JUMO DELOS T02

Temperature probe with display



Bluetooth® Single Pair Ethernet

Operating Manual

90294112T90Z001K000

V1.00/EN/2026-06-03

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1 About this documentation

1.1 Purpose

This documentation is part of the device and includes all information to ensure that it is used safely and as intended across all phases of the product lifecycle.

If you do not follow the documentation and safety information, this may result in risk to life and damage to property due to improper use.

- Read and follow the documentation and the safety information and warnings.
- Store the document in its entirety, in an easily accessible location, and so that it can be read in full at all times.
- Contact the manufacturer if you have any questions about the device and documentation.

1.2 Target group

This documentation is intended to be used by personnel for plant mechanical systems for sanitary, heating and air-conditioning technology, electrical engineering or mechanical and plant engineering throughout all phases of the product life cycle.

1.3 Definition of terms

Use in the documentation	Definition
Device, product	Temperature probe
End device	Smartphone, tablet, laptop, PC etc.
Sensor	Temperature sensor
Medium, measurement medium	Gases, vapors, liquids
Product lifecycle	Overall consideration of Product identification, acceptance of the goods, storage, mounting, connection, operation, troubleshooting, maintenance to disposal

1.4 Trademark information

All trademarks and trade and company names used are the property of their rightful owners or authors.

1.5 Symbols



NOTE!

This symbol is used in tables and indicates that further information is provided after the table.



REFERENCE!

This symbol refers to **further information** in other sections, chapters, or other manuals.

2.1 Intended use

The temperature probe with display measures the temperature of liquid, vaporous, and gaseous media.

The device is suitable for mounting in pipes and containers in various applications. It is mounted using individual process connections.

The documentation is part of the device. The device is only intended for use according to this documentation.

2.2 Qualification of personnel

The personnel deployed must meet the following requirements in all phases of the product lifecycle:

- Trained electrical, mechanical, and plant engineering personnel.
- Members of personnel are familiar with this documentation and the safety information and warnings it contains.

2.3 Hot surfaces

Hot device surfaces pose a risk of injury. Hot device surfaces can be caused by the use of hot media in applications.

- If required, install contact protection.

When working on the device:

- Allow the device and plant to cool down.
- Wear suitable protective equipment.

2.4 Hazardous materials

Using hazardous materials as a medium may result in abrasive and corrosive damage to components of the product that come into contact with the medium. The medium may leak and present a fire hazard and a risk to health.

Carry out a risk assessment taking into consideration the safety data sheet for the relevant hazardous substance for mounting, operation, maintenance, cleaning, and disposal:

- Comparison and systematic checking of the durability of the components of the product that come into contact with the medium and the admissible environmental influences.
- Assessment of the risk to people and the environment.
- Assessment of the fire hazard due to the product materials, the admissible environmental influences, and the voltage supply.

2.5 Mechanical loads

Mechanical load on the device and process connections can lead to leaks.

- Do not place the device and the process connections under mechanical strain.
- Systematically check that the process connections are leak-tight.

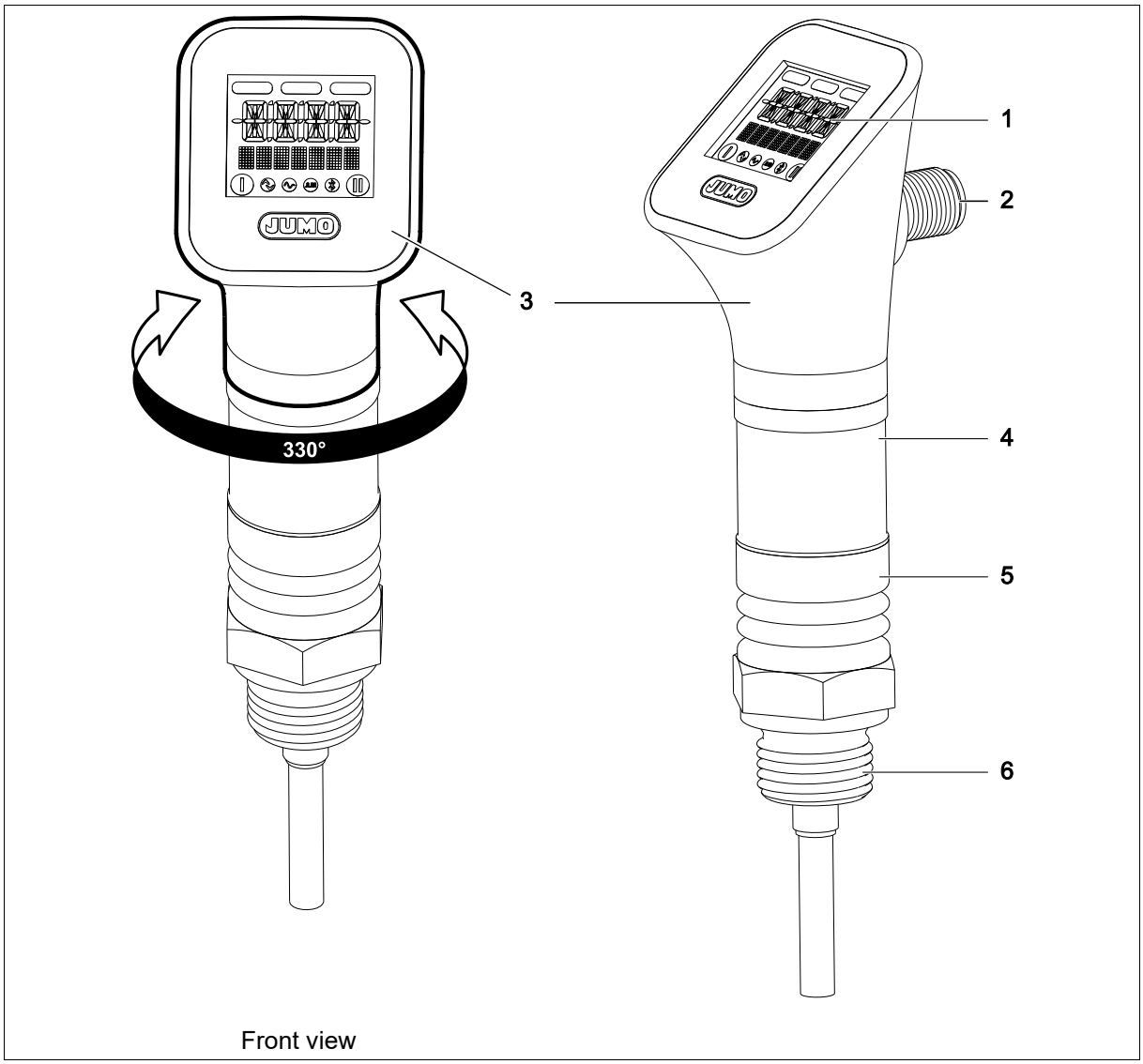
2.6 Transport and storage damage

The device can be damaged if it is insufficiently protected during transport and/or improperly stored.

- Transport the device protected from moisture and dirt in shockproof packaging.
- Protect all electrical and mechanical connections from damage.
- Observe the admissible storage temperature of the device.
- Store the device in a dry and dust-free environment.

3 Description

3.1 Structure



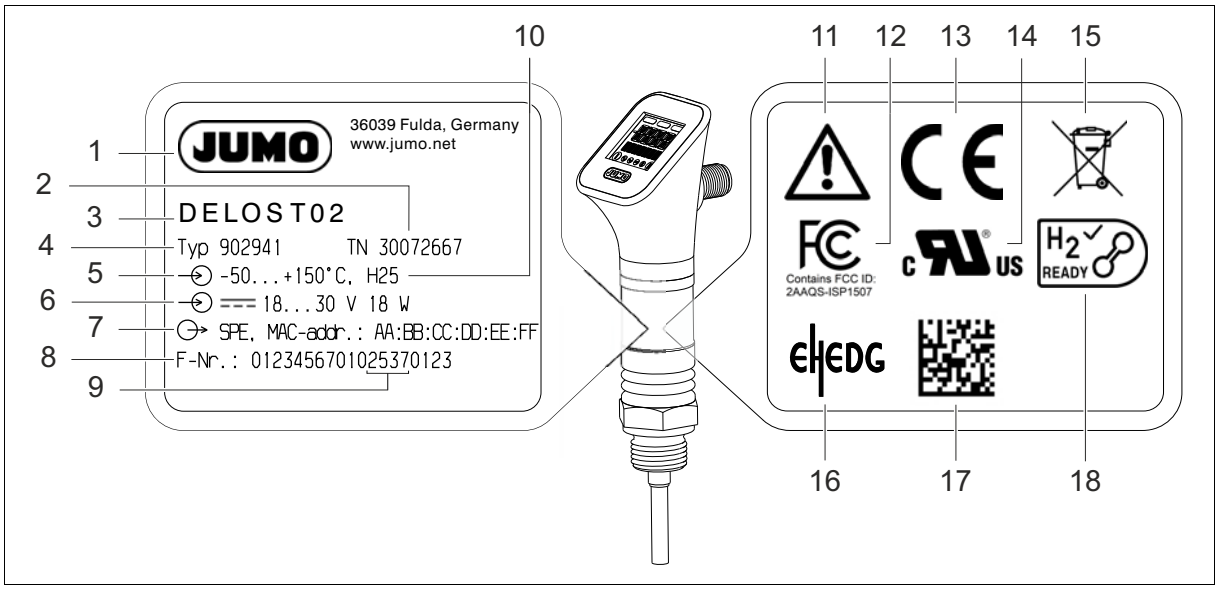
Front view

1	Display	4	Case bottom section
2	M12 plug connector	5	Connection element
3	Top section of the housing (rotating)	6	Process connection with sensor

3.2 Functions

The device measures the temperature. The temperature is acquired by a temperature sensor (sensor) installed in the process connection. The sensor sends an output signal to the transmitter. The transmitter converts the output signal into the process value. The process value can be read on the display and output to higher-level systems via the interfaces or outputs.

3.3 Nameplate



1	Manufacturer and address	10	Rated operating pressure (H_2 ready)
2	Part no.	11	Observe device documentation!
3	Device designation	12	FCC identification marking
4	Order code	13	CE identification marking
5	Measuring range	14	UL identification marking
6	Voltage supply (DC)	15	Disposal
7	MAC address	16	EHEDG identification marking
8	Fabrication number	17	Data matrix code
9	Date of manufacture (YYww)	18	H_2 ready identification marking

3.4 Approval marks and certificates

Certificates for approved device versions are available for download on the manufacturer's website.
H_2 ready is provided as an extra code in the order details.
EHEDG conformity only in conjunction with EHEDG-approved process connections, ⇨ page 20.

Submitted:

Radio Equipment Directive (RED)

JUMO GmbH & Co. KG hereby states that the DELOS T02 device complies with the Directive 2014/53/EU. The full text of the EU Declaration of Conformity is available at the following web address: qr-902941-en.jumo.info.

3 Description

Federal Communications Commission (FCC)

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions.

(1) This device may not cause harmful interference.

(2) This device must accept any interference received, including interference that may cause undesired operation.

Caution: Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

3.5 Scope of delivery

Device in the ordered version
Brief instructions

3.6 Further information and downloads

JUMO DELOS T02 – Temperature probe with display	jmo.to/902941-en

4.1 Electrical safety

Requirements	DIN EN 61010-1:2020 The device must be equipped with an electrical circuit that meets the requirements for "Limited-energy circuits".

4.2 Electrical data

UL approval has been submitted.

