599 s	The measurements of the sensor are triggered by JUMO AQUIS touch. The sampling rate defines the time between the measurements and impacts aging of the sensor cap.

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Configuration point	Selection/ setting option	Explanation
Temperature compensation source	Fixed compensation temperature sensor temperature Analog selector	Selection of the signal source for temperature compensation in the JUMO digiLine electronics Fixed compensation temperature: The value is set in JUMO AQUIS touch under the configuration item "Fixed compensation temperature". Sensor temperature: The integrated temperature probe of the oxygen sensor supplies the compensation temperature. Analog selector: The JUMO AQUIS touch transmits the compensation temperature to the JUMO digiLine electronic components via the serial interface. The source of the compensation temperature is set in the configuration point "Compensation temperature".
Compensation temperature	Selection from Analog selection	Only if "Temperature compensation source" is set to "Analog selector": Selection of the signal source from the Analog selection of the JUMO AQUIS touch P for temperature compensation of the oxygen measurement in the JUMO digiLine electronics
Fixed compensation temperature	0 to 50 °C	Only if "Temperature compensation source" is set to "Fixed compensation temperature": Input of the fixed compensation temperature.

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Configuration point	Selection/ setting option	Explanation
Pressure compensation source	Fixed compensation pressure Analog selector	only if "Oxygen unit" is set to "% Vol" or "% SAT": Selection of the signal source for the pressure compensation of the JUMO digiLine electronics Fixed compensation pressure: Compensation using a fixed pressure value entered in the "Fixed compensation pressure" configuration item. Analog selector: The JUMO AQUIS touch transmits the compensation pressure to the JUMO digiLine electronics via the serial interface. The source for the compensation pressure is set in the "Compensation pressure" configuration item.
Compensation pressure	Selection from Analog selection	Only if the "Oxygen unit" is set to "% Vol" or "% SAT", and "Pressure compensation source" is set to "Analog selector": Selection of the signal source from the Analog selection of the JUMO AQUIS touch P for pressure compensation of the oxygen measurement in the JUMO digiLine electronics
Fixed compensation pressure	500 to 1500 hPa	Only if the "Oxygen unit" is set to "% Vol" or "% SAT", and "Pressure compensation source" is set to "Fixed compensation pressure": Fixed pressure value for compensation of the oxygen measurement in the JUMO digiLine electronic components
Salt content	0 to 99 g/kg	Only if the "Oxygen unit" is set to "ppm" or "ppb": Fixed saline content value for the compensation of the oxygen measurement in JUMO digiLine electronic components

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Configuration point	Selection/ setting option	Explanation
Switch-off temp Measuring	-50 to +130 °C	Input of the temperature value which if it is exceeded, sensor oxygen measurement is to be switched off. A temperature-compensated oxygen measurement value can only be output in the temperature range of 0 to 50 °C.
Minimum Measurement tem- perature	-50 to +130 °C	Input of the minimum temperature value from which the sensor's operating hours are to be acquired.
Maximum Measurement tem- perature	-50 to +130 °C	Input of the maximum temperature value up to which the sensor's operating hours are to be acquired.
Measurements count- er	Inactive Active	This optionally activatable function is only intended for counting oxygen measurements and depends on the configured sampling rate. The counter is an indicator for identifying aging and wear of the sensor cap. If the counter is activated, the count value can be viewed in the "Device info" menu
Limit value count measurements	0 to 99,999,999	Only if "Measurements counter" is set to "active": Input of the limit value for oxygen measurements, e.g. for a request for a sensor cap change via the sensor alarm function.

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Only for sensors of the JUMO digiLine O-DO S10 types

Configuration point	Selection/ setting option	Explanation
TAG checking	Inactive Active	If desired, this function can be activated to assign JUMO digiLine electronics to measuring points. When it is activated, the "TAG number" of the sensor is compared with the entry in the "Sensor Tag" field of the digital sensor inputs on connection of a sensor to a master device. If these differ, the JUMO digiLine electronics are not linked. The "TAG number" of the JUMO digiLine electronics can be entered and edited in the JUMO digiLine electronics only with the JUMO-DSM software.
Sensor TAG	Up to 20 text characters	
Oxygen unit	% Vol % SAT ppm hPa	Selection of the unit in which the oxygen content is displayed. If the unit "hPa" is selected, the oxygen partial pressure is measured in hectopascals.
Start of display range	-99999 to +99999 ^a	Upper/lower limit for labeling the scale when displaying measured values, e.g. in recorder diagrams and bar graphs
End of display range	-99999 to +99999 ^a	
Comma format	Auto Fixed decimal place format	Decimal points in the display
Temperature compensation source	Sensor temperature Analog selector	Selection of the signal source for temperature compensation in the JUMO digiLine electronics Sensor temperature: The integrated temperature probe of the oxygen sensor supplies the compensation temperature. Analog selector: The JUMO AQUIS touch transmits the compensation temperature to the JUMO digiLine electronic components via the serial interface. The source of the compensation temperature is set in the configuration point "Compensation temperature".

10 Configuration

Configuration point	Selection/ setting option	Explanation
Compensation temperature	Selection from Analog selection	Only if "Temperature compensation source" is set to "Analog selector": Selection of the signal source from the Analog selection of the JUMO AQUIS touch P for temperature compensation of the oxygen measurement in the JUMO digiLine electronics
Pressure compensation source	Fixed compensation pressure Analog selector	only if "Oxygen unit" is set to "% Vol" or "% SAT": Selection of the signal source for the pressure compensation of the JUMO digiLine electronics Fixed compensation pressure: Compensation using a fixed pressure value entered in the "Fixed compensation pressure" configuration item. Analog selector: The JUMO AQUIS touch transmits the compensation pressure to the JUMO digiLine electronics via the serial interface. The source for the compensation pressure is set in the "Compensation pressure" configuration item.
Compensation pressure	Selection from Analog selection	only if the "Oxygen unit" is set to "% Vol" or "% SAT", and "Pressure compensation source" is set to "Analog selector": Selection of the signal source from the Analog selection of the JUMO AQUIS touch P for pressure compensation of the oxygen measurement in the JUMO digiLine electronics
Fixed compensation pressure	10 to 2000 hPa	only if the "Oxygen unit" is set to "% Vol" or "% SAT", and "Pressure compensation source" is set to "Fixed compensation pressure": constant pressure value, for pressure compensation of the oxygen measurement in the JUMO digiLine electronics

10 Configuration

Configuration point	Selection/ setting option	Explanation
Salt content compensation source	Fixed salt content Analog selector	only if "Oxygen unit" is set to "ppm": Selection of the signal source for the salt content compensation of the JUMO digiLine electronics Fixed salt content: Compensation using a fixed salt content entered in the "Fixed compensation salt content" configuration item. Analog selector: The JUMO AQUIS touch transmits the compensation salt content to the JUMO digiLine electronics via the serial interface. The source for the compensation salt content is set in the "Compensation salt content" configuration item.
Salt content compensation	Selection from Analog selection	only if "Oxygen unit" is set to "ppm", and "Salt content compensation source" is set to "Analog selector": Selection of the signal source from the Analog selection of the JUMO AQUIS touch P for salt content compensation of the oxygen measurement in the JUMO digiLine electronics As a signal source for the salt content, the JUMO AQUIS touch P offers 4 salinity functions, which can determine the salt content in the process solution with the aid of a conductivity sensor and a temperature sensor (⇒ Chapter 10.10 "Salinity", page 32).
Fixed salt content compensation	0 to 60 mS/cm	only if "Oxygen unit" is set to "ppm" and "Salt content compensation source" are set to "Fixed salt content compensation": constant conductivity value, for salt content compensation of the oxygen measurement in the JUMO digiLine electronics

^a The unit set as the unit in the parameter "Oxygen unit" appears in the entry field.

10 Configuration

Only for sensors of the type JUMO flowTRANS US W02 dL

Configuration point	Selection/ setting option	Explanation
TAG checking	Inactive Active	If desired, this function can be activated to assign JUMO digiLine electronics to measuring points. When it is activated, the "TAG number" of the sensor is compared with the entry in the "Sensor Tag" field of the digital sensor inputs on connection of a sensor to a master device. If these differ, the JUMO digiLine electronics are not linked. The "TAG number" of the JUMO digiLine electronics can be entered and edited in the JUMO digiLine electronics only with the JUMO-DSM software.
Sensor TAG	Up to 20 text characters	
Flow unit	l/sec l/min l/h cm ³ /s cm ³ /h ft ³ /m (ft ³ /min) ft ³ /h uga/m (usgal/min) usgal/h iga/m (impgal/min) iga/h (impgal/h)	Selection of the unit in which the flow value is displayed. The specifications in brackets show the units in full.
Comma format, flow	Auto Fixed decimal place format	Decimal points in the display
Filter time, flow	0 to 25 s	Optimization of measured value updating. The higher the value of the filter time, the slower the measured value is updated.
Inversion, flow	Inactive Active	Inverts the flow signal. Helpful e.g. if the device has been installed in the wrong flow direction.
Characteristic line, flow	Standard User defined 1 to 9	Standard: Water User-defined: Currently cannot be defined by the user. Please do not select!

10 Configuration

Configuration point	Selection/ setting option	Explanation
Start of display range flow	-99999 to +99999	Upper/lower limit for labeling the scale when displaying measured values, e.g. in recorder diagrams and bar graphs
End, display range, flow	-99999 to +99999	
Low flow limit value	0 to 10 %	Input value in % of measuring range end value. No process value is output below the limit value.
Hysteresis Low flow	0 to 50 %	Input value in % of the low flow limit value. Sets hysteresis of low flow.
Unit Totalizer	cm3 l m3 ft3 usgal imgal (impgal)	Selection of the unit in which the total count value is displayed. The specifications in brackets show the units in full. The JUMO AQUIS touch only shows the value of the totalizer of the JUMO flowTRANS US W02. This function must be controlled by the JUMO DSM software or the relevant device's app.
Filter time temperature	0 to 25 s	Optimization of measured value updating. The higher the value of the filter time, the slower the measured value is updated.
Temperature offset	-10 to +10 °C	Offset correction for zero point adjustment
Pressure unit ^a	bar mbar psi	Selection of the unit in which the pressure value is displayed.
Decimal place, pressure ^a	Auto Fixed decimal place format	Decimal points in the display
Filter time, pressure ^a	0 to 25 s	Optimization of measured value updating. The higher the value of the filter time, the slower the measured value is updated.
Offset, pressure ^a	-10000 to 10000	Offset correction for zero point adjustment
Start of display range, pressure ^a	-99999 to 99999	Upper/lower limit for labeling the scale when displaying measured values, e.g. in recorder diagrams and bar graphs.
End of display range, pressure ^a	-99999 to 99999	

10 Configuration

Configuration point	Selection/ setting option	Explanation
Bluetooth mode	Off Restricted On	When selecting "Limited", the Bluetooth® module of the JUMO flowTRANS US W02 is temporarily enabled via NFC. If the Bluetooth® connection is not used after pairing, the Bluetooth® module switches off after a certain period of time.

^a Only visible if JUMO flowTRANS US subtype W02 dL temp and pressure is selected

10 Configuration

10.11.4 Configuration of JUMO ecoLine sensors

For JUMO ecoLine O-DO sensors only

Configuration point	Selection/ setting option	Explanation
Oxygen unit	% Sat mg/l ppm	Selection of the unit in which the oxygen content is displayed.
Salt content	0 to 10000 g/kg	Specification of the salt content (salinity) of the measurement solution for compensation of the effect of the salinity on the measured value of the oxygen content in the measurement solution
Air pressure	500 to 1500 hPa	Specification of the plant's ambient air pressure for compensation of the effect of the air pressure on the measured value of the oxygen content in the measurement solution
Compensation	Fixed compensation temperature Sensor temperature Interface	Fixed compensation temperature: Compensation with a fixed temperature value that is entered in the configuration item "Compensation temperature". Sensor temperature: The integrated temperature probe of the O-DO sensor supplies the compensation temperature. Interface: The AQUIS touch P transmits the compensation temperature to the sensor electronics via the interface. The source of the compensation temperature is set in the configuration point "Compensation temperature".
fixed compensation temp.	-25 to +150 °C	Only if "Compensation" is set to "Fixed compensation temperature": constant temperature value for temperature compensation of the oxygen measurement in the O-DO sensor

10 Configuration

Configuration point	Selection/ setting option	Explanation
Compensation temperature	Selection from Analog selection	Only if "Compensation" is set to "Interface": Selection of the signal source from the Analog selection of the JUMO AQUIS touch P for temperature compensation of the oxygen measurement in the O-DO sensor
Start of display range	-99999 to +99999 ^a	Upper/lower limit for labeling the scale when displaying measured values, e.g. in recorder diagrams and bar graphs
End of display range	-99999 to +99999 ^a	
Sampling time	1 to 999 s	Indication of the length of the interval between 2 measurements A slower "sampling rate" contributes to a longer operating life of the sensor. With faster "sampling rates, the measured value is updated frequently.
Filter time constant	0 to 25 s	Optimization of measured value updating in the JUMO digiLine electronics The higher the value of the filter time const., the slower the measured value is updated.

^a The unit set as the unit in "Oxygen unit" appears in the entry field.

10 Configuration

For JUMO ecoLine NTU sensors only

Configuration point	Selection/ setting option	Explanation
Turbidity measuring range	Automatic 0 to 50 NTU 0 to 200 NTU 0 to 1000 NTU 0 to 4000 NTU	Selection of the measuring range for the turbidity measurement The user can choose a fixed measuring range or automatic measuring range selection.
Turbidity unit	NTU FNU	Selection of the unit in which the measured turbidity value is displayed.
Comma format	Fixed decimal place format	Decimal points in the display
Filter time constant	0 to 25 s	Optimization of measured value updating in the JUMO digiLine electronics The higher the value of the filter time const., the slower the measured value is updated.
Start of display range	-99999 to +99999 ^a	Upper/lower limit for labeling the scale when displaying measured values, e.g. in recorder diagrams and bar graphs
End of display range	-99999 to +99999 ^a	

^a The unit set as the unit in "Turbidity unit" appears in the entry field.

10 Configuration

10.11.5 Configuration of JUMO tecLine sensors

Configuration point	Selection/ setting option	Explanation
Measuring range Free chlorine pH-dependent Open chlorine measurement Total chlorine Chlorine dioxide Chlorine dioxide tenside-neutral Bromide Free chlorine pH-neutral Ozone tenside-dependent Ozone tenside-neutral Peracetic acid Hydrogen peroxide	2 ppm 20 ppm 2 ppm 20 ppm 200 ppm 10 ppm 20 ppm 2 ppm 10 ppm 200 ppm 2000 ppm 20000 ppm 20000 ppm 20 %	Setting of the measuring range for the various measurands of digital JUMO tecLine sensors This is where you set the measuring range of your digital JUMO tecLine sensor according to the order details for the sensor.
Comma format	Auto Fixed decimal place format	Decimal points in the display
Filter time constant	0 to 25 s	Optimization of measured value updating in the JUMO digiLine electronics The higher the value of the filter time const., the slower the measured value is updated.
Start of display range	0 to 20000 ^a	Upper/lower limit for labeling the scale when displaying measured values, e.g. in recorder diagrams and bar graphs
End of display range	0 to 20000 ^a	
pH-compensated chlorine measurement	On Off	available only for pH-dependent measurements of free chlorine: Activation/deactivation of the pH-compensation for the free chlorine measurement

10 Configuration

Configuration point	Selection/ setting option	Explanation
pH compensation source	Selection from Analog selection	available only with pH-compensation activated: Analog input of the pH-value sensor for pH-compensated measurement of free chlorine

^a The unit for the particular sensor value appears in the entry field.

10.11.6 Sensor alarms

Digital sensors cyclically transmit a number of alarm and status bits. In the settings for the sensor alarms, it is possible to set which of these signals should be indicated on the JUMO AQUIS touch P. The settings for the alarm conditions themselves are made in the configuration of the individual sensor electronics or stipulated by the specifications for the particular sensor. More detailed information on configuration can be found in the operating manual for the particular sensor type.

Open Sensor Alarms Digital Sensors:

Device Menu > Configuration > Digital Sensors > Digital Sensors 1 to 6 > Sensor Alarms

Every alarm transmitted by the digital sensors has the following configuration parameters:

Configuration point	Selection/ setting option	Explanation
Alarm/Event list	Off Event Alarm	Assignment of alarm notification to alarm list or event list
Sensor alarm delay	0 to 999 s	time delay from receipt of the alarm signal from the sensor and triggering of the alarm on the device
Alarm text	—	Text for the alarm/event list Displayed only and cannot be changed.

The range of alarm types that can be transmitted by a digital sensor depends on the sensor type. The individual alarm lists for the various sensor types are provided in the following.

10 Configuration

JUMO digiLine pH

Alarm	Explanation
pH sensor alarm	Alarm for pH value out of range
Temperature sensor alarm	Alarm for temperature out of range
pH min. warning	Lower pH limit value pre-alarm from sensor (see "Sensor monitoring" in the JUMO digiLine pH operating manual)
pH min. alarm	Lower pH limit value alarm from sensor (see "Sensor monitoring" in the JUMO digiLine pH operating manual)
pH max. warning	Upper pH limit value pre-alarm from sensor (see "Sensor monitoring" in the JUMO digiLine pH operating manual)
pH max. alarm	Upper pH limit value alarm from sensor (see "Sensor monitoring" in the JUMO digiLine pH operating manual)
Min. temperature warning	Lower temperature limit value pre-alarm from sensor (see "Sensor monitoring" in the JUMO digiLine pH operating manual)
Min. temperature alarm	Lower temperature limit value alarm from sensor (see "Sensor monitoring" in the JUMO digiLine pH operating manual)
Max. temperature warning	Upper temperature limit value pre-alarm from sensor (see "Sensor monitoring" in the JUMO digiLine pH operating manual)
Max. temperature alarm	Upper temperature limit value alarm from sensor (see "Sensor monitoring" in the JUMO digiLine pH operating manual)
Calibration timer alarm	Alarm for sensor calibration due (see "Calibration data" in the JUMO digiLine pH operating manual)
CIP/SIP/Autoclaving warning	Pre-alarm for maximum number of CIP/SIP/autoclaving cycles (see "Sensor monitoring" in the JUMO digiLine pH operating manual)
CIP/SIP/Autoclaving alarm	Alarm for maximum number of CIP/SIP/autoclaving cycles (see "Sensor monitoring" in the JUMO digiLine pH operating manual)
Sensor stress warning	Sensor stress pre-alarm (see "Sensor monitoring" in the JUMO digiLine pH operating manual)
Sensor stress alarm	Sensor stress alarm (see "Sensor monitoring" in the JUMO digiLine pH operating manual)
Digital input state	Signal state of the digital input of the sensor electronics

10 Configuration

JUMO digiLine ORP

Alarm	Explanation
ORP sensor alarm	Alarm for redox value out of range
Calibration timer alarm	Alarm for sensor calibration due (see "Calibration data" in the JUMO digiLine ORP operating manual)
Digital input state	Signal state of the digital input of the sensor electronics

JUMO digiLine T

Alarm	Explanation
Temperature sensor alarm	Alarm for temperature value out of range
Digital input state	Signal state of the digital input of the sensor electronics

JUMO digiLine CR/Ci

Alarm	Explanation
Conductivity alarm	Alarm for conductivity value out of range
Temperature alarm	Alarm for conductivity value out of range
Compensation range left	Alarm for temperature limits violated for the configured temperature compensation type
Pre-alarm for max. CIP/SIP	Pre-alarm for maximum number of CIP/SIP (see "Sensor monitoring" configuration in the JUMO digiLine CR/Ci operating manual)
Alarm for max. CIP/SIP	Alarm for maximum number of CIP/SIP (see sensor monitoring configuration in the JUMO digiLine CR/Ci operating manual)
Sensor stress pre-alarm	Sensor stress pre-alarm (see sensor monitoring configuration in the JUMO digiLine CR/Ci operating manual)
Sensor stress alarm	Sensor stress alarm (see sensor monitoring configuration in the JUMO digiLine CR/Ci operating manual)
Calibration timer expired	Alarm for sensor calibration due (see "Calibration data" in the JUMO digiLine CR/Ci operating manual)
Operating data acquisition alarm	Alarm for violation of allowed limits for operating data acquired for the sensor type (extreme conditions). You can find more on this in the operating manual for the JUMO digiLine CR/Ci.
Contamination alarm	Alarm for heavy contamination of 4-pin conductive conductivity sensors

10 Configuration

JUMO digiLine O-DO H10/H20

Alarm	Explanation
Oxygen error flag	There is a fault with the oxygen sensor
Temperature error flag	There is a fault with the temperature sensor.
Switch-off temp. exceeded	When the specified switch-off temperature is exceeded, the oxygen measurement is automatically switched off. This protects the luminophore against premature aging and increases the operating life. This is particularly useful for CIP and SIP processes where no oxygen measurement is required.
Max. pulse reached	The number of oxygen measurements has exceeded the value that was defined as the limit value for the maximum number of measurements.
Cap missing	The sensor has detected that the sensor cap is missing.
Max. CIP exceeded	The number of CIP cycles since the last calibration has exceeded the value that was defined as the limit value for the maximum number of CIP cycles.
Max. SIP exceeded	The number of SIP cycles since the last calibration has exceeded the value that was defined as the limit value for the maximum number of SIP cycles.

JUMO digiLine O-DO S10

Alarm	Explanation
Oxygen error flag	There is a fault with the oxygen sensor
Temperature error flag	There is a fault with the temperature sensor.
Alarm sensor element	Sensor cap missing.
Oxygen outside the measuring range	The oxygen measured value is outside the sensor specification
Temperature outside the measuring range	The temperature measured value is outside the sensor specification
Sensor element warning status	The sensor cap is worn and should be replaced.

JUMO flowTRANS US W02 dL

Alarm	Explanation
Alarm, flow	Possible causes: Too many air bubbles in the system or the measuring range has been exceeded or the sensor is faulty.
Temperature alarm	Possible causes: The measuring range has been fallen below/exceeded or the sensor is faulty.
Alarm, pressure	
Empty conduit	The meter run is empty.
Air bubbles present	Air bubbles have been detected in the system.

10 Configuration

JUMO ecoLine O-DO

Alarm	Explanation
Warning: Value out of spec	The measured value is out of the sensor specification
Warning: Measurement interrupted	The measurement process was interrupted
Error: Measurement impossible	Error due to measured values being outside sensor specification
Error: Membrane cap missing	Error due to missing membrane cap

JUMO ecoLine NTU

Alarm	Explanation
Warning: Value out of spec	The measured value is out of the sensor specification
Warning: Extraneous light	Warning: Measurement process disrupted by extraneous light
Error: Measurement impossible	Error due to measured values being outside sensor specification
Error: Extraneous light	Error in measurement process due to extraneous light

10 Configuration

10.11.7 CIP/SIP definition for JUMO digiLine pH and JUMO digiLine CR/Ci

For sensor monitoring of JUMO digiLine pH and JUMO digiLine CR/Ci, the parameters listed in the following can be set from the JUMO AQUIS touch P. They are used to count the CIP/SIP cycles in the JUMO digiLine electronics. You can find more on this in the operating manual for the JUMO digiLine pH or JUMO digiLine CR/Ci.



NOTE

Sensor monitoring requires plant-specific empirical values for the sensor stress caused by process conditions. Configure the sensor monitoring parameters on the basis of these empirical values.

Open CIP/SIP Definition Digital Sensors:

Device Menu > Configuration > Digital Sensors > Digital Sensors 1 to 6 > CIP/SIP Definition

Configuration point	Selection/ setting option	Explanation
CIP min. temperature ^a	-20 to +150 °C	Temperature thresholds for identifying CIP/SIP cycles If the CIP/SIP cycle takes place above one of these values during the set duration of a CIP/SIP cycle, the values identify a successfully completed CIP/SIP cycle and the CIP or SIP counter in the JUMO digiLine electronics is incremented. The respective counter is reset only after the value has dropped below the CIP/SIP temperature.
SIP min. temperature ^a		
CIP cycle duration ^a	60 to 65535 s	Minimum time to detection of a CIP/SIP cycle.
SIP cycle duration ^a		
CIP/SIP alarming	Inactive Active	Setting for alarming on the JUMO AQUIS touch P, if the CIP, SIP, or autoclaving counters in the JUMO digiLine electronics have reached the maximum number of permissible cycles.

^a This setting is saved in the configuration of the JUMO digiLine electronics.

10.11.8 CIP/SIP definition for JUMO digiLine O-DO H10/H20

For sensor monitoring, the parameters listed in the following can set from the JUMO AQUIS touch P. They are used to count the CIP/SIP cycles in the sensor. The parameters can alternatively also be set with the DSM or setup program.



NOTE

Sensor monitoring requires plant-specific empirical values for the stress caused by process conditions. Define the sensor monitoring parameters on the basis of these empirical values.

Open CIP/SIP Definition Digital Sensors:

Device Menu > Configuration > Digital Sensors > Digital Sensors 1 to 6 > CIP/SIP Definition

Configuration point	Selection/ setting option	Explanation
CIP min. temperature	-20 to +150 °C	Temperature thresholds for identifying CIP/SIP cycles
SIP min. temperature		
CIP max. temperature	-20 to +150 °C	If the CIP/SIP cycle lasts longer than the set CIP/SIP duration between the minimum and maximum temperature, the values identify a successfully completed CIP/SIP cycle and the CIP or SIP counter in the JUMO digiLine electronic components is incremented. The respective counter is incremented only after the value has dropped below the CIP/SIP min. temperature.
SIP max. temperature		
CIP cycle duration	1 to 65535 min	Minimum time to detection of a CIP/SIP cycle.
SIP cycle duration		
Max. CIP cycles	0 to 65535	Specification of the maximum permissible CIP and SIP cycles.
Max. SIP cycles		
CIP/SIP alarming	Inactive Active	Setting for alarming on the JUMO AQUIS touch P, if the CIP, SIP, or autoclaving counters in the JUMO digiLine electronics have reached the maximum number of permissible cycles.

10.11.9 Calibration timer

Open Calibration Timer Settings Digital Sensors:

Device Menu > Configuration > Digital Sensors > Digital Sensors 1 to 6 > Calibration Timer

Calibration timers prompt the user to calibrate sensors on a regular basis. The settings for all analysis inputs and the universal inputs are explained together.

