Inductive conductivity transmitter in stainless steel housing JUMO CTI-750 Type 202756

B 20.2756.0.1
Operating manual

11.07/00488788

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1 Typographical conventions

1.1 Warning signs

Caution

This sign is used if, by carefully following or not following instructions, **harm to persons** can occur

Caution

This sign is used if, by carefully following or not following instructions, **damage to devices or data** can occur

1.2 Indicative signs

Note

This sign is used when your attention is to be drawn to **something special**.

abc[1]

Footnote

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

Flag in the text and footnote text.

The flagging in the text is done by superscript serial numbers.

✱

Action indication

This sign indicates that **an activity to be carried out** is being described.

The individual work steps are marked by this star.

Example:

✱ Loosen the crosshead screws..

2.1 Foreword

Please read the operating manual before you commission the device. Store the operating manual at a place that is accessible for all users at all times.

Please help us to improve this operating manual.

We would be grateful for your suggestions.

Telephone(06 61) 60 03-7 14
Telefax (06 61) 60 03-6 05

All the required settings are described in this manual. Should there be any difficulties nonetheless at the time of commissioning, we request you not to carry out any impermissible manipulations. You could render your warranty entitlement null and void.

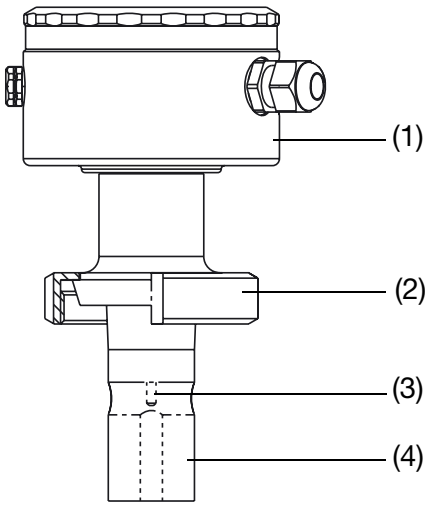
Please get in touch with the nearest branch or with the head office.

In case of technical queries
Service-Hotline:
Telephone:(06 61) 60 03-3 00 or (06 61) 60 03-6 53
Telefax: (06 61) 60 03-88 13 00 or (06 61) 60 03-88 16 53
E-mail: Service@jumo.net

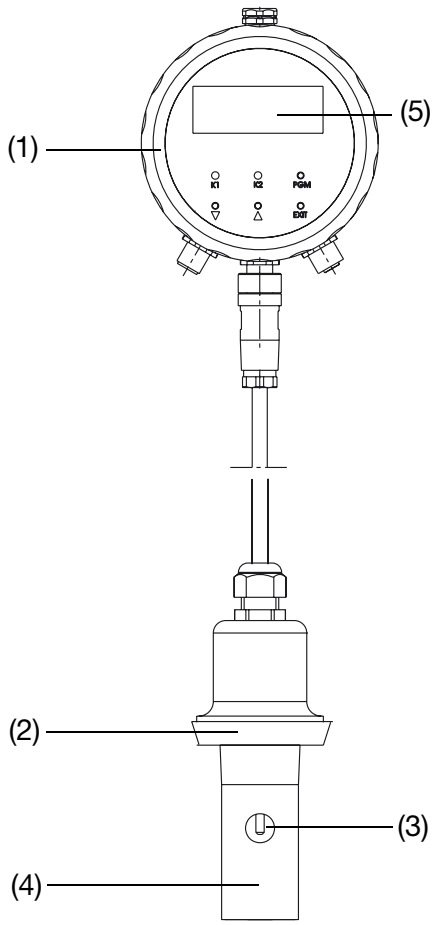
2.2 Structure of the JUMO CTI-750

Examples

Model:
Transmitter and conductivity measuring probe combined, type 202756/xx...



Model:
Transmitter with separate sensor, type 202756/xx...



(1) Transmitter

(2) Process connection

(3) Temperature sensor

(4) Inductive conductivity measuring probe

(5) with or without graphics LC-display

3.1 Range of Applications

General

The inductive measurement process allows a mostly maintenance-free acquisition of the specific conductivity even in difficult medium conditions. In contrast to the conductive measurement process, problems like electrode replacement and polarization do not occur.

Brief description

The device is used for the measurement / control of the conductivity / concentrations of liquid media. Using it is particularly recommended in media in which significant deposits from carried dirt, oil grease or of lime and gypsum are expected. The integrated temperature measurement makes exact and fast temperature compensation possible, which is particularly important for the measurement of the conductivity. Additional functions such as the combined switching of the measurement range and temperature coefficient make possible the optimum use in case of CIP-processes.

Two integrated switching outputs can be freely programmed for limit value monitoring or conductivity / concentration and /or temperature. In addition, alarm and control tasks (desalination) can be assigned.

Operation is either via a membrane keyboard and a plain text graphical display (user language can be changed) or via a comfortable PC-Setup program. By simply turning the housing cover, reading the display is possible both in case of installation in vertical or horizontal pipes. By means of the Setup program, the device configuration data can also be saved and printed for plant documentation purposes. To prevent manipulation, the device can also be supplied without a keyboard / display. In this case, the Setup program is required for programming.

The JUMO CTI-750 can be supplied as a combine device (transmitter and measuring cell in one device) or as a shouldered version (transmitter and measuring cell connected by cables). The separate version is particularly suitable for plants with intense vibrations and/or intense temperature radiation at the measurement location or for installation at not easily accessible places.

Typical usage fields

- CIP-cleaning (CIP = **C**lean **I**n **P**lace / **P**rocess)
- Concentration monitoring or chemical dosing
- Foodstuffs beverages and pharmaceutical industries
- Product monitoring (phase separation, Product / Product mixture / Water) in the beverage industry, breweries, dairies
- Control (e.g. phase separation of cleaners / rinsing water of cleaning processes e.g.. bottle cleaning plants and in case of container cleaning)

3 Inductive conductivity measurement

3.2 Function

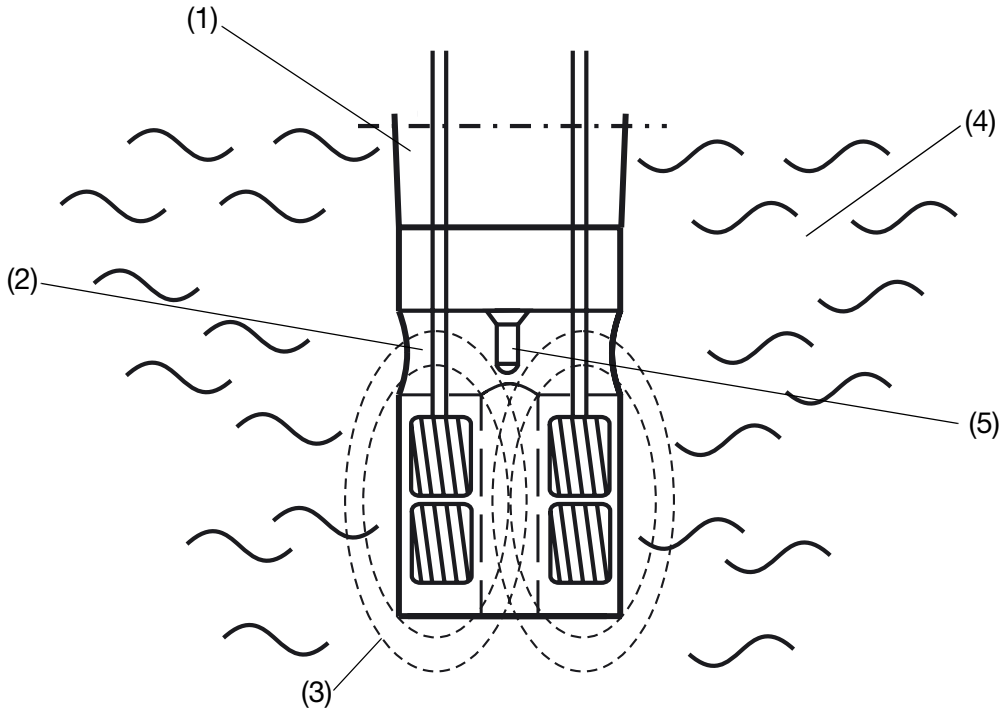
of the transmitter

The JUMO CTI-750 transmitter is conceived for use at the location. A robust housing protects the electronics and the electrical connections from aggressive ambient influences (system of protection IP 67). In the standard version, the device has one analog signal input for the conductivity / concentration and the temperature. The further processing of the standard signals can take place in suitable display / control devices or, e.g. directly in a PLC.

The output signals are galvanically separated from one another and from the measurement medium.

of the measuring cell

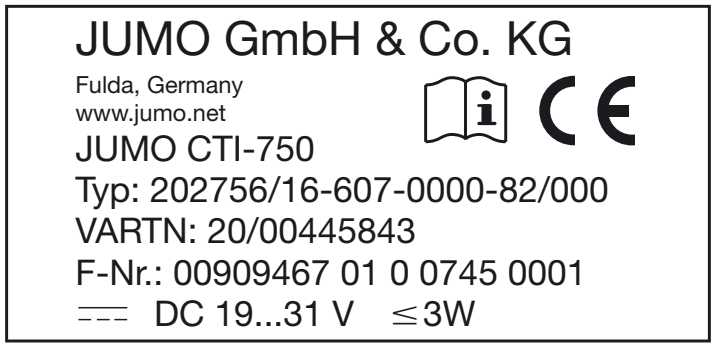
The measurement of the conductivity takes place with an inductive probe. A sinusoidal AC is supplied to the transmitting coil. Depending on the conductivity of the liquid to be measured, a current is induced in the receiver coil. The current is proportional to the conductivity of the medium. The cell constant of the inductive probe is geometry-dependent. In addition, the cell constant can be influenced by parts in its immediate vicinity.



(1) Plastic body
(2) T-shaped flow channel
(3) Fluid loop
(4) Measurement medium
(5) Temperature sensor Pt100

4.1 Type nameplate

on the transmitter



on the connecting cable (only in case of separate sensor)

In the case of devices with a separate sensor (base type supplementation (2) 66), for every instrument, the transmitter and the separate sensor are matched to one another at the factory.
When connecting the components, ensure that the production number of the external sensor (on the flag tag on the connecting cable) is identical to the production number of the transmitter (on the nameplate).

The date of manufacture is encrypted in the "F-No." :

0517 means year of manufacture 2005 / calendar week 17

4 Identifying the device

4.2 Type explanation

4.3 JUMO CTI-750 as "Head-mounted transmitter"

		(1)	**Basic type**
	202756		JUMO CTI-750 Inductive transmitter / switching device for conductivity / concentration and temperature
		(2)	**Basic type supplementation**
	16		Head-mounted transmitter in stainless steel housing with display / keyboard
		(3)	**Process connection**
o	107		Stud thread G1 1/4A
o	108		Stud thread G1 1/2A
o	110		Stud thread G2A
o	606		Screwed pipe connection DN40, DIN 11 851 (MK DN50, milk cone)
o	607		Screwed pipe connection DN50, DIN 11 851 (MK DN40, milk cone)
o	608		Screwed pipe connection DN65, DIN 11 851 (MK DN65, milk cone)
o	609		Screwed pipe connection DN80, DIN 11 851 (MK DN80, milk cone)
o	617		Clamp 2 1/2" [4]
o	686		VARIVENT® DN40/50[1]
o	690		SMS 2"
		(4)	**Immersion length**
o	000		see "Dimensions / Process connections (head-mounted transmitter"
		(5)	**Electrical connection**
o	82		Cable glands
o	83		M12-plug / -sockets (instead of the cable glands)[2]
o	84		Two cable glands M16 and a dummy plug
		(6)	**Extra codes[3]**
	000		None
o	268		Temperature sensor inside
X	767		Measuring cell material PEEK
X	768		Measuring cell material PVDF
o	844		Voltage supply AC 24 V

	(1)		(2)		(3)		(4)		(5)		(6)	
Ordering key		/		-		-		-		/		, ...
Ordering example	202756	/	16	-	607	-	000	-	82	/	000	

[1] Only in conjunction with additional code 767 (measuring cell material PEEK).
[2] If required, M12-plug / -sockets, additional code 580 should be ordered.
[3] Specify additional codes in succession separated by a comma.
[4] Assembly material (mounting brackets) not part of the scope of supply.

4.4 JUMO CTI-750 as "Transmitter with separate sensor"

				(1)	**Basic type**
			202756		JUMO CTI-750 Inductive transmitter / switching device for conductivity / concentration and temperature
				(2)	**Basic type supplementation**
			26		Transmitter in stainless steel housing, with display / keyboard (without sensor)[5]
			66		Transmitter in stainless steel housing, with display / keyboard including sensor (cable length 10 m)
			85		Replacement sensor with 10 m cable[1, 5] for transmitter in stainless steel housing
				(3)	**Process connection**
X			000		not available
o	o	o	107		Stud thread G1 1/4A
o	o	o	108		Stud thread G1 1/2A
o	o	o	110		Stud thread G2A
o	o	o	606		Screwed pipe connection DN40, DIN 11 851 (MK DN40, milk cone)
o	o	o	607		Screwed pipe connection DN50, DIN 11 851 (MK DN50, milk cone)
o	o	o	607		Screwed pipe connection DN65, DIN 11 851 (MK DN65, milk cone)
o	o	o	607		Screwed pipe connection DN80, DIN 11 851 (MK DN80, milk cone)
o	o	o	617		Clamp 2 1/2" [1]
o	o	o	686		VARIVENT® DN40/50[2]
o	o	o	690		SMS 2" [5]
	o	o	706		Submerged version[6]
				(4)	**Immersion length**
X			0000		see "Dimensions / Process connections (separate sensor)"
X	o	o	0500		500 mm
X	o	o	0000		1000 mm
X	o	o	0000		1500 mm
X	o	o	0000		2000 mm
X	o	o	xxxx		Special length (in grid of 250 mm; e.g. 0250; 0750; 1250; 1750)
				(5)	**Electrical connection**
		X	21		Fixed cable with M12-socket at separate sensor
o	o		82		Cable glands on operating part
o	o		83		M12-plug / sockets on operating part[3]
o	o		84		Two cable glands M16 and a dummy plug
				(6)	**Extra codes[4]**
X	X	X	000		no extra code
	o	o	268		Temperature sensor inside
o	o		580		1 set M12-plug / sockets
X	X	X	767		Measuring cell material PEEK
X	X	X	768		Measuring cell material PVDF
o	o		844		Voltage supply AC 24 V

4 Identifying the device

	(1)		(2)		(3)		(4)		(5)		(6)	
Ordering key		/		-		-		-		/		, ...
Ordering example	202756	/	66	-	607	-	1000	-	82	/	767	

[1] Assembly material (Union / grooved nut, mounting bracket) not part of scope of supply. If required, please order as well, see accessories.

[2] Only in conjunction with additional code 767 (measuring cell material PEEK).

[3] If required, M12-plug / -sockets, additional code 580 should be ordered.

[4] Specify additional codes in succession separated by a comma.

[5] An equalizing set is indispensable for commissioning. If not available, please order as well, see Accessories.

[6] Only in conjunction with additional code 768 (measuring cell material PVDF).

5.1 Technical data, transmitter

5.1.1 General

A/D-converter	Resolution: 15-bit sampling time:500 ms = 2 measurements/s
Voltage supply	For operation on SELF- or PELV-circuits Standard production feature: DC 19…31 V (nominal DC 24 V), the device has reverse polarity protection Ripple: < 5% Power drawn with display: ≤ 3 W Power drawn without display: ≤ 2.6 W In case of extra code 844: AC 24 V ±10% Breaking capacity of the semiconductor relay U < 50 V AC/DC I ≤ 200 mA
electrical connection	Threaded plug terminals 2.5 mm^2 or M12-plug/ sockets
Display (option)	Graphic-LCD with background lighting; Contrast adjustable dimensions: 62 x 23 mm
permissible ambient temperature (transmitter)	-5…+50°C max. 93% rel. atmospheric humidity, without thawing
permissible storage temperature (transmitter)	-10…+65°C max. 93% rel. atmospheric humidity, without thawing
System of protection (transmitter)	IP 67
Housing	Stainless steel, material no. 1.4305
Weight	depending on the model and process connection about 2.4 kg

5 Device description

5.1.2 Conductivity-/ Concentration transmitter

Concentration measurement (implemented in the device software)

- NaOH (sodium hydroxide solution)
  0...15 % by weight or 25...50 % by weight
- HNO_3 (nitric acid); pay attention to the chemical resistance of the sensor!
  0...25 % by weight or 36...82 .% by weight
- Customer-specific concentration curve
  freely programable via the setup program (see "Special functions")

Calibration timer

adjustable: 0...999 days (0 = off)

Output - signal conductivity / concentration

0...10 V / 10...0 V
2...10 V / 10...2 V
0...20 mA / 20...0 mA
4...20 mA / 20...4 mA

The output signal is freely scalable.

Load

≤ 500 Ω for current output
≥ 2kΩ for voltage output

Influence of ambient temperature

≤ 0.1%/K

Analog output in case of "Alarm"

Low (0 mA / 0 V / 3.4 mA / 1,4 V) or
High (22.0 mA / 10,7 V) or
a fixed value that can be set (safety value)

Measurement ranges

Four measurement ranges can be selected.
One of these measurement ranges can be activated via an external switch or a PLC .