Voltage supply	DC 18 to 30 V, PELV
Current consumption	≤ 100 mA
Power consumption	≤ 1.8 W
Overvoltage category	II
Pollution degree	2
Protection rating	DIN EN 61140, Class III (protective low voltage)
PoDL class	Class 11, IEEE 802.3cg
PoDL classification	SCCP or Forced Mode
Electrical connection	
Connection element	M12 plug connection
M12 plug connector	IEC 63171-5
Version	2-pole
Connecting cable	IEC 61156-11, IEC 61156-13, IEC 61156-14
Version	2-core, shielded
Bandwidth	≥ 20 MHz
Line length	≤ 500 m (≥ AWG 22 at ≥ DC 24 V supply voltage into the cable)
DC loop resistance	< 59 Ω
Temperature resistance	≥ 80 °C
For UL application	
Approved cables[a]	CYJV2/8, CYJV/7, PVVA2/8, PVVA/7

[a] The cables must be suitable for the voltage, current and temperature used.

4 Technical data

4.3 Inputs

4.3.1 Measuring range and accuracy

Measuring range	
Without extension tube	-50 to +150 °C
With extension tube	-50 to +260 °C
Accuracy	
Device	±(0.3 + 0.005 × |t|[a])

[a] |t| = temperature value in °C

4.3.2 Measurands

Temperature

Sensor element	DIN EN IEC 60751 Platinum film resistor	
Response times	In water 0.3 m/s	In air 3.0 m/s
Protection tube Ø 6 mm	$t_{0.5}$ ≈ 8 s, $t_{0.9}$ ≈ 14 s	$t_{0.5}$ ≈ 40 s, $t_{0.9}$ ≈ 100 s
Protection tube Ø 6 mm (reduced to Ø 3.5 mm)	$t_{0.5}$ ≈ 5 s, $t_{0.9}$ ≈ 9 s	$t_{0.5}$ ≈ 30 s, $t_{0.9}$ ≈ 70 s
Protection tube Ø 3 mm (in thermowell)	⇨ Data sheet 902812	–
Without protection tube (front-flush)	$t_{0.5}$ ≈ 1,5 s, $t_{0.9}$ ≈ 8 s	$t_{0.5}$ ≈ 85 s, $t_{0.9}$ ≈ 270 s

4.4 Interfaces

4.4.1 Bluetooth

Function	Transfer of configuration data and device information, display of process values
Communication	Via end device with JUMO smartCONNECT app
Authentication	Via Bluetooth® radio module and NFC tag
Connection status (configurable)	
Permanently	Active
Temporarily	Restricted (via NFC)
Range	10 m under reference conditions
Radio frequency	
Bluetooth® radio module	2.4 GHz
NFC tag	13.56 MHz
Max. transmission power	
Bluetooth® radio module	0 dBm
NFC tag	–
JUMO smartCONNECT app	
System requirements	
iOS device	iPhone 7 or later (recommended) with iOS 14
Android device	Android 12 or later

4.4.2 SPE

Function	Transfer of process data, configuration data, and device information, voltage supply via PoDL
Communication	Via end device and JUMO Cloud, via Modbus master
SPE standard	10BASE-T1L
Transmission protocol	Integrated JUMO Cloud gateway, Modbus TCP
Data transfer rate	10 Mbit/s

4.5 Display

Type	LCD
Display range	22.5 × 26.0 mm
Resolution	
Process value display	4 × 18-segment
Text line	7 × 5×8 Dot-Matrix
Brightness	11 levels (configurable)
Alignment	0°, 180°

4 Technical data

4.6 Environmental influences

UL approval has been submitted. The approval stipulates that the product may be used indoors only.

Admissible temperatures	DIN 60068-2-1, DIN 60068-2-2
Medium	
Without extension tube	-50 to +150 °C
With extension tube	-50 to +260 °C
H_2 ready	-40 to +120 °C
Environment	-25 to +75 °C
Storage	-40 to +85 °C
Climatic conditions	DIN EN 60721-3-3
Climate class	3K24
Air temperature	-25 to +55 °C
Relative humidity	
Storage	≤ 90 %
Operation	≤ 100 % – condensation on device outer shell
Protection type	DIN EN 60529 IP65, IP67
Electromagnetic compatibility (EMC)	DIN EN 61326-2-3:2022
Interference emission	Class B[a]
Interference immunity	Industrial requirements
Vibration resistance	DIN EN 60068-2-6
Without extension tube	10 g at 10 to 2000 Hz
With extension tube	3 g at 10 to 500 Hz
Shock resistance	DIN EN 60068-2-27 50 g for 11 ms, 100 g for 1 ms
Site altitude	≤ 2000 m above sea level

[a] The product is suitable for industrial use as well as for households and small businesses.

4.7 Mechanical features

4.7.1 Materials

Housing	
Top section of the housing	
Plastic	PBT-GF30, 1.4301 (304)
Stainless steel	1.4404 (316L)
Case bottom section	1.4301 (304), PBT-GF30
Connection element	1.4301 (304)
Seal	EPDM
Display	PMMA
Process connection	
G 1/4, G 1/2, 1/4 - 18 NPT, 1/2 - 14 NPT	1.4571 (316Ti)
M14×1 with O-ring	1.4404 (316L), 1.4301 (304), FMK
None, G 1/2 with CIP-compliant conical seal, aseptic, taper socket with union nut, tank connection with grooved union nut DN 25	1.4404 (316L)
G 1/2 with PEEK sealing, front-flush	1.4404 (316L), PEEK
Clamping socket (clamp)	1.4435 Basler Norm 2 (316L)
JUMO PEKA hygienic process connection	1.4404 (316L), EPDM, VMQ

4.7.2 Device

Weight[a]	
Without extension tube, insertion length 100 mm, with process connection G 1/2	
Plastic	~ 220 g
Stainless steel	~ 300 g
Alignment	
Top section of the housing	Can be rotated by 330°

[a] Depending on the version and DN.

4.7.3 Process connections

Process connection	000	102 to 104, 142 to 144	380	387, 388	551 to 554
Operating temperature[a]	-50 to +260 °C	-50 to +260 °C	-50 to +260 °C	-50 to +150 °C	-50 to +260 °C
Admissible pressure	–	40 bar	16 bar	16 bar	DIN 11864[b]

Process connection	601 to 606	611 to 628	652	997	
Operating temperature[a]	-50 to +260 °C	-50 to +260 °C	-50 to +150 °C	-50 to +150 °C	
Admissible pressure	DIN 11851[b]	DIN 32676[b]	25 bar	10 bar	

[a] Depending on the seal used.

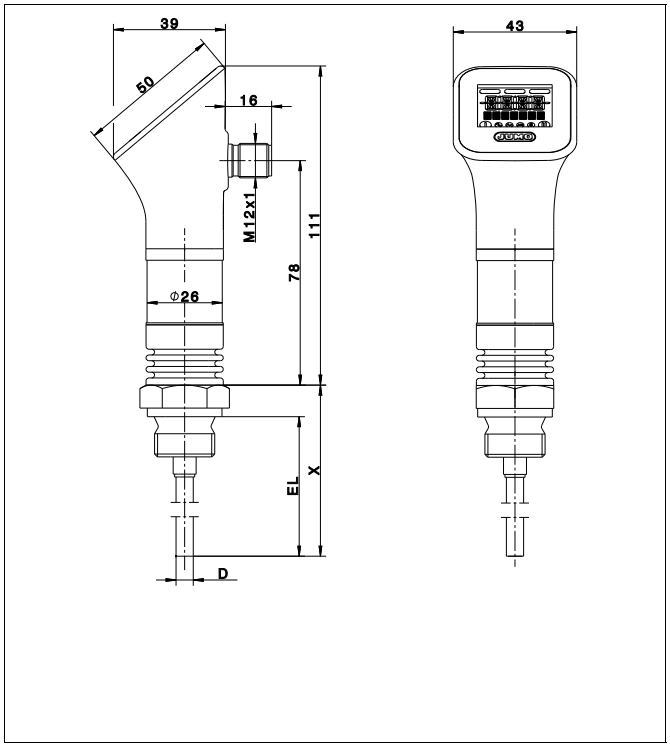
[b] The admissible pressures are designed for an operating temperature range of -10 to +140 °C given use of suitable clamps and sealing materials.

The maximum possible process pressure depends on different influences, e.g. design type, process connection, and process temperature.

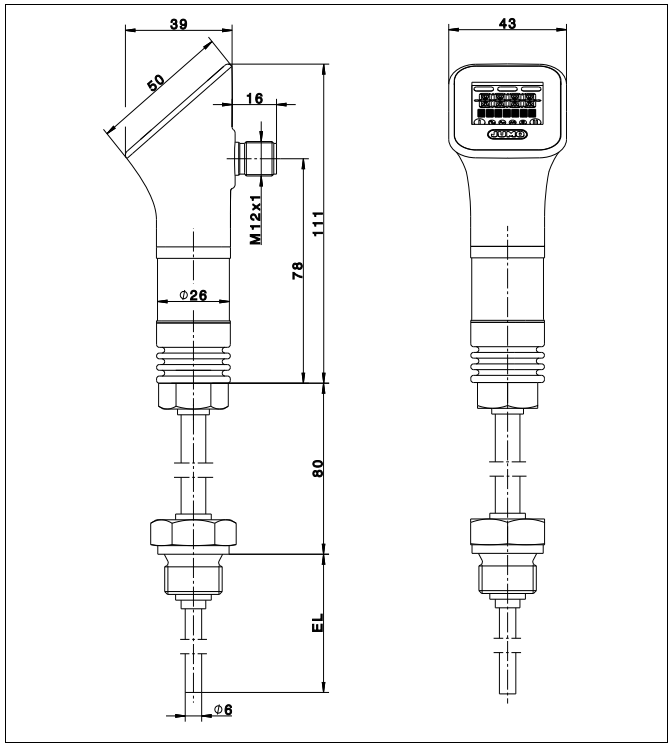
4.8 Dimensions

4.8.1 Device

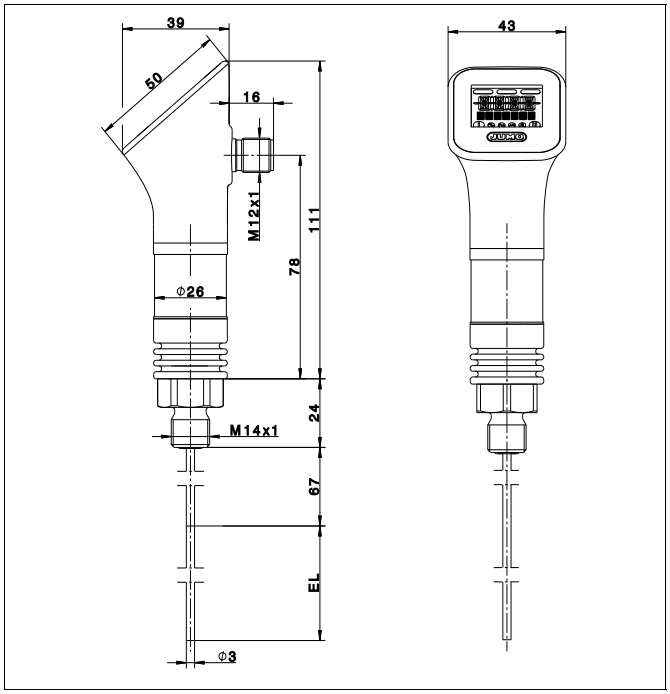
Type 902941/10 without extension tube



Type 902941/30 with extension tube for higher medium temperatures



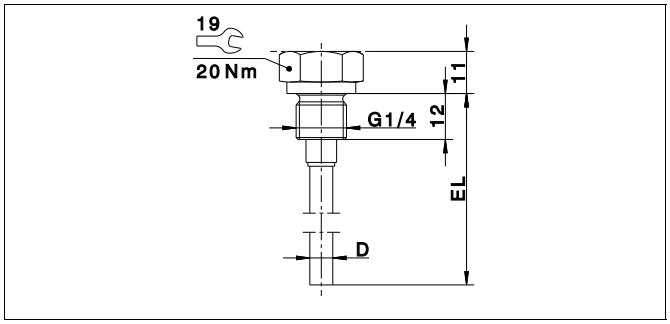
Type 902941/40 adaptation system for thermowells 902812/10