⇒ Chapter 10.13 "Calibration timer", page 70

10 Configuration

10.12 Input alarm functions

10.12.1 Alarms for analog signals and digital sensors

Open Temperature Inputs Alarm Configuration:

Device Menu > Configuration > Analog Inputs >
Temperature Inputs 1 to 2

Open Universal Inputs Alarm Configuration:

Device Menu > Configuration > Analog Inputs >
Universal Input 1 to 3 > Configuration

Open pH/Redox/NH₃ Analysis Inputs Alarm Configuration:

Device Menu > Configuration > Analog Inputs >
Analysis Input 1 to 4 > Configuration

Open CR / Ci Analysis Inputs Alarm Configuration:

Hold function

Device Menu > Configuration > Analog Inputs >
Analysis Input 1 to 4 > Configuration

Alarms

Device Menu > Configuration > Analog Inputs >
Analysis Input 1 to 4 > Configuration > Measuring Range 1 to 4

Open alarm configuration of measured values for digital sensors (all except JUMO digiLine CR/Ci):

Device Menu > Configuration > Digital Sensors >
Digital Sensors 1 to 6 > Configuration

Open alarm configuration of measured values for digital sensors of the type JUMO digiLine CR/Ci:

Hold function

Device Menu > Configuration > Digital Sensors > Digital Sensors 1 to 6 > Configuration

Alarms

Device Menu > Configuration > Digital Sensors > Digital Sensors 1 to 6 > Measuring Range 1 to 4

Open Alarm Configuration For External Analog Inputs:

Device Menu > Configuration > External Analog Inputs >
External Analog Inputs 1 to 16

Open Alarm Configuration For Flow Rate:

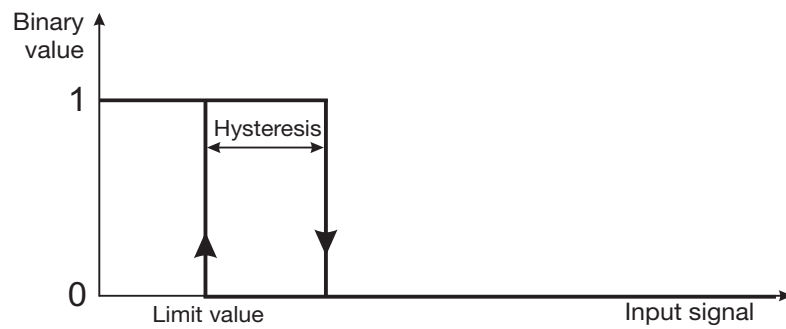
Device Menu > Configuration > Flow Rate > Flow Rate 1 to 2

10 Configuration

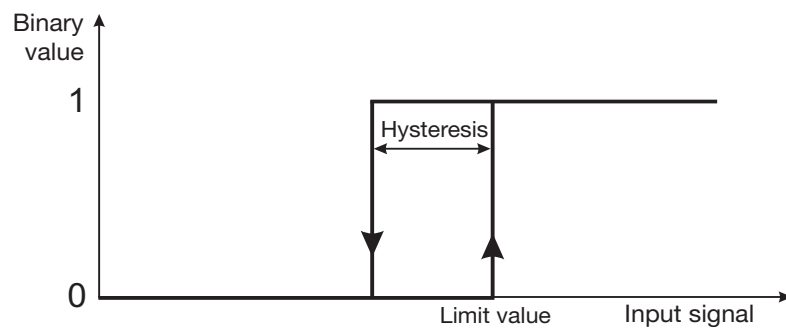
Configuration point	Selection/ setting option	Explanation
Digital signal for hold	Selection from the binary selector	Digital signal for activating the hold function When the hold function is activated, the alarm assumes the state defined in the "Response at hold" setting.
Response at hold	Inactive Active Frozen	Specification of the alarm state when the hold function is activated, at calibration of the particular input or at error (out of range)
Response at calibration	Inactive Active Frozen Normal	Inactive: Alarm suppressed Active: Alarm forced
Response at error	Inactive Active Frozen	Frozen: Alarm state is maintained regardless of alarm condition changes Normal: Alarm in acc. with alarm condition
Alarm type	Inactive Minimum alarm Maximum alarm Alarm window Invert alarm window	Four alarm types (comparator functions) can be selected to monitor measured values for violation of limit values. ⇒ Characteristic lines after the table
	Only for CR analysis inputs: USP Pre-alarm USP Cleaned water Pre-alarm cleaned Water	Limit value alarms to USP <645> or European Pharmacopoeia (Ph. Eur.) for cleaned water
Alarm/Event list	Off Event Alarm	Assignment of alarm notification to alarm list or event list
Alarm text	Up to 21 text characters	Text for the alarm/event list
Limit value	-99999 to +99999	Limit value for the particular alarm type
Hysteresis	0 to 99999	Spacing between switch-on and switch-off points for the alarm types ⇒ Characteristic lines after the table
Window range	0 to 99999	Range of the alarm window ⇒ Characteristic lines after the table
Pulse function	Yes No	Time limit for alarm with the wiper time as maximum alarm duration
Pulse time	0 to 999 s	Duration of alarm with pulse function activated
Alarm delay On	0 to 999 s	Time delay between occurrence of the alarm condition and triggering of the alarm
Alarm delay Off	0 to 999 s	Time delay between ending of the alarm condition and clearing of the alarm

10 Configuration

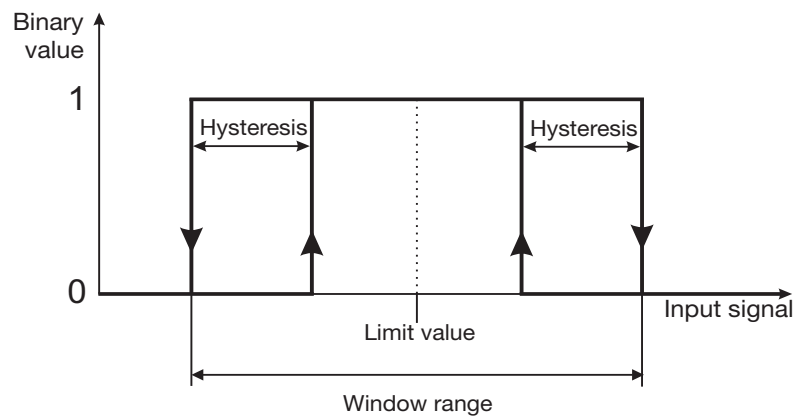
Minimum alarm (On-signal when value drops below lower limit)



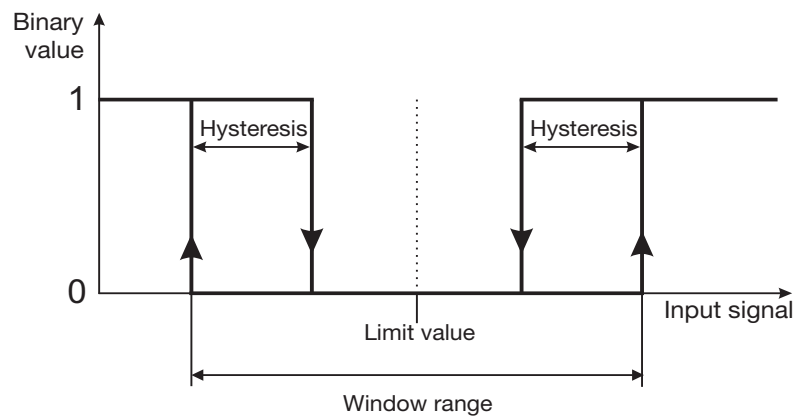
Maximum alarm (On-signal when value exceeds upper limit)



Alarm window (On-signal within a configurable value range)



Invert alarm window (On-signal outside a configurable value range)



10.12.2 Digital signal alarms

Open Alarm Configuration For Binary Inputs:

Device Menu > Configuration > Binary Inputs >
Binary Inputs 1 to 9

Open Alarm Configuration For External Binary Inputs:

Device Menu > Configuration > External Binary Inputs >
External Binary Inputs 1 to 16

Open Alarm Configuration For Logic Formula:

Device Menu > Configuration > Logic Formula > Formula 1 to 30

Configuration point	Selection/ setting option	Explanation
Digital signal for hold	Selection from the binary selector	Digital signal for activating the hold function When the hold function is activated, the alarm assumes the state defined in the "Response at hold" setting.
Response at hold	Inactive Active Frozen Normal	Specification of the alarm state when the hold function is activated Inactive: Alarm suppressed Active: Alarm forced Frozen: Alarm state is maintained regardless of alarm condition changes Normal: Alarm in acc. with alarm condition
Alarm type	Active Inactive	Arming or disarming an alarm
Alarm/Event list	Off Event Alarm	Assignment of alarm notification to alarm list or event list
Alarm text	Up to 21 text characters	Text for the alarm/event list
Alarm active at	High Low	Digital input alarm condition
Alarm delay	0 to 9999 s	Time delay between occurrence of the alarm condition and triggering of the alarm

10 Configuration

10.13 Calibration timer

Every input for analysis measurands has its own calibration timer. Inputs for temperature sensors do not have a calibration timer, since they do not need to be calibrated. Calibration timers signal when sensor calibration is due via a calibration alarm. Once a particular input has been calibrated successfully, its calibration timer is reset. The signal for a calibration due can be generated, for instance, by binary outputs with external indicator lights or the alarm/event list. The structure of the calibration timer configuration of types JUMO digiLine ORP, JUMO digiLine pH and JUMO digiLine CR/Ci differs from that of all other analysis sensors. In this case, there is only the "Calibration interval" parameter. Observe the following configuration table.

10.13.1 Configuration of the calibration timers

Open Calibration Timer Configuration Universal Inputs:

Device Menu > Configuration > Analog Inputs >
Universal Input 1 to 3 > Calibration Timer

Open Calibration Timer Configuration Analysis Inputs:

Device Menu > Configuration > Analog Inputs >
Analysis Input 1 to 4 > Calibration Timer

Open Calibration Timer Settings Digital Sensors:

Device Menu > Configuration > Digital Sensors > Digital Sensors 1 to 6 > Calibration Timer

Configuration point	Selection/ setting option	Explanation
Function ^a	Inactive Active	Activation/deactivation of the calibration timer for an analog input
Alarm/Event list ^a	Off Alarm Event	Assignment of calibration timer timeout notification to alarm list or event list
Alarm text ^a	21 text characters	Text for the alarm/event list upon timeout of calibration timers
Calibration interval ^a	0 to 9999 days	Time from one calibration to the next. When a calibration is due is indicated by the calibration alarm on the JUMO AQUIS touch P.

^a For sensors with JUMO digiLine electronics of types JUMO digiLine-ORP, -pH, and -CR/Ci, only the calibration interval can be set. With these types, the calibration alarm is active automatically. The texts for alarm and event list are preset.

10.14 Serial interfaces

Open: Device Menu > Configuration > Serial Interfaces >
Serial Interfaces 1 to 2

Configuration point	Selection/ setting option	Explanation
Protocol	Modbus slave Modbus master Modbus digital sensors	Communication protocol of the bus system Modbus Slave: For operation of the device as a slave in a Modbus system Modbus master: For operation of the device as a master in a Modbus system, for example for querying measured values from sensors with a Modbus slave function. You can find further information on this in the Modbus interface description for the device. Modbus digital sensors: For operation of JUMO digital sensors on the serial interface (see order details for extra code "JUMO digiLine protocol activated") In the JUMO AQUIS touch P, either the interface on the base unit or the optional serial interface (if present) can be configured for digital sensors (JUMO digiLine operation). Simultaneous use of both interfaces for JUMO digiLine operation is not possible.

10 Configuration

Configuration point	Selection/ setting option	Explanation
Baudrate	9600 19200 38400	Transmission speed (symbol rate) of the serial interface^a For all bus users (device and digital sensors) to communicate with one another, they must have the same baud rate. The baud rates of JUMO tecLine and JUMO digiLine sensors are automatically set by the JUMO digiLine master device during the scanning process. When connecting digital JUMO ecoLine sensors, the baud rate of the JUMO AQUIS touch P must be set to 9600 prior to startup. Otherwise, the sensors will not begin operation. supported baud rates of JUMO digital sensors • JUMO ecoLine: 9600 • JUMO tecLine and JUMO digiLine: 9600, 19200, 38400
Data format	8 - 1 - no parity 8 - 1 - odd parity 8 - 1 - even parity	Format of the data word^a For all bus users (device and digital sensors) to communicate with one another, they must have the same data format. The data formats of JUMO tecLine and JUMO digiLine sensors are automatically set by the JUMO digiLine master device during the scanning process. When connecting digital JUMO ecoLine sensors, the data format of the JUMO AQUIS touch P must be set to "8-1-no parity" prior to startup. Otherwise, the sensors will not begin operation. Format: Useful bit – stop bit – parity bit
Min. response time	0 to 500 ms	Minimum time from receiving a query to sending a response This parameter is used to adjust the response speed of the device to slower bus users.

10 Configuration

Configuration point	Selection/ setting option	Explanation
Modbus slave		
Timeout master	60 to 60000 ms	Master monitoring time After this time, a failure of the Modbus master is identified. An internal digital signal is set in the event of a timeout.
Device address	1 to 254	Unambiguous specification of a bus participant
Modbus master		
Timeout	60 to 10000 ms	A request sent by the master is defined as faulty if no answer is received within this time.
Scan cycle	60 to 99999 ms	The Modbus master requests data from the Modbus slaves at these intervals.

^a For all users to communicate with one another, these settings be the same on all users.

10.15 Modbus TCP

Open: Device Menu > Configuration > Modbus TCP

Configuration point	Selection/ setting option	Explanation
Modbus slave		
Port	0 to 1024	TCP port of the JUMO AQUIS touch P as a Modbus slave. The change to the TCP port for the slave function must be made with the JUMO setup program. In the delivery state , the TCP port number "502" is configured.
Modbus master		
Timeout	4000 to 10000 ms	A request sent by the master is defined as faulty if no answer is received within this time.
Scan cycle	60 to 99999 ms	The Modbus master requests data from the Modbus slaves at these intervals.
External devices (device 1 to 4)^a		
Manual IP address	Valid IP address ^b	IP address of the Modbus slave device
Port	0 to 1024	TCP port of Modbus slave device

^a Settings for up to 4 target slave devices to which the JUMO AQUIS touch P is to send its Modbus commands are created for the Modbus master function of the JUMO AQUIS touch P via Ethernet. It can be selected as the target device for the respective Modbus frame in the settings of the Modbus frames.

^b IP addresses must be unique within a network. Consult your network administrator for a valid IP address configuration.

10 Configuration

11.1 Notes



WARNING!

During the calibration, the relays and analog output signals assume the states configured for the calibration! The response of the output signals is set for each output in its "Response at calibration" configuration point.

⇒ Chapter 10.7 "Analog outputs of base unit and optional boards", page 29

11.2 General information

The actual electrical characteristics of analysis sensors always deviate somewhat from the nominal specifications. The reasons for this include:

- Like every measuring instrument, analysis sensors always have a certain uncertainty of measurement that results from manufacturing tolerances.
- During use, analysis sensors are exposed to chemical processes. Deposits and wear phenomena caused by these processes result in changes of the electrical characteristics of sensors.

To optimize the accuracy of measurements, analysis sensors must be calibrated. Calibrations are required:

- during installation or when changing a sensor
- regularly at time intervals that must be specified by the user
- if implausible measured values are displayed
- if process conditions change, e. g. as the result of equipment modification

Calibration timers can be configured to provide a regular reminder of when calibrations are due.

⇒ Chapter 10.13 "Calibration timer", page 70

Each successfully completed calibration is recorded in the calibration logbook.

⇒ Chapter 11.3 "Calibration logbook", page 77

11.2.1 General procedure for calibration

True calibration (calibrating with routines)

After opening one of the calibration routines in the device, the user is guided through a process with measurements and entries. In the course of this process, the calibration values are determined and saved automatically.

Suitable calibration routines are available for every type of analysis sensor. The individual calibration routines for the various sensor types are described in separate chapters.

⇒ Chapter 12 "Calibrating a pH measuring chain", page 81 to ⇒ Chapter 16 "Calibrating Ci conductivity sensors", page 109

Execution of calibration routines requires that the following prerequisites be met:

11 Calibration in general

- You must be logged in as a user with the right to perform calibrations. Factory-preset users have all of these rights.
⇒ Chapter 8.1.1 "Passwords and user rights", page 75
- You must ensure that the calibration default settings for the individual analysis inputs, and, possibly, the universal inputs are set correctly. The explanations of the calibration default settings can be found in the chapters on calibration of the various analysis sensors.
- In the case of Ci analysis inputs, it should be noted that the optional boards must undergo a basic calibration during the initial commissioning. If this has not yet been performed, it is necessary to do so prior to any other calibration.

⇒ Chapter 9.2 "Ci base calibration", page 114

Manual entry of calibration values



NOTE

Incorrectly entered calibration values result in incorrect measured values. Correct measurements are essential for control systems and limit monitoring.

If calibration values are known, they can also be entered manually. This may be the case with temperature-compensated conductivity measurements, for instance, when the temperature coefficient of a liquid is known. Another important application case is the manual entry of relative cell constants of conductivity sensors. If an ASTM test certificate showing precisely-measured cell constants is available, in addition to entering the nominal cell constants in the configuration of the conductivity sensor concerned, the relative cell constants of all measuring ranges in the calibration values must be manually entered.

Configuration of conductivity sensors:

⇒ Chapter 10.6.6 "CR/Ci analysis inputs (conductive/inductive conductivity)", page 24

⇒ Chapter "Only for sensors with JUMO digiLine CR/Ci", page 39

Known calibration values are entered manually under:

Device menu > Calibration > Select Analog Input or Digital Sensor > Calibration Values

11 Calibration in general

11.3 Calibration logbook

A separate logbook is kept for each input that has been configured for an analysis sensor (analysis inputs, universal inputs or inputs for digital sensors).

The last 10 **successful** calibrations of the input concerned are saved in the calibration logbook. Canceled or failed calibrations (calibrations outside the permissible limits) are not saved in the logbook, but rather noted in the event list. Manual changes of calibration values on the device are also documented. The following data are retained in the logbook:

- Heading with description of the measurement input and calibration method
- Date and time
- Measurand
- Calibration assessment (assessment of the calibration values determined during the true calibration)
- Calibration values determined or entered
- Reference values used
- Calibration mode (true calibration/manual entry of calibration values)

Since this information does not yet fit in a screen line, the logbook entries are listed in abbreviated form with the date and calibration results for the time being. More exact information can be accessed for every entry via the detail view.

Example of a calibration logbook

Calibration logbook				
 Exit		 Details		
	Date	Zero-Point	Slope 1	Slope 2
	12/01/12	+54.65		
	12/01/12	+7.00	-62.11	-62.11
	12/01/12	+6.71	-59.91	-59.91

Calibration assessment symbols

	Calibration values are valid: Sensor is OK
	The calibration values determined are critical. It is recommended that the sensor be cleaned.
	Manual value input

For Ci analysis inputs (inductive conductivity) and universal inputs that have been configured as a conductivity measurement input, a "TC curve" button is also displayed. Tapping this button opens a list with the temperature coefficients determined from the last "TC curve calibration".

11 Calibration in general

Calibration logbook					
 Exit		 Details		 TC-curve	
	Datum	Rel.Zk %	Tk %/K	T1 °C	T2 °C
	01/01/13		1,50		
	01/01/13		3,00		

Example of a detail view of a logbook entry

The calibration logbook provides an overview of the calibrations performed. Tapping the "Details" button opens the selected logbook entry in the detail view. The detail view displays a table with all calibration values from a calibration procedure. The "Service" button is used for diagnostic purposes by trained personnel or JUMO Service.

Calibration logbook		
 Exit		 Service
Analysis input 4		
Two-point pH calibration		
Time	12/01/14 07:45:11	
Calibration mode	With reference solution	
pH zero point	+7.00 pH	
Slope	-62.11 mV/pH +105.0 %	
pH buffer 1	+5.00 pH	+25.00 °C
pH buffer 2	+7.00 pH	+25.00 °C

11 Calibration in general

Assessment criteria

pH calibrations

(glass electrodes and ISFET connected to analysis measuring inputs as well as standard signals connected to universal inputs)

Calibration value [unit]	—    —												
Zero point [pH]	...	<	5	≤	...	<	6 to 8	<	...	≤	9	<	...
Slope [%]	...	<	75	≤	...	<	89.6 to 103.1	<	...	≤	110	<	...

pH calibrations (antimony electrodes connected to analysis measuring inputs)

Calibration value [unit]	—						—
Zero point [pH]	...			<	-2 to +2	<	...
Slope [%]	...			<	10 to 110	<	...

Redox zero-point calibration

Calibration value [unit]	—																	—													
Zero point [mV]	...	<	-200		≤	...	<	-120 to +120		<	...	≤	+200		<	...															



NOTE

There is no assessment of the calibration values in the case of a redox 2-point calibration.

Ammonia calibration

Calibration value [unit]	—																	—													
Zero point [mV]	...	<	-612		≤	...	<	-312 to +588		<	...	≤	+888		<	...															

11 Calibration in general

Calibration of conductivity sensors

(analysis measuring inputs and standard signals connected to universal inputs)

Calibration value [unit]	—    —												
Rel. cell constant (CR) [%]	...	<	50	≤	...	<	75 to 125	<	...	≤	150	<	...
Rel. cell constant (Ci) [%]	...	<	80	≤	...	<	90 to 110	<	...	≤	120	<	...

Calibration value [unit]	—						—
Temperature coefficient (CR) [%/K]	...			<	0 to 8	<	...
Temperature coefficient (Ci) [%/K]	...			<	0 to 5.5	<	...



NOTE

No assessment of the calibration values is performed for universal inputs in the "linear scaling" operation mode.

Calibration of conductivity sensors with JUMO digiLine CR/Ci

Calibration value [unit]	—    —												
Rel. cell constant (CR) [%]	...	<	50	≤	...	<	75 to 125	<	...	≤	150	<	...
Rel. cell constant (Ci) [%]	...	<	80	≤	...	<	90 to 110	<	...	≤	120	<	...

Calibration value [unit]	—						—
Temperature coefficient (CR) [%/K]	...			<	0 to 8	<	...
Temperature coefficient (Ci) [%/K]	...			<	0 to 6	<	...

12 Calibrating a pH measuring chain

12.1 Notes



WARNING!

During the calibration, the relays and analog output signals assume the states configured for the calibration! The response of the output signals is set for each output in its "Response at calibration" configuration point.

⇒ Chapter 10.7 "Analog outputs of base unit and optional boards", page 29

12.2 General information

The calibration of pH electrodes is based on measurements in buffer solutions with a defined pH-value. The pH values of the buffer solutions used are specified either via entry of fixed values into the calibration default settings, entered during the calibration or recognized automatically by "automatic buffer recognition" during the calibration process. For "automatic buffer recognition", a buffer set table must be selected in the calibration default settings. In this case, the buffer solutions used must be listed in the provided buffer set table. Since pH value measurement of liquids is temperature-dependent, the temperature of the buffer solution must be sensed in order to compensate for its effect on the result of the measurement. This requires either manual entry or measurement with the aid of a temperature sensor.

12.2.1 Calibration methods for pH sensors

Zero-point calibration

This calibration method is used to determine the pH zero point on the measurement characteristic curve. The slope is retained.

A buffer solution with a defined pH value is needed as a reference.

Two-point Calibration

By measuring 2 different buffer solutions with defined pH values, the pH zero point and pH slope of the measuring chain are established.

The pH values of the buffer solutions must be at least 2 pH apart. This calibration method is recommended for most applications.

Three-point calibration

With a three-point calibration, the pH zero point as well as the pH slope in the acidic region and the pH slope in the alkaline region are established. The three-point calibration can be performed only for pH sensors on analysis inputs. It is not available for JUMO digiLine pH sensors.

This method requires 3 buffer solutions with defined pH-values as references. One of these must be acidic, one neutral and one alkaline. The pH values of the buffer solution must be at least 2 pH apart from one another. This calibration method is recommended for applications with more demanding accuracy requirements when performing measurements in both the alkaline and acidic regions.

12 Calibrating a pH measuring chain

12.2.2 Calibration default settings for pH sensors

Before you can perform a calibration, you must first enter the necessary calibration default settings. The possible settings for the pH Calibration are described in the following.

Open the calibration default settings:

Device Menu > Calibration > Select Analysis Input or Digital Sensor Input for pH/redox/NH3 > Calibration Presets



NOTE

The "Calibration default settings" menu appears in the Device menu only if a user with corresponding user rights is logged in. The "Calibration default settings" menu for a digital sensor is visible for the digital sensor concerned only when it is linked.

⇒ Chapter 8.2.1 "Log-on/Log-out", page 89

⇒ Chapter 8.2.7 "Digital sensors", page 95

Sample screen:
pH calibration default
settings

12 Calibrating a pH measuring chain

pH calibration default settings

The calibration default settings enable the calibration routines to be accessed in the particular calibration menu.

Calibration routines that are not enabled are not visible in the calibration menu. Additional calibration default settings are explained in the following table.

Parameter	Possible settings	Explanation
Buffer set selection	Buffer set 1 to 3 factory-preset: • Buffer set 1: Reference buffer solutions for calibrating pH measuring instruments acc. to DIN 19266 • Buffer set 2: Technical buffer solutions, preferably for calibrating and adjusting technical pH measuring instruments acc. to DIN 19267	Buffer set tables contain pH values for selected buffer solutions as a function of temperature. These tables can be prepared/edited using commercially available standard solutions (DIN 19266, NIST; otherwise, technical buffer solutions etc.) or on the basis of customer-specific information. With their aid, buffer solutions can be recognized automatically when calibrating. The pH value data for the buffer solutions used must be contained in the buffer set table selected. When a Buffer set is selected, this activates automatic buffer recognition and the entry fields for the settings "pH buffer 1 to 3" are hidden. You need the JUMO PC setup program to edit buffer set tables.
Buffer 1 pH-value	-2 to +16 pH	manual entry of the pH-values of the buffer solutions being used for the calibration Depending on the selected Calibration routine, the corresponding entry fields for "pH buffer 1 to 3" are displayed. The pH-values of the buffer solutions used must be at least 2 pH apart.
Buffer 2 pH-value	-2 to +16 pH	
Buffer 3 pH-value	-2 to +16 pH	
Compensation	Fixed compensation temperature Temperature input Interface	Fixed compensation temperature: Compensation with a fixed temperature value that is entered in the configuration item "Compensation temperature". Temperature input: The integrated temperature probe of the pH sensor supplies the compensation temperature. Interface: The AQUIS touch P transmits the compensation temperature to the sensor electronics via the interface. The source of the compensation temperature is set in the configuration point "Compensation temperature".