Measurement ranges, transmitter	**Accuracy** (in % of the start - of measurement range)
0...500 µS/cm	≤0.5%
0...1000 µS/cm	
0...2000 µS/cm	
0...5000 µS/cm	
0...10 mS/cm	
0...20 mS/cm	
0...50 mS/cm	
0...100 mS/cm	
0...200 mS/cm	
0...500 mS/cm	
0...1000 mS/cm	
0...2000 mS/cm [1]	

[1] not temperature-compensated

Note:
The overall accuracy is formed from the accuracy of the transmitter + the accuracy of the sensor.

5.1.3 Temperature transmitter

Temperature acquisition	manual -20.0...25.0...150°C / °F or automatic
Temperature measurement range	-20...150°C / °F
Characteristic	linear
Accuracy	≤ 0.5% of the measurement range
Influence of ambient temperature	≤ 0.1%/K
Output -signal temperature	0...10 V / 10...0 V 2...10 V / 10...2 V 0...20 mA / 20...0 mA 4...20 mA / 20...4 mA The output signal is freely scalable.
Load	≤ 500 Ω for current output ≥ 2 kΩ for voltage output
Analog output in case of "Alarm"	Low (0 mA / 0 V / 3.4 mA / 1,4 V) or High (22.0 mA / 10,7 V) or a fixed value that can be set (safety value)

5.1.4 Temperature compensation

Reference temperature	15...30°C adjustable
Temperature coefficient	0.0...5.5 %/K adjustable

Compensation range

-20...150°C

Function

- Linear compensation (constant temperature coefficient).
  This type of compensation can be applied with acceptable for many normal types of water. The temperature coefficient used is then about 2.2 %/K.
- Natural water (DIN EN27888 or ISO 7888).
  In this case, a so-called non-linear temperature compensation is applied. According to the above standard, the corresponding type of compensation can be applied in the case of natural ground waters, spring waters and above-ground waters.
  The conductivity of the water is compensated in the range from 0°C to 36°C.
- Not linear (for learning function, see special functions)
  Here, the actual flow of the temperature coefficient during a heating-up or cooling process is determined with the transmitter.

5.1.5 Sensor

Material

PEEK (Polyetheretherketone) or
PVDF (Polyvenylidenfluoride)
Note!:
Temperature, pressure and measurement medium influence the life of the measuring cell

Temperature of the measure-ment medium

-10 ... +120°C
short-term 140°C (sterilization)

Pressure

max. 10 bar

Measurement range Sensor	**Accuracy** (in % of the start - of measurement range)
0...500 µS/cm	≤1%
0...1000 µS/cm	
0...2000 µS/cm	≤0.5%
0...5000 µS/cm	
0...10 mS/cm	
0...20 mS/cm	
0...50 mS/cm	
0...100 mS/cm	
0...200 mS/cm	
0...500 mS/cm	
0...1000 mS/cm	≤1%
0...2000 mS/cm [1]	

[1] not temperature-compensated

6.1 General

Installation location

The compatibility of the material with the measurement medium must be checked by the customer.

Ensure easy accessibility for subsequent calibration.

The fastening must be secure and low-vibration.

Avoid direct sunlight.

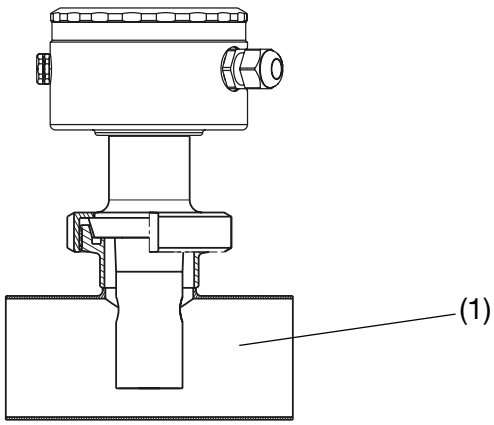
It is necessary to pay attention to a good flow through and around the sensor (1).

When installing in a pipe, a minimum distance of 20 mm must be maintained from the sensor to the pipe wall.
If these minimum distances cannot be maintained, the parameter "Mounting factor" can be used to achieve limited equalization.

In immersion operation in a basin, an installation location that is representative for the typical conductivity or concentration must be provided.

Mounting location

The JUMO CTI-750 can be mounted in any position.

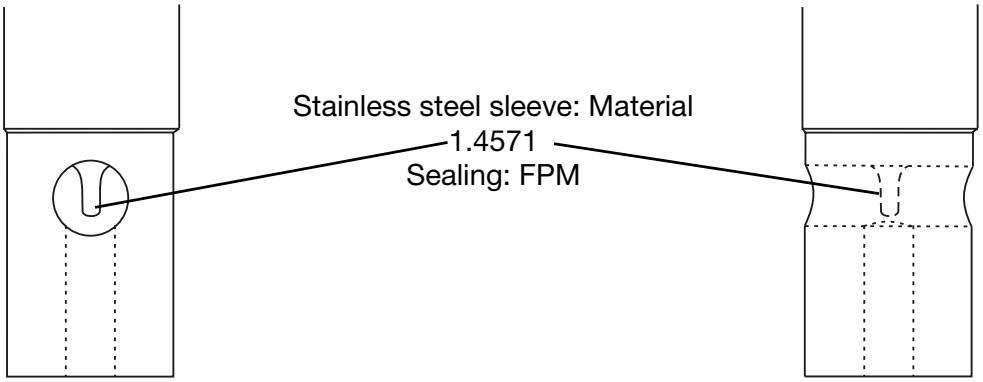


Screwing in and unscrewing the separate sensor

No cable twisting should occur.

Avoid tensile forces on the cable, especially jerky pulling.

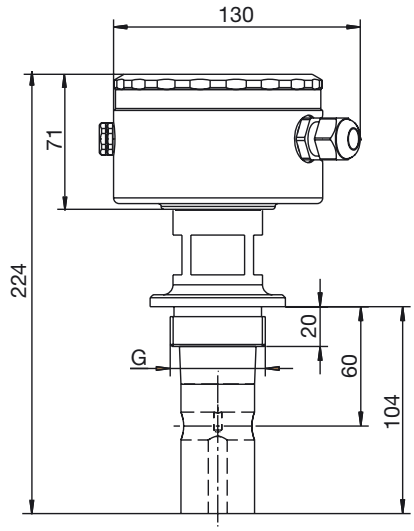
Sensor details



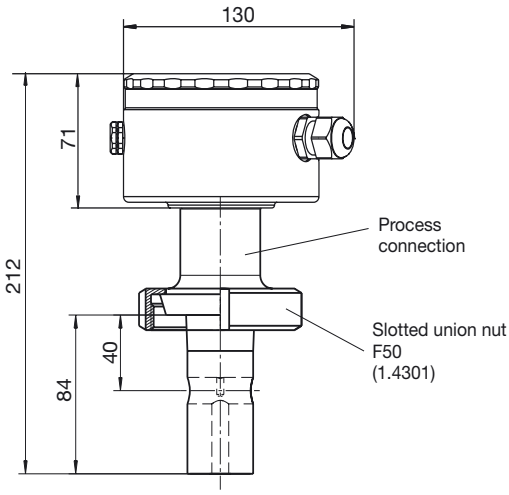
6 Installation

6.2 Dimensions / Process connections, head transmitter

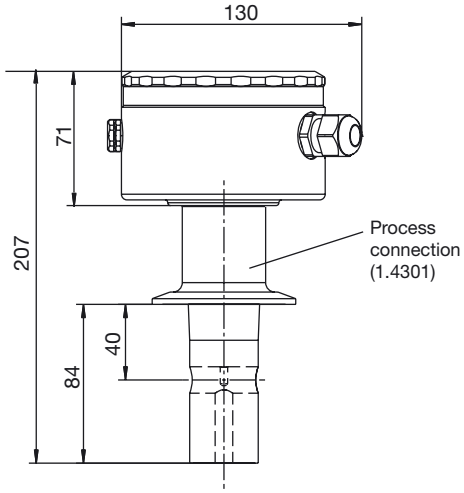
Installation variants



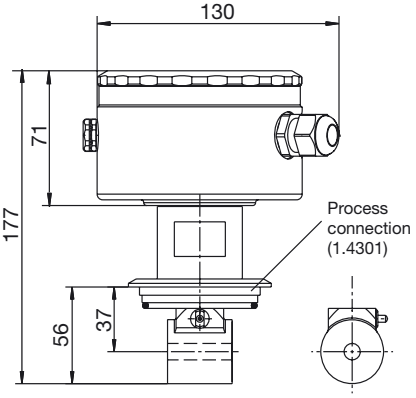
Model with process connection
107 = Stud thread G1 1/4A
108 = Stud thread G1 1/2A
110 = Stud thread G2A



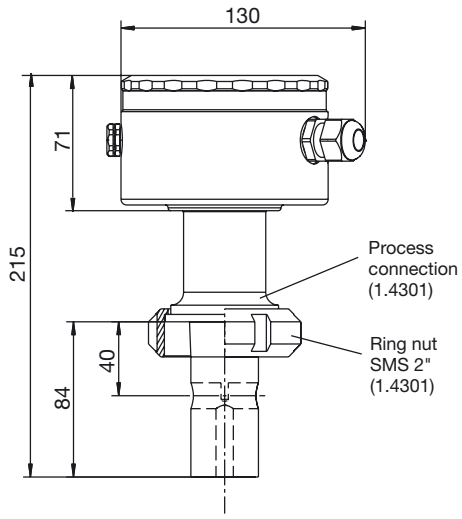
Model with
process connection 607
MK DN50



Model with
process connection 617
Clamp $2^1/_2$"
(mounting bracket not part of scope of supply)



Version with
process connection 686
VARIVENT® DN50
(mounting bracket not in scope of supply)

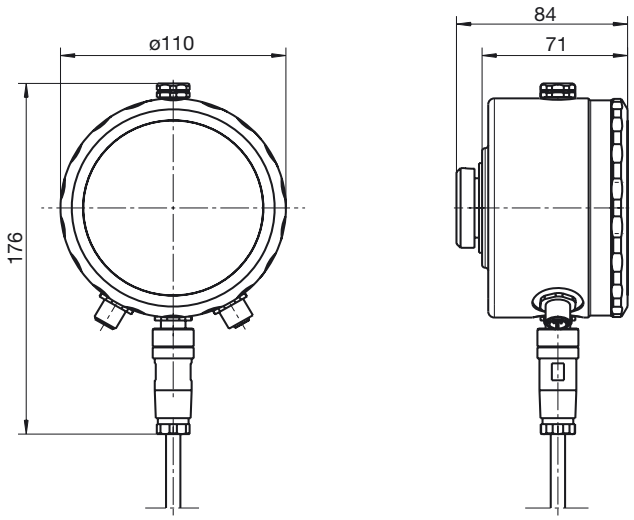


Model with
process connection 690
SMS 2"

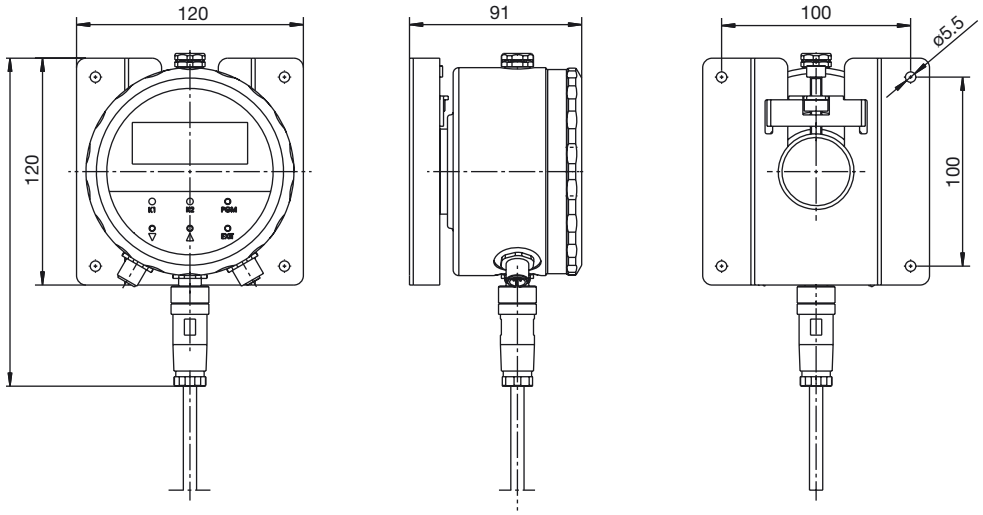
6 Installation

6.3 JUMO CTI-750 with separate sensor

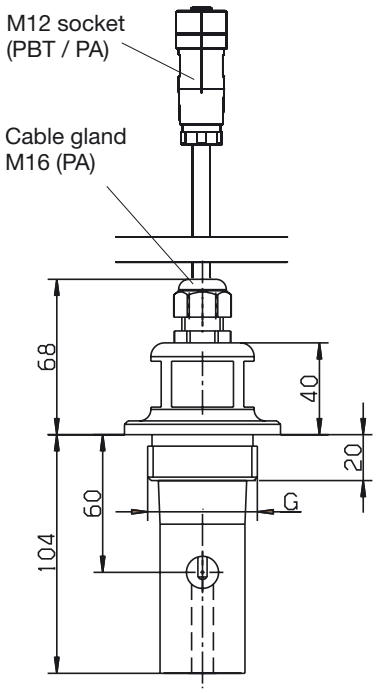
Transmitter-head



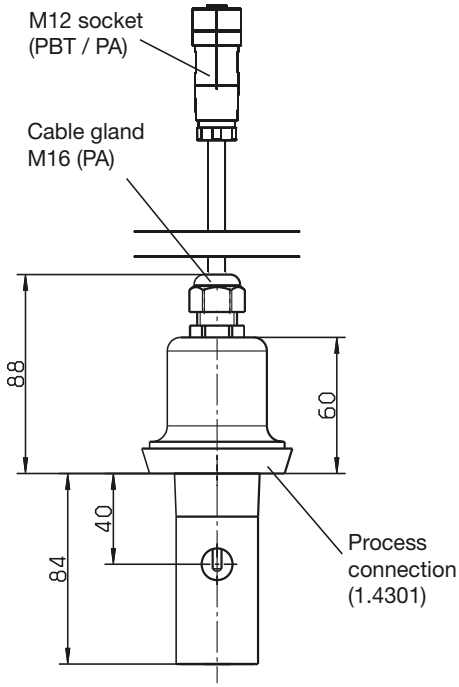
Wall fastening



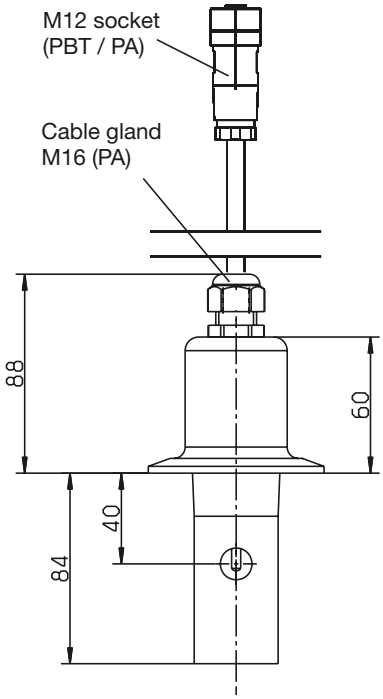
Sensor part



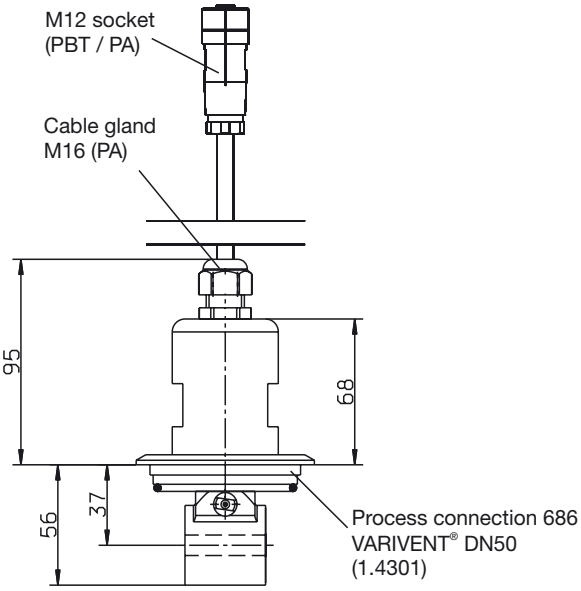
Shouldered version with
process connection
107 = Stud thread G1 1/4A
108 = Stud thread G1 1/2A
110 = Stud thread G2A



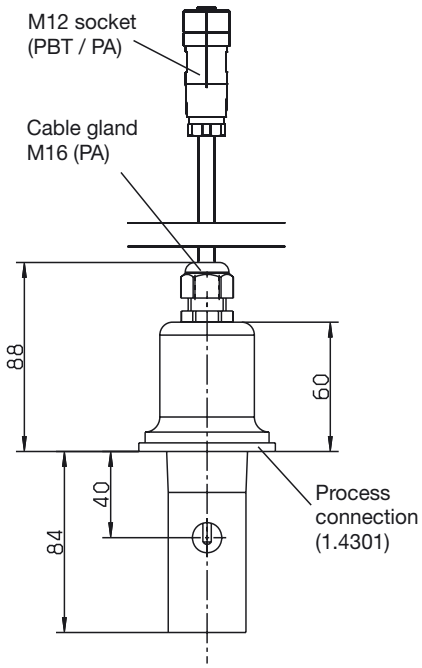
Shouldered version with
process connection 607
MK DN50
(union nut not part
of scope of supply)