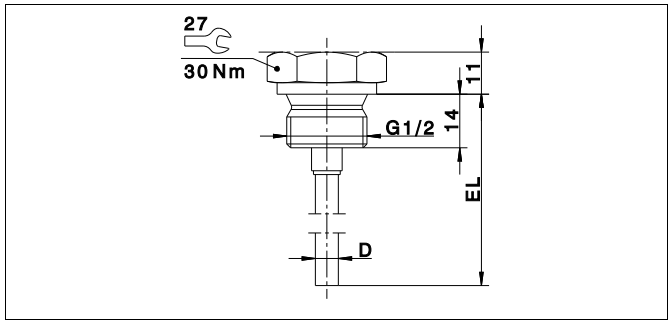
4.8.2 Process connections

Without EHEDG certification

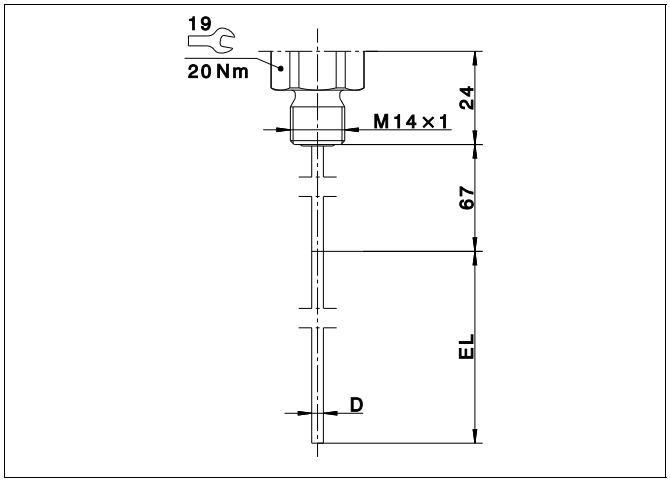
G 1/4



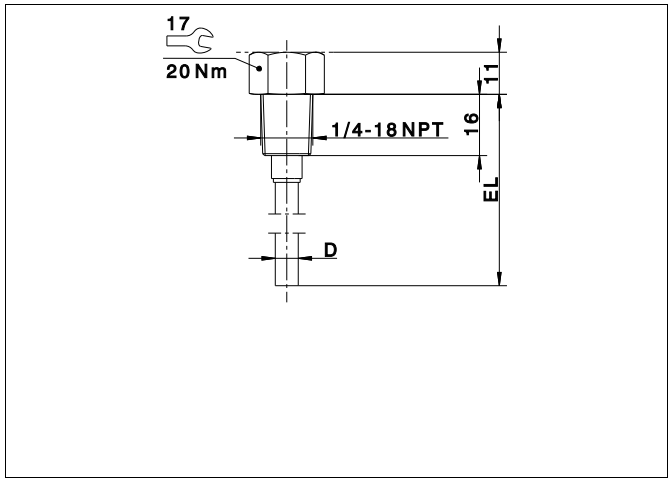
G 1/2



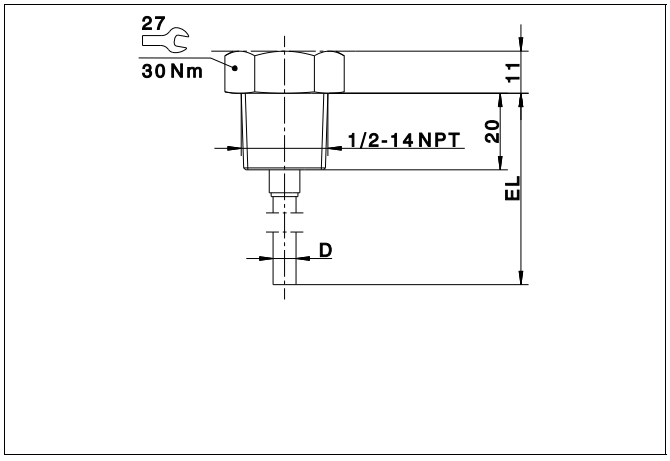
M14×1



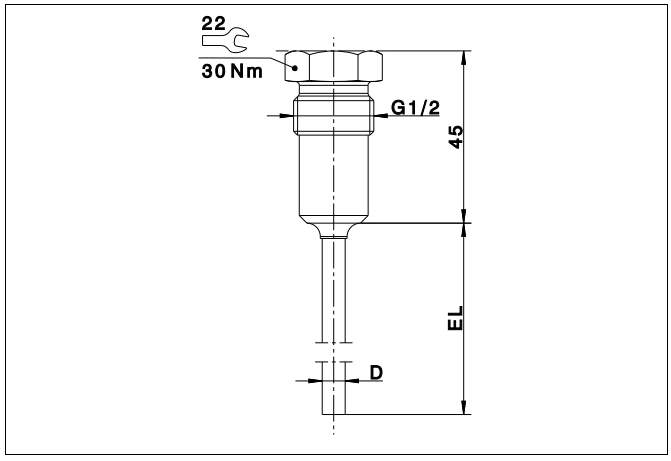
1/4 - 18 NPT



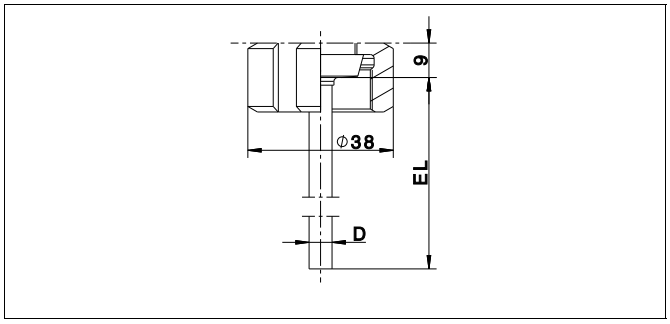
1/2 - 14 NPT



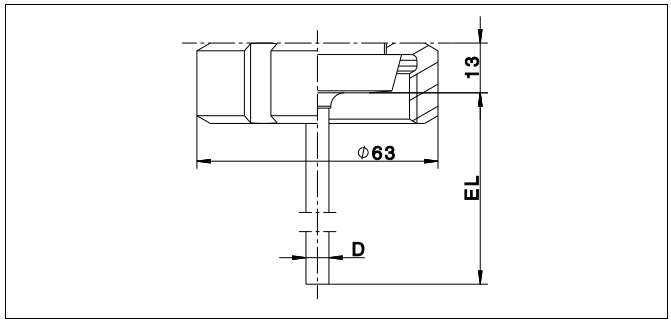
G 1/2 with CIP-compliant conical seal



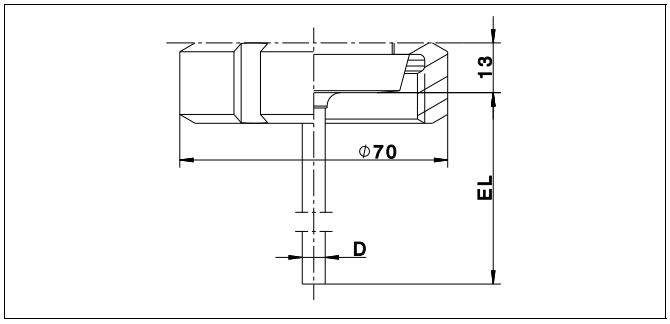
Taper socket with union nut DN 10 DIN 11851



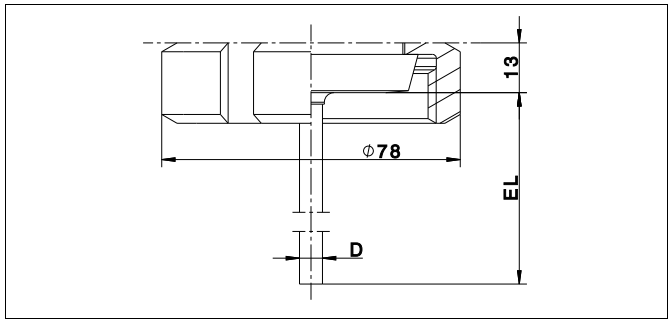
Taper socket with union nut DN 25 DIN 11851



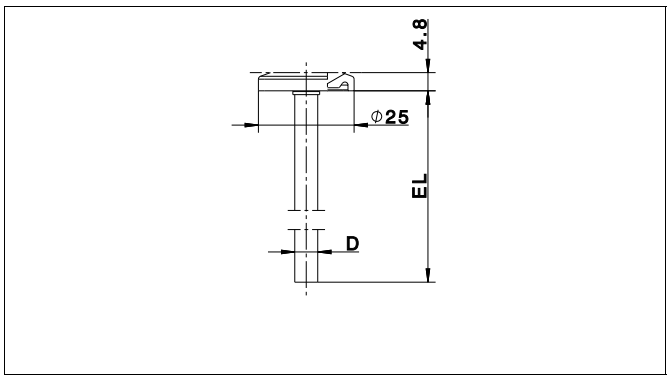
Taper socket with union nut DN 32 DIN 11851



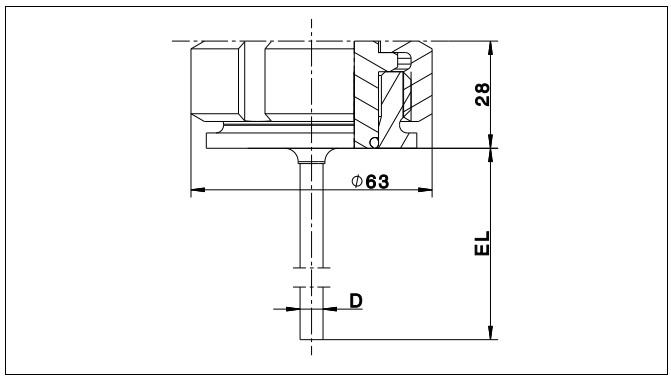
Taper socket with union nut DN 40 DIN 11851



Clamping socket (clamp) DN 10, 20 DIN 32676



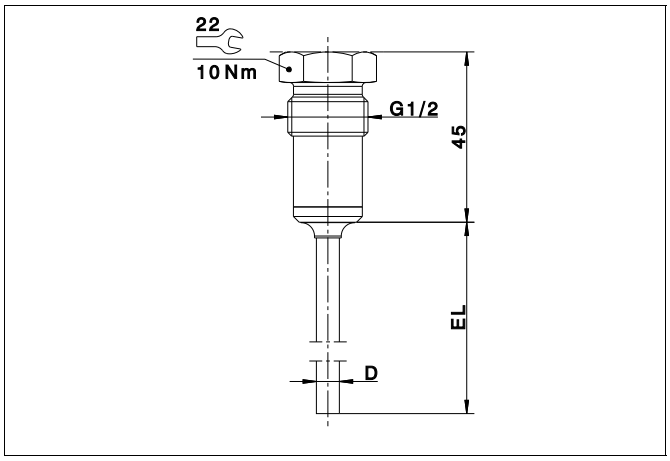
Tank connection with grooved union nut DN 25