12 Calibrating a pH measuring chain

Parameter	Possible settings	Explanation
Temperature compensation	Selection from Analog selection	Temperature input for automatic acquisition of the test/sample solution temperature during the calibration

12 Calibrating a pH measuring chain

12.3 pH Calibration routines



NOTE

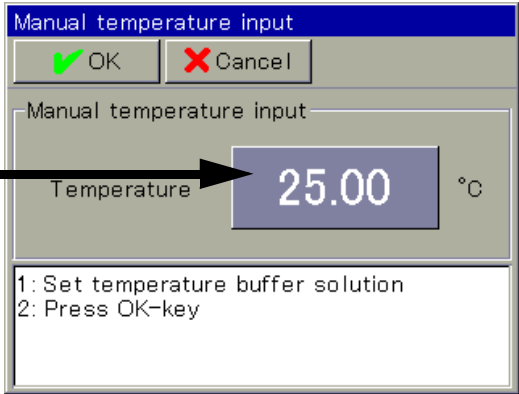
You must be logged in with corresponding user rights to perform calibrations.
⇒ Chapter 8.2.1 "Log-on/Log-out", page 89



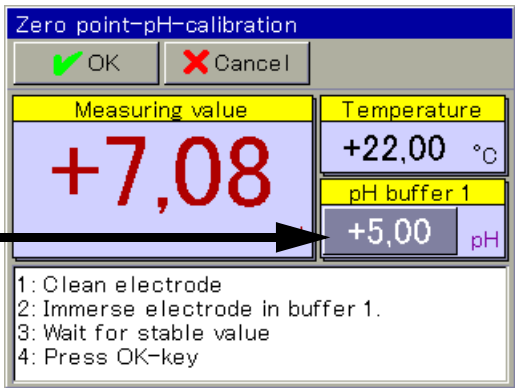
NOTE

Digital sensors need to be linked before they can be calibrated.
⇒ Chapter 8.2.7 "Digital sensors", page 95

12.3.1 Zero-point calibration

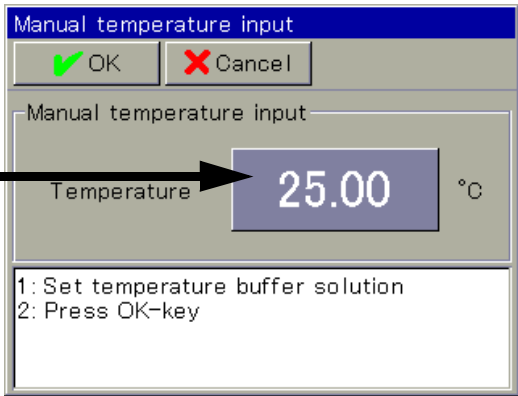
Step	Action
1	Start the Zero-point calibration. for pH sensors on analysis inputs: Device Menu > Calibration > Select Analysis Input for pH/redox/ NH₃ > Open Zero-Point Calibration for pH sensors with JUMO digiLine electronics: Device Menu > Calibration > Digital Sensor 1 to 6 > Open Zero-Point Calibration
2	If temperature compensation was not specified in the calibration default settings, enter the temperature of the buffer solution here manually. If temperature compensation was specified, the temperature of the buffer solution is determined automatically. tap button to enter temperature 
3	Clean the pH electrode and immerse it in the buffer solution.

12 Calibrating a pH measuring chain

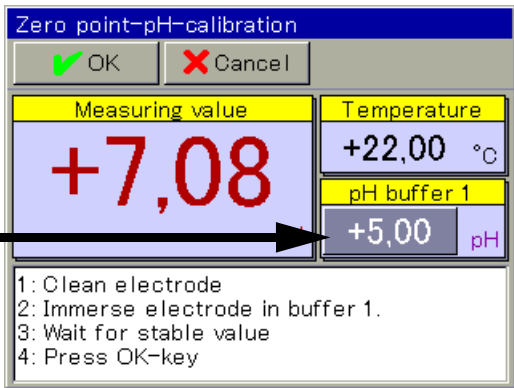
Step	Action
4	Entry of the pH-value of the buffer solution without buffer recognition: Check whether the "pH buffer 1" matches the pH-value of the buffer solution used. If a buffer set table was not specified, the "buffer 1 pH" value is taken from the calibration default settings. It is still possible to change this manually here. tap button to enter pH-value of the buffer field  with buffer recognition: A prerequisite here is that a buffer set table has been selected in the buffer set table and the pH-value of the buffer solution used is contained in this buffer set table. If these prerequisites are satisfied, the pH value of the buffer solution is determined automatically during the calibration.
5	Wait until the measured value displayed stabilizes and then confirm the result of the measurement by pressing "OK"
6	A Protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
7	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

12 Calibrating a pH measuring chain

12.3.2 Two-point and three-point calibration

Step	Action
1	Start the desired Calibration routine. for pH sensors on analysis inputs: Device Menu > Calibration > Analysis Input Select Analysis Input for pH/redox/NH₃ > Open Two-Point or Three-Point Calibration for pH sensors with JUMO digiLine electronics: Device Menu > Calibration > Digital Sensor 1 to 6 > Open Two-Point Calibration
2	If temperature compensation was not specified in the calibration default settings, enter the temperatures of the buffer solution here manually. If temperature compensation was specified, the temperature of the buffer solution is determined automatically. To enter the temperature, tap the button 
3	Clean the pH electrode and immerse it in one of the buffer solutions. For a Two-point calibration, you need 2 buffer solutions. For a three-point calibration, you need 3 buffer solutions (acidic, neutral, and alkaline).

12 Calibrating a pH measuring chain

Step	Action
4	Entry of the pH-value of the buffer solution without buffer recognition: Check whether the "pH buffer 1" matches the pH-value of the buffer solution used. If a buffer set table was not specified, the "buffer 1 pH" value is taken from the calibration default settings. It is still possible to change this manually here. tap button to enter pH-value of the buffer field  with buffer recognition: A prerequisite here is that a buffer set table has been selected in the buffer set table and the pH-value of the buffer solution used is contained in this buffer set table. If these prerequisites are satisfied, the pH value of the buffer solution is determined automatically during the calibration.
5	Wait until the measured value display stabilizes and then confirm the result of the measurement by pressing "OK".
6	For each additional calibration point, repeat steps 3 to 5 with the required buffer solutions.
7	A protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
8	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

13.1 Notes



WARNING!

During the calibration, the relays and analog output signals assume the states configured for the calibration! The response of the output signals is set for each output in its "Response at calibration" configuration point.

⇒ Chapter 10.7 "Analog outputs of base unit and optional boards", page 29

13.2 General information

The calibration of redox sensors is based on measurements in test solutions with a defined redox potential.

13.2.1 Calibration methods for Redox sensors

Zero-point calibration

This calibration method is used to determine the redox zero point.

A test solution with a defined redox potential is needed as a reference.

"mV" must be set as the redox unit in the configuration of the redox measurement input (analysis input or input for digital sensors).

⇒ Chapter 10.6.4 "pH/Redox/NH₃ analysis inputs", page 21

Two-point Calibration

This calibration is used to establish an application-specific measurement characteristic curve where redox potentials are represented as a percentage of concentration values. The redox potentials of 2 solutions are measured.

Concentration values in percent are then assigned to the measured values by the user.

Two process-typical sample solutions are needed as calibration solutions as a reference.

"Percent" must be set as the redox unit in the configuration of the redox measurement input (analysis input or input for digital sensors).

⇒ Chapter 10.6.4 "pH/Redox/NH₃ analysis inputs", page 21

⇒ Chapter "Only for JUMO sensors with JUMO digiLine electronics pH/ORP/T", page 37

Example: In a detoxification plant, the toxicity of a liquid is to be measured on the basis of the Redox potential. The calibration requires 2 solutions:

- the concentration of the highly toxic solution is given as 80 % by the user, for instance
- the concentration of the detoxified solution is given as 10% by the user, for instance

Using the redox potential, the toxicity can now be measured and displayed in percent.

13 Calibrating redox sensors

13.2.2 Calibration default settings for Redox sensors

Before you can perform a calibration, you must first enter the necessary calibration default settings. The possible settings for the Redox calibration are described in the following.

Open the calibration default settings:

Device Menu > Calibration > Select Analysis Input or Digital Sensor Input for pH/redox/ NH_3 > Calibration Presets



NOTE

The "Calibration default settings" menu appears in the Device menu only if a user with corresponding user rights is logged in. The "Calibration default settings" menu for a digital sensor is visible for the digital sensor concerned only when it is linked.

⇒ Chapter 8.2.1 "Log-on/Log-out", page 89

⇒ Chapter 8.2.7 "Digital sensors", page 95

Sample screen:
Redox calibration default
settings
(zero-point calibration)

Redox calibration default settings

The calibration default settings enable the calibration routines to be accessed in the particular calibration menu.

Calibration routines that are not enabled are not visible in the calibration menu. Additional calibration default settings are explained in the following table.

Parameter	Possible settings	Explanation
Redox test solution	-1500 to +1500 mV	Manual entry of the Redox potential of the test solution being used for calibration



NOTE

Remember that the configuration of the redox measurement input must be set to the redox unit "mV" for the zero-point calibration and to "Percent" for the two-point calibration.

⇒ Chapter 10.6.4 "pH/Redox/ NH_3 analysis inputs", page 21

13 Calibrating redox sensors

13.3 Redox calibration routines



NOTE

You must be logged in with corresponding user rights to perform calibrations.
⇒ Chapter 8.2.1 "Log-on/Log-out", page 89



NOTE

Digital sensors need to be linked before they can be calibrated.
⇒ Chapter 8.2.7 "Digital sensors", page 95

13.3.1 Zero-point calibration

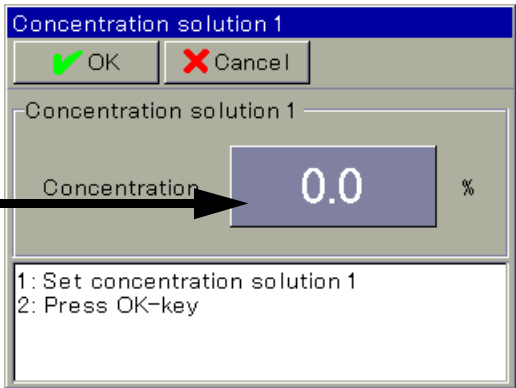
Step	Action
1	Ensure that - the calibration default settings are correct, "mV" is set as the Redox unit in the configuration of the Redox measurement input. ⇒ Chapter 13.2.2 "Calibration default settings for Redox sensors", page 90. ⇒ Chapter 10.6.4 "pH/Redox/NH₃ analysis inputs", page 21
2	Start the Zero-point calibration. for redox sensors on analysis inputs: Device Menu > Calibration > Select Analysis Input for pH/redox/ NH₃ > Zero-Point Calibration for redox sensors with JUMO digiLine electronics: Device Menu > Calibration > Digital Sensor 1 to 6 > Zero-Point Calibration
3	Check that the "Redox test solution" value displayed matches the Redox value of the test solution. The "Redox test solution" value is taken from the calibration default settings. It is still possible to change this manually here. Tap button to change the Redox value of the test solution manually

13 Calibrating redox sensors

Step	Action
4	Clean the Redox electrode and immerse it in the test solution. Wait until the measured value display stabilizes and then confirm the result of the measurement by pressing "OK".
5	A protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
6	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

13 Calibrating redox sensors

13.3.2 Two-point Calibration

Step	Action
1	Ensure that - the calibration default settings are correct "Percent" is set as the Redox unit in the configuration of the Redox measurement input. ⇒ Chapter 13.2.2 "Calibration default settings for Redox sensors", page 90. ⇒ Chapter 10.6.4 "pH/Redox/NH₃ analysis inputs", page 21
2	Start the two-point calibration. for redox sensors on analysis inputs: Device Menu > Calibration > Select Analysis Input for pH/redox/ NH₃ > Two-Point Calibration for redox sensors with JUMO digiLine electronics: Device Menu > Calibration > Digital Sensor 1 to 6 > Two-Point Calibration
3	Enter the concentration value of the first reference solution in percent. Confirm by pressing "OK". Tap button to enter field 
4	Clean the Redox electrode and immerse it in the first test solution. Wait until the measured value display stabilizes and then confirm the result of the measurement by pressing "OK".
5	As in step 3, enter the concentration value of the second solution in percent. Confirm by pressing "OK".
6	Clean the Redox electrode and immerse it in the second test solution. Wait until the measured value display stabilizes and then confirm the result of the measurement by pressing "OK".
7	A protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
8	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

13 Calibrating redox sensors

14 Calibrating ammonia sensors

14.1 Notes



WARNING!

During the calibration, the relays and analog output signals assume the states configured for the calibration! The response of the output signals is set for each output in its "Response at calibration" configuration point.

⇒ Chapter 10.8 "Digital inputs of base unit and optional boards", page 30

14.2 General information

The calibration of ammonia sensors is based on measurements in ammonia-free test solutions.

14.2.1 Calibration methods for ammonia sensors

Zero-point calibration

This calibration method is used to determine the ammonia zero point.

An ammonia-free test solution (e.g. water) is needed as a reference.

14.2.2 Calibration default settings for ammonia sensors

In the ammonia sensor calibration default settings, the zero-point calibration is enabled and preconfigured as the only available calibration routine.

Open the calibration default settings:

Device Menu > Calibration > Select Analysis Input for pH/redox/ NH_3 > Calibration Presets

Sample screen:
Ammonia calibration
default settings

14 Calibrating ammonia sensors

14.3 Ammonia calibration routines

**NOTE**

You must be logged in with corresponding user rights to perform calibrations.
⇒ Chapter 8.2.1 "Log-on/Log-out", page 89

14.3.1 Zero-point calibration

Step	Action
1	Start the Zero-point calibration. Device Menu > Calibration > Select Analysis Input for pH/redox/ NH ₃ > Zero-Point Calibration
2	Clean the ammonia electrode and immerse it in the ammonia-free test solution. Wait until the measured value display stabilizes and then confirm the result of the measurement by pressing "OK".
3	A protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
4	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

15 Calibrating CR conductivity sensors

15.1 Notes



WARNING!

During the calibration, the relays and analog output signals assume the states configured for the calibration! The response of the output signals is set for each output in its "Response at calibration" configuration point.

⇒ Chapter 10.7 "Analog outputs of base unit and optional boards", page 29

15.2 General information

The calibration of CR sensors is based on measurements in test solutions with a defined electrolytic conductivity. Since the electrolytic conductivity of liquids is temperature dependent, the temperature of the test solution must be sensed. This requires either manual entry or measurement with the aid of a temperature sensor.

15.2.1 Calibration methods for CR conductivity sensors (conductive)

Rel. cell constant

The deviation from the nominal cell constant of a CR sensor is described by the relative cell constant. The rel. cell constant is determined by making a measurement in a test solution with a defined conductivity.

Temperature coefficient

The temperature coefficient is a measure of the temperature dependence of the electrolytic conductivity of a liquid. It is used to compensate for the effect of temperature when measuring the electrolytic conductivity. When performing a temperature-compensated conductivity measurement, the conductivity value measured is always indicated with reference to the fixed reference temperature. With the aid of the temperature coefficient, the value of the electrolytic conductivity displayed at the reference temperature is calculated from the current measured values of conductivity and temperature of the liquid.

The reference temperature is set in the configuration of the individual CR analysis input or digital input with JUMO digiLine CR.

⇒ Chapter 10.6.6 "CR/Ci analysis inputs (conductive/inductive conductivity)", page 24

⇒ Chapter "Only for sensors with JUMO digiLine CR/Ci", page 39

The temperature coefficient is determined from 2 measurements in a test solution at different temperatures (reference and operation temp.).



NOTE

If the temperature coefficient of a sample solution is known, it can be entered directly.

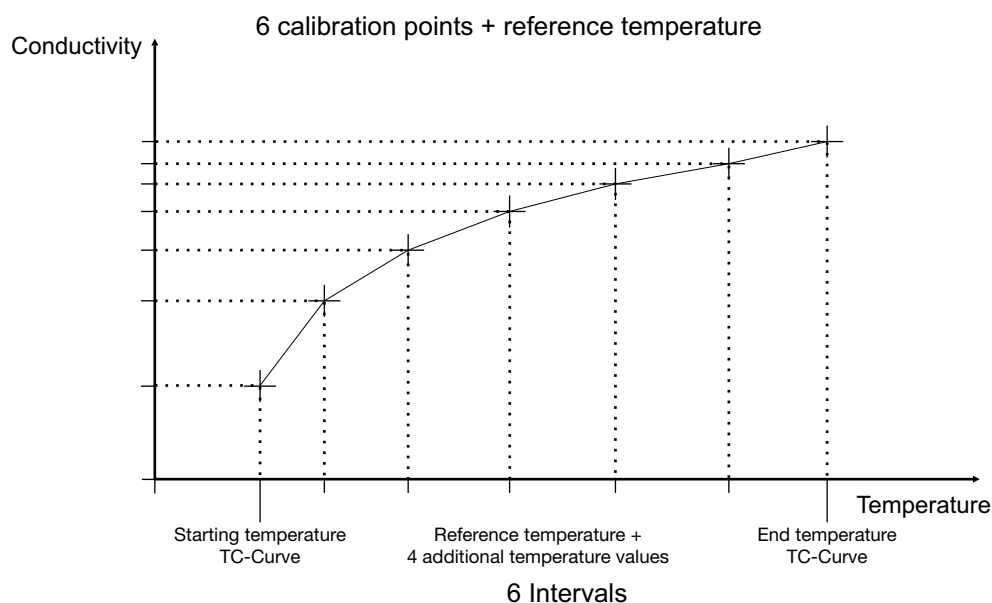
⇒ Chapter 11.2.1 "General procedure for calibration", page 75

15 Calibrating CR conductivity sensors

TC curve for JUMO digiLine CR (for nonlinear temperature coefficients)

If the conductivity of a liquid whose temperature coefficient changes with temperature has to be measured, this method can determine 6 temperature coefficients for 6 temperature intervals. In this way, it is possible to determine a good approximation of the temperature coefficient curve. While the operator brings the sample solution to the temperature values requested by the device, the device determines the temperature coefficient for each interval. This requires installation of a temperature sensor that the device can use to sense the temperature of the sample solution. The series of temperature values consists of 7 values in total:

- Starting temperature and end temperature of the TC curve (⇒ Chapter "Calibration presets for calibrating the TC curve for JUMO digiLine CR", page 100)
- Reference temperature (⇒ Chapter 10.11.2 "Configuration of digital sensors", page 36)
- 4 additional temperature values between the "starting temperature and end temperature of the TC curve"



15 Calibrating CR conductivity sensors

15.2.2 Calibration presets for CR conductivity sensors

Before you can perform a calibration, you must first enter the necessary calibration default settings. The possible settings for the CR calibration are described in the following.

Open the calibration default settings:

for conductivity sensors on analysis inputs:

Device Menu > Calibration > Select CR Analysis Input > Calibration Presets

for conductivity sensors with JUMO digiLine electronics:

Device Menu > Calibration > Digital Sensor 1 to 6 > Calibration Default Settings



NOTE

The "Calibration default settings" menu appears in the Device menu only if a user with corresponding user rights is logged in.

⇒ Chapter 8.2.1 "Log-on/Log-out", page 89

Sample screen:
CR calibration presets

Calibration default setting	
☒ OK ☐ Cancel	
Release calibration routine	
Calib. relative cell	☒
Calib. TC	☒
Reference conduc.	+12.880 mS/cm
Temp. compensation	Temperature input 1

The calibration default settings enable the calibration routines to be accessed in the particular calibration menu.

Calibration routines that are not enabled are not visible in the calibration menu. Additional calibration default settings are explained in the following table.

15 Calibrating CR conductivity sensors

Calibration presets for calibrating the relative cell constant

Parameter	Possible settings	Explanation
Reference conductivity	0 to 9999 mS/cm	Conductivity of the reference solution

Calibration presets for calibrating the temperature coefficient

Parameter	Possible settings	Explanation
Temperature compensation	Selection from analog selection	Temperature input for automatic acquisition of the test/sample solution temperature during the calibration
Reference temperature	-50 to +150 °C	The conductivities of a sample solution at reference temperature and working temperature are captured during the calibration process. This yields 2 value pairs (temperature/conductivity). These value pairs provide the basis for calculating the temperature coefficient. The operation temp. must differ from the reference temperature by at least 5 °C.
Operation temp.	-50 to +150 °C	

Calibration presets for calibrating the TC curve for JUMO digiLine CR

Parameter	Possible settings	Explanation
Compensation	Fixed compensation temperature, Temperature input, Interface	Fixed compensation temperature: Compensation with a fixed temperature value that is entered in the configuration item "Compensation temperature". Temperature input: The integrated temperature probe of the conductivity sensor supplies the compensation temperature. Interface: The AQUIS touch P transmits the compensation temperature to the sensor electronics via the interface. The source of the compensation temperature is set in the configuration point "Compensation temperature".
Temperature compensation	Selection from Analog selection	Temperature input for automatic acquisition of the test/sample solution temperature during the calibration
Starting temperature	-50 to +250 °C	The starting and final temperatures of the range for which a temperature coefficient curve is to be determined. The starting temperature must be at least 20 °C lower than the final temperature. The reference temperature for the measurement input must lie between the starting and final temperatures, and differ from the starting and final temperatures by at least 2 °C.
Final temperature	-50 to +250 °C	

15 Calibrating CR conductivity sensors

**NOTE**

Calibration of the TC curve is possible only with automatic temperature acquisition.

15 Calibrating CR conductivity sensors

15.3 CR calibration routines



NOTE

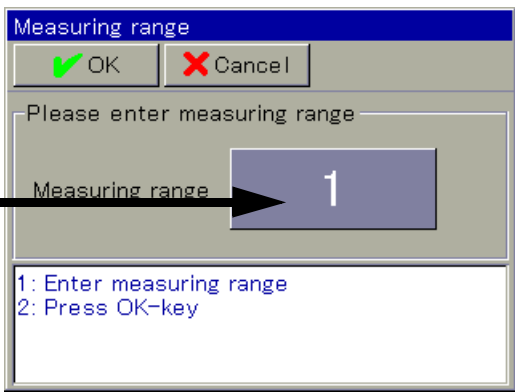
Conductivity measuring inputs can be configured with measuring range change-over. Accordingly, calibrations must be performed for all "accessible measuring ranges".