Shouldered version with
process connection 617
Clamp $2^1/_2$"
(mounting bracket not part
of scope of supply)

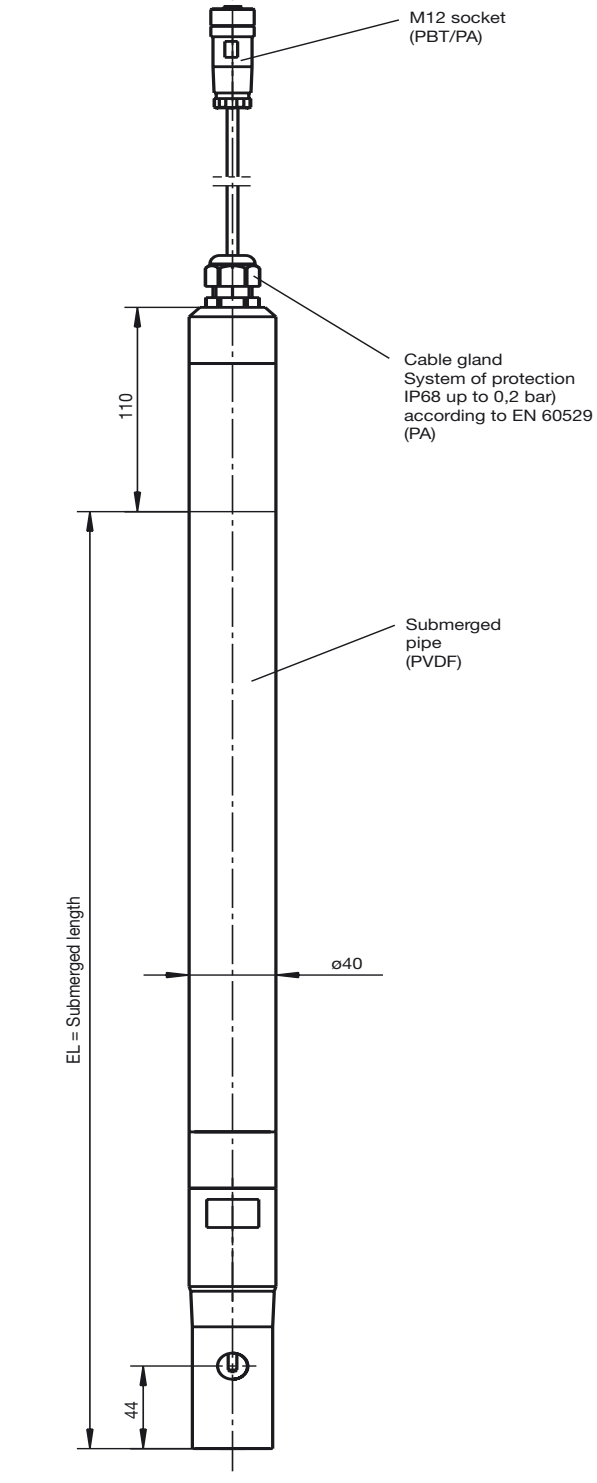


Shouldered version with
process connection 686
VARIVENT® DN50
(mounting bracket not
in scope of supply)

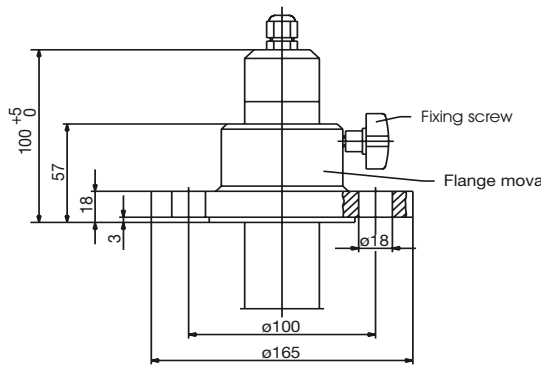


Shouldered version with
process connection 690
SMS 2"
(union nut not part
of scope of supply)

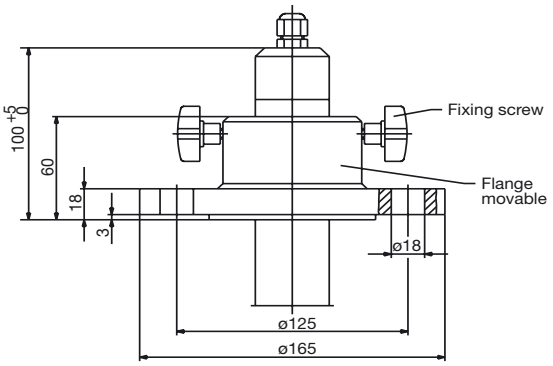
6.3.1 Separate sensor as submerged version



Shouldered version with
process connection 706
Immersion version
(pipe clamps not part of the scope of supply)



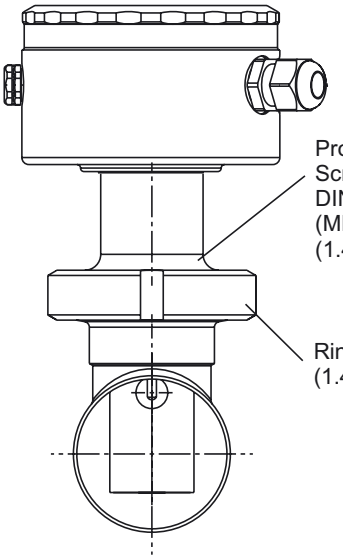
Optional accessories:
Flange DN 32, Sales no.: 20/00083375



Optional accessories:
Flange DN 50, Sales no.: 20/00083376

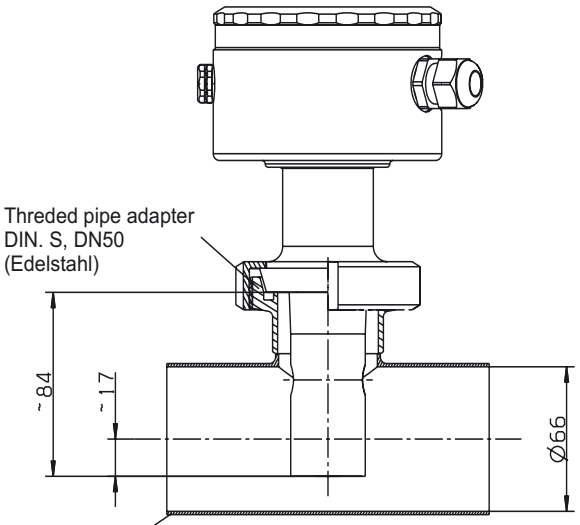
6 Installation

6.4 Installation examples



Process connection 607
Screwed pipe fitting DN50,
DIN 11 851
(MK DN50, Milk cone)
(1.4301)

Ring nut DN50
(1.4301)

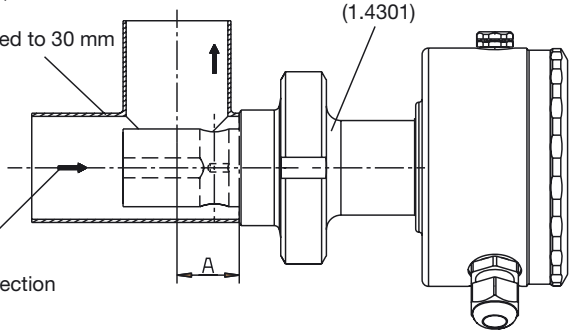


Threded pipe adapter
DIN. S, DN50
(Edelstahl)

Reducing Tee DIN, short SSS DN65/50
(e.g. 1.4301)
(to be provided by the plant operator not supplied by JUMO)

Process sonnection 607
Screwed pipe fitting DN50
DIN11 851
(MK DN50, Milk cone)
(1.4301)

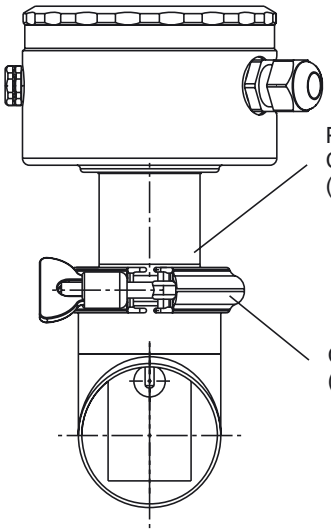
Tee DIN 11 852, SSS
DN50
Dim. A shortened to 30 mm



Flow direction

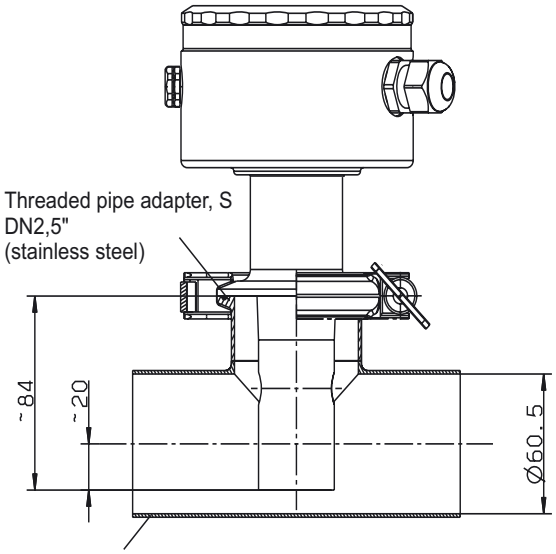
Weld-on threaded connector
DN50, DIN 11 851
(counter-piece to process connection -607)

Sales no.: 20/00085020



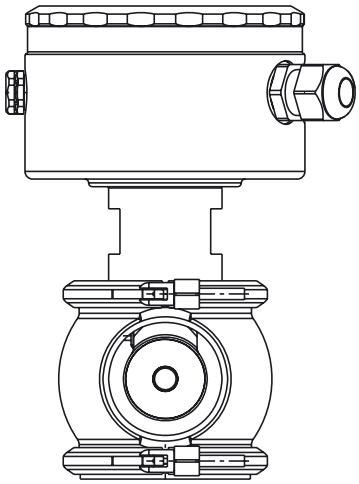
Process connection 617
Clamp 21/2"
(1.4301)

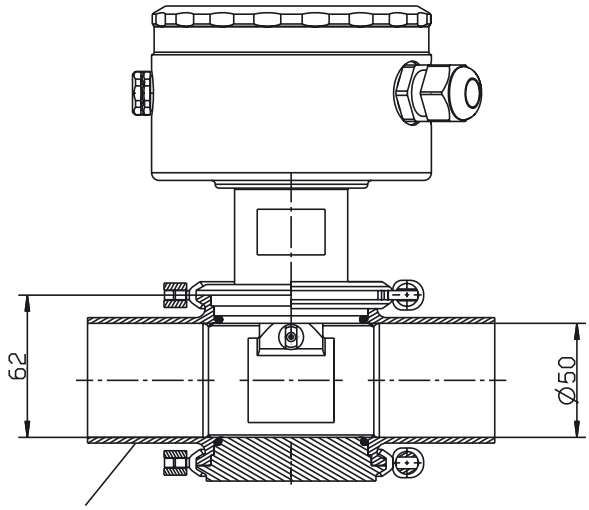
Clamping ring
(e.g. 1.4301)



Threaded pipe adapter, S
DN2,5"
(stainless steel)

Reducing Tee DIN, short SSS DN65/50
(e.g. 1.4301)
(to be provided by the plant operator not supplied by JUMO)





Tee DIN, short SSS DN65/50
(e.g. 1.4301)
(to be provided by the plant operator not supplied by JUMO)

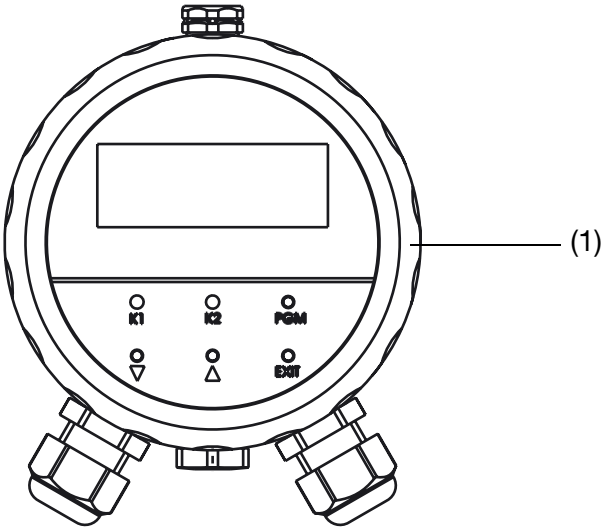
7 Installation

The electrical connections may only be set up by technically qualified personnel.

- ❏ When selecting the conductor material for the installation and for the electrical connections of the device, compliance is required with the specifications of VDE 0100 "Regulations governing the installation of heavy-current systems with rated voltages below 1000 V" or the relevant country specifications.
- ❏ The electrical connections may only be set up by technically qualified personnel.
- ❏ Completely isolate the device from the main supply, if live parts can be touched while working.
- ❏ The electromagnetic compatibility corresponds to EN 61326.
- ❏ The input, output and supply cables must be laid spatially separated from one another and not parallel to one another.
- ❏ The device is not suitable for installation in explosion-endangered areas.
- ❏ Apart from faulty installation, wrongly set values on the device can also have an adverse impact on the following process in its proper functioning, or result in damage.
- ❏ The device must be grounded:
  Head-mounted transmitters:
  e.g. indirectly above a metallic pipe.
  Transmitter with separate sensor:
  e.g. indirectly above a metallic pipe or above the wall fastening.

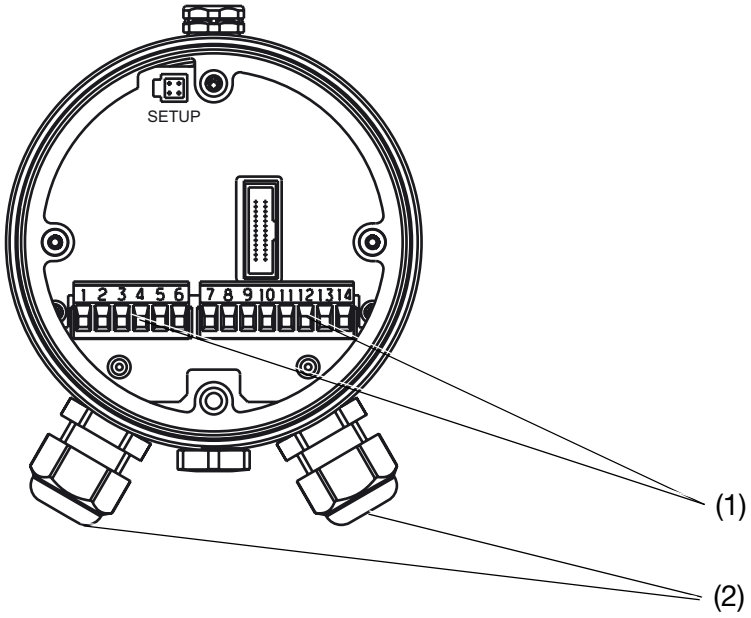
7.1 General

Open the operating unit



✱ Unscrew the cover (1)

Connect the cables



For connecting the individual cores, pull out the threaded plug terminals (1) in the operating unit.

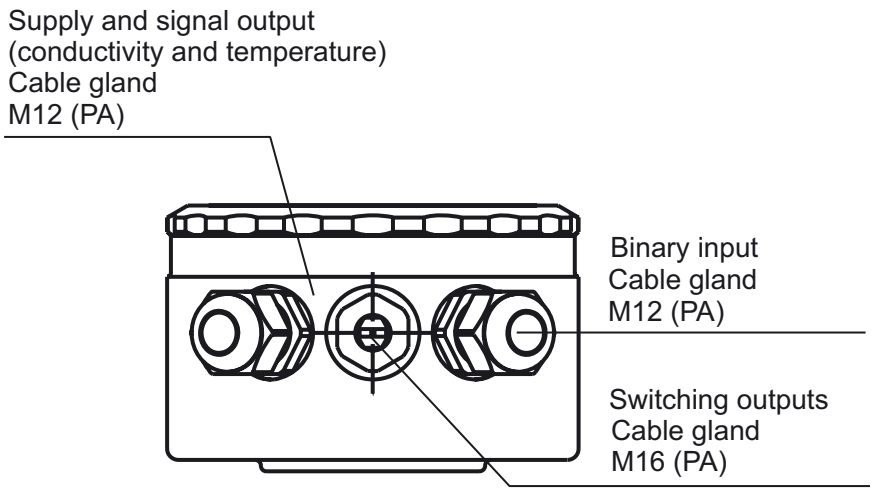
Lead the connecting cables through the cable glands (2).