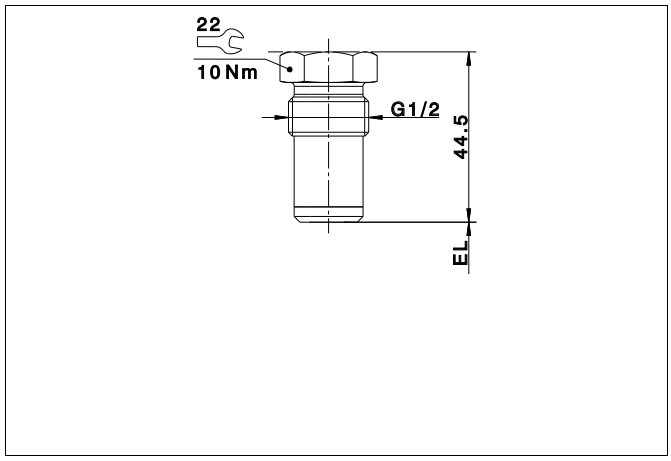
4 Technical data

With EHEDG certification

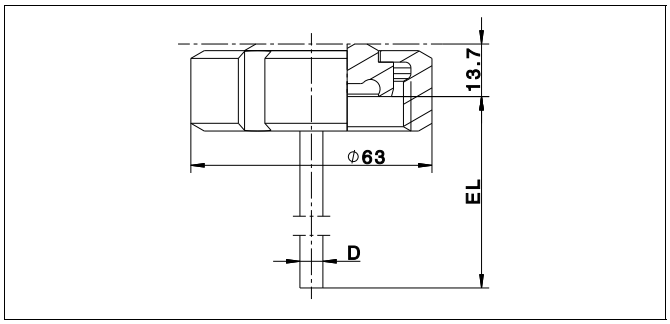
G 1/2 with PEEK sealing



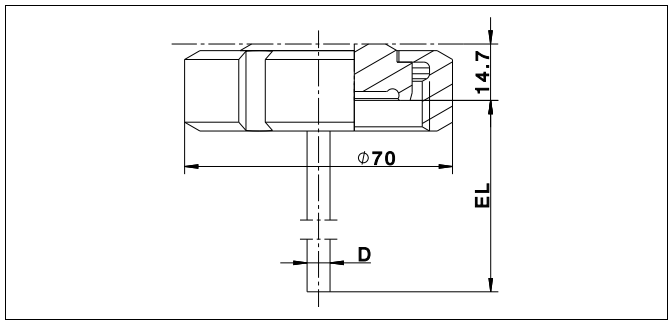
G 1/2 with PEEK sealing, front-flush



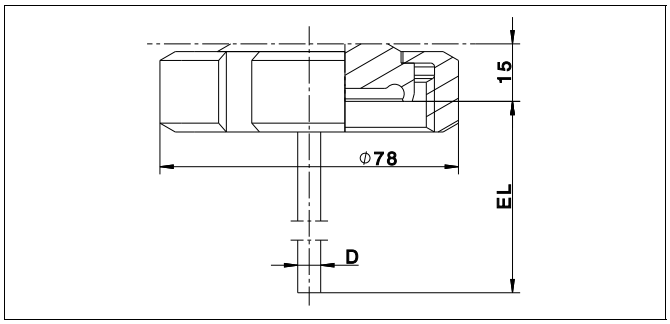
Aseptic DN 25 DIN 11864-1 Form A



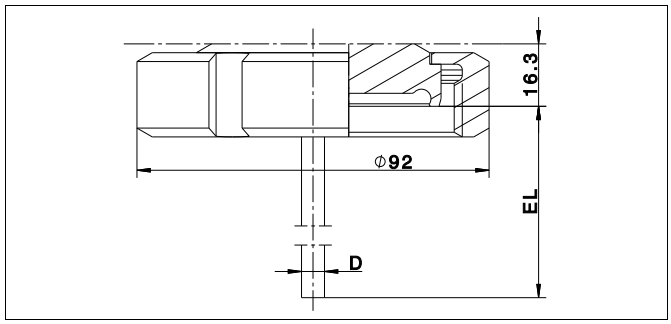
Aseptic DN 32 DIN 11864-1 Form A



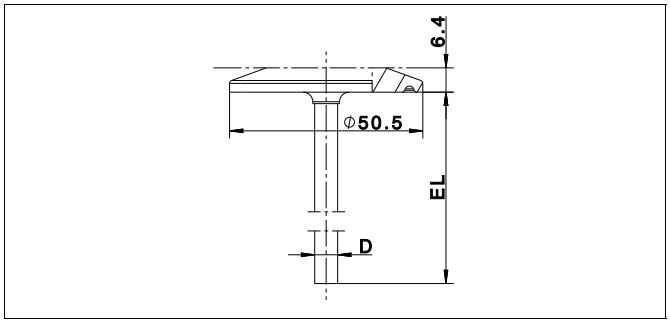
Aseptic DN 40 DIN 11864-1 Form A



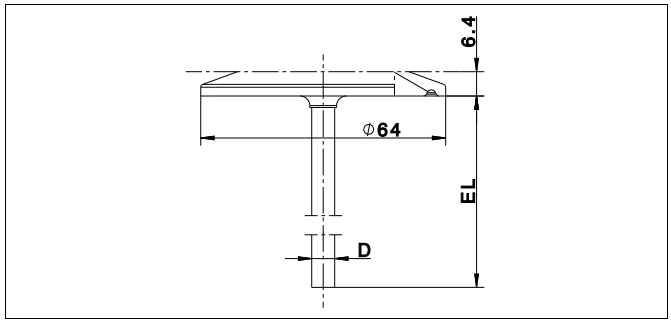
Aseptic DN 50 DIN 11864-1 Form A



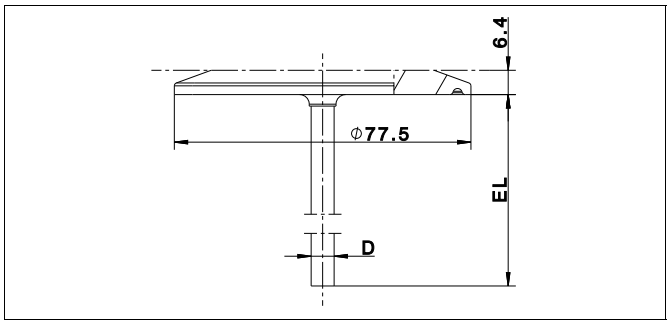
Clamping socket (clamp) DN 25, 32, 40 DIN 32676, 1.5" ISO 2852



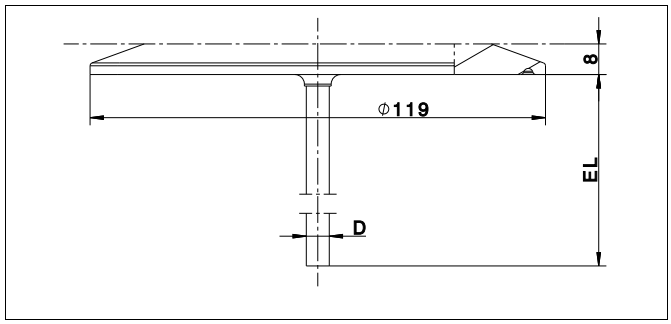
Clamping socket (clamp) DN 50 DIN 32676, 2" ISO 2852



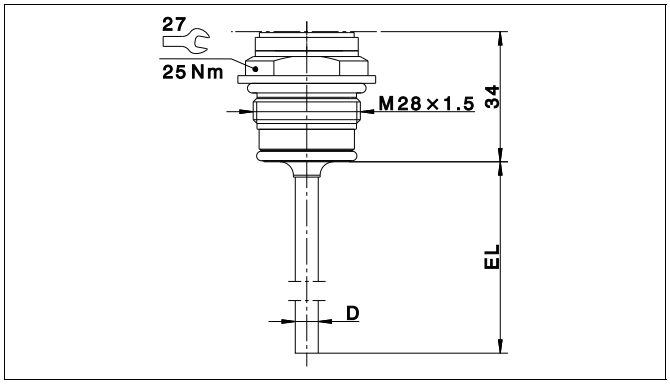
Clamping socket (clamp) 2.5" similar to DIN 32676



Clamping socket (clamp) DN 100 DIN 32676, 4" ISO 2852



JUMO PEKA hygienic process connection



5 Installation

5.1 Important information for usage according to EHEDG

The device in combination with one of the following process connections is suitable for use in food production due to its EHEDG approval:

- Clamp connections DN 25, DN 32, DN 40, DN 50, DN 100 or 1“, 1 1/2“, 2 1/2“, 4“ with Tri-Clamp seal Combifit International B.V.
- JUMO PEKA with FKM or EPDM O-ring
- VARINLINE® housing with process connection type N or type G with EPDM O-ring
- VARIVENT® process connections type B, type F, and type N with EPDM O-ring
- Aseptic screw connections DN 25 to DN 50, DIN 11864-1 and DIN 11864-3
- Screw connection G 1/2 with PEEK sealing
- Screw connection G 1/2 with PEEK sealing, front-flush

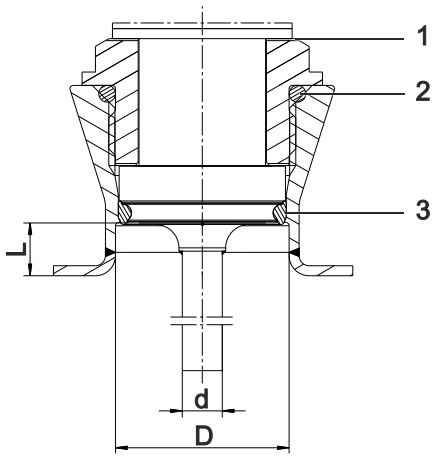
The device is suitable for CIP (Cleaning in Place) when installed accordingly.

Observe temperature and material resistance.

Observe EHEDG-compliant integration into the respective systems:

Prefer installation without cavity.
Ensure self-draining installation of the connection spigots.
Use only EHEDG approved process connections according to the current EHEDG position paper.
When used on tanks, the installation must be flush with the front. Cleaning by direct illumination must be ensured. It must be possible to detect cavity.
Install leakage opening in a clearly visible position. In the case of vertical lines, install pointing downwards.

The following drawing shows an example installation.
To avoid cavities, observe dimensions: **L < D - d**



1 Leakage opening
2 Rear seal
3 Front-flush seal

5.2 Preparing for installation

5.2.1 Installation site

Requirements:

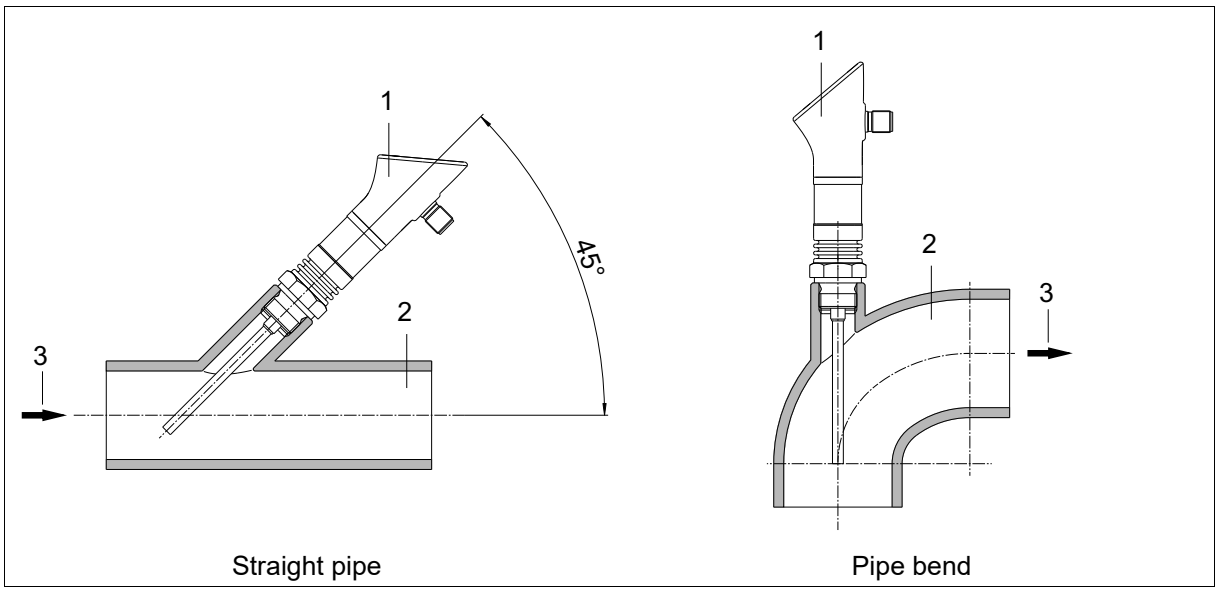
- The device is protected from UV radiation and weather influences in outdoor applications through structural measures.
- Observe the admissible environmental influences, see ⇨ "Environmental influences ", Page 14.