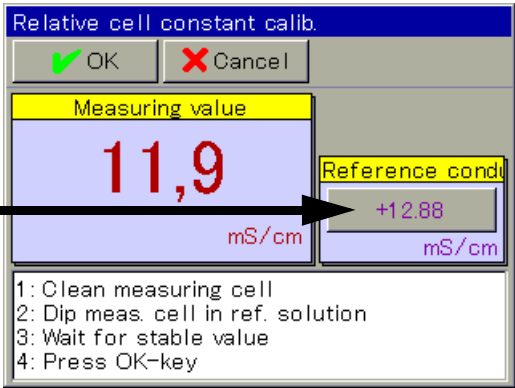
NOTE

You must be logged in with corresponding user rights to perform calibrations.
⇒ Chapter 8.2.1 "Log-on/Log-out", page 89

15.3.1 Calibrating the relative cell constant

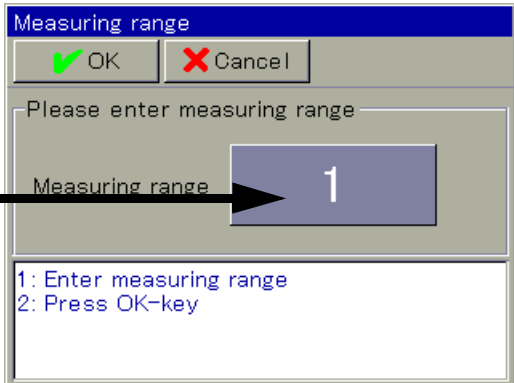
Step	Action
1	Start calibration of the relative cell constant. for conductivity sensors on analysis or universal inputs: Device Menu > Calibration > Select CR Analysis Input or Universal Input > Relative Cell Constant Calibration For CR optional boards, continue with step 2; for universal inputs set to the "conductivity measurement" operation mode, continue with step 3 for conductivity sensors with JUMO digiLine electronics: Device Menu > Calibration > Digital Sensor 1 to 6 > Relative Cell Constant Calibration
2	Enter one of the measuring ranges 1 to 4. Confirm the entry by pressing "OK" The calibration values determined apply only to the selected measuring range. Tap button to enter measuring range 

15 Calibrating CR conductivity sensors

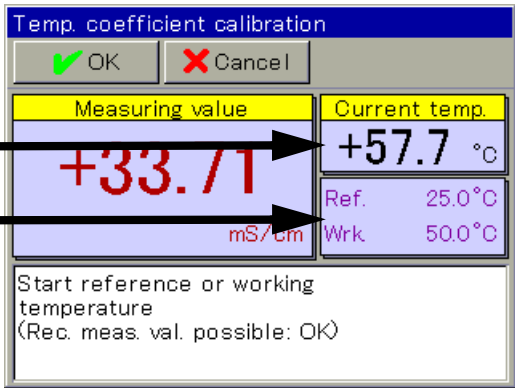
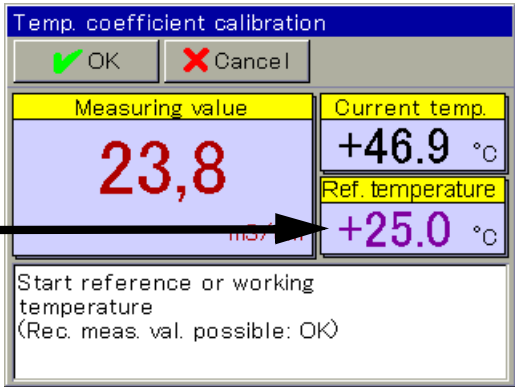
Step	Action
3	Ensure that - the sensor has been cleaned and is immersed in the test solution, - the set reference conductivity matches the conductivity value of the test solution. Wait until the measured value display stabilizes and then confirm the result of the measurement by pressing "OK". The preset reference conductivity can be changed here manually if necessary.  tap button to change reference conductivity field
4	A protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
5	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

15 Calibrating CR conductivity sensors

15.3.2 Calibrating the temperature coefficient

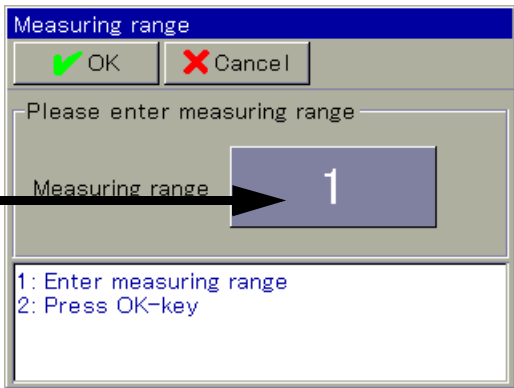
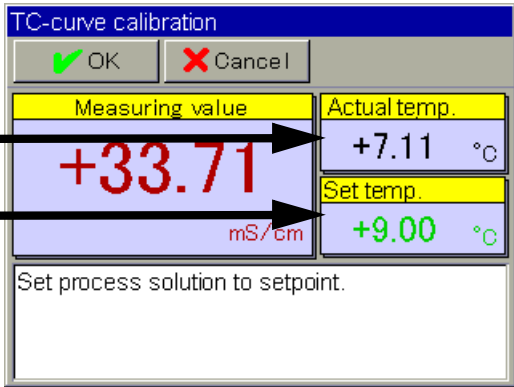
Step	Action
1	Start calibration of the temperature coefficient. for conductivity sensors on analysis or universal inputs: Device Menu > Calibration > Select CR Analysis Input or Universal Input > TC calibration for conductivity sensors with JUMO digiLine electronics: Device Menu > Calibration > Digital Sensor 1 to 6 > TC Calibration
2	Clean the sensor and immerse it in the sample solution. Ensure that the rel. cell constant is calibrated correctly (if necessary, make a trial measurement with a test solution). For CR optional boards, continue with step 3; for universal inputs set to the "conductivity measurement" operation mode, continue with step 4
3	Enter one of the measuring ranges 1 to 4. Confirm the entry by pressing "OK" The calibration values determined apply only to the selected measuring range. tap button to enter measuring field 

15 Calibrating CR conductivity sensors

Step	Action
4	with temperature acquisition A prerequisite is that temperature compensation was specified in the calibration the presets. Bring the temperature of the sample solution to the requested values of the reference and operation temperatures in succession. The order does not matter. Acquisition of the individual values takes place automatically. current temperature value  requested Temperature value Display after acquisition of first value  remaining requested Temperature value without temperature acquisition If temperature compensation was not specified in the calibration presets, you must control acquisition of the value manually. Bring the temperature of the sample solution first to the value of the reference temperature and confirm by pressing "OK". Then proceed in the same manner for the operation temperature.
5	A protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
6	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

15 Calibrating CR conductivity sensors

15.3.3 Calibrating the TC curve for JUMO digiLine CR

Step	Action
1	Start the desired calibration of the TC curve for JUMO digiLine CR for conductivity sensors with JUMO digiLine electronics: Device Menu > Calibration > Digital Sensor 1 to 6 > TC Curve
2	Clean the sensor and immerse it in the sample solution. Ensure that the rel. cell constant is calibrated correctly (if necessary, make a trial measurement with a test solution). for CR optional boards, continue with step 3; for universal inputs set to the "conductivity measurement" operating mode, continue with step 4
3	Enter one of the measuring ranges 1 to 4. Confirm the entry by pressing "OK" The calibration values determined apply only to the selected measuring range. tap button to enter measuring field 
4	Bring the temperature of the sample solution to the requested set-points in succession. Seven temperatures are requested. current temperature value  requested Temperature val-
5	A protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
6	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

15 Calibrating CR conductivity sensors

15 Calibrating CR conductivity sensors

16 Calibrating Ci conductivity sensors

16.1 Notes



WARNING!

During the calibration, the relays and analog output signals assume the states configured for the calibration! The response of the output signals is set for each output in its "Response at calibration" configuration point.

⇒ Chapter 10.7 "Analog outputs of base unit and optional boards", page 29

16.2 General information

The calibration of Ci sensors is based on measurements in test solutions with a defined electrolytic conductivity. Since the electrolytic conductivity of liquids is temperature dependent, the temperature of the test solution must be sensed. This requires either manual entry or measurement with the aid of a temperature sensor.

16.2.1 Calibration methods for Ci conductivity sensors (inductive)

Rel. cell constant

The deviation from the nominal cell constant of a Ci sensor is described by the relative cell constant. The rel. cell constant is determined by making a measurement in a test solution with a defined conductivity.

Temperature coefficient

The temperature coefficient is a measure of the temperature dependence of the electrolytic conductivity of a liquid. It is used to compensate for the effect of temperature when measuring the electrolytic conductivity. When performing a temperature-compensated conductivity measurement, the conductivity value measured is always indicated with reference to the fixed reference temperature. With the aid of the temperature coefficient, the value of the electrolytic conductivity displayed at the reference temperature is calculated from the current measured values of conductivity and temperature of the liquid.

The reference temperature is set in the configuration of the individual Ci analysis input or digital input with JUMO digiLine Ci.

⇒ Chapter 10.6.6 "CR/Ci analysis inputs (conductive/inductive conductivity)", page 24

⇒ Chapter "Only for sensors with JUMO digiLine CR/Ci", page 39

The temperature coefficient is determined from 2 measurements in a test solution at different temperatures (reference and operation temp.).



NOTE

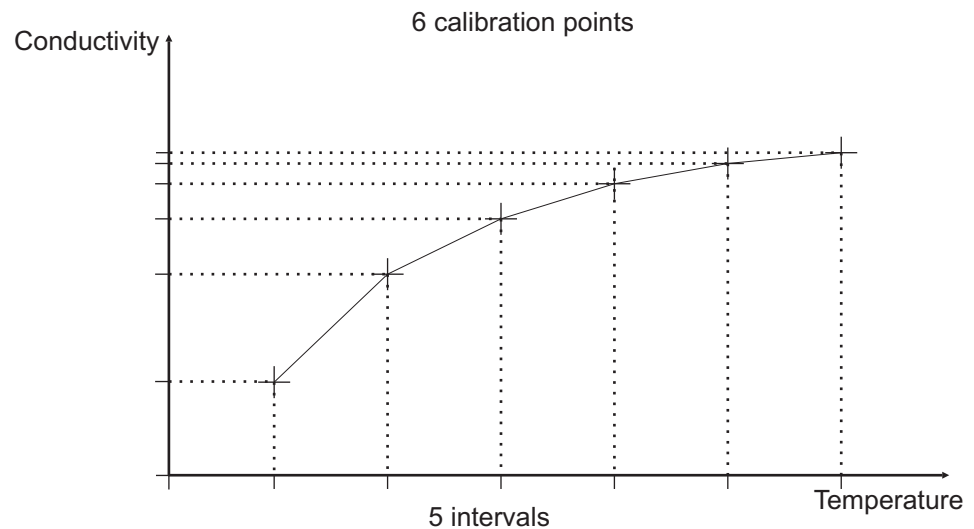
If the temperature coefficient of a sample solution is known, it can be entered directly.

⇒ Chapter 11.2.1 "General procedure for calibration", page 75

16 Calibrating Ci conductivity sensors

TC curve for conductivity sensors on analysis or universal inputs (for nonlinear temperature coefficients)

If the conductivity of a liquid whose temperature coefficient changes with temperature has to be measured, this method can determine 5 temperature coefficients for 5 temperature intervals. In this way, it is possible to determine a good approximation of the temperature coefficient curve. While the operator brings the sample solution to the temperature values requested by the device, the device determines the temperature coefficient for each interval. This requires installation of a temperature sensor that the device can use to sense the temperature of the sample solution.

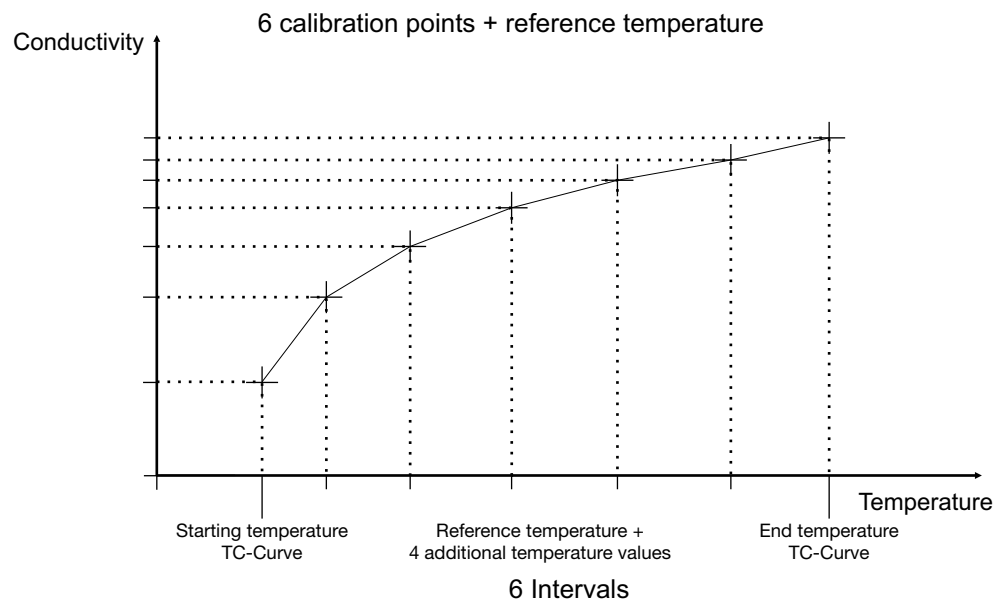


16 Calibrating Ci conductivity sensors

TC curve for JUMO digiLine Ci (for nonlinear temperature coefficients)

If the conductivity of a liquid whose temperature coefficient changes with temperature has to be measured, this method can determine 6 temperature coefficients for 6 temperature intervals. In this way, it is possible to determine a good approximation of the temperature coefficient curve. While the operator brings the sample solution to the temperature values requested by the device, the device determines the temperature coefficient for each interval. This requires installation of a temperature sensor that the device can use to sense the temperature of the sample solution. The series of temperature values consists of 7 values in total:

- Starting temperature and end temperature of the TC curve" (see calibration process for TC curve)
- Reference temperature (⇒ Chapter 10.11.2 "Configuration of digital sensors", page 36)
- 4 additional temperature values between the "starting temperature and end temperature of the TC curve"



16 Calibrating Ci conductivity sensors

16.2.2 Calibration presets for Ci conductivity sensors

Before you can perform a calibration, you must first enter the necessary calibration default settings. The possible settings for the Ci calibration are described in the following.

Open the calibration default settings:

for conductivity sensors on analysis inputs:

Device Menu > Calibration > Select Ci Analysis Input > Calibration Default Settings

for conductivity sensors with JUMO digiLine electronics:

Device Menu > Calibration > Digital Sensor 1 to 6 > Calibration Default Settings



NOTE

The "Calibration default settings" menu appears in the Device menu only if a user with corresponding user rights is logged in.
⇒ Chapter 8.2.1 "Log-on/Log-out", page 89

Sample screen:
Ci calibration presets

Calibration default setting

✓ OK ✗ Cancel

Release calibration routine

Calib. relative cell ☒

Calib. TC ☒

Calib. TC-curve ☒

Reference conduc. +12.880 mS/cm

The calibration default settings enable the calibration routines to be accessed in the particular calibration menu.

Calibration routines that are not enabled are not visible in the calibration menu. Additional calibration default settings are explained in the following table.

Calibration presets for calibrating the relative cell constant

Parameter	Possible settings	Explanation
Reference conductivity	0 to 9999 mS/cm	Conductivity of the reference solution

Calibration presets for calibrating the temperature coefficient

16 Calibrating Ci conductivity sensors

Parameter	Possible settings	Explanation
Temperature compensation	Selection from analog selection	Temperature input for automatic acquisition of the test/sample solution temperature during the calibration
Reference temperature	-50 to +150 °C	The conductivities of a sample solution at reference temperature and working temperature are captured during the calibration process. This yields 2 value pairs (temperature/conductivity). These value pairs provide the basis for calculating the temperature coefficient. The operation temp. must differ from the reference temperature by at least 5 °C.
Operation temp.	-50 to +150 °C	

16 Calibrating Ci conductivity sensors

Calibration presets for calibrating the TC curve

Parameter	Possible settings	Explanation
Compensation	Fixed compensation temperature, Temperature input, Interface	only for JUMO digiLine Ci Fixed compensation temperature: Compensation with a fixed temperature value that is entered in the configuration item "Compensation temperature". Temperature input: The integrated temperature probe of the conductivity sensor supplies the compensation temperature. Interface: The AQUIS touch P transmits the compensation temperature to the sensor electronics via the interface. The source of the compensation temperature is set in the configuration point "Compensation temperature".
Temperature compensation	Selection from analog selection	Temperature input for automatic acquisition of the test/sample solution temperature during the calibration
Starting temperature	-50 to +250 °C	The starting and final temperatures of the range for which a temperature coefficient curve is to be determined. The starting temperature must be at least 20 °C lower than the final temperature. The reference temperature for the measurement input must lie between the starting and final temperatures, and differ from the starting and final temperatures by at least 2 °C.
Final temperature	-50 to +250 °C	



NOTE

Calibration of the TC curve is possible only with automatic temperature acquisition.

16 Calibrating Ci conductivity sensors

16.3 Ci calibration routines



NOTE

Conductivity measuring inputs can be configured with measuring range change-over. Accordingly, calibrations must be performed for all "accessible measuring ranges".



NOTE

You must be logged in with corresponding user rights to perform calibrations.
⇒ Chapter 8.2.1 "Log-on/Log-out", page 89



NOTE

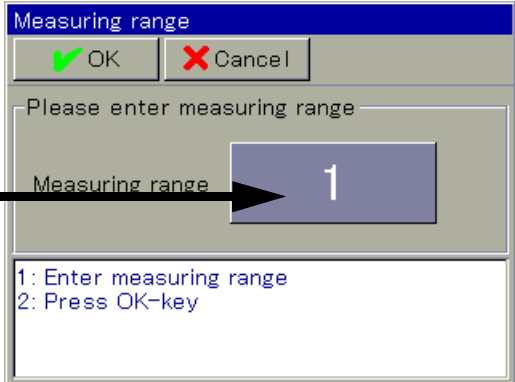
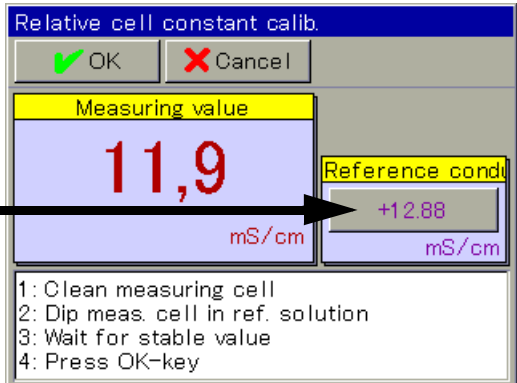
Analysis inputs for inductive conductivity measurements (Ci) must undergo a Ci base calibration in the course of commissioning. Subsequent calibration is not possible without this initial Ci base calibration.

⇒ Chapter 9.2 "Ci base calibration", page 114

16.3.1 Calibrating the relative cell constant

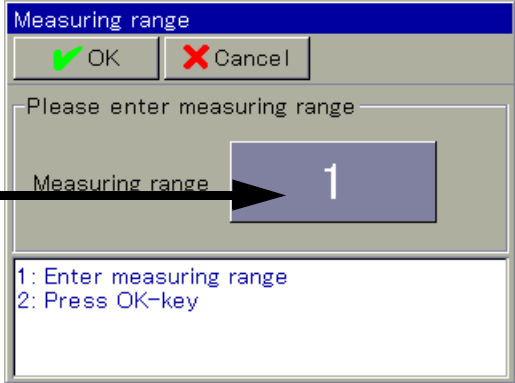
Step	Action
1	Start calibration of the relative cell constant. for conductivity sensors on analysis or universal inputs: Device Menu > Calibration > Select Ci Analysis Input or Universal Input > Relative Cell Constant Calibration For Ci optional boards, continue with step 2; for universal inputs set to the "conductivity measurement" operation mode, continue with step 3 for conductivity sensors with JUMO digiLine electronics: Device Menu > Calibration > Digital Sensor 1 to 6 > Relative Cell Constant Calibration

16 Calibrating Ci conductivity sensors

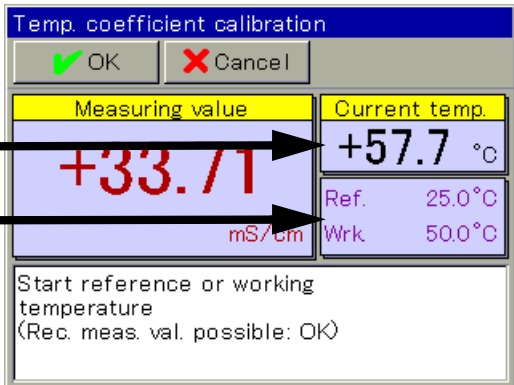
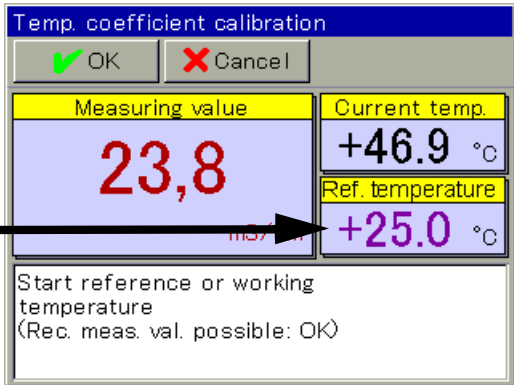
Step	Action
2	Enter one of the measuring ranges 1 to 4. Confirm the entry by pressing "OK" The calibration values determined apply only to the selected measuring range. tap button to enter measuring field 
3	Ensure that - the sensor has been cleaned and is immersed in the test solution, - the set reference conductivity matches the conductivity value of the test solution. Wait until the measured value display stabilizes and then confirm the result of the measurement by pressing "OK". The preset reference conductivity can be changed here manually if necessary. tap button to change reference conductivity field 
4	A protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
5	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

16 Calibrating Ci conductivity sensors

16.3.2 Calibrating the temperature coefficient (TC)

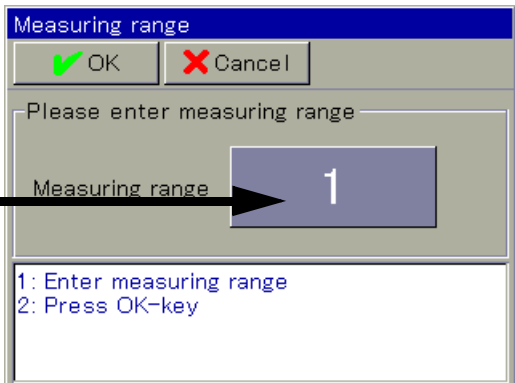
Step	Action
1	Start calibration of the temperature coefficient. for conductivity sensors on analysis or universal inputs: Device menu > Calibration > Select Ci analysis input or universal input > TC calibration for conductivity sensors with JUMO digiLine electronics: Device Menu > Calibration > Digital Sensor 1 to 6 > TC Calibration
2	Clean the sensor and immerse it in the sample solution. Ensure that the rel. cell constant is calibrated correctly (if necessary, make a trial measurement with a test solution). for Ci optional boards, continue with step 3; for universal inputs set to the "conductivity measurement" operating mode, continue with step 4
3	Enter one of the measuring ranges 1 to 4. Confirm the entry by pressing "OK" The calibration values determined apply only to the selected measuring range. tap button to enter measuring field 

16 Calibrating Ci conductivity sensors

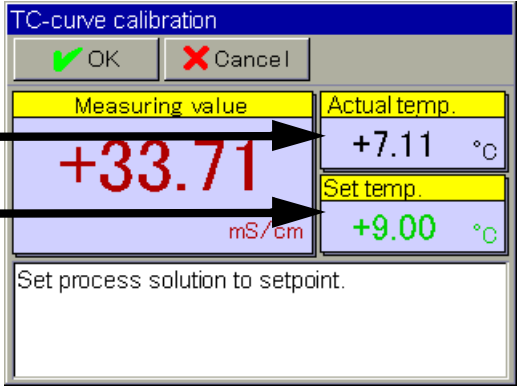
Step	Action
4	with temperature acquisition A prerequisite is that temperature compensation was specified in the calibration the presets. Bring the temperature of the sample solution to the requested values of the reference and operation temperatures in succession. The order does not matter. Acquisition of the individual values takes place automatically. current temperature value requested Temperature value  Display after acquisition of first value remaining requested Temperature value  without temperature acquisition If temperature compensation was not specified in the calibration presets, you must control acquisition of the value manually. Bring the temperature of the sample solution first to the value of the reference temperature and confirm by pressing "OK". Then proceed in the same manner for the operation temperature.
5	A Protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
6	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

16 Calibrating Ci conductivity sensors

16.3.3 Calibrating the TC curve

Step	Action
1	Start the desired calibration of the TC curve. for conductivity sensors on analysis or universal inputs: Device Menu > Calibration > Select Ci Analysis Input or Universal Input > TC Curve for conductivity sensors with JUMO digiLine electronics: Device Menu > Calibration > Digital Sensor 1 to 6 > TC Curve
2	Clean the sensor and immerse it in the sample solution. Ensure that the rel. cell constant is calibrated correctly (if necessary, make a trial measurement with a test solution). for Ci optional boards, continue with step 3; for universal inputs set to the "conductivity measurement" operating mode, continue with step 4
3	Enter one of the measuring ranges 1 to 4. Confirm the entry by pressing "OK" The calibration values determined apply only to the selected measuring range. tap button to enter measuring field 

16 Calibrating Ci conductivity sensors

Step	Action
4	Bring the temperature of the sample solution to the requested set-points in succession. The temperatures for the individual calibration points will be requested: • Six temperatures for Ci analysis inputs or universal input • Seven temperatures for JUMO digiLine Ci current temperature value requested Temperature val- 
5	A protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
6	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

17 Calibrating universal inputs

17.1 Notes



WARNING!

During the calibration, the relays and analog output signals assume the states configured for the calibration! The response of the output signals is set for each output in its "Response at calibration" configuration point.

⇒ Chapter 10.7 "Analog outputs of base unit and optional boards", page 29

17.2 General information

17.2.1 Calibration methods for universal inputs

Universal inputs can be configured with various operation modes for a number of different process variables (see table below).

Detailed information on the possible configurations:

⇒ Chapter 10.6.2 "Universal inputs of base unit and optional boards", page 17

Appropriate calibration routines for each operation mode of a universal input can be enabled in the calibration default settings.

The following table lists the availability of calibration routines for the individual operation modes.

Universal input Operation modes Calibration routine	linear scaling	Temp. measurement	pH value measurement	Conductivity measurement	free chlorine, pH/T-compensated
Zero-point calibration	X		X		
Slope calibration	X				X
Two-point Calibration	X		X		
Rel. cell constant				X	
Temperature coefficient				X	
TC curve				X	

Zero-point calibration

This calibration method is used to determine the zero point on the measurement characteristic curve. The slope is retained.

A test solution with a defined value of the respective measurand is needed as a reference.

Slope calibration

This calibration method is used to determine the slope of the measurement characteristic curve. The zero point is retained.

A test solution with a defined value of the respective measurand is needed as a reference.

17 Calibrating universal inputs

Two-point Calibration

The zero point and slope of the measuring characteristic curve are determined with the aid of 2 measurings of 2 different reference solutions.

Two test solutions with defined values of the respective measurand are needed as a references.

Calibrating rel. cell constants, temperature coefficients, and TC curves

The calibration routines for conductivity measuring with the universal input correspond to those for the Ci calibration.

⇒ Chapter 16 "Calibrating Ci conductivity sensors", page 109

17 Calibrating universal inputs

17.2.2 Universal inputs calibration default settings

Which calibration default settings are available depends on the configuration settings of the universal input.

Open the calibration default settings:

Device menu > Calibration > Select Universal Input >
Calibration default settings

Calibration default settings for the individual operation modes

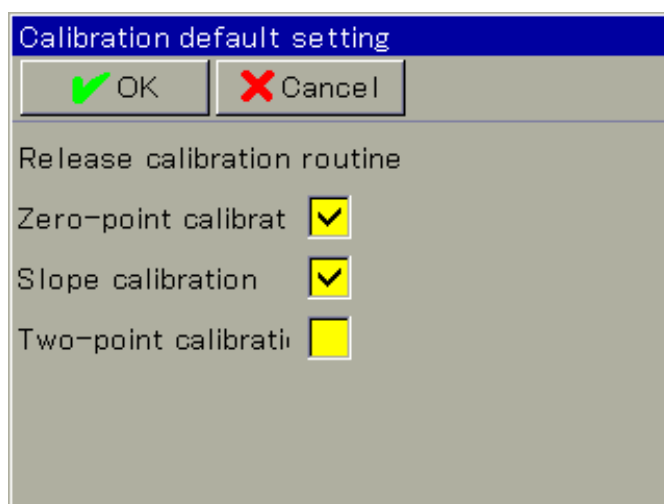
- **linear scaling**

The calibration default settings enable the calibration routines to be accessed in the particular calibration menu.

Calibration routines that are not enabled are not visible in the calibration menu. The "linear scaling" operation mode permits adjustment of the zero point, slope, and two-point calibration.

Sample screen:

Universal input calibration default settings in the "linear scaling" operation mode



- **pH value measurement**

The calibration default settings correspond to those for the zero-point and two-point calibration for pH/redox/NH₃ analysis inputs.

⇒ "pH calibration default settings", page 83

- **Conductivity measurement**

The calibration default settings correspond to those for the Ci calibration.

⇒ Chapter 16.2.2 "Calibration presets for Ci conductivity sensors", page 112

17 Calibrating universal inputs

- **free chlorine, pH/Temp.-compensated**

In the universal inputs calibration default settings for the "free chlorine, pH/T-compensated" operation mode, the slope calibration is enabled and preconfigured as the only available calibration routine.