7 Installation

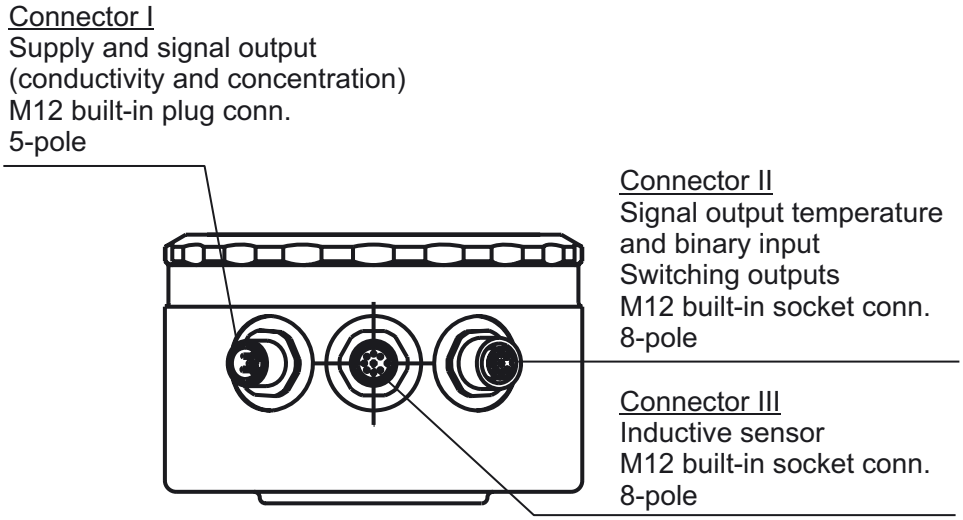
Wiring

In the case of devices with a separate sensor (base type supplementation (2) /65 or /60), for every instrument, the transmitter and the separate sensor are matched to one another at the factory.
When connecting the components, ensure that the production number of the external sensor (on the flag tag on the connecting cable) is identical to the production number of the transmitter (on the nameplate).

Wiring suggestion, head-mounted transmitter

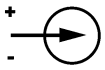
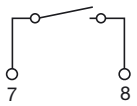
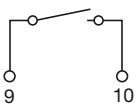
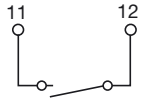
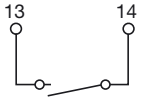


Wiring suggestion Transmitter with separate sensor



Caution:
In the case of devices with a separate sensor and M12-plugs/ -sockets, the threaded terminals in the device are pigmented.
Removing the pigmenting will result in the warranty being rendered null and void.

Connection layout of the transmitter

Connection		Threaded terminals	Plug / Pin
Voltage supply			
Standard production feature: Voltage supply DC 19…31 V (with polarity reversal protection) In case of extra code 844: AC 24 V		1 L+ 2 L-	I / 1 I / 2
Outputs			
analog signal output conductivity/ concentration 0...20 mA or 20...0 mA or 4...20 mA or 20...4 mA or 0...10 V or 10...0 V or 2...10 V or 10...2 V (galvanically separated)		3 + 4 -	I / 3 I / 4
analog signal output temperature 0...20 mA or 20...0 mA or 4...20 mA or 20...4 mA or 0...10 V or 10...0 V or 2...10 V or 10...2 V (galvanically separated)		5+ 6-	II / 1 II / 2
Switching output K1 (potential-free) Switch position indication LED K1		7 8	II / 3 II / 4
Switching output K2 Switch position indication LED K2		9 10	II / 5 II / 6
Binary inputs			
Binary input E1		11 12	II / 7 I / 5
Binary input E2		13 14	II / 8 I / 5

8 Setup-Program

8.1 Function

Configurable parameters

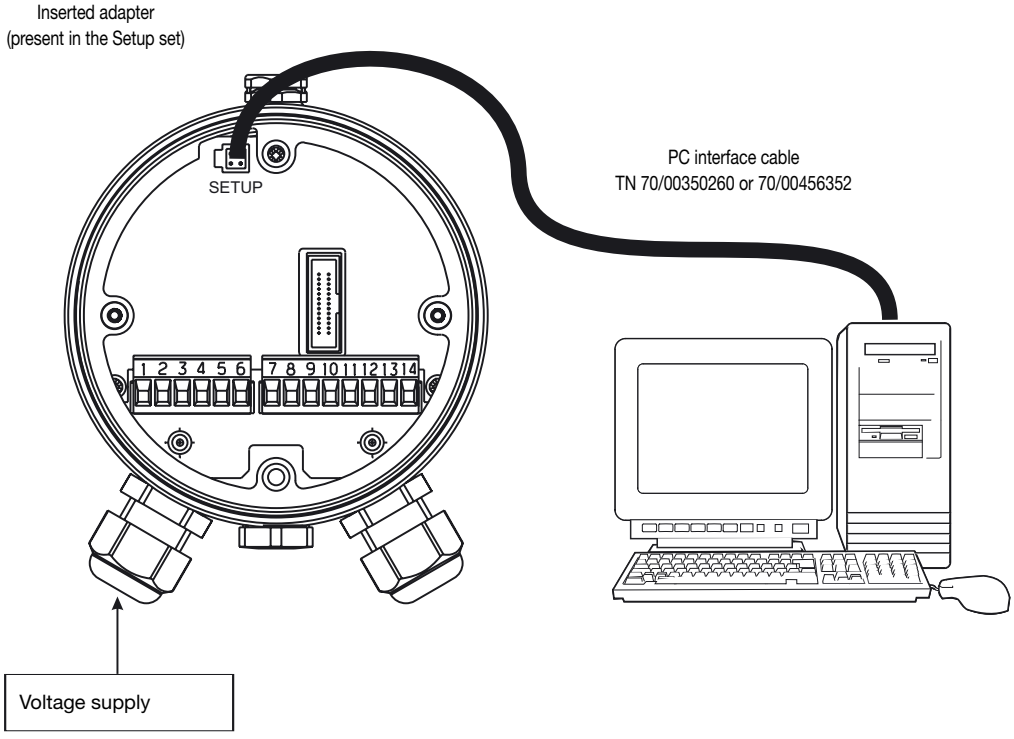
With the optional Setup program that is available, the transmitter can be comfortably matched to the requirements.

- Setting the measurement range and the measurement range limits.
- Setting the behavior of the outputs in case of overshooting of the measurement range.
- Setting the functions of the switching outputs K1 and K2.
- Setting the functions of the binary inputs E1 and E2.
- Setting special functions (e.g. desalination function).
- Setting a customer-specific characteristic
- etc.

Data transmission from and to the transmitter can only take place if the voltage supply is connected to it see chapter 7 "Installation", page 30ff.

Connection

The Setup interface does not have any galvanic isolation. Therefore, when connecting the PC interface cable, it is imperative to ensure that either the voltage supply of the transmitter or of the PC **are not** electrolytically coupled to the ground (e.g. notebook should be used in battery mode).



The measuring transmitters are checked in the factory for flawless operability and shipped ready for operation.

9.1 Head transmitter or transmitter with separate sensor

✱ Install the device, see "Installation", page 21.

✱ Connect the device, see "Installation", page 30.

In the case of devices with a separate sensor (base type supplementation (2) 66), for every instrument, the transmitter and the separate sensor are matched to one another at the factory.
When connecting the components, ensure that the production number of the external sensor (on the flag tag on the connecting cable) is identical to the production number of the transmitter (on the nameplate).

9.2 Replacement sensor

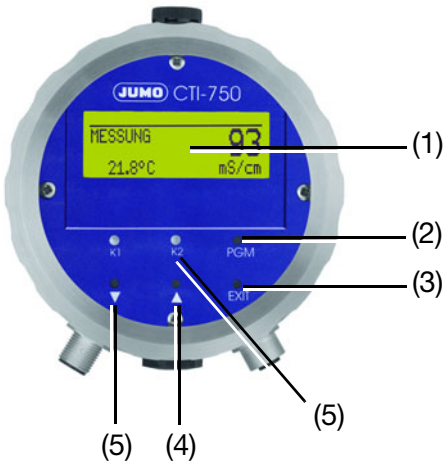
✱ Connect the sensor, see the operating manual of the replacement sensor.

✱ Calibrate the sensor, see the operating manual of the replacement sensor.

10 Operation

10.1 Operating elements

JUMO CTI-750 with and without LC-Display



(1) Graphical LC-display, background lit up.

(2) Key (PGM)
confirm inputs, select menu.

(3) Key (EXIT)
interrupt inputs without saving / interrupt calibration.
One menu-level back.

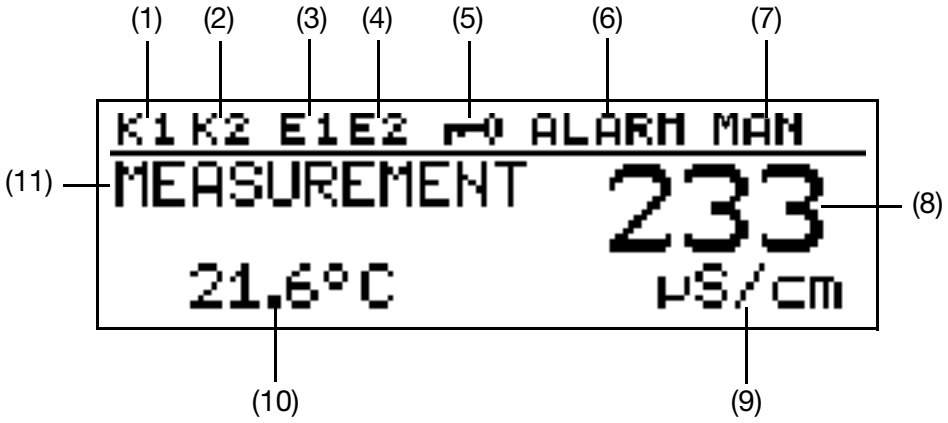
(4) Key (▲)
increase numerical value / forward the selection.

(5) Key (▼)
decrease numerical value / forward the selection.

(6) LEDs "K1" / "K2" indicate the status of the switching outputs. In normal operation, the LED flows when the corresponding switching output is active.
If the wiper function is activated, the LED only indicates the status.

The LED "K1" flashes during the calibration.
In case of an error, LEDs "K1" and LED "K2".flash.

LC-Display



(1) Output K1 is active

(2) Output K2 is active

(3) Binary input 1 is triggered

(4) Binary input 2 is triggered

(5) Keyboard is locked

(6) Device status (hints)
- Alarm (e.g. overrange)
- Calib. flashing (calibration timer run out)
- Calib (customer calibration enabled)

(7) Output mode
- manual (manual operation)
- hold (hold operation)

(8) Conductivity /concentration-measured value

(9) Unit of the conductivity- /concentrations measured value

(10) Medium temperature

(11) Device status e.g.
- Measurement (normal)
- Desalination (desalination function)
- Dosing (desalination function)
- Locked (desalination function)
- Status of the calibration

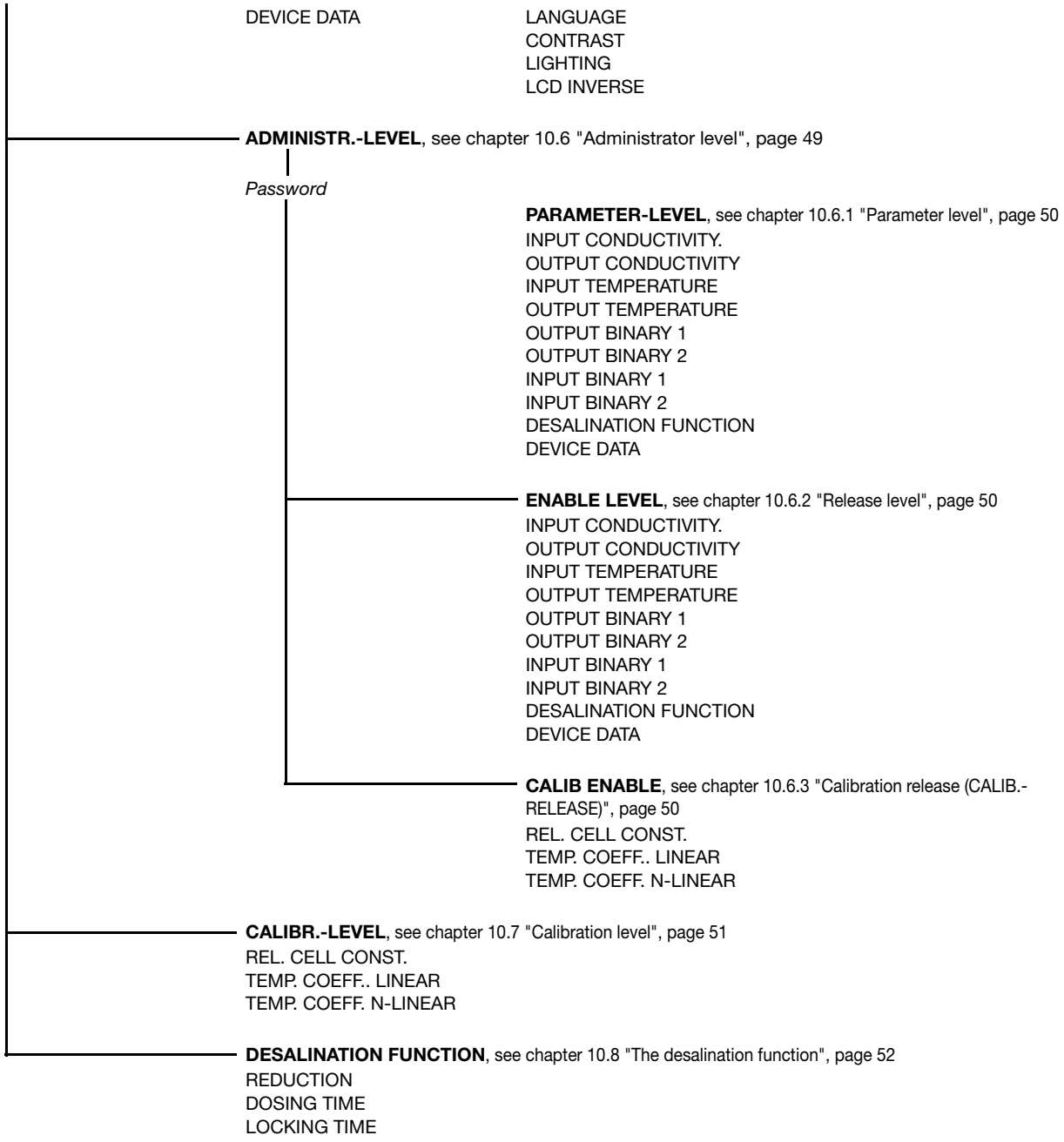
10.2 Operation principle

10.2.1 Operating in levels

Measurement mode, see chapter 10.4 "Measurement mode", page 41

OPERATOR LEVEL, see chapter 10.5 "Operating level", page 41

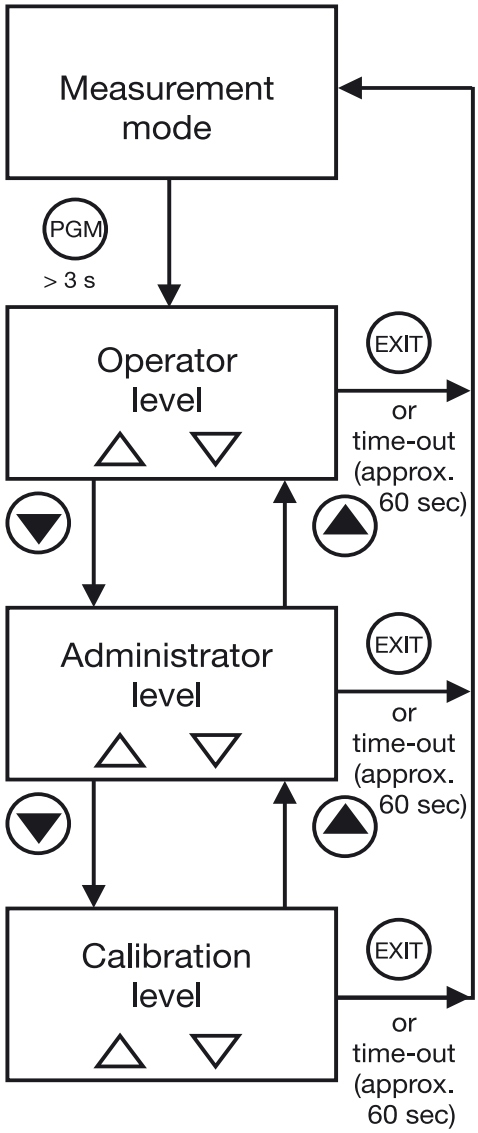
INPUT CONDUCTIVITY	MEASUREMENT RANGE 1...4
	TEMP.COMPENSATION
	TEMP.COEFFICIENT 1...4
	REFERENCE TEMPERATURE
	REL.CELL CONSTANT
	MOUNTING FACTOR
	CONCENTR.MEASUREMENT
	CONCENTR.RANGE
	OFFSET
	FILTER TIME
	CALIBR.INTERVAL
OUTPUT CONDUCTIVITY	SIGNAL TYPE
	SCALING START 1...4
	SCALING END 1...4
	IN CASE OF ALARM
	IN CASE OF CALIBRATION
	SAFETY VALUE
	MANUAL OPERATION
	MANUAL VALUE
INFLOW TEMPERATURE	UNIT
	MEASURED VALUE ACQUISITION
	MANUAL SPEC.
	OFFSET
	FILTERING TIME
OUTFLOW TEMPERATURE	SIGNAL TYPE
	SCALING START
	SCALING END
	IN CASE OF ALARM
	AT TIME OF CALIBRATION
	SAFETY VALUE
	MANUAL OPERATION
	MANUAL VALUE
OUTPUT BINARY 1	FUNCTION
	LIMIT VALUE
	HYSTERESIS
	DISTANCE
	MANUAL OPERATION
	IN CASE OF HOLD
	IN CASE OF ALARM / CALIB.
	SWITCH-ON DELAY
	SWITCH-OFF DELAY
	PULSE DURATION
OUTPUT BINARY 2	FUNCTION
	LIMIT VALUE
	HYSTERESIS
	DISTANCE
	MANUAL OPERATION
	IN CASE OF HOLD
	IN CASE OF ALARM / CALIB.
	SWITCH-ON DELAY
	SWITCH-OFF DELAY
	PULSE DURATION
INPUT BINARY 1	FUNCTION
INPUT BINARY 2	FUNCTION
DESALINATION FUNCTION	REDUCTION
	DOSING TIME
	LOCKING TIME