5.2.2 Installation position

The device must be installed in a straight pipe at an angle of 45° against the direction of flow. Perpendicular alignment to the flow must be avoided.

In the case of protection tubes with lengths exceeding the pipe diameter, they shall be installed in a pipe bend. The extended probe tip must be aligned to the direction of flow.

The probe tip must be placed in the center of the pipe.



1 Device
2 Pipe
3 Direction of flow

5 Installation

5.3 Installing the device

Example describes installation of the device version with a G 1/2 process connection DIN EN 837 in a pipe with port. Auxiliary equipment and tightening torques dependent on the selected process connection, ⇨ page 18.

Auxiliary equipment	Torque wrench with open-ended insert, wrench size 27

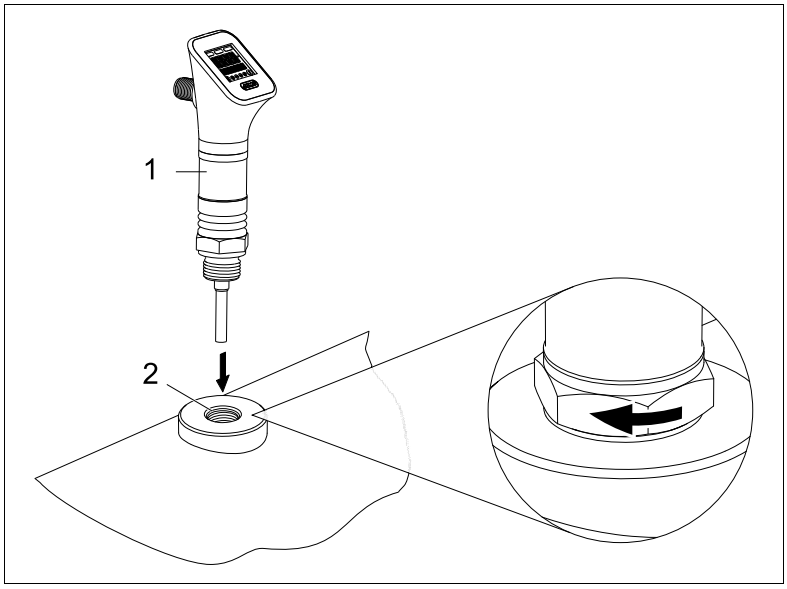
Requirements:

- The system has been de-energized and secured against being switched on again.
- The medium circulation of the plant is stopped.
- The pipe is drained and rinsed.
- Suitable protective equipment has been set up.
- The pipe is prepared for installation.

Procedure:

1. Manually (1) screw the device into the port (2) and tighten with suitable auxiliary equipment.

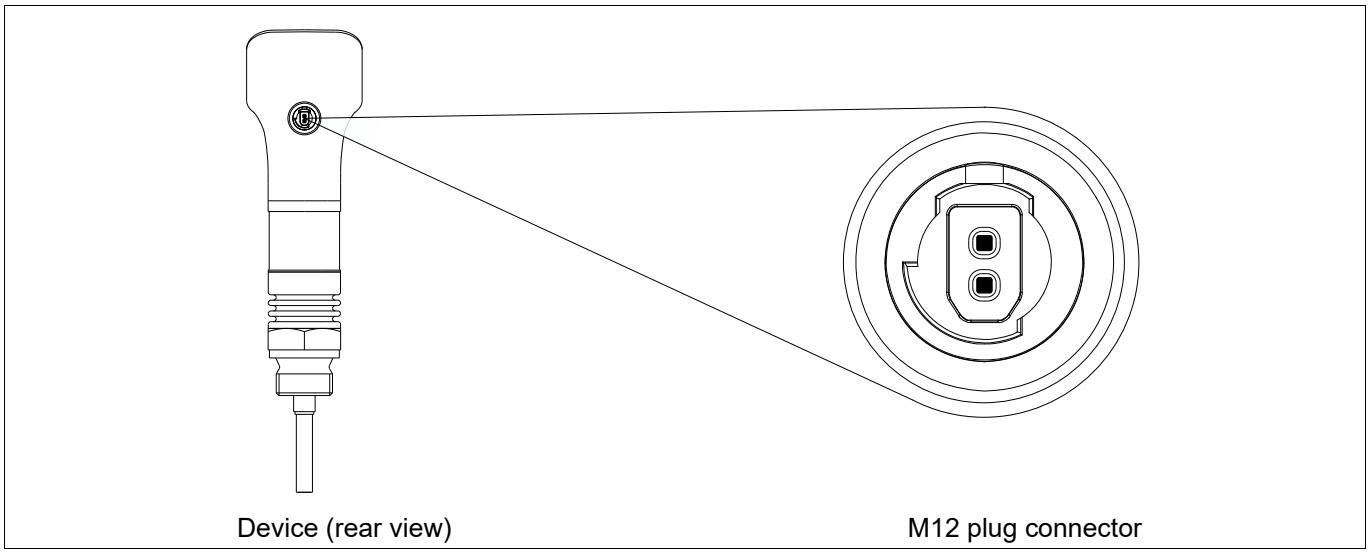
   Tightening torque: 30 Nm



2. Switch on the plant, fill the pipe and check the tightness of the process connections under operating conditions.

The device is now installed in the pipe.

6.1 Connection elements

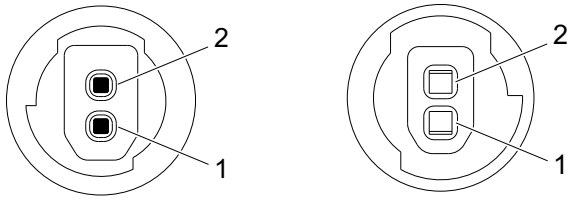


Device (rear view) M12 plug connector

6.1.1 Terminal assignment

M12 plug connection

Designation	Description	Assignment
SPE	RxTx+/PoDL+	1 WH (white)
	RxTx-/PoDL-	2 BU (blue)



Device Connecting cable

6 Electrical connection

6.2 Connecting the device

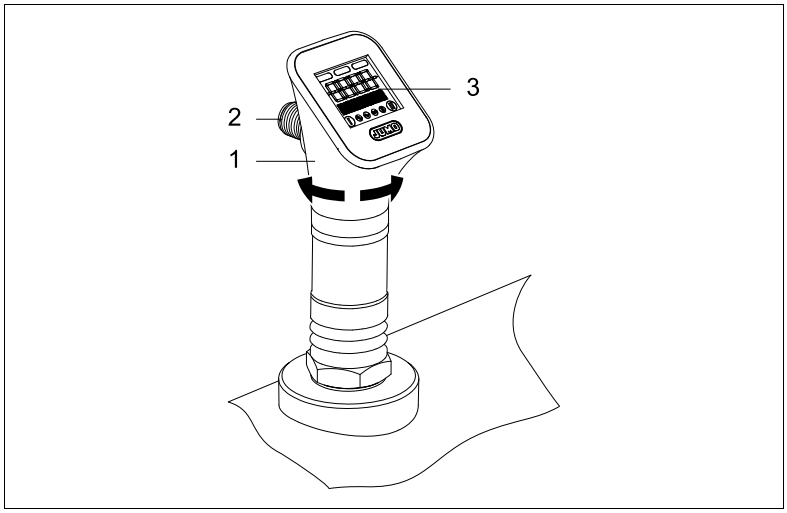
Auxiliary equipment	Torque wrench with socket wrench insert, wrench size 5
Material	Connecting cable for plug connector M12

Requirements:

- The system has been de-energized and secured against being switched on again.
- The connections for the voltage supply and signal processing have been correctly prepared.
- The process connection of the device is grounded.
- The connection cable is temperature resistant according to the process.
- The connection cable is installed at a minimum distance of 30 cm from high-voltage or high-frequency cables.

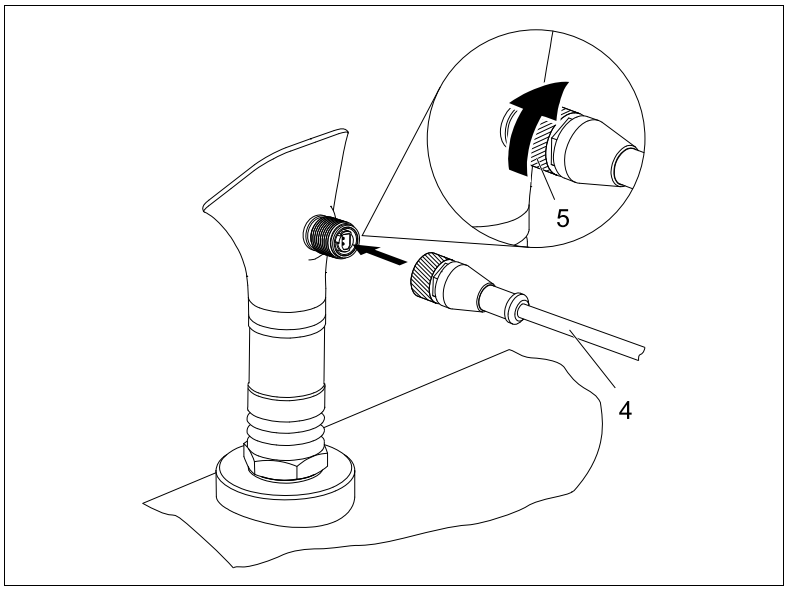
Procedure:

1. Align the top section of the device (1) so that the M12 plug connector (2) is easily accessible and the process display (3) is easy to read.



2. Insert the connecting cable (4) into the M12 plug connector and screw the connecting cable's union nut (5) to the M12 plug connector.

   Tightening torque: 0.4 Nm.



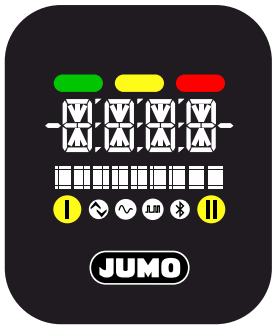
3. Connect the connecting cable to the device that is processing the signals and to the voltage supply.
4. Lay the connecting cable so that it is protected from mechanical load.

The device is ready for operation as soon as the voltage supply is established, ⇨ "Startup display ", Page 27.

7.1 Display elements

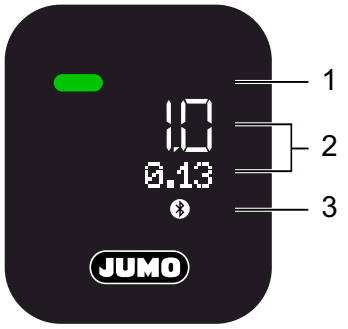
7.1.1 Startup display

The start-up display shows all of the display segments and switches to the device info display after a few milliseconds.