Sample screen:
Universal input calibration default settings in the "free chlorine, pH/T-compensated" operation mode

Additional calibration default settings for calibration of chlorine sensors are explained in the following table.

Parameter	Possible settings	Explanation
Temperature compensation	Selection from Analog selection	Temperature input for automatic acquisition of the test/sample solution temperature during the calibration
pH compensation source	Selection from Analog selection	pH measurement input for automatic sensing of the test/sample solution pH value during the calibration



NOTE

The "Calibration default settings" menu appears in the Device menu only if a user with corresponding user rights is logged in.
⇒ Chapter 8.2.1 "Log-on/Log-out", page 89

17.3 Universal input calibration routines

This chapter explains the universal inputs calibration routines for the "linear scaling" and "free chlorine, pH/T-compensated" operation modes.

The explanations in the corresponding calibration chapters for the "pH value measurement" and "Conductivity measurement" operation modes apply, except that three-point calibration for pH sensors is not available for universal inputs (⇒ Chapter 17.2.1 "Calibration methods for universal inputs", page 121).

⇒ Chapter 12.3 "pH Calibration routines", page 85

⇒ Chapter 16.3 "Ci calibration routines", page 115



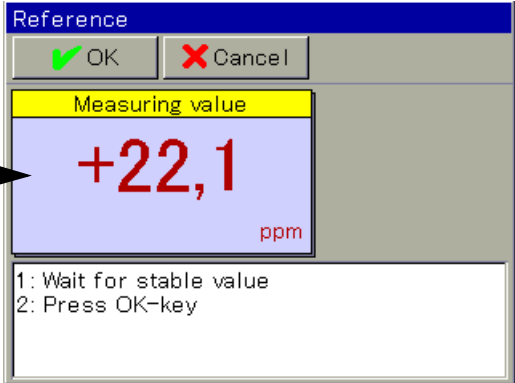
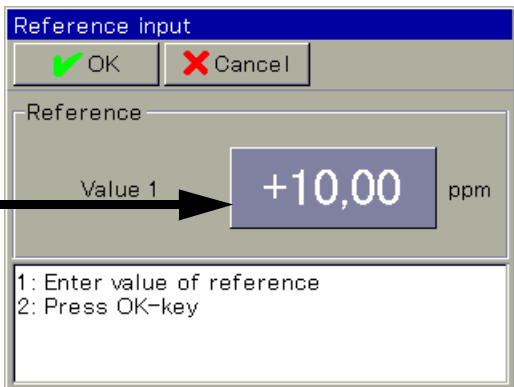
NOTE

You must be logged in with corresponding user rights to perform calibrations.

⇒ Chapter 8.2.1 "Log-on/Log-out", page 89

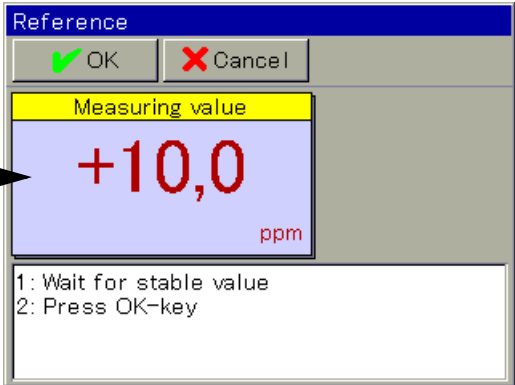
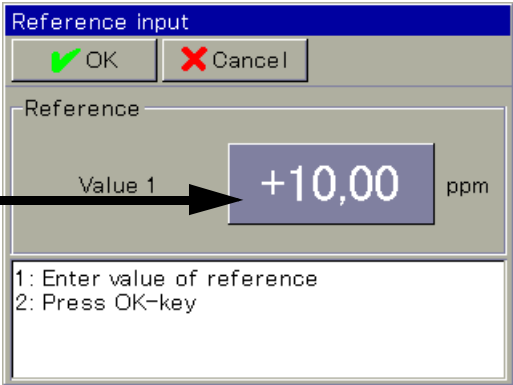
17 Calibrating universal inputs

17.3.1 Zero point/slope calibration (linear scaling)

Step	Action
1	Start the desired Calibration routine. Device menu > Calibration > Select Universal Input > Zero-point calibration
2	Clean the sensor and immerse it in the test solution. Wait until the measured value display stabilizes and then confirm the result of the measurement by pressing "OK". The measuring value is based on previous calibration values 
3	Enter the reference value of the test solution. Confirm by pressing "OK" Tap button to enter reference value of test solution 
4	A protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
5	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

17 Calibrating universal inputs

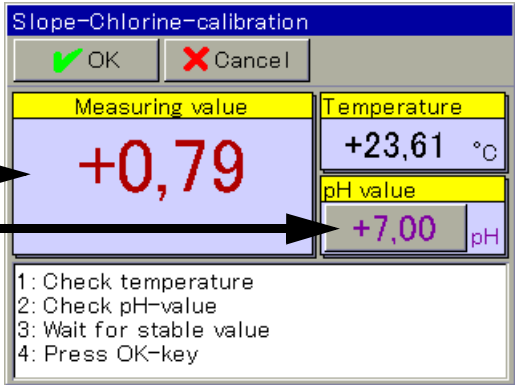
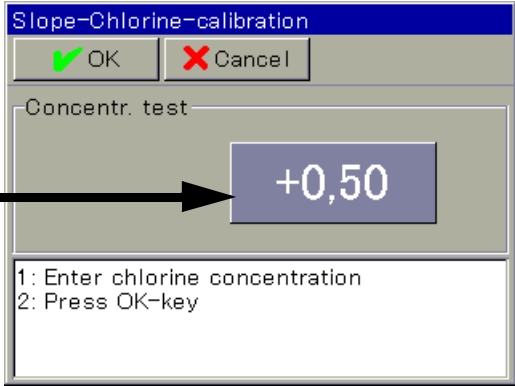
17.3.2 Two-point calibration (linear scaling)

Step	Action
1	Start the desired Calibration routine. Device menu > Calibration > Select Universal Input > Two-point calibration
2	Clean the sensor and immerse it in the first test solution. Wait until the measuring value displayed stabilizes and then confirm the result of the measurement by pressing "OK". Measuring value based on previous calibration values 
3	Enter the reference value of the first test solution. Tap button to enter reference value of test solution 
4	Clean the sensor and immerse it in the second reference solution. Wait until the measured value display stabilizes and then confirm the result of the measurement by pressing "OK".
5	As in step 3, enter the reference value of the second test solution. Confirm by pressing "OK".
6	A protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
7	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

17 Calibrating universal inputs

17 Calibrating universal inputs

17.3.3 Slope calibration (free chlorine, pH/Temp.-compensated)

Step	Action
1	Start the slope calibration. Device menu > Calibration > Select Universal Input > Slope Calibration
2	Clean the sensor and immerse it in the test solution.
3	Check the displayed values for the pH value and temperature. Automatic sensing can be configured in the calibration default settings for both measurands independently of one another. With automatic acquisition, the particular influencing variable is only displayed and can no longer be changed here. Without automatic acquisition, the particular influencing variable must be entered manually here. Wait until the measured value displayed stabilizes and then check the pH value displayed. Then confirm by pressing "OK". Example with temperature acquisition and without pH value acquisition Measuring value based on previous calibration values Tap button to enter pH value of test solution 
4	Enter the concentration value of the test solution. Confirm by pressing "OK" Tap button to enter chlorine concentration 

17 Calibrating universal inputs

Step	Action
5	A protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
6	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

18 Calibrating O-DO sensors

18.1 Notes



WARNING!

During the calibration, the relays and analog output signals assume the states configured for the calibration! The response of the output signals is set for each output in its "Response at calibration" configuration point.

⇒ Chapter 10.7 "Analog outputs of base unit and optional boards", page 29

The duration of the calibration processes can then be tracked in the event list of the JUMO AQUIS touch.

18.2 General information

The sensors are calibrated ex works, meaning that no calibration is required before initial startup. If the measured values appear implausible during operation, the sensors should be calibrated. The various calibration methods for JUMO oxygen sensors are described in detail below.



NOTE

JUMO digital sensors can be calibrated on both the JUMO AQUIS touch P and on the PC using the JUMO DSM software. Further information in this regard can be found in the operating manual of the sensor type.

Before starting the calibration processes, ensure stable environmental influences and give your calibration setup enough time to achieve a stable physical and chemical state. To ensure successful calibration, the calibration sample should therefore be kept at room temperature in the open sample vessel for 30 minutes before the start of calibration. An equilibrium in the gas exchange between the calibration sample and ambient air is therefore established. Prevent interfering factors in the direct surroundings of the calibration setup such as direct sunlight, drafts, etc.



NOTE

The **JUMO digiLine O-DO S10** sensor ideally needs 10 to 15 minutes of warm-up time after being switched on. Measurements can be taken in this time. For an optimal calibration, however, the process should not be started until the warm-up time has lapsed.



NOTE

JUMO digiLine O-DO H10 and **H20** sensors are calibrated using test solutions or test gases. Depending on the humidity content of the calibration medium, a distinction must be drawn between the "Humid" and "Dry" mode in the sensor's calibration default setting.

The "Humid" mode must always be selected for test solutions. For test gases, "Humid" should be selected for a humidity content of over 50 % and "Dry" for a humidity content below 50 %.

18 Calibrating O-DO sensors

18.2.1 Calibration methods for O-DO sensors

Zero point calibration

The zero point of the oxygen saturation characteristic line is determined with this calibration. The slope is retained.

An oxygen-free measurement medium is required as a reference. The zero-point calibration is commonly carried out in water treated with sodium sulfite (sodium sulfite concentration < 2 %).

In the case of the **JUMO ecoLine O-DO** sensor, the zero-point calibration is only performed together with the end-value calibration as a two-point calibration.

In the case of the **JUMO digiLine O-DO H10/H20**, the "Humid" measurement mode needs to be selected for the calibration method with sodium sulfite solution in the calibration default setting.

A zero-point calibration of the JUMO digiLine O-DO H10/H20 with nitrogen gas (nitrogen 5.0) is also possible under laboratory conditions.

During calibration with humidified gas, the "Humid" measurement mode must be set for this in the calibration default setting and the "Dry" measurement mode must be set in the case of direct supply of the nitrogen gas without prior humidification.

End-value or slope calibration (all O-DO sensors except JUMO digiLine O-DO H20)

With end-value calibration, the end value of the measurement characteristic curve is calibrated at the defined state of 100 % oxygen saturation.

This state can in principle be achieved in the following ways:

- By positioning the sensor in water vapor-saturated air (for example, directly over a water surface).
- By positioning the sensor in air-saturated water (air is directed through water until the water is saturated with it).

In the case of the JUMO digiLine O-DO H10, the "Humid" measurement mode must be set in the calibration default setting for these two calibration methods.

- Positioning of the sensor in an oxygen calibration gas with an oxygen content of 20.9 % vol.

In the case of the JUMO digiLine O-DO H10, the "Humid" measurement mode must be set in the calibration default setting for this calibration method for humidified gas and the "Dry" measurement mode must be set in the case of direct supply of the oxygen calibration gas without prior humidification.



NOTE

As the manufacturing of air-saturated water requires a high level of effort and is difficult to reproduce, the easier process of calibration in water vapor-saturated air is recommended for the operational calibration.

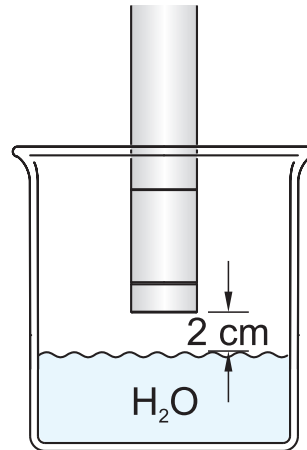
18 Calibrating O-DO sensors



NOTE

The basic design for the calibration methods of the JUMO digiLine O-DO H10 and H20 sensors is described in their operating manual.

Positioning the sensor in the water vapor-saturated air



To achieve successful calibration, the following points must be taken into account:

- The sensor membrane must be kept dry during the calibration process. Drops of water adhering to the sensor membrane could distort the measurement result.
- The air pressure and temperature must remain constant during the calibration.

End-value or slope calibration of JUMO digiLine O-DO H20 (trace sensor)

With the end-value calibration of this sensor, the end value of the measurement characteristic line is calibrated using an oxygen calibration gas with an oxygen content of 1 to 2 % vol.

The "Humid" measurement mode must be set in the calibration default setting for this calibration method for humidified gas and the "Dry" measurement mode must be set in the case of direct supply of the oxygen calibration gas without prior humidification.

Two-point calibration (all O-DO sensors)

The two-point calibration is a combination of zero-point and end-value calibration. This calibration method offers the greatest possible level of accuracy and is particularly recommended for measurements of low concentration values.

18 Calibrating O-DO sensors

18.2.2 Calibration default settings for O-DO sensors

Before you can perform a calibration, you must first enter the necessary calibration default settings. The possible settings for the O-DO calibration are described in the following.

Open the calibration default settings:
Device Menu > Calibration > Digital Sensor 1 to 6 >
Calibration Default Settings



NOTE

The "Calibration default settings" menu appears in the Device menu only if a user with corresponding user rights is logged in. The "Calibration default settings" menu for a digital sensor is visible for the digital sensor concerned only when it is linked.

⇒ Chapter 8.2.1 "Log-on/Log-out", page 89

⇒ Chapter 8.2.7 "Digital sensors", page 95

Sample screen:
Calibration default settings
for the
JUMO digiLine O-DO S10

Sample screen:
Calibration default settings
for
JUMO digiLine O-DO H10
JUMO digiLine O-DO H20

18 Calibrating O-DO sensors

Sample screen:
Calibration default settings
for the JUMO ecoLine O-
DO

The screenshot shows a software dialog box titled "Calibration default setting" with a blue header bar. Below the header are two buttons: "OK" with a green checkmark icon and "Cancel" with a red X icon. The main area of the dialog contains the following settings:

- "Release calibration routine" is a label.
- "End value-Calibrati" is a label followed by a checked checkbox.
- "Two-point calibrati" is a label followed by a checked checkbox.
- "Compensation" is a label followed by a text box containing "Sensor temperature".
- "Compensation temp." is a label in a lighter blue font.

18 Calibrating O-DO sensors

O-DO calibration default settings

The calibration default settings enable the calibration routines to be accessed in the particular calibration menu.
Calibration routines that are not enabled are not visible in the calibration menu.

Additional calibration default settings, which are available for the **JUMO eco-Line O-DO** as well, are explained in the following table.

Parameter	Possible settings	Explanation
Compensation	Fixed compensation temperature Temperature input Interface	Fixed compensation temperature: Compensation with a fixed temperature value that is entered in the configuration item "Compensation temperature". Temperature input: The integrated temperature probe of the O-DO sensor supplies the compensation temperature. Interface: The AQUIS touch P transmits the compensation temperature to the sensor electronics via the interface. The source of the compensation temperature is set in the configuration point "Compensation temperature".
Temperature compensation	Selection from Analog selection	Temperature input for automatic acquisition of the test/sample solution temperature during the calibration

An additional calibration default setting that is also available for the JUMO digiLine O-DO H10/H20 sensors is explained in the following table.

Parameter	Possible settings	Explanation
Measurement mode	Humid Dry	Humid: Select this if the sensor is to be calibrated in a liquid measurement medium or in a gaseous measurement medium with a humidity content > 50 %. Dry: Select this if the sensor is to be calibrated in a gaseous measurement medium with a humidity content < 50 %.



NOTE

For JUMO digiLine O-DO H10/H20 sensors, the measurement mode can be set **both in the configuration and in the calibration default settings**. Once the calibration is finished, the sensors return to the mode that was set **in the configuration**.

18.3 O-DO calibration routine

18 Calibrating O-DO sensors



NOTE

For the JUMO digiLine O-DO H10/H20 and JUMO digiLine O-DO S10 sensors, the compensation settings and measuring units from the configuration also apply during calibration. Before calibration, it is necessary to check whether these settings are valid for the conditions during the calibrations. It may be necessary to adjust the configuration for the calibration process and reset it to the process conditions when the calibration is complete.

The sensors acquire the oxygen partial pressure as the process variable and convert it internally into the set unit.

Therefore, a unit different to the one used for measurement mode in the process can be used during the calibration.

⇒ Chapter "Only for sensors of the JUMO digiLine O-DO H10/H20 types", page 44

⇒ Chapter "Only for sensors of the JUMO digiLine O-DO S10 types", page 48



NOTE

You must be logged in with corresponding user rights to perform calibrations.

⇒ Chapter 8.2.1 "Log-on/Log-out", page 89



NOTE

Digital sensors need to be linked before they can be calibrated.

⇒ Chapter 8.2.7 "Digital sensors", page 95

18 Calibrating O-DO sensors

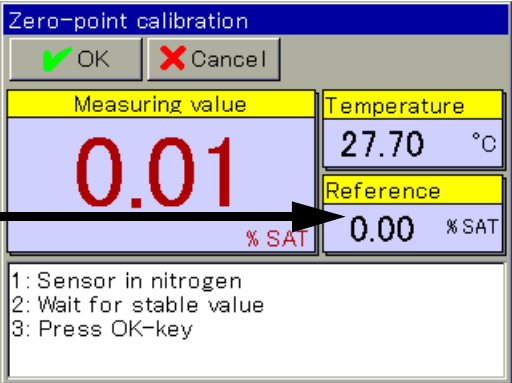
18.3.1 JUMO digiLine O-DO H10 and H20 Humid zero-point calibration

Step	Action
1	Prepare a stable calibration setup and an oxygen-free reference specimen. ⇒ Chapter 18.2.1 "Calibration methods for O-DO sensors", page 132. The basic design for this calibration is also described in the sensor's operating manual.
2	Place the oxygen sensor in the calibration setup. Leave the reference specimen in the open sample vessel for some time to reach chemical and physical equilibrium. Make sure that the calibration setup, with the reference specimen, guarantees consistent environmental influences throughout the calibration process.
3	Ensure that the oxygen unit is configured to "% SAT" (if using oxygen-free water as a reference) for measuring the oxygen content. Call up Device Menu > Configuration > Digital Sensors > Digital Sensors 1 to 6 > Configuration.
4	Ensure that the measurement mode is set to "Humid" in the calibration default settings of the sensor. Call up Device Menu > Calibration > Digital Sensor 1 to 6 > Calibration Default Setting.
5	When the measured value and temperature are stable, start the zero-point calibration. Call up Device Menu > Calibration > Digital Sensor 1 to 6 > Zero-Point Calibration.
6	Wait until the measured value has stabilized. Zero-point calibration ✓ OK ✗ Cancel Measuring value: 5.77 Temperature: 27.70 °C Reference: 0.00 % SAT 1: Sensor in sodium sulfite sol. 2: Wait for stable value 3: Press OK-key Specified reference value for the oxygen saturation
7	When the measured value display is stable, confirm the result of the measurement by pressing "OK". The calibration values determined are applied and the calibration is entered in the calibration logbook.

18 Calibrating O-DO sensors

Step	Action
8	If the calibration ends successfully, a protocol summarizing determined calibration values appears. Acknowledge the protocol by pressing "OK". This concludes the calibration process.

18.3.2 JUMO digiLine O-DO H10 and H20 Dry zero-point calibration

Step	Action
1	Prepare a stable calibration setup with an oxygen-free reference environment , e.g. a measurement chamber with oxygen-saturated atmosphere (nitrogen gas 5.0). The basic design for this calibration is described in the sensor's operating manual.
2	Place the oxygen sensor in the calibration setup. Make sure that the calibration setup, with the oxygen-free reference environment, guarantees consistent environmental influences throughout the calibration process.
3	Ensure that the measurement mode is set to " Dry " in the calibration default settings of the sensor. Call up Device Menu > Calibration > Digital Sensor 1 to 6 > Calibration Default Setting.
4	When the measured value and temperature are stable, start the zero-point calibration. Call up Device Menu > Calibration > Digital Sensor 1 to 6 > Zero-Point Calibration.
5	Wait until the measured value has stabilized. Specified reference value for the oxygen saturation 
6	When the measured value display is stable, confirm the result of the measurement by pressing "OK". The calibration values determined are applied and the calibration is entered in the calibration logbook.
7	If the calibration ends successfully, a protocol summarizing determined calibration values appears. Acknowledge the protocol by pressing "OK". This concludes the calibration process.

18 Calibrating O-DO sensors

18.3.3 JUMO digiLine O-DO H10 Humid end-value calibration

Step	Action
1	Prepare a stable calibration setup with water vapor-saturated air or oxygen-saturated water. ⇒ Chapter 18.2.1 "Calibration methods for O-DO sensors", page 132. The basic design for this calibration is also described in the sensor's operating manual.
2	Place the oxygen sensor in the calibration setup. Make sure that the calibration setup, with the reference specimen, guarantees consistent environmental influences throughout the calibration process.
3	Ensure that the oxygen unit is configured to "% SAT" for measuring the oxygen content. Call up Device Menu > Configuration > Digital Sensors > Digital Sensors 1 to 6 > Configuration.
4	Ensure that the measurement mode is set to "Humid" in the calibration default settings of the sensor. Call up Device Menu > Calibration > Digital Sensor 1 to 6 > Calibration Default Setting.
5	When the measured value and temperature are stable, start the end-point calibration (slope calibration). Call up Device Menu > Calibration > Digital Sensor 1 to 6 > Zero-Point Calibration.
6	Wait until the measured value has stabilized. Editable reference value for the oxygen saturation 1: Sensor in O₂-saturated water 2: Wait for stable value 3: Press OK-key
7	You can change the reference value by pressing the default value ("100.00" in the example). You can enter the reference value you want in the window that opens.
8	When the measured value display is stable, confirm the result of the measurement by pressing "OK". The calibration values determined are applied and the calibration is entered in the calibration logbook.

18 Calibrating O-DO sensors

Step	Action
9	If the calibration ends successfully, a protocol summarizing determined calibration values appears. Acknowledge the protocol by pressing "OK". This concludes the calibration process.

18.3.4 JUMO digiLine O-DO H10 and H20 Dry end-value calibration

Step	Action
1	Prepare a stable calibration setup with an oxygen calibration gas with the oxygen content required for the end-value calibration: 20.9 % vol for the JUMO digiLine O-DO H10 sensor 1 to 2 % vol for the JUMO digiLine O-DO H20 sensor The basic design for this calibration is described in the sensor's operating manual.
2	Place the oxygen sensor in the calibration setup. Make sure that the calibration setup, with the reference environment, guarantees consistent environmental influences throughout the calibration process.
3	Ensure that the oxygen unit is configured to "% SAT" for measuring the oxygen content. Call up Device Menu > Configuration > Digital Sensors > Digital Sensors 1 to 6 > Configuration.
4	Ensure that the measurement mode is set to " Dry " in the calibration default settings of the sensor. Call up Device Menu > Calibration > Digital Sensor 1 to 6 > Calibration Default Setting.
5	When the measured value and temperature are stable, start the end-point calibration (slope calibration). Call up Device Menu > Calibration > Digital Sensor 1 to 6 > Zero-Point Calibration.
6	Wait until the measured value has stabilized.
7	You can change the reference value by pressing the default value ("2.00" in the example). You can enter the reference value you want in the window that opens.

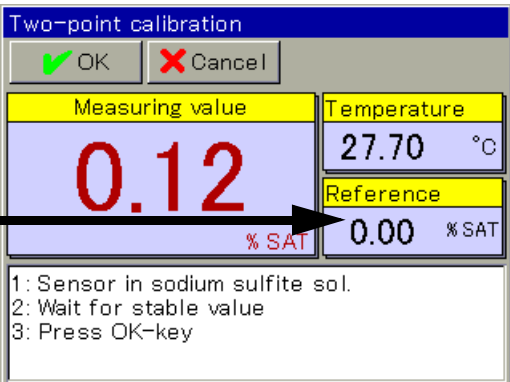
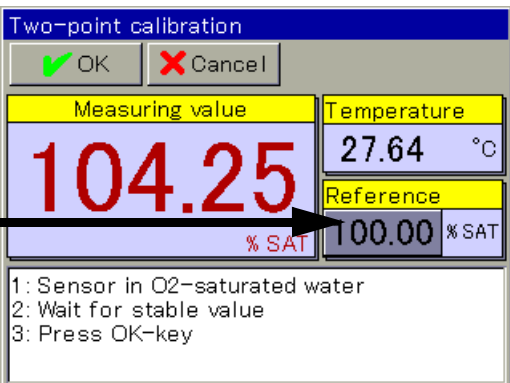
18 Calibrating O-DO sensors

Step	Action
8	When the measured value display is stable, confirm the result of the measurement by pressing "OK". The calibration values determined are applied and the calibration is entered in the calibration logbook.
9	If the calibration ends successfully, a protocol summarizing determined calibration values appears. Acknowledge the protocol by pressing "OK". This concludes the calibration process.

18.3.5 JUMO digiLine O-DO H10 Humid two-point calibration

Step	Action
1	Prepare both a stable calibration setup with oxygen-free water (for the zero-point calibration) and a stable calibration setup with oxygen-saturated water or water vapor-saturated air (for the end-value calibration). ⇒ Chapter 18.2.1 "Calibration methods for O-DO sensors", page 132. The basic design for these calibrations is also described in the sensor's operating manual.
2	Place the oxygen sensor in the calibration setup with oxygen-free water . Make sure that the calibration setup, with the reference specimen, guarantees consistent environmental influences throughout the calibration process. Leave the reference specimen in the open sample vessel for some time to reach chemical and physical equilibrium.
3	Ensure that the oxygen unit is configured to "% SAT" for measuring the oxygen content. Call up Device Menu > Configuration > Digital Sensors > Digital Sensors 1 to 6 > Configuration.
4	Ensure that the measurement mode is set to " Humid " in the calibration default settings of the sensor. Call up Device Menu > Calibration > Digital Sensor 1 to 6 > Calibration Default Setting.
5	When the measured value and temperature are stable, start the two-point calibration. Device Menu > Calibration > Digital Sensor 1 to 6 > Two-Point Calibration The device starts with the zero-point calibration.