DEVICE DATA
LANGUAGE
CONTRAST
LIGHTING
LCD INVERSE
ADMINISTR.-LEVEL, see chapter 10.6 "Administrator level", page 49
Password
PARAMETER-LEVEL, see chapter 10.6.1 "Parameter level", page 50
INPUT CONDUCTIVITY.
OUTPUT CONDUCTIVITY
INPUT TEMPERATURE
OUTPUT TEMPERATURE
OUTPUT BINARY 1
OUTPUT BINARY 2
INPUT BINARY 1
INPUT BINARY 2
DESALINATION FUNCTION
DEVICE DATA
ENABLE LEVEL, see chapter 10.6.2 "Release level", page 50
INPUT CONDUCTIVITY.
OUTPUT CONDUCTIVITY
INPUT TEMPERATURE
OUTPUT TEMPERATURE
OUTPUT BINARY 1
OUTPUT BINARY 2
INPUT BINARY 1
INPUT BINARY 2
DESALINATION FUNCTION
DEVICE DATA
CALIB ENABLE, see chapter 10.6.3 "Calibration release (CALIB.-RELEASE)", page 50
REL. CELL CONST.
TEMP. COEFF.. LINEAR
TEMP. COEFF. N-LINEAR
CALIBR.-LEVEL, see chapter 10.7 "Calibration level", page 51
REL. CELL CONST.
TEMP. COEFF.. LINEAR
TEMP. COEFF. N-LINEAR
DESALINATION FUNCTION, see chapter 10.8 "The desalination function", page 52
REDUCTION
DOSING TIME
LOCKING TIME

10 Operation

10.3 Principle

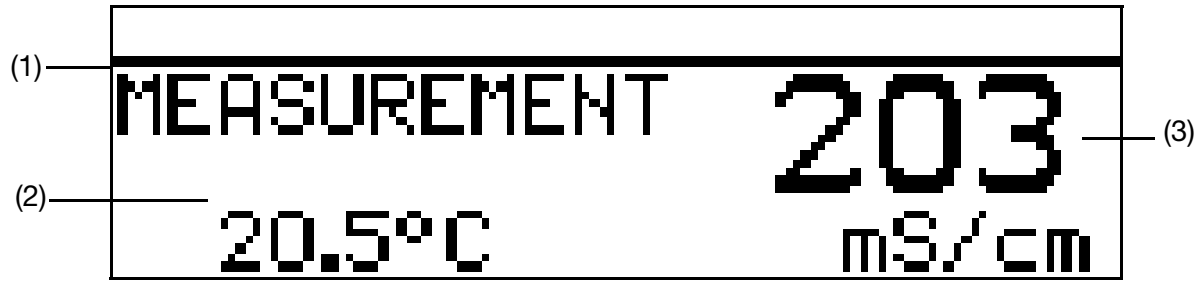
Level



10.4 Measurement mode

Depiction

In the measurement mode, the conductivity compensated to the reference temperature, or the concentration, and the temperature of the measurement medium are displayed.



(1) MEASUREMENT -> Measurement mode

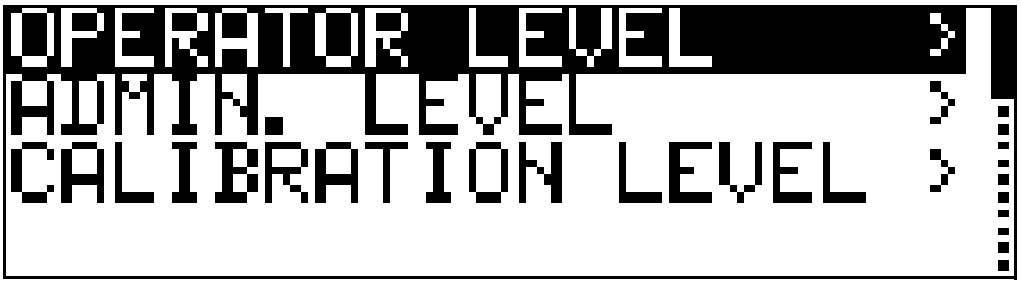
(2) 20.5°C -> Temperature of the measurement medium

(3) 203 mS/cm -> compensated conductivity of the measurement medium (referred to the reference temperature, generally 25°C).

10.5 Operating level

In this level, all the parameters that have been released by the Administrator (Administrator level) can be edited. All the other parameters (marked by a key) can only be read.

* Press the key PGM for longer than 3 seconds.
* Select "OPERATOR LEVEL".



10.5.1 INPUT CONDUCTIVITY (Input conductivity)

MEASUREMENT RANGE 1...4 [1]

0...500 µS/cm
0...1000 µS/cm
0...2000 µS/cm
0...5000 µS/cm
0...10 mS/cm
0...20 mS/cm
0...50 mS/cm
0...100 mS/cm
0...200 mS/cm
0...500 mS/cm
0...1000 mS/cm
0...2000 mS/cm UNK[2]

[1] The measurement ranges 2, 3 and 4 are only used if "INPUT BINARY" is configured on "MEASUREMENT RANGE./TEMP C.".

[2] This measurement range is not temperature-compensated.

TEMP. COMPENSATION

LINEAR
NON-LINEAR (see "Non-linear temperature coefficient (ALPHA)", page 60)
NAT WATERS (permissible temperature range 0...36°C according to EN 27 888)

TEMP. COEFFICIENT 1...4 [1]

0...**2.20**...5.5%

[1] The ranges 2, 3 and 4 are only used if "INPUT BINARY" is configured on "MEASUREMENT RANGE./TEMP C.".

REFERENCE TEMPERATURE

15.0...**25.0**...30°C

CELL CONSTANT

2.00...**6.80**...10.0 1/cm

Checking or changing is only necessary if there is a substitute sensor (base type supplementation 85) connected to the transmitter with a separate sensor. The cell constant is printed on the substitute sensor (K=x,xx).

REL. CELL CONSTANT

80.0...**100.0**...120%

MOUNTING FACTOR

80.0...**100.0**...120%

If the minimum distances (20 mm) of the sensor to the outer wall cannot be maintained, a limited compensation can be achieved with this parameter.

CONCENTR. MEASUREMENT

NO FUNCT.

NaOH

HNO3

CUST. SPEC. (The input of the values is only possible with the optional Setup program)

CONCENTR. RANGE

In case of HNO_3

0...25 % by WEIGHT
36...82 % by WEIGHT

In case of NaOH

0...15 % by WEIGHT
25...50 % by WEIGHT

OFFSET

-100...**0**...+100 mS/cm (+/- 10% of the measurement range)

FILTERING TIME

00:00:00...**00:00:01**...00:00:25 H:M:S

CALIBR.-INTERVAL

0...999 DAYS (0 = switched off)

10.5.2 OUTPUT CONDUCTIVITY. (Output conductivity)

SIGNAL TYPE

0...20 mA
4...20 mA
20...0 mA
20...4 mA
0...10 V
2...10 V
10...0 V
10...2 V

SCALING START 1...4[1]

0 µS/cm = 4 mA

Can be set in the current measurement range, depending on the signal type

[1]The ranges 2, 3 and 4 are only used if
"INPUT BINARY" is configured on "MEASUREMENT RANGE./TEMP C.".

SCALING END 1...4[1]

1000 µS/cm = 20 mA

Can be set in the current measurement range, depending on the signal type

[1]The ranges 2, 3 and 4 are only used if
"INPUT BINARY" is configured on "MEASUREMENT RANGE./TEMP C.".

IN CASE OF ALARM

LOW (0 mA / 0 V / 3,4 mA / 1,4 V)
HIGH (22 mA / 10.7 V)
SAFETY VALUE (depending on the signal type)

AT THE TIME OF CALIBRATION

ACCOMPANYING
FROZEN
SAFETY VALUE

SAFETY VALUE

0,0...**4,0.**..22,0 mA (depending on the signal type)
0...10,7 V

MANUAL OPERATION

off
on

MANUAL VALUE

0,0...**4,0.**..22,0 mA (depending on the signal type)
0...10,7 V

10.5.3 INFLOW TEMPERATURE

UNIT

°C
°F

MEASUREMENT VALUE ACQUISITION

Sensor
manual

MANUAL SPECIFICATION

-20.0...**25.0.**..150.0°C

OFFSET

-15.0...**0.0.**..+15.0°C

FILTERING TIME

00:00:00...**00:00:01**...00:00:25 H:M:S

10.5.4 OUTFLOW TEMPERATURE

SIGNAL TYPE

0...20 mA
4...20 mA
20...0 mA
20...4 mA
0...10 V
2...10 V
10...0 V
10...2 V

SCALING START

-20 ... **0.0°C = 4 mA** (depending on the signal type)

SCALING END

+200 ... **150.0°C = 20 mA** (depending on the signal type)

IN CASE OF ALARM

LOW (0 mA / 0 V / 3,4 mA / 1,4 V)
HIGH (22 mA / 10.7 V)
SAFETY VALUE (depending on the signal type)

AT THE TIME OF CALIBRATION

ACCOMPANYING
FROZEN
SAFETY VALUE

SAFETY VALUE

0,0...**4,0.**..22,0 mA (depending on the signal type)
0...10,7 V

MANUAL OPERATION

off
on

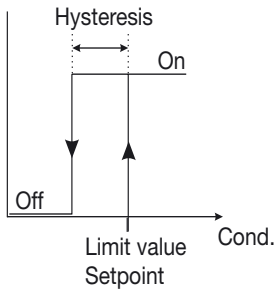
MANUAL VALUE

0,0...**4,0.**..22,0 mA (depending on the signal type)
0...10,7 V

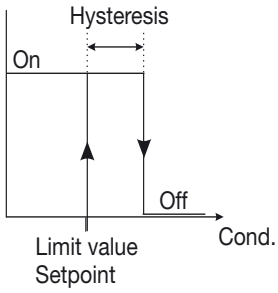
10.5.5 OUTPUT BINARY 1 and OUTPUT BINARY 2

FUNCTION

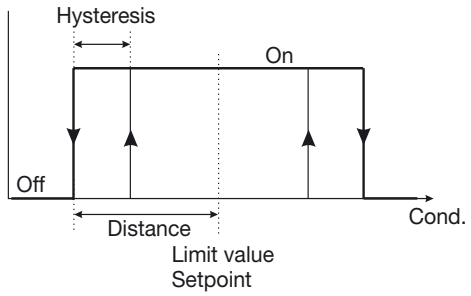
NO FUNCTION
COND. MIN.
COND. MAX.
COND. LK1
COND. LK2
TEMP. MIN.
TEMP. MAX.
TEMP. LK1
TEMP. LK2
CALIBR. TIMER
ALARM



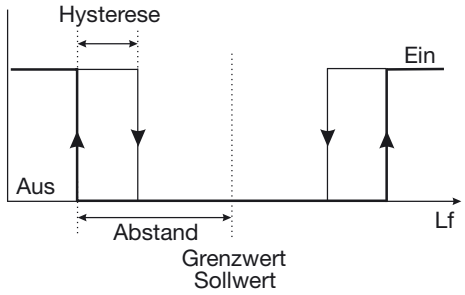
Max limit comparator



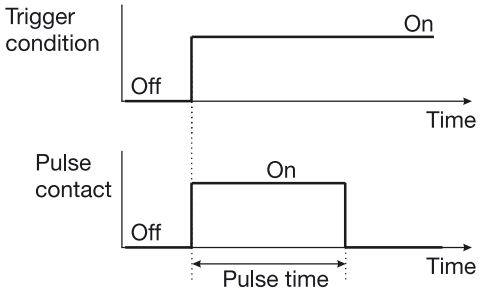
Min limit comparator



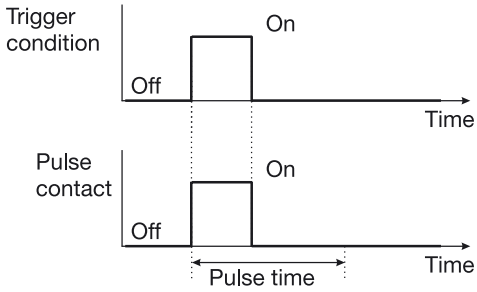
Alarm window LK1



Alarm window LK2



Wiper contact
Triggering condition longer than pulse duration



Wiper contact
Triggering condition shorter than pulse duration

LIMIT VALUE

-20.0... 999.0 (depending on the function, see above)

HYSTERESIS

0.0...**1.0**...999.0 (depending on the function, see above)

DISTANCE

0.0... 999.0 (depending on the function, see above)

MANUAL OPERATION

OFF
ON

IN CASE OF HOLD

INACTIVE
ACTIVE
FROZEN

IN CASE OF ALARM / CALIB.

INACTIVE
ACTIVE
FROZEN

SWITCH-ON DELAY

00:00:00...01:00:00 H:M:S

SWITCH-OFF DELAY

00:00:00...01:00:00 H:M:S

PULSE DURATION

00:00:00...01:00:00 H:M:S (see above: "Function, wiping contact)

10.5.6 INPUT BINARY 1 and INPUT BINARY 2

FUNCTION

NO FUNCTION
KEYBOARD LOCK/HOLD
MEASUREMENT RANGE./TEMP C.
DESALINATION FUNCTION.

Setting parameters		**binary input 1**	**binary input 2**
Measurement range- / Temperature-coefficient switching	MB1 / Tk1	open	open
	MB2 / Tk2	closed	open
	MB3 / Tk3	open	closed
	MB4 / Tk4	closed	closed
Keyboard lock		closed	X
Hold-function		X	closed
Desalination function: Start		close (flank 0 - 1)	open
Desalination function Stop		open	close (flank 0 - 1)

10.5.7 DESALINATION FUNCTION (Description see "The desalination function", page 52)

REDUCTION

0...**10**...50%

DOSING TIME

0:00:00...**00:01:00**...18:00:00 H:M:S

LOCKING TIME

0:00:00...**00:01:00**...18:00:00 H:M:S

10.5.8 DEVICE DATA

LANGUAGE

GERMAN
ENGLISH
FRENCH
SPANISH
POLISH
SWEDISH
ITALIAN
PORTUGUESE
DUTCH
RUSSIAN

By inputting the password 7485 in the Administrator level, the operating language is reset to English.

CONTRAST

0...**6**...11

LIGHTING

OFF
ON
FOR OPERATION (about 50 s after the last keystroke, the lighting gets switched off)

INVERSE LCD

OFF
ON

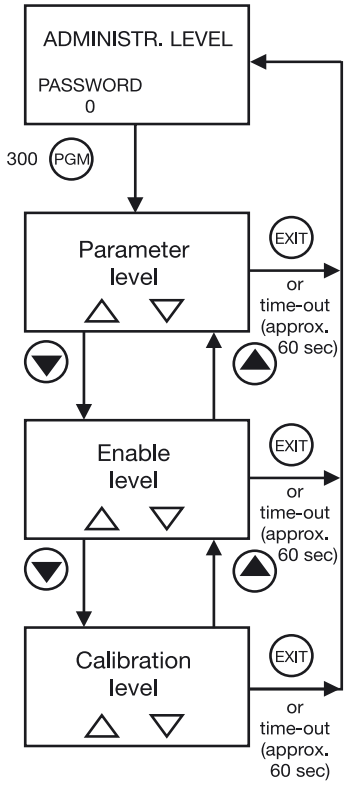
10.6 Administrator level

- All the parameters can be edited in this level.
- In this level, it is also possible to determine which parameters a "normal" user may edit or which calibrations may be carried out.
  Editable parameters can be edited in the operator level.
  Non-editable parameters are marked in the operator level with a key symbol .

You can get to the Administrator level as follows:

* Press the key PGM for longer than 3 seconds.
* With the keys ▼ or ▲, select "ADMINISTRATOR-LEVEL".
* Keys ▼ or ▲ input the password 300.
* Press the key PGM.

Levels of the Administrator level



10.6.1 Parameter level

In this level, the Administrator can edit any parameter of the operator level. The structure of the parameter level in the Administrator level is identical to the operator level
see "Operating level", page 41 and onwards.

10.6.2 Release level

In this level, the Administrator can determine which parameters the operator is permitted to modify in the operator level..
The options "READ ONLY" and "EDIT" are available for the purpose.
The structure of the parameter level in the Administrator level is identical to the operator level
see "Operating level", page 41 and onwards.

10.6.3 Calibration release (CALIB.-RELEASE)

In this level, the Administrator can specify whether the operator may calibrate

- the relative cell constant
- the linear temperature coefficient
- the non-linear temperature coefficient

i.e. change them

10.7 Calibration level

In this level, the calibrations released by the Administrator (Administrator level) can be carried out.

* Press the key (PGM) for longer than 3 seconds.
* With the keys (▼) or (▲), select "CALIBRATION-LEVEL".