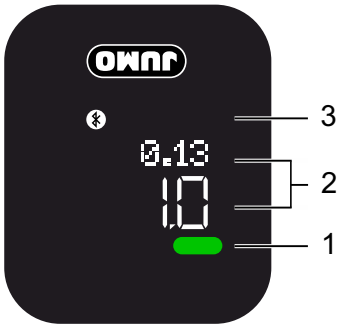


Orientation: 0°

7.1.2 Device info display



Orientation: 0°



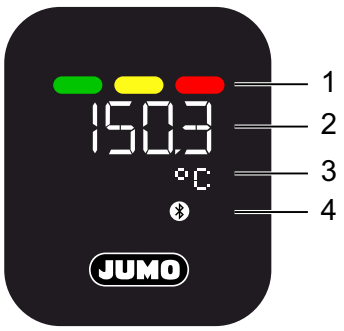
Orientation: 180°

Pos.	Designation	Description
1	**Device info display**	Shows the device status.
2		Shows the device software version, MAC and IP address.
3		Shows the configuration and status of the interfaces.

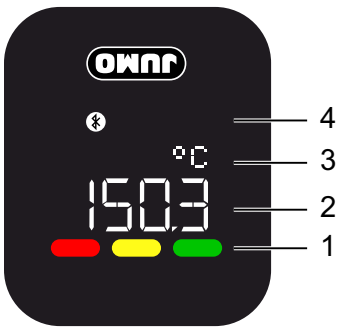
The device info display switches to the process display after approximately three seconds.

7 Operation

7.1.3 Process display



Orientation: 0°



Orientation: 180°

Pos.	Designation	Description
1	**Device status** Multicolored	Indicates the device status based on the classification according to NAMUR NE 107: • Steady green = Normal operation • Flashing green = Maintenance required (M) • Steady yellow[a] = Outside the specification (S) • Steady red = Failure (F) • Flashing red = Functional check (C)
2	**Process value**	Shows: • The measured process value • Error messages ⇨ "Error messages ", Page 28
3	**Text line**	Shows: • The configured unit • Error messages and warnings as running text
4	**Toolbar**	Shows: • The configuration and status of the interface connection

[a] Contrary to classification according to NAMUR NE 107, steady yellow instead of flashing red.

Toolbar

Symbol, display	Description
	Interface connection: Bluetooth® • Does not light up if NFC approval is needed for the connection or if Bluetooth® is permanently disabled. • Flashes when Bluetooth® is ready for a connection. • Lights up when a Bluetooth® connection has been established.

7.2 Error messages

Error messages and warnings are specified as running text in the text line – alternately with the unit configured for the display. If there are several error messages, only the error message with the highest priority is displayed.

The illuminated fields that display the device status indicate the error category.

Further information, ⇨ "Troubleshooting ", Page 44.

7.3 Interfaces

7.3.1 Bluetooth

The JUMO smartCONNECT app allows the device to be configured and its parameters to be set using an end device. Configuration data and device information are transmitted via Bluetooth. The Bluetooth radio module of the device is permanently active during initial startup.

The app is available for free download from the manufacturer´s websites or alternatively using the QR code:

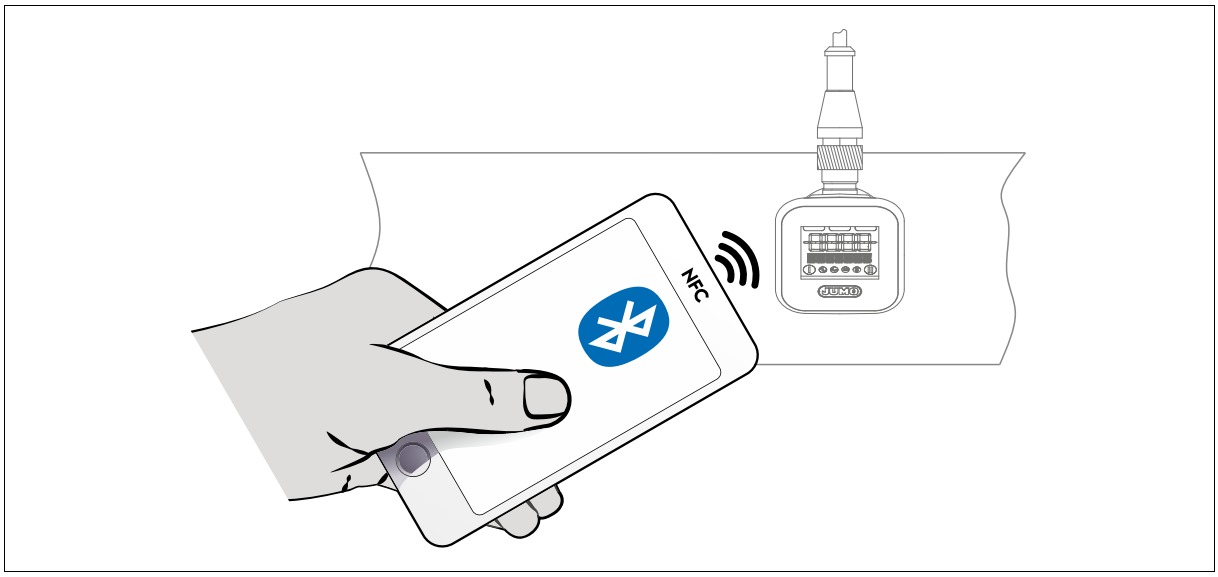
JETZT BEI Google Play

Laden im App Store

Active: The Bluetooth® radio module is permanently active. The device is detected by the smartCONNECT app as soon as it is within range of the Bluetooth® radio module.

Restricted (via NFC): The Bluetooth® radio module is inactive and can be temporarily activated via an NFC tag in the device. To establish a connection between the NFC tag and the end device, this device must be NFC-capable and held close to the device display.

Inactive: The Bluetooth® radio module can disabled and enabled via SPE.



7.3.2 JUMO Cloud

The device can be connected to the JUMO Cloud or any instance of the audako Cloud. Values can be read out and the device configured via the cloud. However, not all parameters are available.

The prerequisite for connecting to the cloud is configuring the device appropriately. This can be performed on the app or via Modbus TCP.

The gateway required to connect to the cloud is integrated into the device. The device is connected to the network via an SPE switch and the data packets are forwarded accordingly.

The MQTT protocol is used.

Data exchange

Data is transferred from the device to the cloud through the cloud gateway.

The data is buffered before transmission. This allows network failures to be bridged without immediately losing data.

The device sends its data to the cloud ("Historical data") via the buffer at the configured interval.

If the live mode is activated, the data is also sent directly – without buffering – to the device ("live data"). The interval for live mode can be configured.

All process values are always transmitted to the cloud in JUMO base units. This happens regardless of what is configured as the unit for the display or for Modbus TCP.

The relevant JUMO base units are:

°C	Temperature

Startup

In order for the cloud gateway to work, the following things must be set up in the cloud and then transferred to the device.

1. The device must be assigned to a tenant.
2. A data source must be created. This automatically generates the access data – consisting of device ID and password.
3. A data connection must be set up.
4. A signal must be created in the cloud for each value to be sent from the device to the cloud.

   The following information is relevant:

   a) Signal type (analog or binary)
   b) Average value / last value
   c) Interval
   d) Address

The Smart Device Wizard in the cloud simplifies startup.

Further information

A detailed description of the JUMO Cloud can be found in the help center.

The default settings are shown in **bold** in the following tables.

8.1 Limit value monitoring

Parameter	Value	Description
Function	**Inactive** Single Point Mode Window Mode Two Point Mode	**Inactive:** The limit value monitoring function is inactive **Single Point Mode:** Hysteresis mode ("Switching point SP1" and "Hysteresis") **Window Mode:** Window mode ("Switching point SP1", "Release point SP2" and "Hysteresis") **Two Point Mode:** Two-point mode ("Switching point SP1" and "Release point SP2")
Logic	**High-active** Low-active	The limit value logic can be inverted. **High-active:** An active limit value monitoring function corresponds to the High signal (logic level 1). **Low-active:** An active limit value monitoring function corresponds to the Low signal (logic level 0).
Switching point SP1	-999.9 to +999.9 °C (**0**)	–
Switching point SP2	-999.9 to +999.9 °C (**0**)	Only when "Switching function" = "Window Mode" and "Two Point Mode"
Hysteresis	-999.9 to +999.9 °C (**0**)	Only when "Switching function" = "Single Point Mode" and "Window Mode"
Switch-on delay	0 to 100 s (**0**)	The state is only given to the limit value monitoring function output after the time has elapsed.
Switch-off delay	0 to 100 s (**0**)	The state is only given to the limit value monitoring function output after the time has elapsed.
Error behavior	**Inactive** Active Frozen	Behavior of the limit value monitoring function output signal when there is a process value error. **Inactive:** Inactive signal (logic level 0) **Active:** Active signal (logic level 1) **Frozen:** Last valid value

Two limit value monitoring functions are available for each measurand. All limit value monitoring functions can be configured independently of each other.

Different switching modes are selectable, all of which can be inverted. In addition, the limit value monitoring functions have a switching delay.

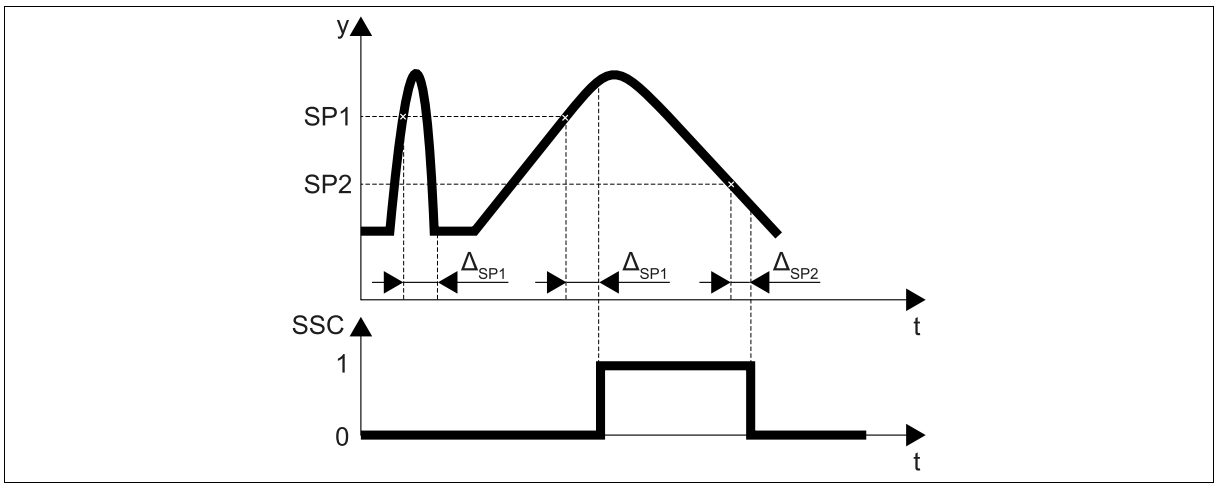
Switching delay

A switching delay for switching on and / or switching off can be configured.

If the switching condition is fulfilled, the set timer for the switch-on delay (Δ_{SP1}) starts to elapse. The state is only output after the time has elapsed. If the switching condition is no longer fulfilled before the time has elapsed, the timer is restarted.

The switch-off delay (Δ_{SP2}) works analogously.