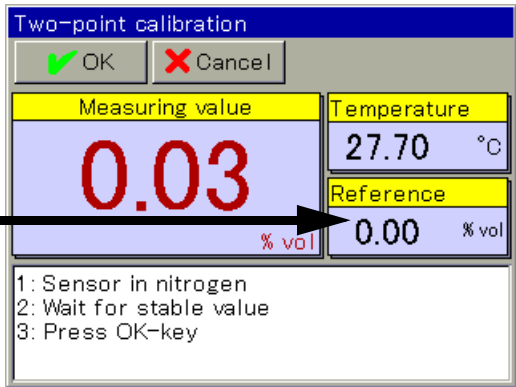
18 Calibrating O-DO sensors

Step	Action
6	Wait until the measured value has stabilized.  Specified reference value for the oxygen saturation 1: Sensor in sodium sulfite sol. 2: Wait for stable value 3: Press OK-key
7	When the measured value display is stable, confirm the result of the measurement by pressing "OK". The calibration values determined for the zero point are applied and the calibration is entered in the calibration logbook.
8	If the zero point calibration ends successfully, a protocol summarizing determined calibration values appears. Acknowledge the protocol by pressing "OK". The device switches to end value calibration.
9	Place the oxygen sensor in the calibration setup with oxygen-saturated water or water vapor-saturated air. The basic design for this calibration is described in the sensor's operating manual. Make sure that the calibration setup, with the reference specimen, guarantees consistent environmental influences throughout the calibration process.
10	Wait until the measured value has stabilized.  Editable reference value for the oxygen saturation 1: Sensor in O2-saturated water 2: Wait for stable value 3: Press OK-key
11	You can change the reference value by pressing the default value ("100.00" in the example). You can enter the reference value you want in the window that opens.
12	When the measured value display is stable, confirm the result of the measurement by pressing "OK". The calibration values determined for the end value are applied and the calibration is entered in the calibration logbook.

18 Calibrating O-DO sensors

Step	Action
13	If the calibration ends successfully, a protocol summarizing determined calibration values appears. Acknowledge the protocol by pressing "OK". This concludes the calibration process.

18.3.6 JUMO digiLine O-DO H20 Dry two-point calibration

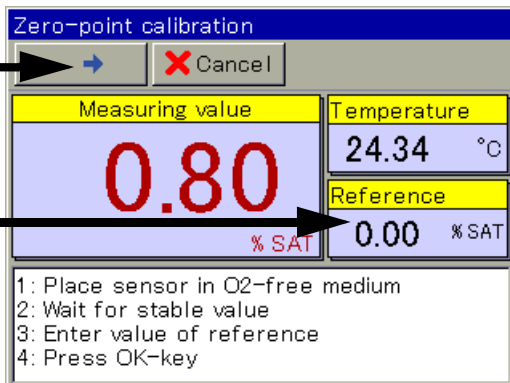
Step	Action
1	Prepare a stable calibration setup, e.g. with a measurement chamber. The measurement chamber should be able to be filled both with an oxygen-free reference environment (e.g. nitrogen calibration gas) and with a reference environment with the oxygen content required for the end-value calibration (1 to 2 % vol). The basic design for this calibration is described in the sensor's operating manual.
2	Place the oxygen sensor in the measurement chamber and ensure an oxygen-free reference environment . Make sure that the calibration setup, with the reference environment, guarantees consistent environmental influences throughout the calibration process.
3	Ensure that the oxygen unit is configured to " % vol " for measuring the oxygen content. Call up Device Menu > Configuration > Digital Sensors > Digital Sensors 1 to 6 > Configuration.
4	Ensure that the measurement mode is set to " Dry " in the calibration default settings of the sensor. Call up Device Menu > Calibration > Digital Sensor 1 to 6 > Calibration Default Setting.
5	When the measured value and temperature are stable, start the two-point calibration. Device Menu > Calibration > Digital Sensor 1 to 6 > Two-Point Calibration The device starts with the zero-point calibration.
6	Wait until the measured value has stabilized. Specified reference value for the oxygen saturation 

18 Calibrating O-DO sensors

Step	Action
7	When the measured value display is stable, confirm the result of the measurement by pressing "OK". The calibration values determined for the zero point are applied and the calibration is entered in the calibration logbook.
8	If the zero point calibration ends successfully, a protocol summarizing determined calibration values appears. Acknowledge the protocol by pressing "OK". The device switches to end value calibration.
9	Ensure a reference environment with the oxygen content required for the end-value calibration in the reference setup measurement chamber. Make sure that the calibration setup, with the reference environment, guarantees consistent environmental influences throughout the calibration process.
10	Wait until the measured value has stabilized. Editable reference value for the oxygen saturation
11	You can change the reference value by pressing the default value ("2.00" in the example). You can enter the reference value you want in the window that opens.
12	When the measured value display is stable, confirm the result of the measurement by pressing "OK". The calibration values determined for the end value are applied and the calibration is entered in the calibration logbook.
13	If the calibration ends successfully, a protocol summarizing determined calibration values appears. Acknowledge the protocol by pressing "OK". This concludes the calibration process.

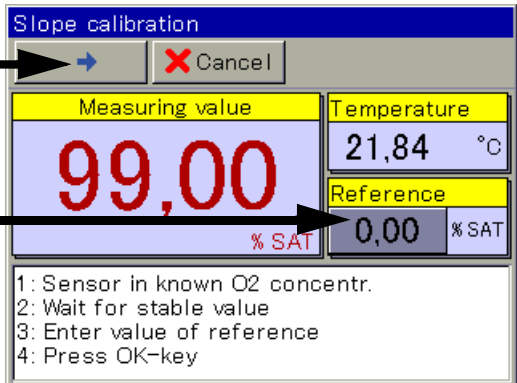
18.3.7 Zero-point calibration with JUMO digiLine O-DO S10

18 Calibrating O-DO sensors

Step	Action
1	Prepare a stable calibration setup and an oxygen-free reference specimen with clean water. Place the oxygen sensor in your calibration setup. Make sure that the calibration setup, with the reference specimen, guarantees consistent environmental influences throughout the calibration process. Leave the reference specimen in the open sample vessel for several minutes to reach chemical and physical equilibrium.
2	When measured value and temperature are stable, start the zero-point calibration. Device Menu > Calibration > Digital Sensor 1 to 6 > Open Zero-Point Calibration
3	Wait at least 90 seconds until the "OK" button is active. During the waiting time of 90 seconds a blue arrow runs through the button. Only then can it be pressed to confirm the calibration. Wait 90 seconds until the "OK" button is active Specified reference value for the oxygen saturation 
4	After the waiting time has elapsed and the measured value display is stable, confirm the result of the measurement by pressing "OK"
5	Successful calibration: If the calibration ends successfully, a protocol summarizing determined calibration values appears. Acknowledge the protocol by pressing "OK". The calibration values determined are applied and enter the calibration in the Calibration logbook. This concludes the calibration process. Calibration error: Failed calibrations result in an error message at this point. By pressing the "OK" button, the calibration can be repeated by returning to step 2. With the "Cancel" button, the calibration process is ended at this point without any results. Within a calibration process, the calibration can be repeated up to 4 times by returning to step 2. Then the calibration process has to be ended without any results by pressing "Cancel".

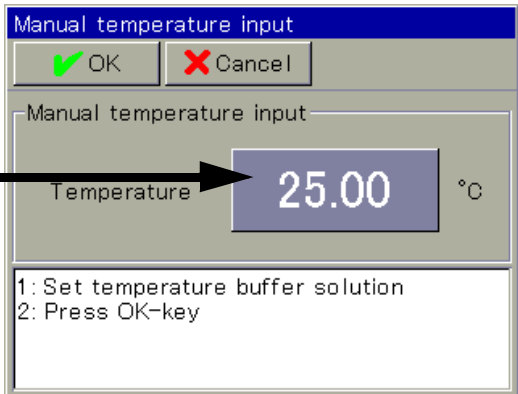
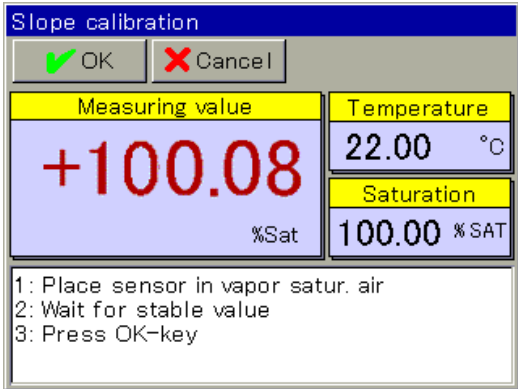
18 Calibrating O-DO sensors

18.3.8 End value calibration for JUMO digiLine O-DO S10

Step	Action
1	Prepare a stable calibration setup and a reference specimen of known oxygen concentration with clean water. Place the oxygen sensor in the calibration setup. Make sure that the calibration setup, with the reference specimen, guarantees consistent environmental influences throughout the calibration process. Leave the reference specimen in the open sample vessel for at least 30 minutes to reach chemical and physical equilibrium.
2	Start the end value calibration. Go to Device Menu > Calibration > Digital Sensor 1 to 6 > End Value Calibration
3	Enter the known oxygen concentration of your calibration sample as the reference value. If you leave the reference value at the value 0 %, the calibration is automatically carried out with the reference value 100 %. Wait at least 90 seconds until the "OK" button is active. During the waiting time of 90 seconds a blue arrow runs through the button. Only then can it be pressed to confirm the calibration. Wait 90 seconds until the "OK" button is active Tap to enter the reference value of the oxygen saturation 
4	After the waiting time has elapsed and the measured value display is stable, confirm the result of the measurement by pressing "OK"
5	Successful calibration: If the calibration ends successfully, a protocol summarizing determined calibration values appears. Acknowledge the protocol by pressing "OK". The calibration values determined are applied and enter the calibration in the Calibration logbook. This concludes the calibration process. Calibration error: Failed calibrations result in an error message at this point. By pressing the "OK" button, the calibration can be repeated by returning to step 2. With the "Cancel" button, the calibration process is ended at this point without any results. Within a calibration process, the calibration can be repeated up to 4 times by returning to step 2. Then the calibration process has to be ended without any results by pressing "Cancel".

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18.3.9 End value calibration for JUMO ecoLine O-DO

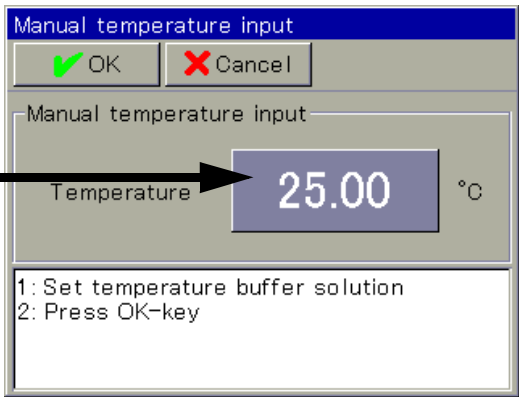
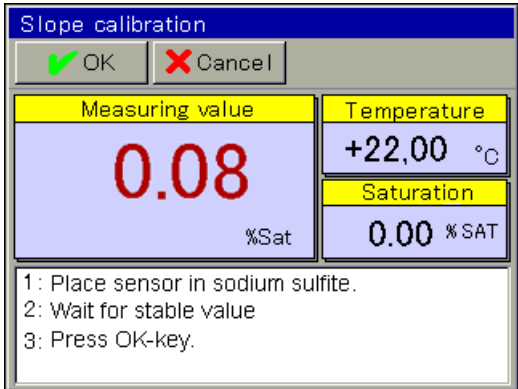
Step	Action
1	Start the end value calibration. Device Menu > Calibration > Digital Sensor 1 to 6 > End Value Calibration
2	If temperature compensation was not specified in the calibration default settings, enter the temperature of the air-saturated water or the water vapor-saturated air here manually. If temperature compensation was specified, the temperature is determined automatically. Tap button to enter temperature 
3	Immerse the sensor in air-saturated water or position it in water vapor-saturated air (⇒ Chapter 18.2.1 "Calibration methods for O-DO sensors", page 132). If you use water vapor-saturated air, ensure constant air pressure, constant temperature and that no water drops adhere to the membrane during the calibration procedure. Wait until the measured value display stabilizes and then confirm the result of the measurement by pressing "OK".
4	The device displays the current measured value of oxygen saturation and the test material temperature. The setpoint value for oxygen saturation (100 % sat.) is set automatically by the device. The user does not need to make any entries here. 
5	Wait until the measured value displayed stabilizes and then confirm the result of the measurement by pressing "OK"

18 Calibrating O-DO sensors

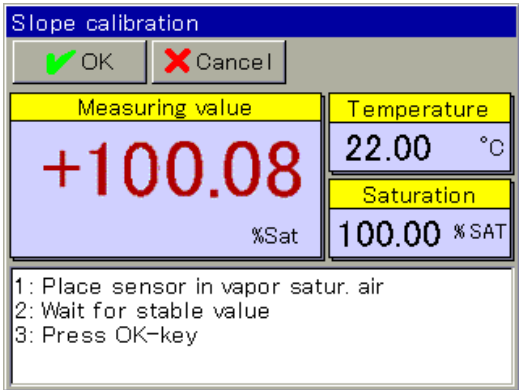
Step	Action
6	A protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
7	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

18 Calibrating O-DO sensors

18.3.10 Two-point calibration for JUMO ecoLine O-DO

Step	Action
1	Start the two-point calibration. Device Menu > Calibration > Digital Sensor 1 to 6 > Two-Point Calibration
2	To determine the zero point, prepare a water sulfite solution (sulfite concentration < 2 %).
3	If temperature compensation was not specified in the calibration default settings, enter the temperature of the test materials used here manually. If temperature compensation was specified, the temperature is determined automatically. Tap button to enter temperature 
4	Immerse the sensor in the water sulfite solution. Wait until the measured value display stabilizes and then confirm the result of the measurement by pressing "OK".
5	The device displays the current measured value of oxygen saturation and the test material temperature. The setpoint value for oxygen saturation (0 % sat.) is set automatically by the device. The user does not need to make any entries here. 
6	Wait until the measured value displayed stabilizes and then confirm the result of the measurement by pressing "OK"

18 Calibrating O-DO sensors

Step	Action
7	Immerse the sensor in air-saturated water or position it in water vapor-saturated air (⇒ Chapter 18.2.1 "Calibration methods for O-DO sensors", page 132). If you use water vapor-saturated air, ensure constant air pressure, constant temperature and that no water drops adhere to the membrane during the calibration procedure. Wait until the measured value display stabilizes and then confirm the result of the measurement by pressing "OK".
8	The device displays the current measured value of oxygen saturation and the test material temperature. The setpoint value for oxygen saturation (100 % sat.) is set automatically by the device. The user does not need to make any entries here. 
9	Wait until the measured value displayed stabilizes and then confirm the result of the measurement by pressing "OK"
10	A protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
11	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

18 Calibrating O-DO sensors

19 Calibrating turbidity sensors

19.1 Notes



WARNING!

During the calibration, the relays and analog output signals assume the states configured for the calibration! The response of the output signals is set for each output in its "Response at calibration" configuration point.

⇒ Chapter 10.7 "Analog outputs of base unit and optional boards", page 29

19.2 General information

Turbidity sensors are calibrated by means of two-point calibration in distilled water and formazine reference solution. The sensor is calibrated ex works, meaning that no calibration is required before initial startup. If the measured values are seen to drift during operation, the sensor should be calibrated.

Preparatory cleaning

Rinse off the sensor with clear water. Organic deposits left on the sensor optics, such as a biofilm or silt, may cause measurement errors. These deposits should be removed carefully with warm soapy water and a soft sponge. Never use abrasive agents (e.g. scouring sponge)!

Calcium deposits can be removed by submersing the sensors in a diluted hydrochloric acid solution (**concentration max. 5 %**) for several minutes.

19.2.1 Calibration methods for turbidity sensors

Two-point calibration

With two-point calibration, the zero point and slope of the sensor are calibrated. Distilled water is used as the test material for determining the zero point. Formazine is used as the test material for determining the second reference point. The zero point and calculated percent deviation from the ideal slope are saved as reference values.

19 Calibrating turbidity sensors

19.2.2 Calibration presets for turbidity sensors

Before you can perform a calibration, you must first enter the necessary calibration default settings. The possible settings for the calibration of turbidity sensors are described in the following.

Open the calibration default settings:

Device Menu > Calibration > Digital Sensor 1 to 6 >
Calibration Default Settings



NOTE

The "Calibration default settings" menu appears in the Device menu only if a user with corresponding user rights is logged in. The "Calibration default settings" menu for a digital sensor is visible for the digital sensor concerned only when it is linked.

⇒ Chapter 8.2.1 "Log-on/Log-out", page 89

⇒ Chapter 8.2.7 "Digital sensors", page 95

The calibration default settings enable the calibration routines to be accessed in the particular calibration menu.

Calibration routines that are not enabled are not visible in the calibration menu. You can enable the two-point calibration for turbidity sensors.

19 Calibrating turbidity sensors

19.3 Calibration routines for turbidity sensors



NOTE

Turbidity sensors can be configured with automatic selection of the measuring range. Accordingly, calibrations must be performed for all "accessible measuring ranges".



NOTE

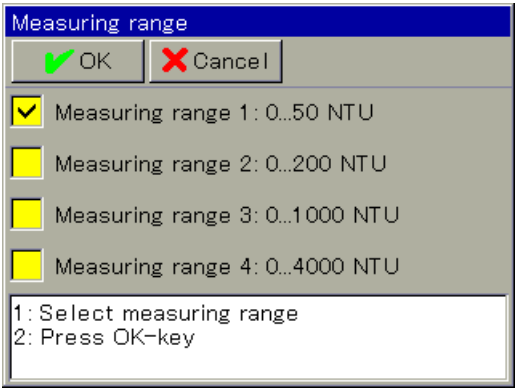
You must be logged in with corresponding user rights to perform calibrations.
⇒ Chapter 8.2.1 "Log-on/Log-out", page 89



NOTE

Digital sensors need to be linked before they can be calibrated.
⇒ Chapter 8.2.7 "Digital sensors", page 95

19.3.1 Two-point calibration

Step	Action
1	Start the two-point calibration. Device Menu > Calibration > Digital Sensor 1 to 6 > Two-Point Calibration
2	Enter one of the measuring ranges 1 to 4. Confirm the entry by pressing "OK" 
3	Clean the sensor and immerse it in the distilled water.
4	The device displays the current measured value of the distilled water. The user does not need to make any entries here.
5	Wait until the measured value displayed stabilizes and then confirm the result of the measurement by pressing "OK"
6	Immerse the sensor in a formazine reference solution. Its turbidity value should be approximately at the middle of the selected measuring range.

19 Calibrating turbidity sensors

Step	Action
7	The device displays the current measured value of the formazine reference solution. Enter the actual turbidity value of the reference solution.
8	Wait until the measured value displayed stabilizes and then confirm the result of the measurement by pressing "OK"
9	A protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
10	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

20 Calibration during disinfection measurements

20.1 Notes

**WARNING!**

During the calibration, the relays and analog output signals assume the states configured for the calibration! The response of the output signals is set for each output in its "Response at calibration" configuration point.

⇒ Chapter 10.7 "Analog outputs of base unit and optional boards", page 29

20.2 General information

JUMO digital sensors for disinfection measurands (chlorine, hydrogen peroxide, peracetic acid, ozone, chlorine dioxide and bromide) are calibrated by means of suitable comparison measurements in the measured value for the sensor type concerned (e.g. DPD method). Be sure to observe the information in the operating manual of the sensor for disinfection measurands with respect to calibration. The concentration values from the comparison measurement are entered in the device during the calibration process.

20 Calibration during disinfection measurements

20.2.1 Calibration methods for disinfection measurand sensors

End value calibration

For end value calibration, the slope of the sensor is calibrated by means of a comparison measurement (e.g. DPD method).

Two-point Calibration

With two-point calibration, the zero point and slope of the sensor are calibrated. This calibration method offers the greatest possible level of accuracy and is particularly recommended for measurements of low concentration values.

20.2.2 Calibration default settings for disinfection measurand sensors

Before you can perform a calibration, you must first enter the necessary calibration default settings. The possible settings for disinfection measurand sensors are described in the following.

Open the calibration default settings:

Device Menu > Calibration > Digital Sensor 1 to 6 >
Calibration Default Settings



NOTE

The "Calibration default settings" menu appears in the Device menu only if a user with corresponding user rights is logged in. The "Calibration default settings" menu for a digital sensor is visible for the digital sensor concerned only when it is linked.

⇒ Chapter 8.2.1 "Log-on/Log-out", page 89

⇒ Chapter 8.2.7 "Digital sensors", page 95

Sample screen:
Chlorine
calibration presets

20 Calibration during disinfection measurements

Calibration default settings for disinfection measurand sensors

The calibration default settings enable the calibration routines to be accessed in the particular calibration menu.

Calibration routines that are not enabled are not visible in the calibration menu. Additional calibration default settings are explained in the following table.

Parameter	Possible settings	Explanation
pH compensation	Selection from Analog selection	Available only for chlorine measurement with pH compensation pH input for automatic sensing of the test/sample solution pH value during the calibration

20 Calibration during disinfection measurements

20.3 Calibration routine for disinfection measurands



WARNING!

Be sure to observe the information in the respective operating manual of the various digital sensors for disinfection measurands with respect to calibration. Depending on sensor type, run-in periods may need to be observed and the sensors built into an appropriate fitting. Non-compliance will lead to incorrect calibration values and hence to incorrect measurement results.



NOTE

You must be logged in with corresponding user rights to perform calibrations.
⇒ Chapter 8.2.1 "Log-on/Log-out", page 89



NOTE

Digital sensors need to be linked before they can be calibrated.
⇒ Chapter 8.2.7 "Digital sensors", page 95

20.3.1 End value calibration

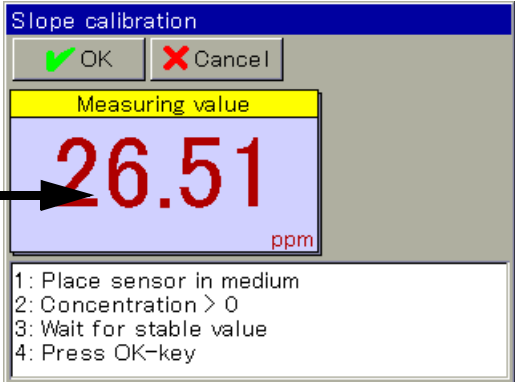
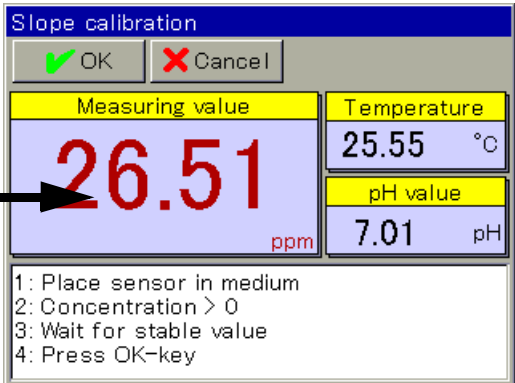
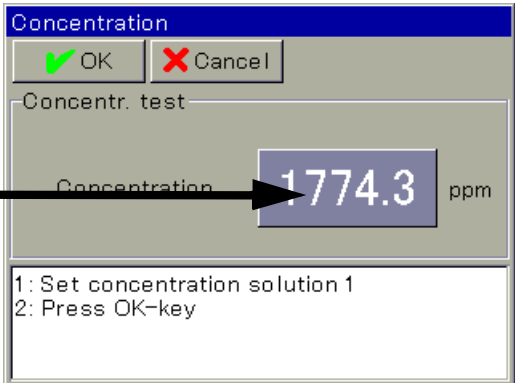


WARNING!

Steps 4 to 5 should be carried out very quickly, since the comparison measurement and the inputting of your result must be done promptly.

Step	Action
1	Make sure that the sensor to be calibrated is built into a suitable fitting and had enough time to run-in before the calibration was started. Be sure to observe the information in the operating manual of the sensor with respect to operation and calibration of the sensor type concerned and respect the stated operating conditions during the calibration.
2	Start the end value calibration. Device Menu > Calibration > Digital Sensor 1 to 6 > End Value Calibration

20 Calibration during disinfection measurements

Step	Action
3	The device will show the current concentration measured value for the disinfection measurand. The user does not need to make any entries here. Wait until the measured value displayed stabilizes and then confirm by pressing "OK". Display of concentration value  Display of concentration value with pH-compensated chlorine measurement 
4	Remove a sample of the solution from the fitting and determine, as quickly as possible, its actual concentration value using a suitable comparison measurement.
5	Enter the concentration value of the solution determined during the comparison measurement as soon as possible after the comparison measurement. To enter the concentration value, tap the button 

20 Calibration during disinfection measurements

Step	Action
6	A protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
7	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

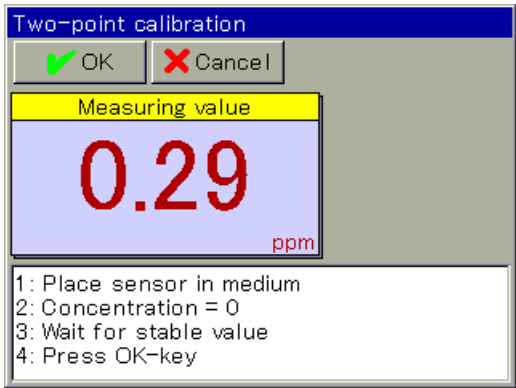
20 Calibration during disinfection measurements

20.3.2 Two-point Calibration

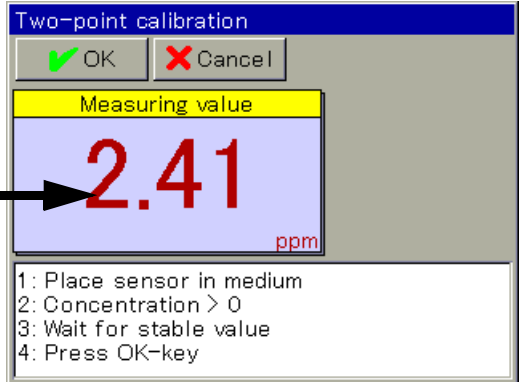
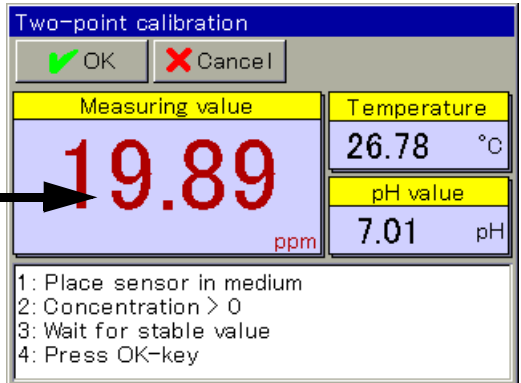
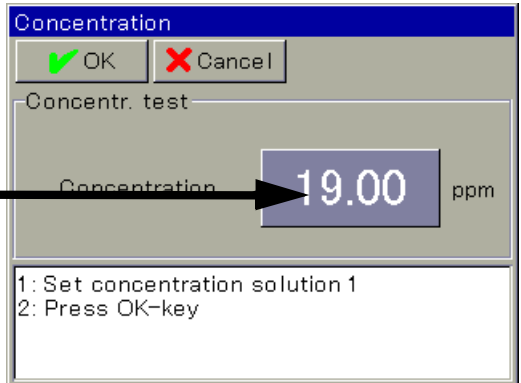


WARNING!