10.7.1 **REL. CELL CONSTANT.** (relative cell constant)

If this function has been released by the Administrator, the operator can calibrate the relative cell constant of the JUMO CTI-750 here;
see "Calibration of the relative cell constant", page 56.

10.7.2 **TEMP. COEF. LINEAR** (Temperature coefficient linear)

If this function has been released by the Administrator, the operator can calibrate the JUMO CTI-750 on fluids with linear temperature coefficients;
see "Linear temperature coefficient (ALPHA)", page 57.

10.7.3 **TEMP. CO. N-LINEAR** (Temperature coefficient, non-linear)

If this function has been released by the Administrator, the operator can calibrate the JUMO CTI-750 on fluids with non-linear temperature coefficients;
see "Non-linear temperature coefficient (ALPHA)", page 60.

10 Operation

10.8 The desalination function

Brief description

In the case of cooling water, using the conductivity, the total salt content is assessed. Upon reaching a limiting conductivity (at maximum permissible salt concentration / densification), dilution of the cooling water is necessary. For this purpose, a desalination valve is opened, densified water flows out and is supplemented with fresh water. After the conductivity of the cooling water has dropped below the limit value, the desalination valve is closed again.

Addition of biocide

In order to prevent biological growth in cooling systems, biocides are added to the cooling water. There is no ideal control variable for the added quantity and time of a biocide dosing. In most cases, the dosing time is used as the control variable. Here, the dosing quantity is obtained from the pump capacity and pump operating time (plant-specific). The success of the biocide treatment must be checked at regular intervals.

Desalination before the addition of biocide

If a conductivity-enhancing biocide is added to the cooling water, the conductivity can cross the limit value as a result. Thereupon, the desalination valve would open and a part of the added biocide would be discharged into the effluent canal (note and comply with the legal conditions!).

To prevent this, before adding the biocide, the conductivity in the cooling system is reduced by desalination by about 10% below the limit value. Thereafter, the desalination valve is temporarily blocked.

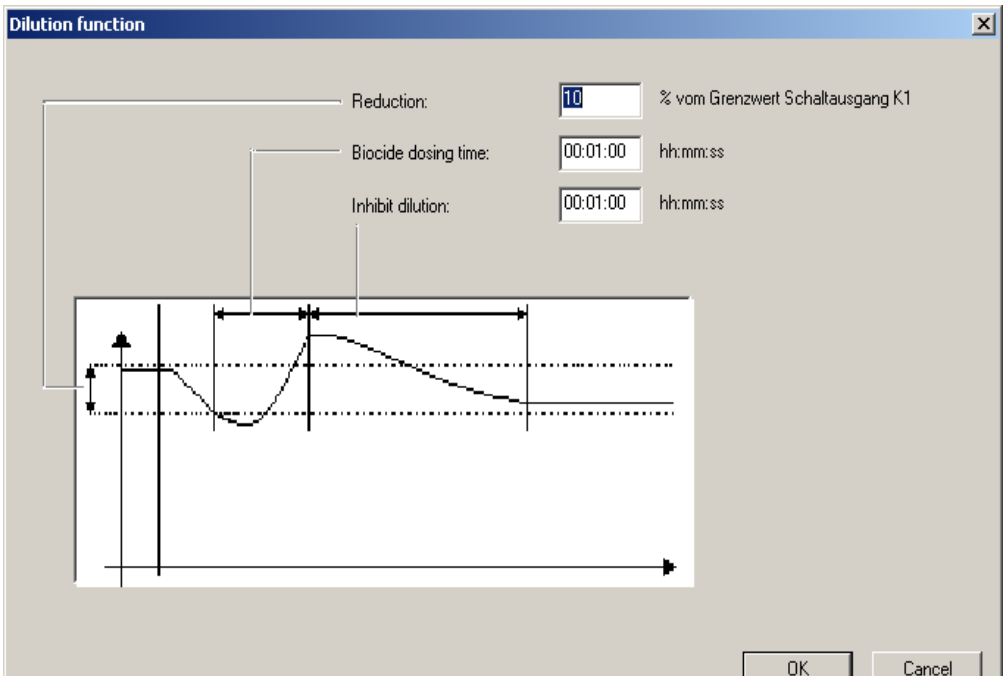
Desalination locking

After the addition of the biocide, the desalination should be blocked till the biocide that has been added has mostly decomposed in the cooling system (not and comply with the legal requirements.).

Realization in the case of the JUMO CTI-750

- The desalination function is only possible in the mode "Conductivity measurement". Not in the case of concentration measurement..
- If the desalination function is activated, all the parameters that are not relevant for this function are turned off.
- The desalination function can be started via the binary input 1 and stopped using the binary input 2, see "INPUT BINARY 1 and INPUT BINARY 2", page 48.
  The desalination function can also be stopped with the (EXIT) key.
- The current status of the desalination function is shown in the display.
- The desalination valve is controlled through output K1.
- The addition of biocide is controlled via output K2.
- After the desalination, K1 goes into the configured Hold state (desalination locking).

- The desalination reduction can be set in the range from 1...50% below the actual limit value of binary input 1. The default setting is 10% below the limit value.

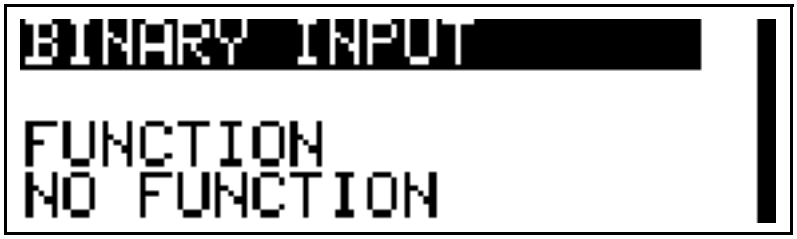


10.8.1 Setting the desalination function

All the parameters are plant-dependent and must be matched to the prevalent conditions.

* Press the key PGM for longer than 3 seconds.
* With the keys ▼ or ▲, select the "OPERATOR LEVEL"; with key PGM, confirm the selection.

* With the keys ▼ or ▲, select "INPUT BINARY"; with key PGM, confirm the selection.



* With the keys ▼ or ▲, select "DESALINATION FUNCT.". with key PGM, confirm the selection.

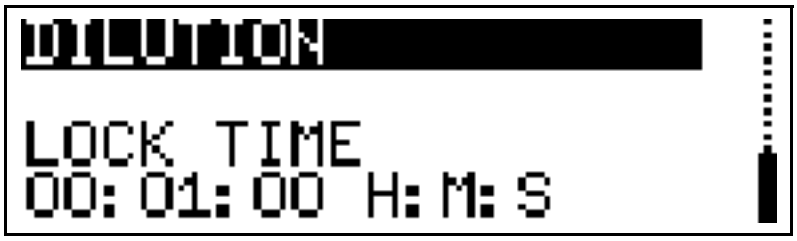
* Use the key EXIT to switch to the operator level.
* With the key ▼ select "DESALINATION FUNCTION".

* With key PGM, confirm the selection.

* Set the desalination reduction with the keys ▼ or ▲ in the range from 1...**10**...50% below the actual limit value.
* with key PGM, confirm the setting.
* With the keys ▼ or ▲, select "DOSING TIME"; with key PGM, confirm the selection.

* Set the dosing time with the keys ▼ or ▲ in the range from 0:00:00...**00:01:00**...18:00:00 H:M:S.
* with key PGM, confirm the setting.

✱ With the keys ▼ or ▲, select "LOCKING TIME"; with key PGM, confirm the selection.



✱ Set the locking time with the keys ▼ or ▲ in the range from 0:00:00...**00:01:00**...18:00:00 H:M:S.

✱ with key PGM, confirm the setting.

☞ If there is a failure of the supply voltage during the running of the desalination function, the function is canceled.

In order that the desalination function can run again, it must be started again.

11 Calibration

11.1 General

For increasing the accuracy, the device has various calibration options.

At regular intervals (depending on the measurement medium), the conductivity sensor must be cleaned and calibrated.

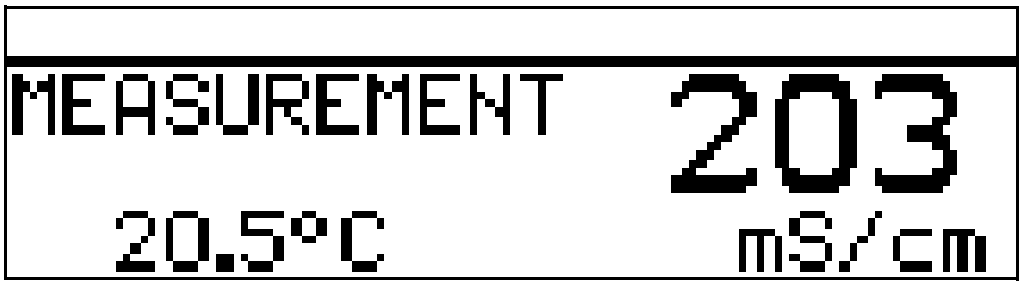
The LED "K1" flashes during the calibration.

11.2 Calibration of the relative cell constant

In case of increased demands on the accuracy, the cell constant must first be calibrated.

Precondition

- the JUMO CTI-750 must be supplied with power.
  see chapter 7 "Installation", page 30ff.
- The sensor must be connected to the transmitter (in case of "shouldered" construction).
- The transmitter is in "Measurement mode".

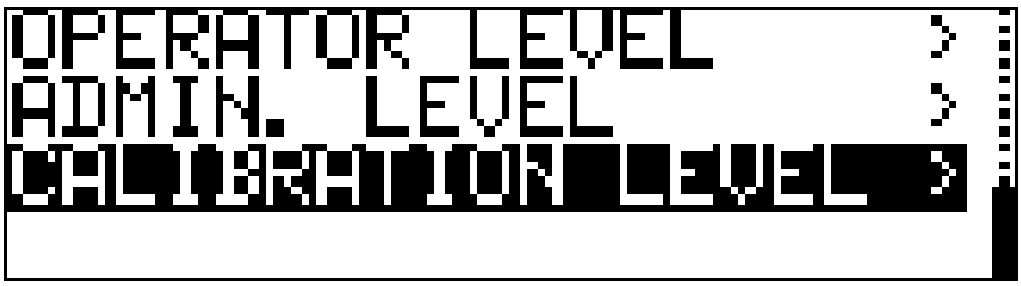


✱ Submerge the conductivity sensor in a reference solution of known conductivity.

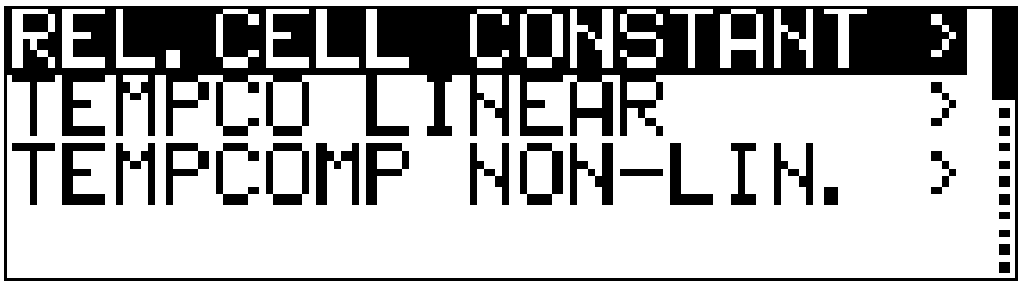
During the calibration, the temperature of the measurement solution must remain constant.

✱ Press the key (PGM) for longer than 3 seconds.

✱ With the keys (▼) or (▲), select "CALIBRATION-LEVEL". With key (PGM), confirm the selection.



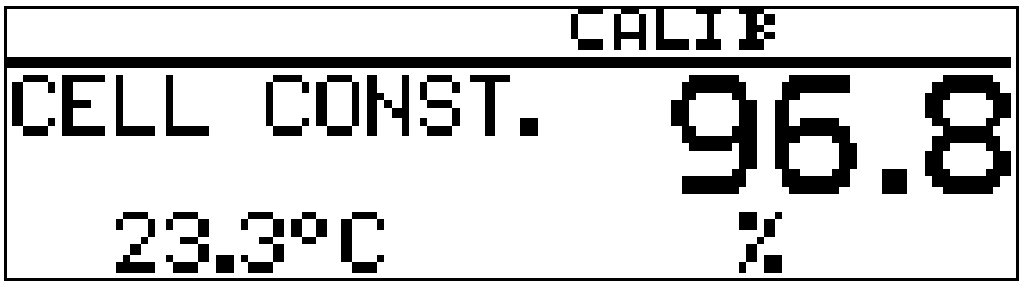
✱ With the keys ▼ or ▲, select "REL. CELL CONSTANT.". with key PGM, confirm the selection.



✱ When the measured value is stable, press the PGM key.

✱ With the keys ▼ or ▲, correct the displayed uncompensated conductivity value to the conductivity value of the reference solution.

✱ Press the PGM key.
The relative cell constant calculated by the JUMO CTI-750 is displayed.



✱ Accept the relative cell constant determined -> press the key PGM for longer than 3 seconds, or
discard the value -> press the key EXIT .

The transmitter is in the "Calibration menu".

✱ Press key EXIT;
The transmitter is in "Measurement mode" and displays the compensated conductivity of the reference solution.

11.3 Calibration of the temperature coefficient of the measurement solution

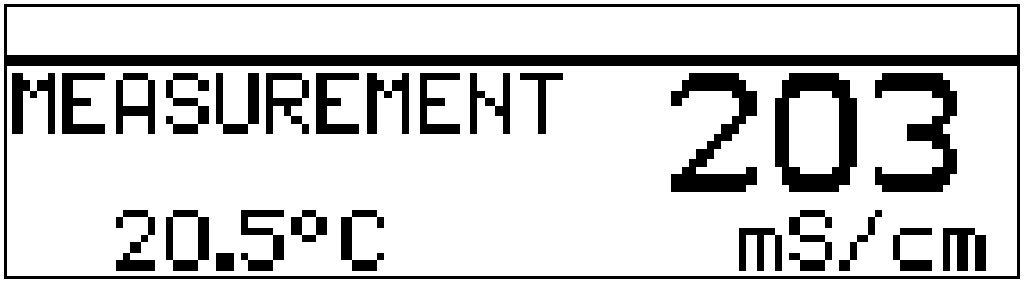
11.3.1 Linear temperature coefficient (ALPHA)

The conductivity of any measurement solution changes according it its specific temperature coefficient.
We therefore recommend carrying out the calibration of the temperature coefficient

11 Calibration

Precondition

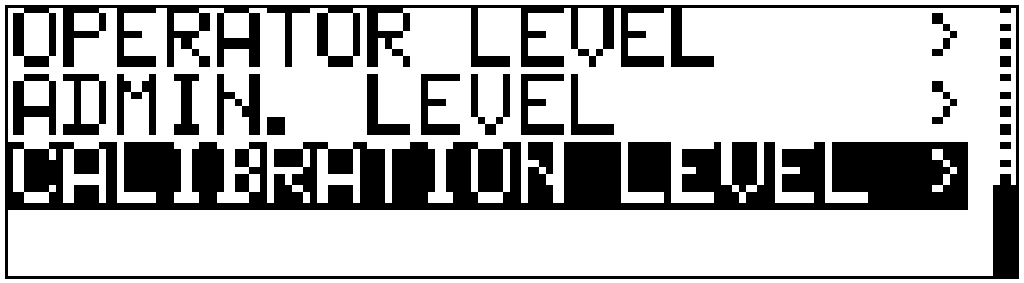
- the JUMO CTI-750 must be supplied with power.
  see chapter 7 "Installation", page 30ff.
- The sensor must be connected to the transmitter (in case of "shouldered" construction).
- The transmitter is in "Measurement mode".



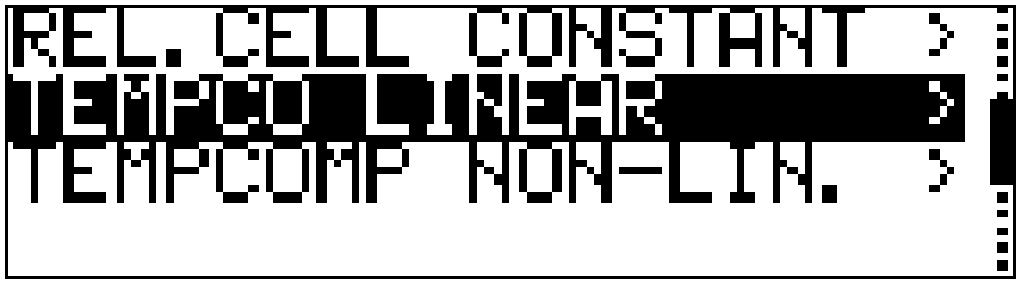
✱ Submerge the conductivity sensor in a sample of the measurement solution.

✱ Press the key PGM for longer than 3 seconds.

✱ With the keys ▼ or ▲, select "CALIBRATION-LEVEL". with key PGM, confirm the selection.