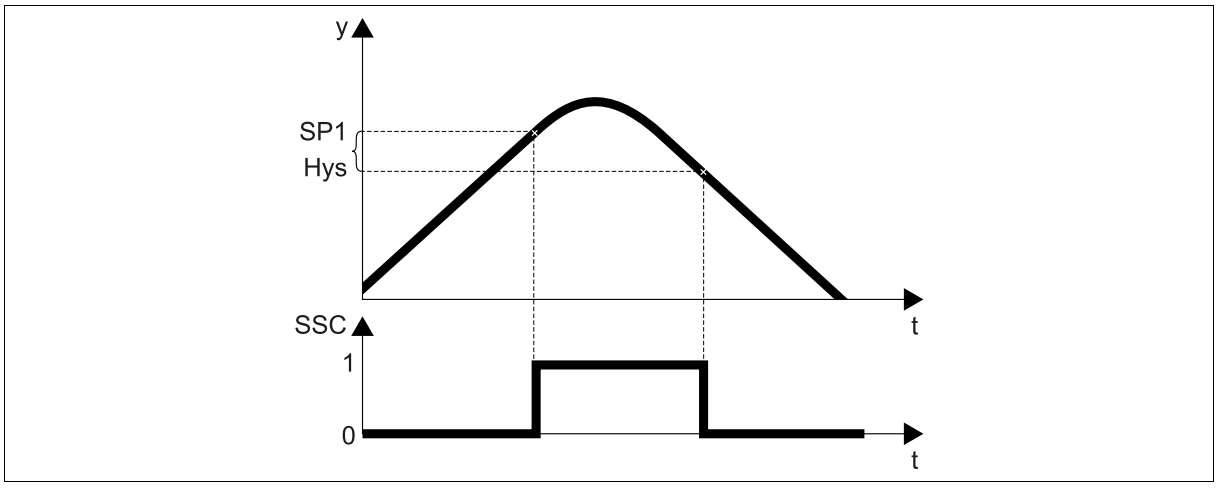
The delay times prevent the output from being switched by measured value peaks or by measured value dips.



(Δ_{SP1}) Switch-on delay
(Δ_{SP2}) Switch-off delay
(SSC) Limit value monitoring function output signal
(SP1) Switching point
(SP2) Release point
(t) Time
(y) Measured value

Hysteresis mode

If the process value exceeds the switching point SP1, the output of the limit value monitoring function becomes active. If the switching point SP1 reduced by the amount of the hysteresis is undershot again, the output of the limit value monitoring function becomes inactive again.

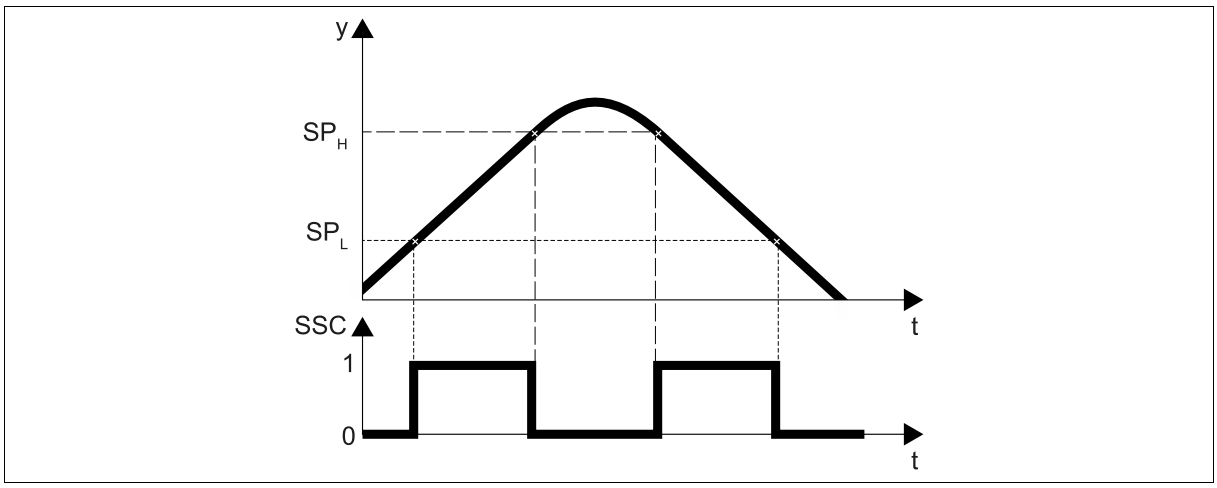


(SSC) Limit value monitoring function output signal
(Hys) Hysteresis
(SP1) Switching point
(t) Time
(y) Measured value

Window mode

Window mode checks whether the process value is within a certain range. SP_L is defined as the smaller value of switching points SP1 and SP2. SP_H is defined as the larger value of switching point SP1 and SP2.

The hysteresis of the switching points is adjustable.

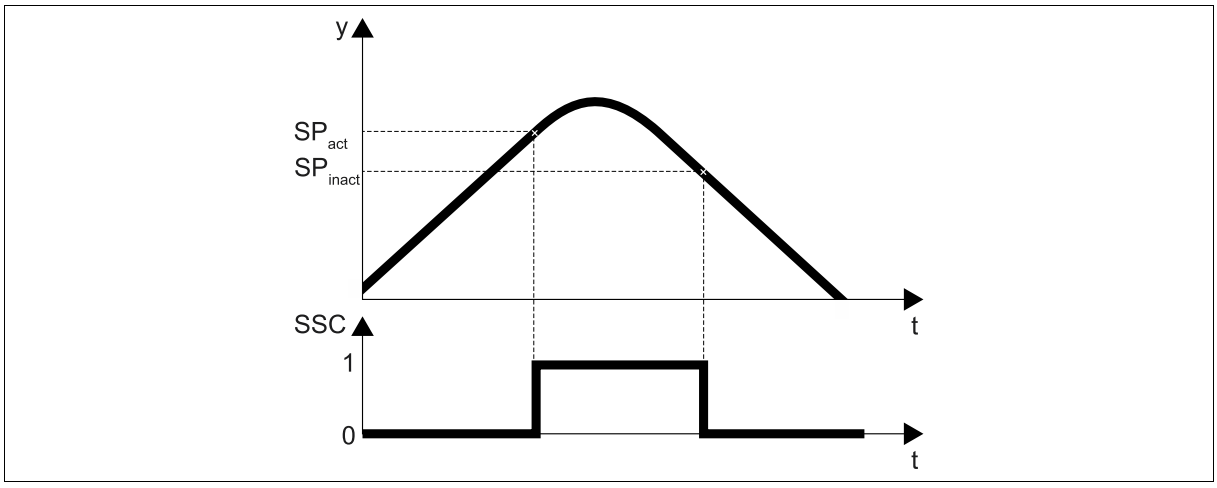


(SSC) Limit value monitoring function output signal
(t) Time
(SP_H) High switching point
(y) Measured value
(SP_L) Low switching point

Two-point mode

In two-point mode, two switching points are defined. If the process value exceeds the SP_{act} switching point, the limit value monitoring function output becomes active. If the process value falls below the SP_{inact} switching point, the output becomes inactive.

SP_{act} is defined as the larger value of switching points SP1 and SP2, SP_{inact} is correspondingly the smaller of the two values.



(SSC) Limit value monitoring function output signal
(t) Time
(SP_{act}) Active switching point
(y) Measured value
(SP_{inact}) Inactive switching point

9 Configuration via Bluetooth

The parameter lists are based on the JUMO smartCONNECT app operating menu. The table headings locate the respective parameters in the app operating menu..

The default settings are shown in **bold** in the following tables.

9.1 Device

System data

Parameter	Value	Description
National language	Deutsch, **English**, Français, Español	National language for the process display error messages.
Application-specific marking	**DELOS T02**	TAG designation (text entry with max. 19 characters possible).

Identification

Parameter	Value	Description
DNS name		Name to access the device in the Ethernet network – instead of the IP address.

System units

Parameter	Value	Description
Temperature	**°C**, °F, K	System unit for temperature.

9.2 Display

Parameter	Value	Description
Brightness	0 to 10 (**5**)	Brightness of the display.
Orientation	**0°**, 180°	Alignment of the display.

9.3 Bluetooth

Parameter	Value	Description
Function	Restricted (via NFC), **active**	Status of the Bluetooth® connection, ⇨ Page29.

9.4 Measurands

Configuration

Parameter	Value	Description
Offset	Input range: -15.00 to 15.00 (**0.00**)	Offset correction for zero point adjustment.

Configuration > Simulation

Parameter	Value	Description
Value	Input range: -273.0 to 999.0 °C (**0.0**)	Input value for the simulation.
Function	**Inactive**, active	Parameter function. After a device restart, the default setting is always active.

Configuration > Filter

Parameter	Value	Description
Time constant	Input range: 0 to 100 s (**1**)	Optimization of measured value updating. The higher the filter time constant value, the slower the change in measured value at the output.

Fine adjustment

Parameter	Value	Description
Function	**Inactive**, active	–
Actual start value	Input range: -273.0 to 999.0 °C (**-50.0**)	
Actual end value	Input range: -273.0 to 999.0 °C (**260.0**)	
Target start value	Input range: -273.0 to 999.0 °C (**-50.0**)	
Target end value	Input range: -273.0 to 999.0 °C (**260.0**)	

9 Configuration via Bluetooth

9.5 Service data

Parameter	Value	Description
Drag indicator	Minimum drag indicator	Data is persisted every 15 minutes.
	Maximum drag indicator	
Drag indicator system command	165	Reset both
	163	Reset minimum drag indicator
	164	Reset maximum drag indicator
Operating hours counter	Operating hours counter	Data is persisted every 15 minutes.
Operating hours counter system command	162	Reset

9.6 Limit value monitoring

Temperature 1 (2)

Parameter	Value	Description
Switching point SP1	Input range: -999.9 to 999.9 °C (**0.0**)	Process value of the limit value monitoring function signal. As-delivered condition: 40 % of the nominal measuring range
Switching point SP2	Input range: -999.9 to 999.9 °C (**0.0**)	Process value of the limit value monitoring function signal. As-delivered condition: 50 % of the nominal measuring range
Logic	**High-active**, Low-active	As-delivered condition: High-active
Function	**Inactive**, Single Point Mode, Window Mode, Two Point Mode	As-delivered condition: Single Point Mode
Hysteresis	Input range: -999.9 to 999.9 °C (**0.0**)	As-delivered condition: 1 % of the nominal measuring range
Error behavior 📖	**Inactive**, active, frozen	Behavior of the output signal in case of a malfunction.
Switch-on delay	Input range: 0 to 100 s (**0**)	–
Switch-off delay	Input range: 0 to 100 s (**0**)	
Switching edge counter	Reset switching edge counter	Data is persisted every 15 minutes.

Error behavior

Inactive value: If the **function** parameter of digital output 1 is configured as a **switching output** value, a process value error sets the **switching output** value to **inactive**.

Frozen value: If the **function** parameter of digital output 1 is configured as a **switching output** value, a process value error does not have any influence on the configuration of the **switching output** value.

9.7 Network

Parameter	Value	Description
Function	Manual, **automatic**	Manual: IP address is permanently set in the device. Automatic: IP address is assigned automatically by DHCP server.
IP address	**0.0.0.0**	**Function** parameter must be configured as the value **manual**.
Subnet mask	**255.255.0.0**	
Standard gateway	**0.0.0.0**	
DNS server IP automatic	**On**, off	**Function** parameter must be configured as the value **automatic**.
DNS server	**0.0.0.0**	**Function** parameter must be configured as the value **automatic** and **DNS server IP automatic** parameter must be configured as the value **off**.