Steps 7 to 8 should be carried out very quickly, since the comparison measurement and the inputting of your result must be done promptly.

Step	Action
1	Make sure that the sensor to be calibrated is built into a suitable fitting and had enough time to run-in before the calibration was started. Be sure to observe the information in the operating manual of the sensor with respect to operation and calibration of the sensor type concerned and respect the stated operating conditions during the calibration.
2	Start the two-point calibration. Device Menu > Calibration > Digital Sensor 1 to 6 > Two-Point Calibration
3	Now let a solution containing no disinfectant to flow through the fitting (concentration value = 0)
4	The device will show the current concentration measured value for the disinfection measurand. The user does not need to make any entries here. Wait until the measured value displayed stabilizes and then confirm by pressing "OK". 
5	Now let a solution containing disinfectant to flow through the fitting (concentration value > 0)

20 Calibration during disinfection measurements

Step	Action
6	The device will show the current concentration measured value for the disinfection measurand. The user does not need to make any entries here. Wait until the measured value displayed stabilizes and then confirm by pressing "OK". Display of concentration value  Display of concentration value with pH-compensated chlorine measurement 
7	Remove a sample of the solution from the fitting and determine, as quickly as possible, its actual concentration value using a suitable comparison measurement.
8	Enter the concentration value of the solution determined during the comparison measurement as soon as possible after the comparison measurement. To enter the concentration value, tap the button 

20 Calibration during disinfection measurements

Step	Action
9	A protocol summarizing the calibration values determined then appears. Acknowledge the protocol by pressing "OK". Failed calibrations are canceled at this point and discarded.
10	Press "Yes" to accept the Calibration values determined and enter the Calibration in the Calibration logbook. Press "No" to discard the results.

20 Calibration during disinfection measurements

21.1 Analog inputs base unit

21.1.1 Temperature measurement input (IN 4)

Probe-/Signal type	Connection type	Measuring range	Measuring accuracy	Ambient temperature influence
Pt100 DIN EN 60751	2-wire/3-wire	-200 to +850 °C	$\leq 0.05\%$ of MR ^a	≤ 50 ppm/K
Pt1000 DIN EN 60751	2-wire/3-wire	-200 to +850 °C	$\leq 0.1\%$ of MR ^a	≤ 50 ppm/K
RTD temperature probe with customer-specific characteristic line ^b				
up to 400 Ω	2-wire/3-wire	0 to 400 Ω	$\leq 0.1\%$ of R _{max} ^c	≤ 100 ppm/K
to 4000 Ω	2-wire/3-wire	0 to 4000 Ω	$\leq 0.1\%$ of R _{max} ^c	≤ 100 ppm/K
Sensor lead resistance	maximal 30 Ω per line with 3-wire circuit			
Lead compensation	Not required for 3-wire circuit. With a 2-wire circuit, lead calibration can be executed at the respective input by means of an measured value correction with the aid of the "Offset" setting.			

^a MR: measuring range span

^b Customer-specific linearization can be used to enter a sensor characteristic line.

^c R_{max}: maximal resistance across the measuring range (400 Ω , or 4000 Ω)

21 Technical data

21.1.2 Temperature measurement input (IN 5)

Probe-/Signal type	Connection type	Measuring range	Measuring accuracy	Ambient temperature influence
Pt100 DIN EN 60751	2-wire/3-wire	-200 to +850 °C	≤ 0.05 % of MR ^a	≤ 50 ppm/K
Pt1000 DIN EN 60751	2-wire/3-wire	-200 to +850 °C	≤ 0.1 % of MR ^a	≤ 50 ppm/K
Resistance transmitter	3-wire	0 to 100 kΩ	0.5 % of R _{Tot} ^b	≤ 100 ppm/K
RTD temperature probe with customer-specific characteristic line ^c				
up to 400 Ω	2-wire/3-wire	0 to 400 Ω	≤ 0.1 % of R _{max} ^d	≤ 100 ppm/K
to 4000 Ω	2-wire/3-wire	0 to 4000 Ω		
to 100 kΩ	2-wire/3-wire	0 to 100 kΩ		
NTC 8k55	2-wire/3-wire	0 to 150 °C	≤ 0.1 % of R _{max} ^d	≤ 100 ppm/K
NTC 22k	2-wire/3-wire	0 to 150 °C		
Sensor lead resistance	maximal 30 Ω per line with 3-wire circuit			
Lead compensation	Not required for 3-wire circuit. With a 2-wire circuit, lead calibration can be executed at the respective input by means of an measured value correction with the aid of the "Offset" setting.			

^a MR: measuring range span

^b R_{Tot}: total resistance of the resistance transmitter/Resistance potentiometer

^c Customer-specific linearization can be used to enter a sensor characteristic line.

^d R_{max}: maximal resistance across the measuring range (400 Ω , 4000 Ω or 100 k Ω)

21.1.3 Universal input (IN 6)

Signal type	Measuring range	Measuring accuracy	Ambient temperature influence
Current signal	0(4) to 20 mA	0.1% of MR ^a	100 ppm/K

^a MR: measuring range span

21.1.4 Measuring circuit monitoring base unit

Inputs	Underrange/ overrange
Temperature input	Yes
Universal input (current signal)	Yes

21.2 Analog inputs optional boards

21.2.1 Universal input (IN 11, IN 12)

Probe-/Signal type	Connection type	Measuring range	Measuring accuracy	Ambient temperature influence
Pt100 DIN EN 60751	2-wire/3-wire	-200 to +850 °C	$\leq 0.05\%$ of MR ^a	≤ 50 ppm/K
Pt1000 DIN EN 60751	2-wire/3-wire	-200 to +850 °C	$\leq 0.1\%$ of MR ^a	≤ 50 ppm/K
Resistance transmitter	3-wire	100 to 4000 Ω	0.5% of R _{Tot} ^b	≤ 100 ppm/K
RTD temperature probe with customer-specific characteristic line ^c				
up to 400 Ω	2-wire/3-wire	0 to 400 Ω	$\leq 0.1\%$ of R _{max} ^d	≤ 100 ppm/K
to 4000 Ω	2-wire/3-wire	0 to 4000 Ω	$\leq 0.1\%$ of R _{max} ^d	≤ 100 ppm/K
Voltage signal	-	0 to 10 V	0.2% of MR ^a	100 ppm/K
Current signal	-	0(4) to 20 mA	0.1% of MR ^a	100 ppm/K
Sensor lead resistance ^e	maximal 30 Ω per line with 3-wire circuit			
Lead calibration ^e	Not required for 3-wire circuit. With a 2-wire circuit, lead calibration can be executed at the respective input by means of an measured value correction with the aid of the "Offset" setting.			

^a MR: measuring range span

^b R_{Tot}: total resistance of the resistance transmitter/Resistance potentiometer

^c Customer-specific linearization can be used to enter a sensor characteristic line.

^d R_{max}: maximal resistance across the measuring range (400 Ω or 4000 Ω)

^e Specification does not apply for standard signals

21.2.2 Analysis input: pH/Redox/NH₃

Measurand	Measuring range	Temperature compensation	Measuring accuracy	Ambient temperature influence
pH-value (standard electrode)	-2 to +16 pH	-10 to +150 °C	$\leq 0.3\%$ of MR ^a	0.2%/10 K
pH-value (ISFET electrode)	-2 to +16 pH	through electrode ^b		
Redox voltage	-1500 to +1500 mV	None		
NH ₃ (ammonia)	0 to 20000 ppm	-10 to +150 °C		

^a MR: measuring range span

^b ISFET electrodes supply a temperature-compensated pH-measured value.

21.2.3 Analysis input: CR (resistive conductivity)

Units	$\mu\text{S/cm}$ mS/cm $\text{k}\Omega \times \text{cm}$ $\text{M}\Omega \times \text{cm}$
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Display ranges^a	0.0000 to 9.9999 00.000 to 99.999 000.00 to 999.99 0000.0 to 9999.9 00000 to 99999
Temperature compensation	TC-linear, natural water DIN EN 27888, natural water with expanded range, TDS ^b , ASTM D-1125-95 for neutral (NaCl), acid (HCl) and alkali (NaOH) impurities
Cell constant	0.01 to 10 cm ⁻¹
Measuring range selection^c	4 configurable measuring ranges
Measuring accuracy	± 0.6% of MR ^d 0.3 µS × cell constant (C)
Ambient temperature influence	0.2%/10 K

^a The display range is scalable. The decimal place is user configurable. In addition, an automatic Comma format can be set.

^b TDS (Total Dissolved Solids)

^c In the Configuration up to 4 different measuring ranges with separate display range limits, units, temperature compensation methods, and alarm functions can be configured. The respective active measuring range is selected via binary signals.

^d MR: measuring range span

21.2.4 Analysis input: Ci (conductivity, inductive)

Units	$\mu\text{S/cm}$ mS/cm
Measuring/display ranges^a	0.0000 to 9.9999 00.000 to 99.999 000.00 to 999.99 0000.0 to 9999.9 00000 to 99999
Temperature compensation	TC linear ^b TC curve natural water natural water with expanded temperature range NaOH 0 to 12% NaOH 25 to 50% HNO ₃ 0 to 25 % HNO ₃ 36 to 82 % H ₂ SO ₄ 0 to 28 % H ₂ SO ₄ 36 to 85 % H ₂ SO ₄ 92 to 99% HCl 0 to 18 % HCl 22 to 44 %
Cell constant	4.00 to 8.00 cm^{-1}
Measuring range selection^c	4 configurable measuring ranges
Measuring accuracy	for 0 to 999 $\mu\text{S/cm}$: 1.5% of the MRE ^d for 1 to 500 mS/cm : 1% of the MBE ^d for 500.1 to 2000 mS/cm : 1.5% of the MBE ^d
Ambient temperature influence	0.1 %/K

^a The display range is scalable. The decimal place is user configurable. In addition, an automatic Comma format can be set.

^b TC: temperature coefficient

^c In the Configuration up to 4 different measuring ranges with separate display range limits, units, temperature compensation methods and alarm functions can be configured. The respective currently active measuring range is selected via binary signals.

^d MRE: Measuring range end value

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21.2.5 Temperature compensations

Compensation type	Compensation range
TC linear ^a	-50 to +250 °C
TC curve	-50 to +250 °C
TDS	-50 to +250 °C
natural water according to DIN EN 27888	0 to 36 °C
natural water with expanded temperature range ^b	0 to 100 °C
ASTM D-1125-95 (neutral, alkaline, and acidic impurities)	0 to 100 °C
NaOH 0 to 12 %	0 to 90 °C
NaOH 25 to 50 %	10 to 90 °C
HNO ₃ 0 to 25 %	0 to 80 °C
HNO ₃ 36 to 82 %	-20 to +65 °C
H ₂ SO ₄ 0 to 28 %	-17 to +104 °C
H ₂ SO ₄ 36 to 85 %	-17 to +115 °C
H ₂ SO ₄ 92 to 99 %	-17 to +115 °C
HCl 0 to 18 %	10 to 65 °C
HCl 22 to 44 %	-20 to +65 °C

^a TC: temperature coefficient

^b The temperature compensation "natural water with expanded temperature range" extends beyond the standardized temperature thresholds of DIN EN 27888.

21.2.6 Measuring circuit monitoring, optional boards

Input/Sensor	Underrange / overrange	Short circuit/ sensor break	Line break	Special features
pH-value (glass electrode)	Yes	Configurable Impedance measurement ^a	Configurable Impedance measurement ^a	-
pH-value (ISFET)	Yes	No ^b	No ^b	-
Resistive conductivity	Yes	No ^b	Configurable	Only with 4-wire circuit ^a
Inductive conductivity	Yes	No ^b	No ^b	-
Universal input for connection of: voltage/current signal, RTD temperature probe	Yes	No ^b	No ^b	-
Universal input for connection of: resistance transmitter	No ^b	No ^b	No ^b	-

^a With impedance monitoring and detection of deposits, the sensor alarm is tripped in case of a fault. Monitoring via impedance measurement can also be activated.

The following points should be observed to ensure correct function:

Impedance measurements are possible only with glass-based sensors.

Sensors must be connected directly to an analysis input for pH/Redox/NH₃ on the device.

Impedance converters must not be installed in the measuring circuit.

The maximal admissible cable length between sensor and device is 10 m.

Liquid resistance has a direct impact on the measurement result. It is therefore advisable to activate the impedance measurement in liquids at a minimum conductivity of approx. 100 µS/cm.

^b Errors in the measuring circuit (short circuit or line break) lead to display errors (underrange or overrange or inadmissible value).

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21.3 Analog outputs of base unit and optional boards

Signal type	Signal range	Admissible load resistance	Accuracy	Ambient temperature influence
Voltage signal	0 to 10 V	> 500 Ω	$\leq 0.25 \%$	≤ 100 ppm / K
Current signal	0/4 to 20 mA	< 450 Ω	$\leq 0.25 \%$	≤ 100 ppm / K

21.4 Digital inputs base unit

Designation	Input frequency ranges	Min. pulse duration		Signal type	Switching thresholds ^a	
		On	Off		On	Off
IN 1 ^b	≤ 1 Hz	300 ms	300 ms	Configurable as: potential-free contact, or ext. voltage supply (maximal 28 V)	> 8 V > 1.8 mA	< 5 V < 1.2 mA
IN 2 to 3 ^{b,c} Switching signal	≤ 1 Hz	30 μ s	30 μ s			
IN 2 to 3 ^{b,c} Flow	3 to 300 Hz 300 Hz to 10 kHz	30 μ s	30 μ s			

^a This specification is relevant only if the Ext. voltage supply is selected under the "Contact" point in the Configuration. Sensors and transmitters should be supplied from voltage supply outputs on the JUMO AQUIS touch P. An externally supplied voltage signal must not have a voltage over 28 V.

^b All digital inputs IN 1 to 3 are suitable for connecting proximity switches. Recommended types are: Wachendorff P2C2B1208NO3A2 and Balluff BES M12EG-PSC80F-BP03.

^c Digital inputs IN 2 and IN 3 can be used for paddlewheel flow sensors (water meters) or magnetic-inductive flow meters (square-wave signal), for example. The input frequency depends on the configured measurement principle in the flow function.

21.5 Digital inputs optional boards

Max. number of retrofittable digital inputs	Max. pulse frequency	Min. pulse duration		Signal type
		On	Off	
max. 2 optional boards with 3 digital inputs each	1 Hz	300 ms	300 ms	Potential-free contact

21.6 Digital outputs, power supply unit board

Designation	Switching output	Ampacity at resistive load	Contact life ^a
OUT 1	Relay, change-over contact	3 A at AC 250 V	150,000 switching cycles
OUT 2	Relay, change-over contact		

^a The maximal ampacity of the contacts must not be exceeded.

21.7 Digital outputs, optional boards

Optional card	Switching output	Ampacity at resistive load	Contact life ^a	Special features
Relay output, dual normally open contacts	2 normally open contacts ^b	3 A at AC 250 V	150,000 switching cycles	-
Relay output, single Changeover contact	1 changeover contact			-
Solid state relay triac	Switching output with triac (protected by varistor) ^c	1 A at AC 230 V	wear-free	-
PhotoMOS® ^e solid state relay	Switching output with PhotoMOS® ^d	200 mA at DC 45 V and/or AC 30 V	wear-free	not short-circuit-proof; max. voltage DC 45 V AC 30 V
Logic output 0/12 V	High/low signal	20 mA ^e	wear-free	-
Logic output 0/22 V	High/low signal	30 mA ^e	wear-free	-

^a The maximal ampacity of the contacts must not be exceeded.

^b Combining a mains voltage circuit with a protective low-voltage circuit on the "dual normally open contact" option is not admissible.

^c A varistor protects the triac against excessive voltages such as those that can occur during switching.

^d PhotoMOS® is a registered trademark of Panasonic.

^e Current limiting via the logic output of the device

21.8 Voltage supply outputs, optional board

Designation	Output voltage	Ampacity	Connection
DC 24 V voltage supply for external transmitters ^a	DC 24 V +5 / -5 %	42 mA	Screw terminals
DC ±5 V voltage supply (e.g. for ISFET pH-sensors)	DC +5 V +10 / 0 % (between terminals 3 and 4)	150 mA	
	DC -5 V ±15 % (between terminals 5 and 4)	30 mA	

^a An optional board for voltage supply outputs accommodates all the outputs listed in this table. A maximum of 1 such optional board can be integrated into a device.

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21.9 Interfaces

21.9.1 Serial interface RS485 (base unit)

Protocol	Data formats ^a	Device addresses as slave	Baud rates in baud	Connection
Modbus slave	8 - 1 - no parity	1 to 254	9600	Screw terminals
Modbus master	8 - 1 - odd parity		19200	
Modbus digital sensors	8 - 1 - even parity		38400	

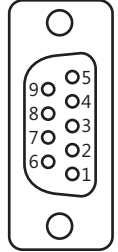
^a Specification in useful bit - stop bit - parity format. Therefore, the frame always comprises 8 useful bits and 1 stop bit. Only the parity is differentiated.

21.9.2 Serial Interface RS422/485 (optional board)

Protocol	Data formats ^a	Device addresses as slave	Baud rates in baud	Connection
Modbus slave	8 - 1 - no parity	1 to 254	9600	Screw terminal
Modbus master	8 - 1 - odd parity		19200	
Modbus digital sensors	8 - 1 - even parity		38400	

^a Specification in useful bit - stop bit - parity format. Therefore, the frame always comprises 8 useful bits and 1 stop bit. Only the parity is differentiated.

21.9.3 PROFIBUS-DP (optional board)

Protocol	Data formats ^a	Device addresses	Baud rates	Connection
DP-V0	Big Endian Little Endian	0 to 127	9.6 kBaud to 12 MBaud	D-sub socket 9-pole 

^a Big Endian corresponds to the Motorola[®] data format and Little Endian to Intel[®] data format.

21.9.4 Scanning cycle times for digital sensors

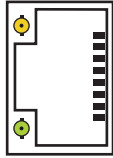
with up to 2 digital sensors with baudrate = 9600 and generally with baud rate > 9600 baud ^a	500 ms
at baud rate = 9600 baud and more than 2 digital sensors on the bus ^b	1 s

^a Baud rates above 9600 are supported only by JUMO tecLine sensors and JUMO sensors with JUMO digiLine electronics. JUMO ecoLine sensors support only a baud rate of 9600.

^b For JUMO ecoLine O-DO sensors, the sample rate can be adjusted (1 to 999 s). JUMO ecoLine NTU sensors have a fixed sample rate of 1 s.

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21.9.5 Ethernet optional board (10/100Base-T)

Function	Use	Application protocol/ program	Special features	Connection
Web server	Online visualization via web browser	HTTP	Editable via HTML Editor	RJ 45 socket 
E-mail/SMS text message ^a	E-mail dispatch via SMTP server Transmission as SMS text message	SMTP	5 e-mail templates can be stored, up to 3 recipients for each e-mail template	
Modbus TCP/IP	Process data exchange with Modbus users as slave or master ^b	Modbus TCP/IP	-	
Automatic IP-configuration	Network administration ^c	DHCP	-	
Setup via PC	Device settings via PC setup program	JUMO PC setup program (HTTP)	-	
Recording function ^d	Extract, archive, evaluate measurement data	JUMO PCC and PCA 3000	-	

^a The e-mail function allows the device, when triggered by internal and/or external binary signals, to send hard-programmed messages. This requires the data of an SMTP server (E-mail intermediate server) to be known. The e-mail function can be configured exclusively via the PC setup program.

^b Modbus TCP/IP enables Modbus users to communicate via a LAN, provided this is connected to the LAN (e.g. via gateways). You can find further information on this in the interface description of the JUMO AQUIS touch P.

^c Enlist the help of your network administrator or an IT specialist for the IP-configuration.

^d The recording function stores measurement data in a ring buffer inside the device. Further details appear on ⇒ Page 181.

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21.9.6 USB interfaces

Interface	Use	Support	Connection	version
USB Host interface	Extract measurement data memory ^a , Read/write device settings, Save service data ^b Update device software	USB flash drive	USB port Type A 	USB 2.0
USB device interface	Device setting via PC setup program, Extract, archive, evaluate measurement data	JUMO PC setup program, JUMO PCC/PCA 3000 software	USB port Type Mini-B 	

^a The recording function stores measurement data in a ring buffer inside the device.

^b Service data can be stored on a USB flash drive for diagnostic purposes.

21.10 Electrical data

Voltage supply (switch-mode)	AC 110 to 240 V +10/-15%; 48 to 63 Hz or AC/DC 24 V +30/-25 %; 48 to 63 Hz
electrical safety	According to EN 61010, part 1 overvoltage category III, pollution degree 2
Max. power consumption AC 110 to 240 V AC/DC 24 V	27.9 VA (11.7 W at 230 V) 25.2 VA (14.7 W at DC 24 V)
Data backup	Flash memory
Electrical connection	at the back via screw terminals Specifications for conductor cross-sections ⇒ Chapter 6.2.2 "Conductor cross-sections for base unit and power supply unit", page 31
electromagnetic compatibility (EMC): Interference emission Interference immunity	DIN EN 61326-1 Class A – only for industrial use – Industrial requirement

21.11 Screen Touchscreen

Type	TFT-touchscreen
Touchscreen sensors	Resistive (can also be operated wearing gloves)
Display protection	Front/design film for protection against damage and scratches
Size	3.5"
Dissolution	320 × 240 pixel
Color depth	256 colors
Viewing angle	Horizontal: $\pm 65^\circ$ Vertical: -65 to $+40^\circ$

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21.12 Housing

geographic height for operation	maximum 2000 m above sea level
Housing type	Plastic front frame with metal case barrel (for use indoors only)
Materials	Plastic front panel UL 94 V0 Case barrel from zinc-plated steel sheet
Dimensions of the front	96 mm × 96 mm
Dimensions of the panel cut-out	92 mm × 92 mm Tolerance = +0.8 mm
Mounting depth without Ci-conductivity sensor with Ci-conductivity sensor	130.9 mm 283.3 mm (including manoeuvring space for sensor cable)
Panel thickness	Max. 5 mm
Minimum distance to other operating equipment	from edge of the panel cut-out horizontal 35 mm, vertical 80 mm
Ambient temperature	-5 to +50 °C
Storage temperature	-30 to +70 °C
Resistance to climatic conditions	Relative humidity < 85% annual average, no condensation
Operating position	Any (with due consideration for the viewing angle of the screen)
Protection type Case front in panel mounting Metal case barrel	According to DIN EN 60529 IP66 IP20
Weight (fully fitted)	approx. 1000 g

21.13 Functions

21.13.1 Controller channels

Quantity	4
Controller type	Two-state controller Three-state controller Continuous controller Coarse/fine controller Modulating controller proportional controller with integrated actuator driver
Controller structure	P, PI, PD, PID
Controller outputs	For each controller channel, 2 outputs configurable as: pulse length output, pulse frequency output (maximal 240 pulses per minute), continuous output
Disturbance feedforward control	multiplicative and/or additive ^a
Autotuning	Step response method
Sampling rate	250 ms

^a Ena. variable disturbance permits consideration of influencing variables in the process environment beyond the actual value alone. This keeps the control response stable, even when fluctuations in such ambient conditions occur.

21.13.2 Recording function

	Data monitor	Recording function (also available)
Number of groups ^a	4	4
Number of input variables per group	4× analog 3× digital	4× analog 3× digital
Recording / Memory rate	1 to 3600 s	1 to 3600 s
Memory values	Current value Average value Minimum value Maximum value	Current value Average value Minimum value Maximum value
Size of the ring buffer ^b	sufficient for 150 entries ^c	sufficient for approx. 31 million entries ^c
History function ^d	No	Yes
Archiving/evaluation	No	Yes (via JUMO PCA3000 evaluation software)

^a A user configurable set of input variables can be pooled in one group. Each group has its own display screen. The group affiliation is considered for data storage to enable evaluation via PC.

^b The measurement data are stored in a ring buffer. When the ring buffer is full, the recording function begins at the start of the ring buffer by overwriting the measuring value history.

^c One entry contains 3 analog values and 3 binary values. The sum total of all 4 groups is indicated.

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^d The history function allows the user to scroll the diagram back in the recording time period. All measured data stored in the ring buffer can thus be viewed on the device.

21.13.3 Customer-specific linearization

Number of grid points ^a	up to 40 value pairs
Interpolation ^b	linear
Formula entry ^c	4th degree polynomial

^a An approximate characteristic line can be entered by inputting grid points (value pairs of the customer-specific characteristic line). Kennlinie) kann eine genäherte Kennlinie eingegeben werden.

^b Linear interpolation means forming a slope function from 2 grid points.

^c As an alternative to entering support points, a customer-specific characteristic curve can also be entered as a formula in the form of a polynomial.

21.14 Approvals/approval marks

c UL us	
Test facility	Underwriters Laboratories
Certificate/certification number	E201387
Inspection basis	UL 61010-1 (3rd Edition), CAN/CSA-C22.2 No. 61010-1 (3rd Edition)
Valid for	Type 202580/...
DNV GL	
Test facility	DNV GL
Certificate/certification number	TAA000014K
Inspection basis	Class Guideline DNVGL-CG-0339
Valid for	Type 202580/...