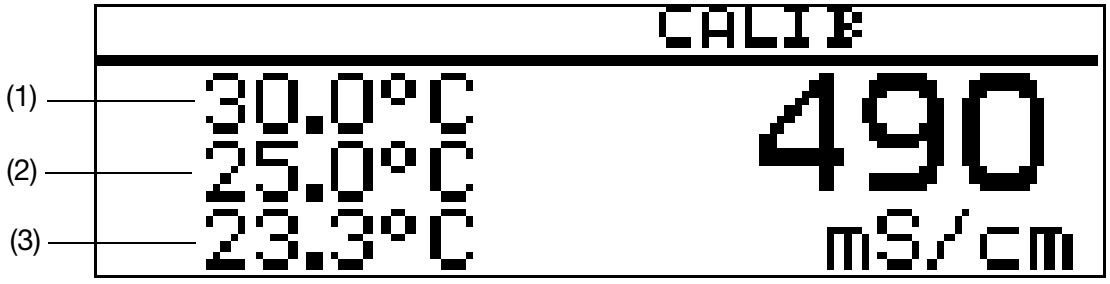


✱ With the keys ▼ or ▲, select "TEMP. COEFF LINEAR". with key PGM, confirm the selection.



✱ With the keys ▼ or ▲, input the operating temperature and confirm with the PGM key .

☞ The operating temperature must be at least 5°C above or below the reference temperature (25.0°C).



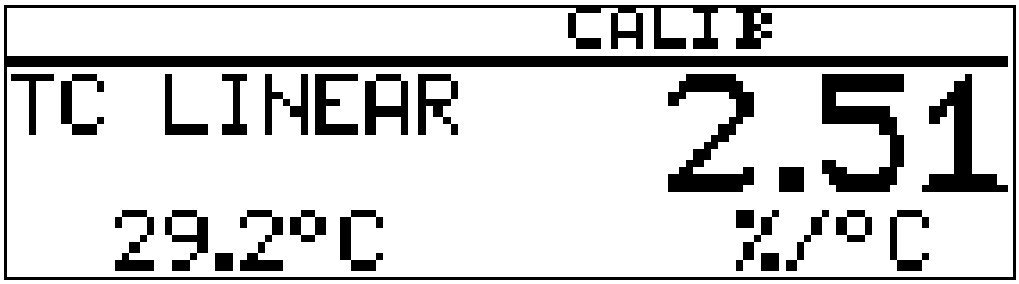
The LC-Display now shows
- at the top (1) the selected operating temperature (flashing)
- below that (2) the reference temperature (flashing)
- below that (3) the current sensor temperature (static)

✱ Heat the measurement medium till both the reference temperature as well as the operating temperature are reached (the corresponding value does not flash any more).

During the calibration, the temperature changing speed of the measurement solution of
10 K/min in the case of JUMO CTI-750 with a free-standing temperature sensor or
1 K/min in the case of JUMO CTI-750 with an integrated temperature sensor
must not be exceeded.

As soon as one of the target temperatures is reached, its display becomes static (not flashing).

Calibration is also possible in the cooling process (under dropping temperature). The start is made above the operating temperature, the end below the reference temperature.



The LC-display now shows the determined temperature coefficient in %/K.

Accept the temperature coefficient determined -> press the key (PGM) for longer than 3 seconds, or
discard the value -> press the key (EXIT) .

The transmitter is in the "Calibration menu".

✱ Press key (EXIT);
The transmitter is in "Measurement mode" and displays the compensated conductivity of the reference solution.

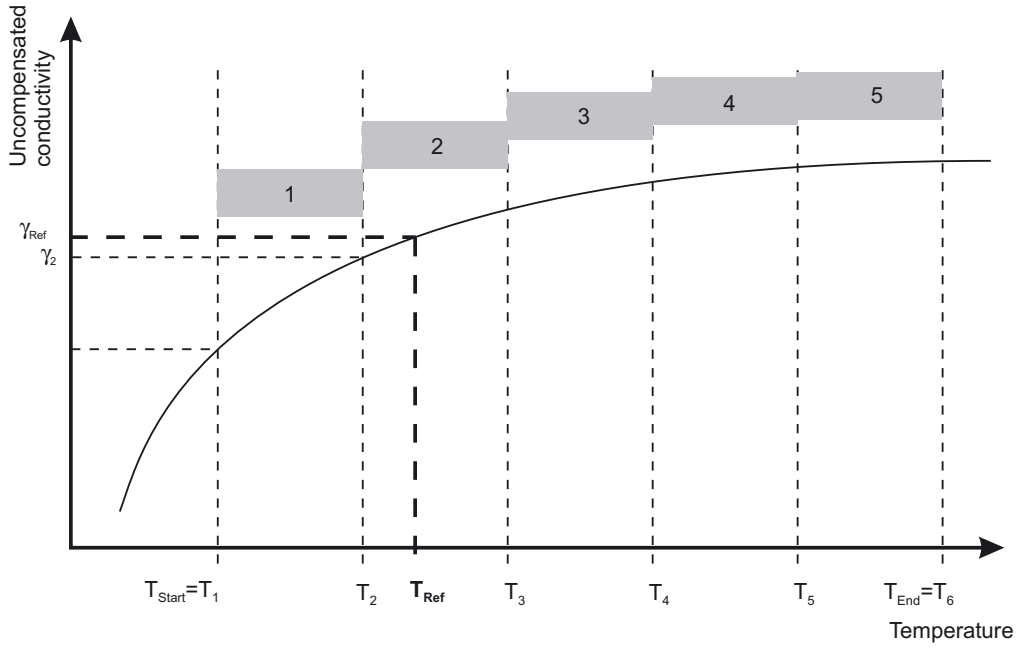
11.3.2 Non-linear temperature coefficient (ALPHA)

General

Since the temperature coefficient of some media is not constant over a larger temperature range, the JUMO CTI-750 has the facility to divide a temperature range (T_{start} to T_{end}) into 5 sub-ranges. In each of these ranges, compensation can be carried out with different TC values. This so-called TC curve can

- be edited with the Setup program and transmitted to the device
- or calibrated automatically at the device.

Determining the TC-curve



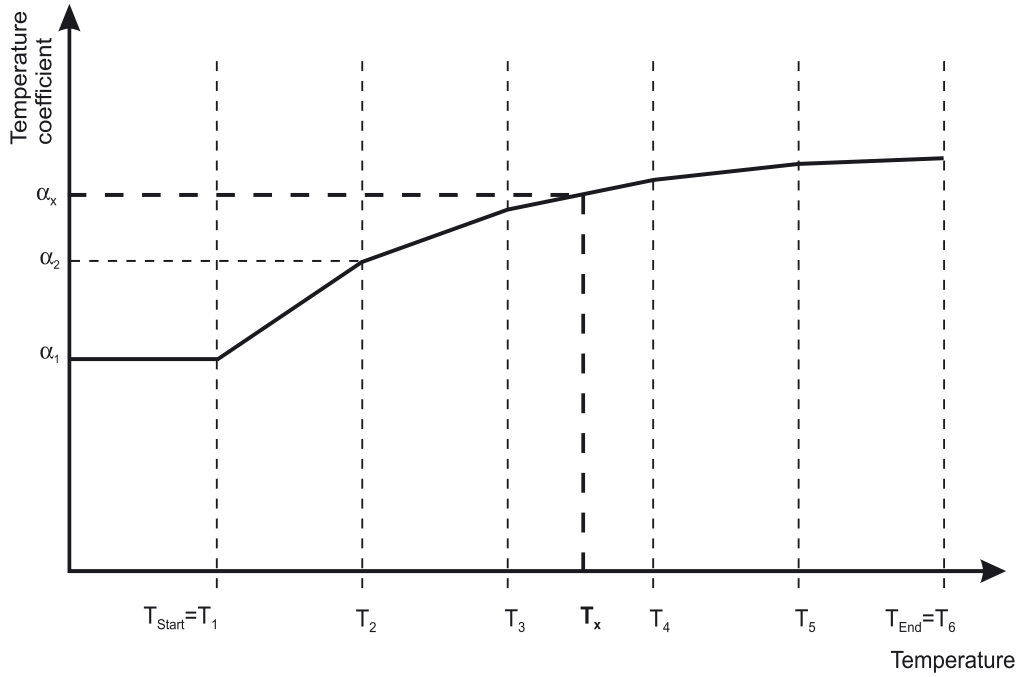
Calculation of a temperature coefficient

$$\alpha_1 = \frac{\left(\frac{\gamma_1}{\gamma_{Ref}} - 1\right) \times 100}{T_1 - T_{Ref}}$$

α = Temperature coefficient (TC)

γ = uncompensated conductivity

TC-curve



Temperature compensation with the TC-curve

With the help of the current medium temperature, the corresponding temperature coefficient is determined from the TC curve,'
see "TC-curve", page 61.

Intermediate values, e.g. (α_x in the case of T_x) between two determined values (α_3 in the case of T_3) and (α_4 in the case of T_4) are approximated linearly.

With the TC determined, the compensated electric conductance is calculated as in the case of the linear temperature compensation.

If the measured temperature is less than the starting temperature, compensation is done with the first TC.
If the measured temperature is greater than the final temperature, compensation is done with the last TC.

$$\gamma_{(Comp)} = \frac{\gamma_{(Meas)}}{\left(1+\frac{\alpha_x}{100} * (T_x - T_{Ref})\right)}$$

Sequence of the automatic calibration on the JUMO CTI-750

The TC curve is plotted automatically in a temperature range determined by the user. Here, the temperature range from the starting to the final temperature is divided into 5 equal sections.

The temperature range must be greater than 20 Kelvin and overlap the reference temperature.
Example: Reference temperature 25°C, starting temperature 18°C and final temperature 50°C.

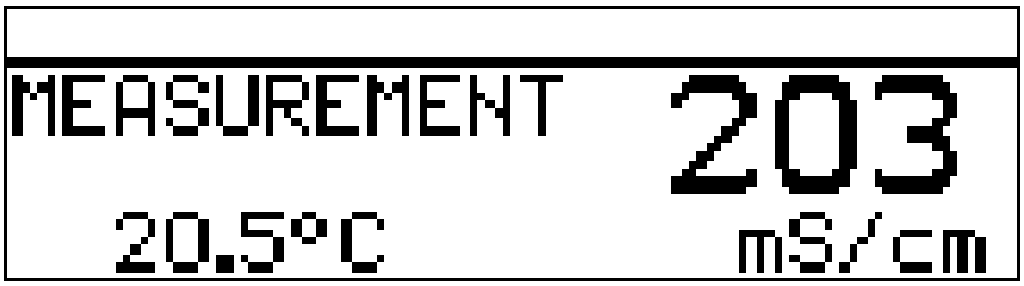
11 Calibration

The temperature changing speed may not exceed
- 10 K/min in case of a free-standing temperature sensor and
- 1 K/min in case of an integrated temperature sensor

!

Precondition

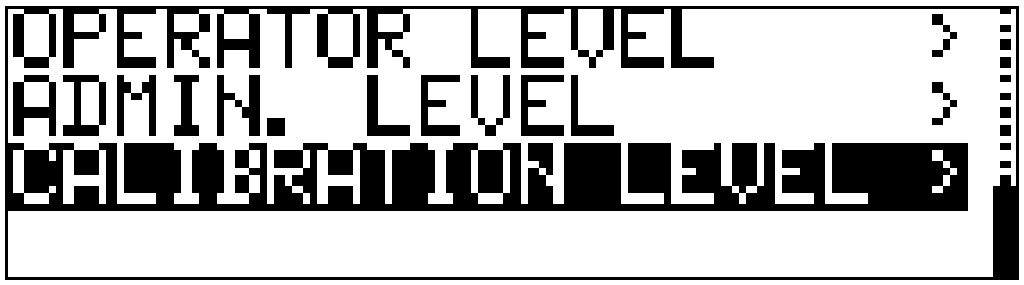
- the JUMO CTI-750 must be supplied with power.
  see chapter 7 "Installation", page 30ff.
- The sensor must be connected to the transmitter (in case of "shouldered" construction).
- The transmitter is in "Measurement mode".



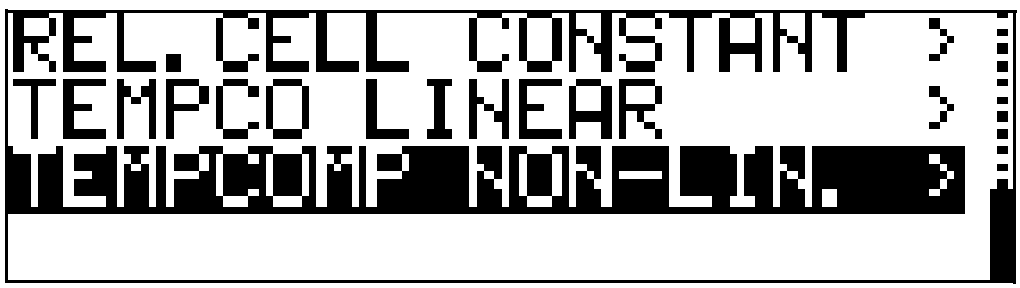
✱ Submerge the conductivity sensor in a sample of the measurement solution.

✱ Press the key PGM for longer than 3 seconds.

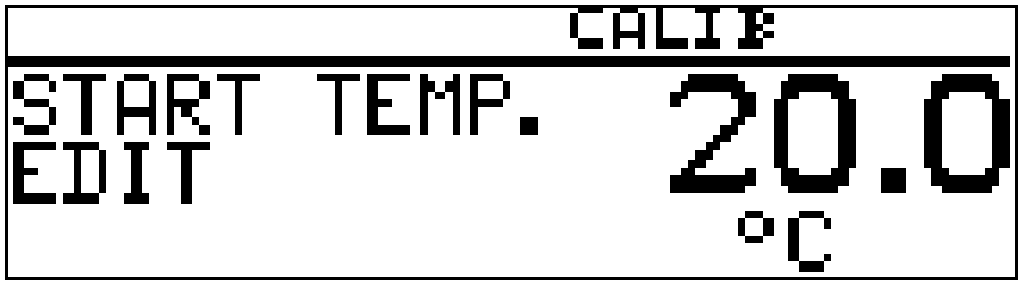
✱ With the keys ▼ or ▲, select "CALIBRATION-LEVEL". with key PGM, confirm the selection.



✱ With the keys ▼ or ▲, select "TEMPCO. N-LINEAR". with key PGM, confirm the selection.

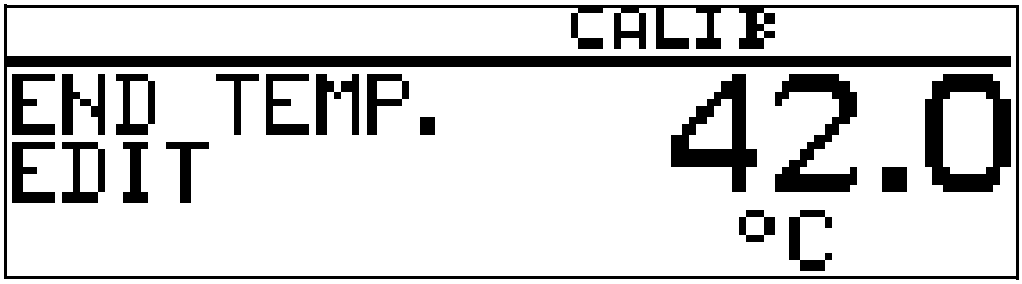


* With the keys ▼ or ▲, input the starting temperature and confirm with the PGM key .



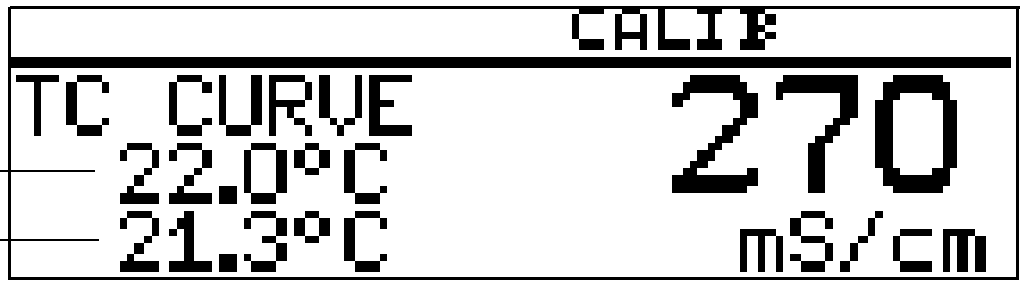
☞ The starting temperature must be below the reference temperature (25.0°C).

* With the keys ▼ or ▲, input the final temperature and confirm with the PGM key .



☞ The final temperature must be at least 20°C above the starting temperature.

The transmitter automatically determines the temperature data points. The LC display now shows
- at the top (1) the next temperature to be reached (flashing)
- below that (2), the current sensor temperature (static)



(1)
(2)

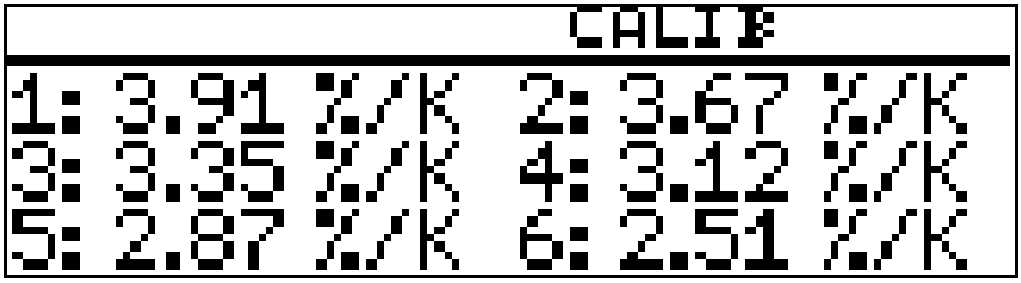
* Heat the measurement medium till the flashing temperature is exceeded or undershot.