22.1 Troubleshooting and remedies for digital sensors

22.1.1 Possible faults on sensors with JUMO digiLine electronics

Fault symptom	Possible cause	Remedy
A sensor is not detected after being connected and is also not visible for manual linking (⇒ Chapter "Sub-menu for linking", page 97).	The serial interface of the device concerned is configured incorrectly.	Check the following serial interface setting: Protocol: Modbus digital sensors
	More than 6 digital sensors were connected.	Ensure that no more than 6 digital sensors are connected to a JUMO AQUIS touch P.
	The voltage supply for powering the sensor electronics is inadequate.	Ensure compliance with the specifications in the tables for planning the cabling for digital sensors. ⇒ Chapter 22.2 "Planning the cabling for digital sensors", page 191

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Fault symptom	Possible cause	Remedy
Sensors are not linked	The JUMO AQUIS touch P cannot unambiguously assign the sensors to specific inputs for digital sensors. Possible causes: • Several sensors with JUMO digiLine electronics of the same kind that were not yet linked to the device were connected simultaneously. • Several inputs were configured for digital sensors of the same kind and show the status "Installation".	Follow the instructions in the operating manual for startup of digital sensors. Sensors with JUMO digiLine electronics of the same kind must be put into operation individually. Sensors with JUMO digiLine electronics can only be linked to inputs for digital sensors if the configuration of the input matches the type of sensor. If "TAG check" is activated in the configuration of an input for digital sensors, the "Sensor TAG" must match the "TAG number" in the configuration of the JUMO digiLine electronics to be linked.
	"TAG check" is activated in the configuration of the input for digital sensors concerned and the "Sensor TAG" does not match the "TAG number" in the configuration of the JUMO digiLine electronics to be linked.	⇒ Chapter 7.3 "Digital sensors", page 67
	No suitably configured input for digital sensors is available for the type of sensor (status "Installation").	⇒ Chapter 8.2.7 "Digital sensors", page 95
	The interface configuration of the JUMO digiLine electronics concerned does not match the interface settings of the JUMO AQUIS touch P (baud rate or data format)	Perform a manual bus scan (⇒ Chapter "Submenu for linking", page 97).
	The data of JUMO digiLine electronics required for linking do not match any configured input for digital sensors, because a sensor with JUMO digiLine electronics was replaced or removed from the bus and incorrectly reconfigured via the JUMO DSM software.	Try to link the sensor with JUMO digiLine electronics through a manual bus scan (⇒ Chapter "Submenu for linking", page 97). If this fails, check the settings of the JUMO digiLine electronics and of the corresponding input for digital sensors. Identical type information must be set on both sides. When the TAG test is activated, the TAG number must be identical on both sides.

Fault symptom	Possible cause	Remedy
Some of the connected sensors malfunction sporadically. (bus status appears as "Yellow" in the title bar of the user interface and in the "Alarm list") ^a	Poor contact in the bus cabling	Check for reliable contact at all plug connectors and terminals in the JUMO AQUIS touch P. Inspect the cabling for damage. The occurrence and clearing of bus faults is recorded in the "Event list". This allows you to use the entries to investigate sporadic bus faults.
Individual sensors malfunction continuously. ("Bus fault" is signaled in the title bar of the user interface and in the "Alarm list")	Poor contact in the bus cabling	Check for reliable contact at all plug connectors and terminals in the JUMO AQUIS touch P. Inspect the cabling for damage.
	Defect in the sensor electronics	Replace the sensor electronics.
All sensors connected to the bus simultaneously malfunction continuously. ("Bus fault" is signaled in the title bar of the user interface and in the "Alarm list")	The bus voltage supply has failed.	Diagnose the failure of the voltage supply with a multimeter and replace the faulty voltage source or correct the short-circuit in the voltage supply.

^a ⇒ Chapter 8.3.1 "Alarm list", page 101 if a "Bus fault" is signaled.

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22.1.2 Possible faults on digital JUMO ecoLine and tecLine sensors

Fault symptom	Possible cause	Remedy
A sensor is not detected after being connected and is also not visible for manual linking (⇒ .Chapter "Sub-menu for linking", page 97).	The serial interface of the device concerned is configured incorrectly.	Check the following serial interface setting: Protocol: Modbus digital sensors Baudrate • with JUMO ecoLine sensors: 9600 • only JUMO tecLine sensors and sensors with JUMO digiLine electronics: 9600, 19200 or 38400 Data format • with JUMO ecoLine sensors: 8 - 1 - no parity • only JUMO tecLine sensors and sensors with JUMO digiLine electronics: 8 - 1 - no parity 8 - 1 - odd parity 8 - 1 - even parity
	Two or more sensors of the same kind were connected.	Follow the instructions in the operating manual for startup of digital sensors. Digital JUMO ecoLine and tecLine sensors must be put into operation individually. ⇒ Chapter 7.3 "Digital sensors", page 67 ⇒ Chapter 8.2.7 "Digital sensors", page 95
	Several digital JUMO ecoLine or tecLine were connected to the same device address, causing collisions during bus communication.	
	More than 6 digital sensors were connected.	Ensure that no more than 6 digital sensors are connected to a JUMO AQUIS touch P.
see previous page	The voltage supply for powering the sensor electronics is inadequate.	Ensure compliance with the specifications in the tables for planning the cabling for digital sensors. ⇒ Chapter 22.2 "Planning the cabling for digital sensors", page 191

Fault symptom	Possible cause	Remedy
A sensor is not detected after being connected and is also not visible for manual linking (⇒ .Chapter "Sub-menu for linking", page 97).	The device address of the sensor is outside the range provided for the sensor type.	The device address must be set to the base address for the particular sensor type using the JUMO DSM software. Then, the sensor must be put into operation at the JUMO AQUIS touch P (initial startup). Base addresses • JUMO ecoLine O-DO (Type 202613): 10 • JUMO tecLine CI2 (Type 202630): 20 • JUMO tecLine TC (Type 202631): 30 • JUMO ecoLine NTU (Type 202670): 40 • JUMO tecLine O3 (Type 202634): 50 • JUMO tecLine H2O2 (Type 202636): 60 • JUMO tecLine PAA (Type 202636): 70 • JUMO tecLine ClO2 (Type 202634): 80 • JUMO tecLine BR2 (Type 202637): 90 • JUMO tecLine CI2 (Type 202638): 100
Sensors are not linked	No suitably configured input for digital sensors is available for the type of sensor (status "Installation").	Digital JUMO ecoLine and JUMO tecLine sensors can only be linked to inputs for digital sensors if the configuration of the input matches the type of sensor.
Some of the connected sensors malfunction sporadically. ("Bus fault" is signaled in the title bar of the user interface and in the "Alarm list")	Poor contact in the bus cabling	Check for reliable contact at all plug connectors and terminals in the JUMO AQUIS touch P. Inspect the cabling for damage. The occurrence and clearing of bus faults is recorded in the "Event list". This allows you to use the entries to investigate sporadic bus faults.
Individual sensors malfunction continuously. ("Bus fault" is signaled in the title bar of the user interface and in the "Alarm list")	Poor contact in the bus cabling	Check for reliable contact at all plug connectors and terminals in the JUMO AQUIS touch P. Inspect the cabling for damage.
	Defect in the sensor electronics	Replace the sensor electronics.

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Fault symptom	Possible cause	Remedy
All sensors connected to the bus simultaneously malfunction continuously. ("Bus fault" is signaled in the title bar of the user interface and in the "Alarm list")	The bus voltage supply has failed.	Diagnose the failure of the voltage supply with a multimeter and replace the faulty voltage source or correct the short-circuit in the voltage supply.

22.2 Planning the cabling for digital sensors

22.2.1 Introduction

JUMO offers a number of different digital sensors for the JUMO AQUIS touch P. In addition to the voltage outputs of the JUMO AQUIS touch P, there is also the possibility to supply the bus by means of a power supply unit in conjunction with the JUMO digiLine hub to ensure a stable voltage supply for all sensors on the JUMO digiLine bus. Planning correct installation of the various digital sensors from JUMO is discussed in detail in the following chapters.

22.2.2 Voltage supply to the bus with DC 5 V from a JUMO AQUIS touch P

The cable length information in this subchapter applies when supplying **JUMO ecoLine sensors as well as pH, redox, and temperature sensors with** JUMO digiLine electronics from a DC 5 V voltage supply output on the JUMO AQUIS touch P. In this case, stub lines can also be supplied from a JUMO digiLine hub or through use of JUMO Y-splitters. If a JUMO digiLine hub is used, the slide switch on the JUMO digiLine hub must be set to DC 5 V as input voltage. In this setting, the DC 5 V input voltage is passed through to the outputs of the JUMO digiLine hub.

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Bus cabling in line topology

In the line topology, the bus line must be provided with terminating resistors at both ends wherever possible, in order to avoid transmission interference through reflections. If JUMO ecoLine sensors are used, however, terminating resistors must not be employed. You should therefore use terminating resistors only in a JUMO digiLine bus without JUMO ecoLine sensors. M12 terminating connectors are available from JUMO for the bus termination.

⇒ Chapter 4.4 "Accessories", page 19

Terminating resistors can be activated via DIP switch on the options board for serial interface RS422/485.

⇒ Chapter "Interfaces for data and bus communication - Optional boards", page 58

Sensor type	Max. length of bus line ^a	Max. length of stub lines ^b	Max. number of connectable sensors	Comment
JUMO digiLine pH/ORP/T	100 m	10 m	6	max. admissible voltage drop between DC 5 V supply and the last sensor: 1.0 V
JUMO ecoLine O-DO JUMO ecoLine NTU	100 m	10 m	6	Bus termination not admissible; max. admissible voltage drop between DC 5 V supply and the last sensor: 1.3 V
JUMO digiLine CR/Ci	Because of the energy requirement, installation of a JUMO digiLine hub with separate power supply the unit is required for connection of JUMO digiLine CR/Ci devices. The voltage supply from the JUMO AQUIS touch P is not sufficient in this case. ⇒ Chapter 22.2.5 "Voltage supply of the bus for JUMO digiLine CR/Ci", page 198			

^a The maximum length of the bus line depends on the number and type of connected sensors and on how they are distributed along the bus line. Due to the widely varying current consumptions of the different sensor types, it is difficult to state a generate value that will apply for all installation situations. In case of doubt, it is advisable to carry out a voltage drop calculation during the planning phase (⇒ Chapter 22.2.6 "Voltage drop calculation", page 199).

^b Stub line from a JUMO digiLine hub or Y-splitter up to a JUMO ecoLine sensor or a sensor with JUMO digiLine electronics

Bus cabling in star topology

Bus terminations should not be used for star topology (with stub line). Transmission over stub lines is unproblematic. The use of numerous terminating resistors in a bus, however, can severely disrupt the signal.

Sensor type	Maximum length per branch	Max. number of connectable sensors	Comment
JUMO digiLine pH/ ORP/T	50 m	6	Bus termination is not permissible
JUMO ecoLine O-DO JUMO ecoLine NTU	50 m	6	Bus termination is not permissible
JUMO digiLine CR/Ci	Because of the energy requirement, installation of a JUMO digiLine hub with separate power supply the unit is required for connection of JUMO digiLine CR/Ci devices. The voltage supply from the JUMO AQUIS touch P is not sufficient in this case. ⇒ Chapter 22.2.5 "Voltage supply of the bus for JUMO digiLine CR/Ci", page 198		

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22.2.3 Voltage supply to the bus with DC 5 V from a JUMO digiLine hub

The line length specifications in this subchapter apply when supplying **JUMO ecoLine sensors and sensors with JUMO digiLine electronics** with DC 5 V from a JUMO digiLine hub. In this case, the JUMO digiLine hub must be supplied with DC 24 V. The slide switch on the JUMO digiLine hub must be set to the position for DC 24 V as the input voltage. The electronics of the JUMO digiLine hub generate the bus supply voltage of DC 5 V internally and supply its outputs with this voltage.

Bus cabling in line topology

In the line topology, the bus line must be provided with terminating resistors at both ends wherever possible, in order to avoid transmission interference through reflections. If JUMO ecoLine sensors are used, however, terminating resistors must not be employed. You should therefore use terminating resistors only in a JUMO digiLine bus without JUMO ecoLine sensors. M12 terminating connectors are available from JUMO for the bus termination.

⇒ Chapter 4.4 "Accessories", page 19

Terminating resistors can be activated via DIP switch on the options board for serial interface RS422/485.

⇒ Chapter "Interfaces for data and bus communication - Optional boards", page 58

Sensor type	Max. length of bus line ^a	Max. length of stub lines ^b	Max. number of connectable sensors	Comment
JUMO digiLine pH/ORP/T	200 m	10 m	6	-
JUMO ecoLine O-DO JUMO ecoLine NTU	200 m	10 m	6	Bus termination is not permissible
JUMO digiLine CR/Ci	Because of the energy requirement, installation of a JUMO digiLine hub with separate power supply the unit is required for connection of JUMO digiLine CR/Ci devices. The voltage supply from the JUMO AQUIS touch P is not sufficient in this case. ⇒ Chapter 22.2.5 "Voltage supply of the bus for JUMO digiLine CR/Ci", page 198			

^a The maximum length of the bus line depends on the number and type of connected sensors and on how they are distributed along the bus line. Due to the widely varying current consumptions of the different sensor types, it is difficult to state a generate value that will apply for all installation situations. In case of doubt, it is advisable to carry out a voltage drop calculation during the planning phase (⇒ Chapter 22.2.6 "Voltage drop calculation", page 199).

^b Stub line from a JUMO digiLine hub or Y-splitter up to a JUMO ecoLine sensor or a sensor with JUMO digiLine electronics

Bus cabling in star topology

Bus terminations should not be used for star topology (with stub line). Transmission over stub lines is unproblematic. The use of numerous terminating resistors in a bus, however, can severely disrupt the signal.

Sensor type	Maximum length per branch	Max. number of connectable sensors	Comment
JUMO digiLine pH/ORP/T	50 m	6	–
JUMO ecoLine O-DO JUMO ecoLine NTU	50 m	6	Bus termination is not permissible
JUMO digiLine CR/Ci	Because of the energy requirement, installation of a JUMO digiLine hub with separate power supply the unit is required for connection of JUMO digiLine CR/Ci devices. The voltage supply from the JUMO AQUIS touch P is not sufficient in this case. ⇒ Chapter 22.2.5 "Voltage supply of the bus for JUMO digiLine CR/Ci", page 198		

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22.2.4 Voltage supply to the bus with DC 24 V

The cable length information in this subchapter applies when supplying **digital JUMO tecLine sensors** with DC 24 V. In this case, stub lines can also be supplied from a JUMO digiLine hub or through use of JUMO Y-splitters. If a JUMO digiLine hub is used, the slide switch on the JUMO digiLine hub must be set to the correct position for the voltage supply being used. There are two possibilities:

- DC 24 V voltage supply from the voltage supply output on the JUMO AQUIS touch P via the bus input of the JUMO digiLine hub
- DC 24 V voltage supply through a separate power supply unit for the JUMO digiLine hub (available from JUMO, part no.: 00646871)

In both settings, the respective DC 24 V input voltage is fed through to all bus connections on the JUMO digiLine hub.

Bus cabling in line topology

In the line topology, the bus line must be provided with terminating resistors at both ends wherever possible, in order to avoid transmission interference through reflections. If JUMO ecoLine sensors are used, however, terminating resistors must not be employed. You should therefore use terminating resistors only in a JUMO digiLine bus without JUMO ecoLine sensors. M12 terminating connectors are available from JUMO for the bus termination.

⇒ Chapter 4.4 "Accessories", page 19

Terminating resistors can be activated via DIP switch on the options board for serial interface RS422/485.

⇒ Chapter "Interfaces for data and bus communication - Optional boards", page 58

Sensor type	Max. length of bus line ^a	Max. length of stub lines ^b	Max. number of connectable sensors	Comment
digital JUMO tecLine sensors (Types 20263x)	100 m	10 m	6	max. admissible voltage drop between DC 24 V supply and the last sensor: 1.5 V

^a The maximum length of the bus line depends on the number and type of connected sensors and on how they are distributed along the bus line. Due to the widely varying current consumptions of the different sensor types, it is difficult to state a generate value that will apply for all installation situations. In case of doubt, it is advisable to carry out a voltage drop calculation during the planning phase (⇒ Chapter 22.2.6 "Voltage drop calculation", page 199).

^b Stub line from a JUMO digiLine hub or Y-splitter up to a JUMO tecLine sensor.

Bus cabling in star topology

Bus terminations should not be used for star topology (with stub line). Transmission over stub lines is unproblematic. The use of numerous terminating resistors in a bus, however, can severely disrupt the signal.

Sensor type	Maximum length per branch	Max. number of connectable sensors	Comment
digital JUMO tecLine sensors (Types 20263x)	50 m	6	Bus termination is not permissible

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22.2.5 Voltage supply of the bus for JUMO digiLine CR/Ci

Because of their high energy requirement, conductivity sensors with JUMO digiLine electronics (JUMO digiLine CR/Ci, Types 20276x) may only be connected if a JUMO digiLine hub is used. Each hub must be supplied separately with DC 24 V. If necessary, separate power supply units and connecting cables with appropriately sized wires must be used. Only one JUMO digiLine electronics may be connected to each output of the hub. The maximum allowed length of the stub line between the hub and sensor with JUMO digiLine electronics is 10 m. If a longer length is needed, an additional hub must be used.

Sensor type	Max. length of bus line ^a	Max. length of stub lines ^b	Max. number of connectable sensors	Comment
JUMO digiLine pH/ORP/T	200 m	10 m	6	-
JUMO ecoLine O-DO JUMO ecoLine NTU	200 m	10 m	6	Bus termination is not permissible
JUMO digiLine CR/Ci	200 m	10 m	6	-

^a The maximum length of the bus line depends on the number and type of connected sensors and on how they are distributed along the bus line. Due to the widely varying current consumptions of the different sensor types, it is difficult to state a general value that will apply for all installation situations. In case of doubt, it is advisable to carry out a voltage drop calculation during the planning phase (⇒ Chapter 22.2.6 "Voltage drop calculation", page 199).

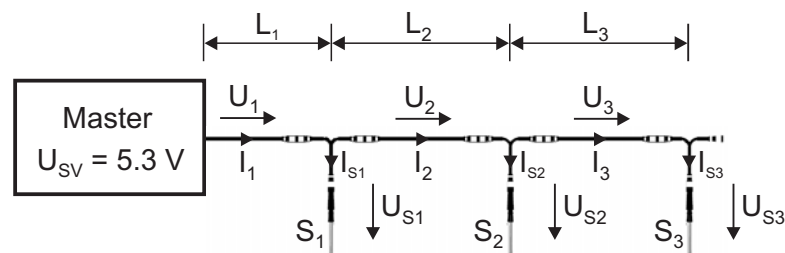
^b Stub line from a JUMO digiLine hub or Y-splitter up to a digital sensor.

22.2.6 Voltage drop calculation

In the case of a JUMO digiLine bus with line topology (Y-adapter or JUMO digiLine hub with 5.3 V through a separate power supply unit) there is inevitably a voltage drop between the supply voltage feed-in and each sensor. The amount of the voltage drop depends on the sensor type, the number of sensors, the length of the bus, and the distribution of the sensors on the bus. Since each sensor requires a minimum voltage for proper operation, the voltage drop needs to be considered in the planning.

In the following description the calculation of the voltage drop is shown with the help of an example.

Bus structure



- L_x Length of line segment x ($x = 1, 2, 3$)
- U_{PS} Supply voltage at the point of feed-in
- U_x Voltage drop at line segment x
- I_x Current through line segment x
- S_x Sensor x
- I_{Sx} Current consumption of sensor x
- U_{Sx} Supply voltage at sensor x

Step 1: Calculate the current in the individual line segments

For the calculation of the current flowing through a line segment, the partial currents of all sensors, which are supplied via this segment, are added. For the bus structure shown above this means:

$$I_1 = I_{S1} + I_{S2} + I_{S3}$$

$$I_2 = I_{S2} + I_{S3}$$

$$I_3 = I_{S3}$$

The current consumption of a sensor is shown in the following table; it applies for Modbus operation without bus termination and a sampling time of 1 second.

Sensor	Average value of current consumption	Peak value of current consumption
JUMO digiLine pH/ORP/T	approx. 17 mA	approx. 20 mA
JUMO ecoLine O-DO	approx. 4 mA	approx. 50 mA
JUMO ecoLine NTU	approx. 2 mA	approx. 60 mA

In the case of bus termination at both ends (120 ohm), the current consumption increases during communication by up to 55 mA.

When operating with JUMO digiLine protocol, collisions occur on the bus during bus scan; this can also lead to increased current consumption. However, this is usually not critical, since there is no measured value processing during the scan

and therefore the supply voltage of the sensor may be lower.

For sensors of type JUMO digiLine pH/ORP/T, the calculation must be performed with the peak values:

$$I_1 = I_{S1} + I_{S2} + I_{S3} = 20 \text{ mA} + 20 \text{ mA} + 20 \text{ mA} = 60 \text{ mA}$$

$$I_2 = I_{S2} + I_{S3} = 20 \text{ mA} + 20 \text{ mA} = 40 \text{ mA}$$

$$I_3 = I_{S3} = 20 \text{ mA}$$

For sensors of type ecoLine O-DO/NTU, the highest peak value is used once and the remaining sensors are considered with their average values. Example for 1 x O-DO and 2 x NTU:

$$I_1 = I_{S1} + I_{S2} + I_{S3} = 4 \text{ mA} + 2 \text{ mA} + 60 \text{ mA} = 66 \text{ mA}$$

$$I_2 = I_{S2} + I_{S3} = 2 \text{ mA} + 60 \text{ mA} = 62 \text{ mA}$$

$$I_3 = I_{S3} = 60 \text{ mA}$$

For further calculation it is assumed that the following sensors are used in the bus structure shown above:

Sensor 1: JUMO digiLine pH (use peak value)

Sensor 2: ecoLine O-DO (use average value)

Sensor 3: ecoLine NTU (use peak value)

Thus, the following currents result:

$$I_1 = I_{S1} + I_{S2} + I_{S3} = 20 \text{ mA} + 4 \text{ mA} + 60 \text{ mA} = 84 \text{ mA} = \mathbf{0.084 \text{ A}}$$

$$I_2 = I_{S2} + I_{S3} = 4 \text{ mA} + 60 \text{ mA} = 64 \text{ mA} = \mathbf{0.064 \text{ A}}$$

$$I_3 = I_{S3} = 60 \text{ mA} = \mathbf{0.06 \text{ A}}$$

Step 2: Calculate the voltage drop on the individual line segments

The cable lengths of the line segments are **20 m** each.

The voltage drop on a line segment is calculated in accordance with the following formula:

$$U_x = \rho \times 2 \times L_x \times I_x / A; \text{ where } \rho = 1/56 \text{ } \Omega\text{mm}^2/\text{m} \text{ and } A = 0.34 \text{ mm}^2$$

In the above example this means:

$$U_1 = \rho \times 2 \times L_1 \times I_1 / A = 1/56 \text{ } \Omega\text{mm}^2/\text{m} \times 2 \times \mathbf{20 \text{ m} \times 0.084 \text{ A}} / 0.34 \text{ mm}^2 = 0.177 \text{ V}$$

Shown in simplified form:

$$U_1 = 1/56 \text{ } \Omega \times 2 \times \mathbf{20 \times 0.084 \text{ A}} / 0.34 = \mathbf{0.177 \text{ V}}$$

$$U_2 = 1/56 \text{ } \Omega \times 2 \times \mathbf{20 \times 0.064 \text{ A}} / 0.34 = \mathbf{0.135 \text{ V}}$$

$$U_3 = 1/56 \text{ } \Omega \times 2 \times \mathbf{20 \times 0.06 \text{ A}} / 0.34 = \mathbf{0.126 \text{ V}}$$



NOTE

The calculation of the voltage drop according to the sample shown is not valid for mixed connection of sensors with 5 V and 24 V voltage supply.

Step 3: Calculate the voltage at the respective sensor

The value of the supply voltage at the respective sensor is given by the supply voltage at the point of feed-in minus the sum of all the voltages which drop on the line segments that are located between the point of feed-in and the sensor. In the above example this means:

$$U_{S1} = U_{SV} - U_1 = 5.3 \text{ V} - 0.177 \text{ V} = 5.123 \text{ V} \approx \mathbf{5.1 \text{ V}}$$

$$U_{S2} = U_{SV} - U_1 - U_2 = 5.3 \text{ V} - 0.177 \text{ V} - 0.135 \text{ V} = 4.988 \text{ V} \approx \mathbf{5.0 \text{ V}}$$

$$U_{S3} = U_{SV} - U_1 - U_2 - U_3 = 5.3 \text{ V} - 0.177 \text{ V} - 0.135 \text{ V} - 0.126 \text{ V} = 4.862 \text{ V} \approx \mathbf{4.9 \text{ V}}$$

The required minimum voltage of the sensors is shown in the following table.

Sensor	Minimum voltage
JUMO digiLine pH/ORP/T	4.2 V
JUMO ecoLine O-DO	5 V
JUMO ecoLine NTU	5 V

The voltage at sensor 1 (JUMO digiLine pH) is well above the minimum value (4.2 V). The voltage at sensor 2 (ecoLine O-DO) roughly corresponds to the minimum value (5 V). For sensor 3 (ecoLine NTU), the voltage is not enough.



NOTE

For the operation of JUMO ecoLine sensors, it is generally recommended to use JUMO digiLine hubs and to generate the DC 5.3 V supply voltage within the JUMO digiLine hub.



NOTE

The voltage drop calculation shown here only applies when using digital sensors of types 202705 (JUMO digiLine pH/ORP/T), 202613 (JUMO ecoLine O-DO) and 202670 (JUMO ecoLine NTU).

22.3 China RoHS

部件名称 Product group: 202580/81	有毒有害物质或元素 Hazardous substances						
		铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
外壳 Housing (Gehäuse)		○	○	○	○	○	○
过程连接 Process connection (Prozessanschluss)		○	○	○	○	○	○
-螺母 Nut (Mutter)		○	○	○	○	○	○
螺钉 Screw (Schraube)		○	○	○	○	○	○
本表格依据 SJ/T 11364-2014的规定编制。 (This table is prepared in accordance with the provisions of SJ/T 11364-2014.) O : 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。 (O: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.) X : 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。 (X: Indicates that said hazardous substance contained in one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572.)							



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