The next temperature to be reached is displayed flashing.

During the calibration, the temperature changing speed of the measurement solution of
10 K/min in the case of JUMO CTI-750 with a free-standing temperature sensor or
1 K/min in the case of JUMO CTI-750 with an integrated temperature sensor
must not be exceeded.

As soon as one of the target temperatures is reached, its display becomes static (not flashing).

* Heat the measurement medium till the flashing temperature is exceeded.
* Repeat the procedure till all 6 temperature coefficients are determined by the JUMO CTI-750.



The LC-display now shows the determined temperature coefficients in %/K.

* Accept the temperature coefficients determined -> press the key (PGM) for longer than 3 seconds, or
  discard the values -> press the key (EXIT) .

The transmitter is in the "Calibration menu".

* Press key (EXIT);
  The transmitter is in "Measurement mode" and displays the compensated conductivity of the reference solution.

12.1 Conductivity-clean sensor

Do not use any solvents.

Stubborn sediments or deposits can be dissolved with dilute hydrochloric acid and removed.

Comply with the safety specifications.

Deposits

Deposits on the sensor part can be removed with a soft brush (e.g. bottle brush).

13 Rectifying errors and faults

Error possibilities

Problem	Possible cause	Measure
No display of measured value or signal output	Voltage supply absent	Check voltage supply, check terminals
Measured value display 000 or signal output 0% (e.g. 4 mA)	Sensor not submerged in medium; Tank level too low	Fill up tank
	Flow meter blocked	Clean the flow meter
	Sensor faulty	see "Device checking", page 66
Measured value display 8888 flashing + device status ALARM flashing. The temperature display is OK or LED 1 + LED 2 flashing	Out of range => the measurement/ display range was exceeded or undershot	select suitable measurement range or check the concentration table
Measured value display 8888 flashing + device status ALARM flashing. The temperature display is 8888 flashing or LED 1 + LED 2 flashing	The temperature sensor is faulty	The transmitter or the conductivity sensor must be replaced. or set measured value acquisition "Inflow temperature" briefly to manual, see "INFLOW TEMPERATURE", page 45.
wrong or varying measured value display	Sensor not submerged deep enough	Fill the tank
	no blending taking place	ensure good blending near the sensor, ensure clearance of about 5 mm for circulation
	Air bubbles	Check installation location, see "General", page 21.

13.1 Device checking

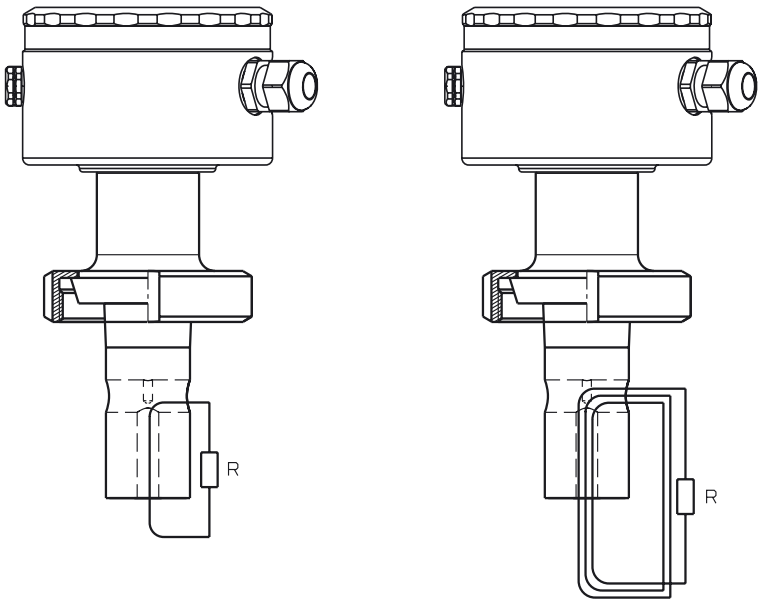
General

The device is calibrated at the factory and is maintenance-free. If measurement value variations from unknown causes should occur nonetheless, the transmitter can be checked as follows.

13.1.1 Checking with resistance loop

Position of the resistance loop

When calibrating the sensitive part of the measurement cell, do not place on or touch any surface, else the measured value will get falsified.



✱ Lead a wire through the measurement cell (see Figure)

✱ Connect the resistance R to the wire

Calculation of the resistance

Formula for calculation of the resistance of the resistance loop:

$$R = \frac{N^2 \cdot K}{Lf}$$

R = Resistance of the resistance loop

N = Number of turns in the loop

K = Cell constant

Lf = desired display in S/cm

Remark: 1 mS/cm = $1 \cdot 10^{-3}$ S/cm

1 µS/cm = $1 \cdot 10^{-6}$ S/cm

In case of display values up to 20 mS, the resistance loop must have 1 turn.
In case of display values from 50 mS onwards, the resistance loop must have 3 turns.

The cell constant of the JUMO CTI-750 depends on the structural shape.!

The Tee measuring cell has a cell constant of 6.80 1/cm.
The VARIVENT®-measuring celll has a cell constant of 6.50 1/cm.

Example 1

The JUMO CTI-750 with Tee-shaped measuring cell should display 20 mS:

$$R = \frac{1^2 \cdot 6.80\ 1/cm}{20 \cdot 10^{-3}\ S/cm} = 340\ \Omega$$

To get a display of 20 mS/cm, the resistance loop (with 1 turn) must have a resistance of 340 Ohm.

Example 2

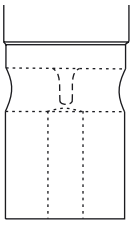
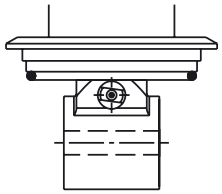
The JUMO CTI-750 with Tee-shaped measuring cell should display 500 mS:

$$R = \frac{3^2 \cdot 6.80\ 1/cm}{500 \cdot 10^{-3}\ S/cm} = 122.4\ \Omega$$

To get a display of 500 mS/cm, the resistance loop (with 3 turns) must have a resistance of 122.4 Ohm.

Pre-calculated values

The display value 0 is obtained when the sensor is dry and without conducting coats, as well as when there is no resistance loop.

Structural shape/ Cell constant		
		
Material: PEEK K = 6.80 1/cm	Material:PVDF K = 5.45 1/cm	Material: PEEK K = 6.50 1/cm

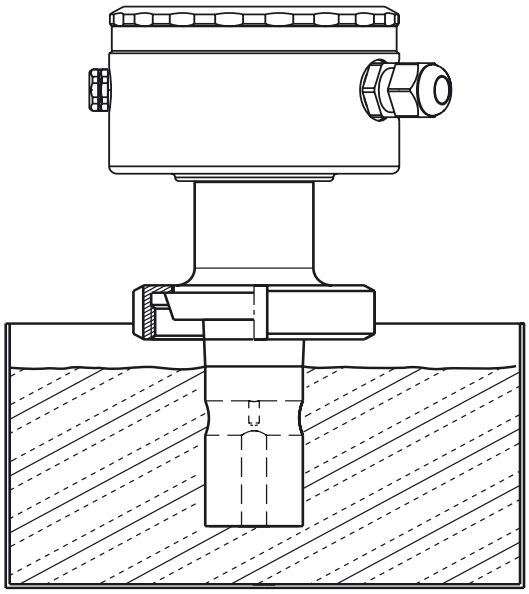
Display in case of measurement range end	Number of turns	Cell constant [1/cm]	Required resistance [Ω]
500 µS/cm	1	6,80	13600,00
	1	6,50	13000,00
1000 µS/cm	1	6,80	6800,00
	1	6,50	6500,00
2000 µS/cm	1	6,80	3400,00
	1	6,50	3250,00
5000 µS/cm	1	6,80	1360,00
	1	6,50	1300,00
10 mS/cm	1	6,80	680,00
	1	6,50	650,00
20 mS/cm	1	6,80	340,00
	1	6,50	325,00
50 mS/cm	3	6,80	1224,00
	3	6,50	1170,00
100 mS/cm	3	6,80	612,00
	3	6,50	585,00
200 mS/cm	3	6,80	306,00
	3	6,50	292,50
500 mS/cm	3	6,80	122,40
	3	6,50	117,00
1000 mS/cm	3	6,80	61,20
	3	6,50	58,50
2000 mS/cm	3	6,80	30,60
	3	6,50	29,25

Carry out test

- ✱ Determine test resistance.
- ✱ Connect the JUMO CTI-750 electrically, see chapter 7 "Installation", page 30.
- ✱ Select the corresponding measurement range, see chapter 10.5.1 "INPUT CONDUCTIVITY (Input conductivity)", page 42 -> MEASUREMENT RANGE 1...4
- ✱ Set TC to 0%/K, see chapter 10.5.1 "INPUT CONDUCTIVITY (Input conductivity)", page 42 -> TEMP.COEFFICIENT.
- ✱ Put the resistance loop in place in accordance with the figure.

13.1.2 Testing with reference fluid

Put in test solution

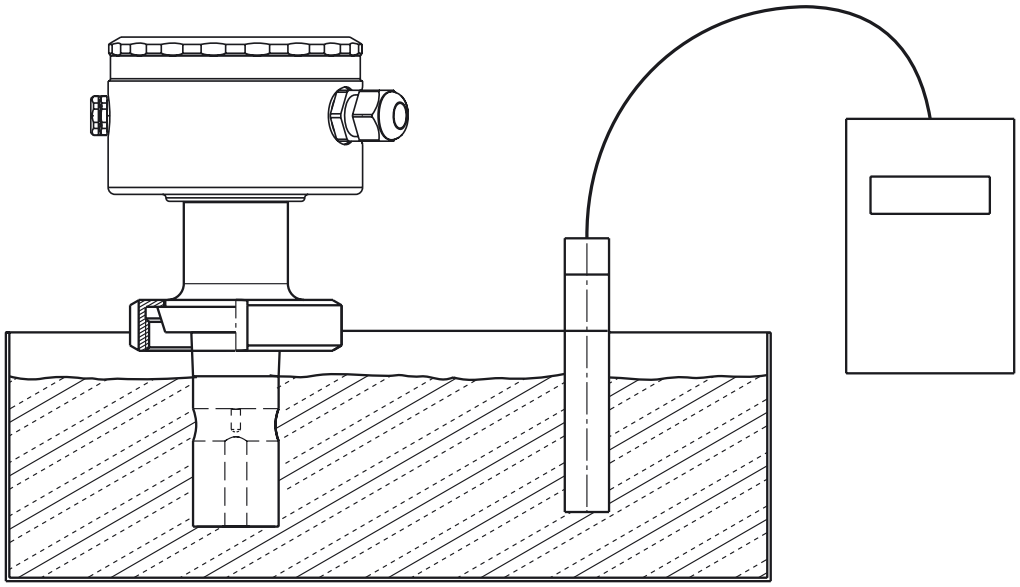


Carry out test

- ✱ Prepare the conductivity test solution in a sufficiently large container
- ✱ Connect the device electrically, see chapter 7 "Installation", page 30.
- ✱ Select the measurement range according to the conductivity test solution, see chapter 10.5.1 "INPUT CONDUCTIVITY (Input conductivity)", page 42 -> MEASUREMENT RANGE 1...4
- ✱ Set TC to 0%/K, see chapter 10.5.1 "INPUT CONDUCTIVITY (Input conductivity)", page 42 -> TEMP.COEFFICIENT.
- ✱ Submerge the measurement cell in the container and do not move any more during the measurement.

13.1.3 Testing with reference measuring instrument

Put in test solution



Carry out test

- Prepare the conductivity test solution in a sufficiently large container
- Connect the JUMO CTI-750 electrically, see chapter 7 "Installation", page 30.
- Select the measurement range according to the conductivity test solution, see chapter 10.5.1 "INPUT CONDUCTIVITY (Input conductivity)", page 42 -> MEASUREMENT RANGE 1...4
- Set TC to 0%/K, see chapter 10.5.1 "INPUT CONDUCTIVITY (Input conductivity)", page 42 -> TEMP.COEFFICIENT.
- Set the TC of the reference instrument also to 0%/K (see operating manual of the reference instrument). If that is not possible, the liquid sample must be tempered to the reference temperature of the reference instrument.
- Submerge the measuring cell to be tested and the measuring cell of the reference instrument in the tank and do not move them any more at all during measurement.
- The output and the display of the instrument to be tested or the display of the display device connected to it and that of the reference device connected to it must match after taking the permissible instrument errors into account.

14 Annex

14.1 Before configuring

If many parameters of the device are to be re-configured, it is advisable to make a note of all the parameters to be changed in the following table, and to process the parameters in the given sequence.

The following list shows the maximum number of modifiable parameters.

Depending on the configuration, some of the parameters are not modifiable (editable) in this device.

Parameter	Selection / Range of values **Factory setting**	New setting	see page
Input, conductivity			
Measurement range 1...4	0...500 µS/cm **0...1000 µS/cm** 0...2000 µS/cm 0...5000 µS/cm 0...10 mS/cm 0...20 mS/cm 0...50 mS/cm 0...100 mS/cm 0...200 mS/cm 0...500 mS/cm 0...1000 mS/cm 0...2000 mS/cm (uncompensated)		42
Temperature compensation	**linear** non-linear natural water		42
Temperature coefficient 1...4	0...**2.20**...5.5%/K		42
Reference temperature	15.0...**25.0**...30°C		42
Cell constant	2.00...**6.80**...10.00 1/cm		42
Relative cell constant	80.0...**100.0**...120.0%		42
Mounting factor	80,0...**100.0**...120,0%		43
Concentration measurement	**no function** NaOH HNO_3 customer-specific		43
Offset	-200...**0**...+200 mS/cm		43
Filtering time	**00:00:01**...00:00:25 H:M:S		43
Calibration interval	**0**...999 days		43
Output, conductivity			

Parameter	Selection / Range of values **Factory setting**	New setting	see page
Signal type	0...20 mA **4...20 mA** 20...0 mA 20...4 mA 0...10 V 2...10 V 10...0 V 10...2 V		44
Scaling, beginning	**0**...90% = 4 mA (e.g.) from the measurement range scope		44
Scaling: End	**100**...10% = 20 mA (e.g.) from measurement range scope		44
In case of an alarm	**low** high safety value		44
At the time of calibration	**accompanying** frozen safety value		44
Safety value	0.0...**4.0**...22.0 mA		44
Manual operation	**off** on		44
Manual value	0.0...**4.0**...22.0 mA		44
Inflow temperature			
Unit	**°C** °F		45
Measurement value acquisition	**Sensor** manual		45
Manual specification	-20.0...**25**...150°C		45
Offset	-15.0...**0.0**...+15°C		45
Filtering time	00:00:00...**00:00:01**...00:00:25 H:M:S		45
Outflow temperature			
Signal type	0...20 mA **4...20 mA** 20...0 mA 20...4 mA 0...10 V 2...10 V 10...0 V 10...2 V		45
Scaling, beginning	-20...**0.0**...183°C = 4 mA (0...90% of measurement range scope)		45

14 Annex

Parameter	Selection / Range of values **Factory setting**	New setting	see page
Scaling: End	-3...**150**...200°C = 20 mA (100...10% of measurement range scope)		45
In case of an alarm	**low** high safety value		44
At the time of calibration	**accompanying** frozen safety value		44
Safety value	0.0...**4.0**...22.0 mA		46
Manual operation	**off** on		44
Manual value	0.0...**4.0**...22.0 mA		44
Output binary 1 or binary 2			
Function	**no function** Conductivity min.-contact Conductivity Max.-contact Conductivity LK1 Conductivity LK2 Conductivity Min.-contact Conductivity Max.-contact Conductivity LK1 Conductivity LK2 Calibration timer Alarm		46
Limit value	**0.0**...9999.0		47
Hysteresis	0.0...**1.0**...999.0		47
Distance	**0.0**...999.0		47
Manual operation	**off** on		47
in case of Hold	**inactive** active frozen		47
in case of alarm / calibration	**inactive** active frozen		47
Switch-on delay	**00:00:00**...01:00:00 H:M:S		48
Switch-off delay	**00:00:00**...01:00:00 H:M:S		48
Pulse duration	**00:00:00**...01:00:00 H:M:S		48
Input binary			

Parameter	Selection / Range of values **Factory setting**	New setting	see page
Function	**no function** Keyboard locking/ Hold Measurement range / Temperature coefficient desalination function		48
Desalination function			
Reduction	0...**10**...50%		48
Dosing time	00:00:00...**00:01:00**...18:00:00 H:M:S		48
Locking time	00:00:00...**00:01:00**...18:00:00 H:M:S		48
Device data			
Language	**German** English French Spanish Polish Swedish Italian Portuguese Dutch Russian		49
Contrast	0...**6**...11		49
Lighting	off on **at the time of operation**		49
Inverse LCD	**off** on		49

JUMO GmbH & Co. KG
Street address:
Moltkestraße 13 - 31
36039 Fulda, Germany
Delivery address:
Mackenrodtstraße 14
36039 Fulda, Germany
Postal address:
36035 Fulda, Germany
Phone: +49 661 6003-0
Fax: +49 661 6003-607
e-mail: mail@jumo.net
Internet: www.jumo.net

JUMO Instrument Co. Ltd.
JUMO House
Temple Bank, Riverway
Harlow, Essex CM20 2TT, UK
Phone: +44 1279 635533
Fax: +44 1279 635262
e-mail: sales@jumo.co.uk
Internet: www.jumo.co.uk

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