9.8 Modbus TCP

Interface

Parameter	Value	Description
Function	**On**, off	–
Port	Input range: 1 to 1024 (**502**)	TCP port of the device.

System units

Parameter	Value	Description
Temperature	**°C**, °F, K	System unit for temperature.

9 Configuration via Bluetooth

9.9 Cloud Gateway

Parameter	Value	Description
Function	**Inactive**, active	–
Target server	**JUMO Cloud**, SCADA	
SCADA URL for configuration	**https://hostname/api/driver/v1/device**	**Function** parameter must be configured as the value **active** and **Target server** parameter must be configured as the value **SCADA**. TAG designation (text entry with max. 64 characters possible).
SCADA URL for MQTT	**wss://hostname/mqtt**	
Device ID		
Password		
Permanent live mode	Inactive, **active**	**Function** parameter must be configured as the value **active**.
Sampling rate (Polling)	Input range: 1000 to 25000 ms (**1000**)	Time during which live data is acquired. **Function** parameter must be configured as the value **active**.

Transmission

All data types are transmitted in big-endian format according to Modbus standard.

Access types

RO = Read-Only (read-only access)
RW = Read/Write (read and write access)
WO = Write-Only (write-only access)

Limited write cycles

The numbers of write cycles of memory modules (e.g. EEPROM, flash memory) are limited.

- Do not send write operations to save or commit actions on a non-cyclical basis.

10.1 Version and fabrication number

Modbus PDU address		Data type	Number of Modbus registers	Access	Data	Encoding
Dec	Hex					
21	0x0015	string	19	RO	Software version number	–
70	0x0046	string	11	RO	Hardware version number	–
110	0x006E	string	10	RO	Fabrication number	–

10.2 Configuration

Display

The following settings of the units concern the display on the device. For the Modbus interface, the units can be set separately ⇨ "Modbus TCP ", Page 40.

Modbus PDU address		Data type	Number of Modbus registers	Access	Data	Encoding
Dec	Hex					
1000	0x03E8	selection	1	RW	National language	0: German 1: English 2: French 3: Spanish
1001	0x03E9	selection	1	RW	Temperature unit	0: °C 1: °F 2: K
1002	0x03EA	string	10	RW	Device name	–
1012	0x03F4	string	18	RW	DNS name	Name to access the device in the Ethernet network – instead of the IP address
1100	0x044C	selector	6	RW	Process value	–
1106	0x0452	selection	1	RW	Display orientation	0: 0° 1: 180°
1107	0x0453	integer	2	RW	Display brightness	0 to 10

10 Modbus address tables

Analog input

Modbus PDU address		Data type	Number of Modbus registers	Access	Data	Encoding
Dec	Hex					
1200	0x04B0	float	2	RW	Filter time constant	0 s to 100 s
1202	0x04B2	float	2	RW	Simulation value	-273 °C to +999 °C
1205	0x04B5	selection	1	RW	Simulation activation	0: Inactive 1: Active
1215	0x04BF	float	2	RW	Offset	-15 to +15

Modbus TCP

The following settings of the units concern the Modbus interface. For the display on the device, the units can be set separately ⇨ "Display ", Page 39.

Modbus PDU address		Data type	Number of Modbus registers	Access	Data	Encoding
Dec	Hex					
1600	0x0640	integer	2	RW	Port gateway	1 to 1024
1602	0x0642	selection	1	RW	Temperature unit	0: °C 1: °F 2: K

Network settings

Modbus PDU address		Data type	Number of Modbus registers	Access	Data	Encoding
Dec	Hex					
1700	0x06A5	selection	1	RW	Method	0: Manual 1: Automatic
1701	0x06A6	string	8	RW	IP address	–
1709	0x06AD	string	8	RW	Subnet mask	–
1717	0x06B5	string	8	RW	Standard gateway	–
1725	0x06BD	boolean	1	RW	Assign DNS server IP automatically	–
1726	0x06BE	string	8	RW	DNS server	–

Bluetooth

Modbus PDU address		Data type	Number of Modbus registers	Access	Data	Encoding
Dec	Hex					
2100	0x0834	selection	1	RW	Bluetooth mode	0: Inactive 1: Restricted 2: Active

Limit value function

Modbus PDU address		Data type	Number of Modbus registers	Access	Data	Encoding
Dec	Hex					
2350	0x092E	float	2	RW	LVS 1: Switching point SP1	-999.9 °C to +999.9 °C
2352	0x0930	float	2	RW	LVS 1: Switching point SP2	-999.9 °C to +999.9 °C
2354	0x0932	selection	1	RW	LVS 1: Inversion	0: HighActive 1: LowActive
2355	0x0933	selection	1	RW	LVS 1: Switching function	0: Deactivated 1: Hysteresis mode 2: Window mode 3: Two-point mode
2356	0x0934	float	2	RW	LVS 1: Hysteresis	-999.9 °C to +999.9 °C
2358	0x0936	selection	1	RW	LVS 1: Error behavior	0: Inactive 1: Active 2: Frozen
2359	0x0937	float	2	RW	LVS 1: Switch-on delay	0 s to 100 s
2361	0x0939	float	2	RW	LVS 1: Switch-off delay	0 s to 100 s

Modbus PDU address		Data type	Number of Modbus registers	Access	Data	Encoding
Dec	Hex					
2375	0x0947	float	2	RW	LVS 2: Switching point SP1	-999.9 °C to +999.9 °C
2377	0x0949	float	2	RW	LVS 2: Switching point SP2	-999.9 °C to +999.9 °C
2379	0x094B	selection	1	RW	LVS 2: Inversion	0: HighActive 1: LowActive
2380	0x094C	selection	1	RW	LVS 2: Switching function	0: Deactivated 1: Hysteresis mode 2: Window mode 3: Two-point mode
2381	0x094D	float	2	RW	LVS 2: Hysteresis	-999.9 °C to +999.9 °C
2383	0x094F	selection	1	RW	LVS 2: Error behavior	0: Inactive 1: Active 2: Frozen
2384	0x0950	float	2	RW	LVS 2: Switch-on delay	0 s to 100 s
2386	0x0952	float	2	RW	LVS 2: Switch-off delay	0 s to 100 s

10 Modbus address tables

10.3 Actions

The device only saves the configuration once the relevant action has been performed.

Modbus PDU address		Data type	Number of Modbus registers	Access	Data	Encoding
Dec	Hex					
3000	0x0BB8	action	2	RW	Save configuration	Save (0x70babef) Discard (0x23dfef8) Default setting (0xe41d575f)
3625	0x0E29	action	2	RW	LVS 1: Switching edge counter	Reset switching edge counter (0xac8a560)
3627	0x0E2B	action	2	RW	LVS 2: Switching edge counter	
3631	0x0E2F	action	2	RW	Teach function	Teach SP1 (0x57fbe8) Teach SP2 (0x35800a1)
3700	0x0E74	action	2	RW	Operating hours counter	Reset (0x4fc51d54)
3702	0x0E76	action	2	RW	Drag indicator	Reset both (0xbdc325ef) Reset minimum drag indicator (0x70289c08) Reset maximum drag indicator (0x663c1402)

The status of a triggered action can be checked. For this purpose, the Modbus register of the corresponding action can be read back.

Read-back value	Meaning
0x00000000	The action was performed successfully.
0xFFFFFFFF	An error has occurred when performing the action.
The previously written value	The action has not been performed.

10.4 Process values

Measured values

Modbus PDU address		Data type	Number of Modbus registers	Access	Data	Encoding
Dec	Hex					
6000	0x1770	float	2	RO	Temperature	–

Transfer of configuration

Modbus PDU address		Data type	Number of Modbus registers	Access	Data	Encoding
Dec	Hex					
6450	0x1932	boolean	1	RO	Device restart required due to a configuration change	–

Limit value monitoring function

Modbus PDU address		Data type	Number of Modbus registers	Access	Data	Encoding
Dec	Hex					
3629	0x0E2D	unsigned short integer	1	RW	Measuring channel for which teach process is to be executed	1: Measuring channel 1 (limit value switch 1) 2: Measuring channel 1 (limit value switch 2)
3630	0x0E2E	unsigned short integer	1	RO	Result of the teach process	0: Inactive 1: SP1 successful 2: SP2 successful 7: Error
6900	0x1AF4	boolean	1	RO	LVS 1: Output	–
6901	0x1AF5	uint32	1	RO	LVS 1: Switching edge counter	–
6903	0x1AF7	boolean	1	RO	LVS 2: Output	–
6904	0x1AF8	uint32	1	RO	LVS 2: Switching edge counter	–

10.5 Service data

Service data

Modbus PDU address		Data type	Number of Modbus registers	Access	Data	Encoding
Dec	Hex					
6775	0x1A77	float	2	RO	Maximum drag indicator	–
6777	0x1A79	float	2	RO	Minimum drag indicator	–
6779	0x1A7B	uint32	2	RO	Operating hours counter	–

10.6 Error

Modbus PDU address		Data type	Number of Modbus registers	Access	Data	Encoding
Dec	Hex					
6400	0x1900	boolean	1	RO	General error	–
6401	0x1901	boolean	1	RO	Temperature faulty	–
6402	0x1902	boolean	1	RO	Configuration faulty	–
6403	0x1903	boolean	1	RO	Calibration data faulty	–
6404	0x1904	boolean	1	RO	Process values faulty	–
6405	0x1905	boolean	1	RO	Device not calibrated	–
6406	0x1906	boolean	1	RO	Simulation active	–
6408	0x1908	boolean	1	RO	Device operating conditions	–

11 Troubleshooting

11.1 Process value error

Process value errors are displayed instead of the process value.

Appearance	Cause	Remedy
++++	Temperature for compensation outside	Bring temperature into admissible range.
----	Invalid input value	Contact the manufacturer.
	Division by zero	Bring configuration parameter into admissible range.
->->	Probe break	Check lines and remedy probe break.
<-<-	Probe short circuit	Check lines and remedy probe short circuit.
<<<<	The measuring range was undershot.	Operate the device within the device specifications.
>>>>	The measuring range was exceeded.	Operate the device within the device specifications.

11.2 Error messages

Symbol	Classification according to NAMUR NE 107
 Steady red	**Error/failure**

Error message	Cause	Remedy
Temperature value faulty	The measuring range has been fallen below or exceeded or the temperature sensor has failed.	Operate the device within the device specifications.
Configuration faulty	The checksum of the configuration data is faulty.	Transfer the configuration data to the device again.
Calibration data faulty	The checksum of the calibration data is faulty.	Contact the manufacturer.
Process values faulty	The checksum of the process data is faulty.	
Device not calibrated	There is no calibration data.	

Symbol	Classification according to NAMUR NE 107
 Flashing red	**Function check**

Error message	Cause	Remedy
Simulation active	Simulation mode is active.	Deactivate simulation mode. Alternatively: Restart device.

Symbol	Classification according to NAMUR NE 107
 Steady yellow[a]	**Out of specification**

[a] Contrary to classification according to NAMUR NE 107, steady yellow instead of flashing red.

Error message	Cause	Remedy
Device operating conditions	The device is being operated outside the device specifications.	Operate the device within the device specifications.

Symbol	Classification according to NAMUR NE 107
 Flashing green	**Maintenance required**

Error message	Cause	Remedy
Restart the device	The device must be restarted due to a configuration change.	Restart the device.

12 Maintenance and cleaning

12.1 Maintenance

The device is maintenance-free.

12.2 Cleaning device housing

The device housing can be cleaned when the device has been installed.

Clean the device with a cloth dampened with water.

12.3 Decontamination

Use:

- When the medium is changed in the plant.
- Before replacing sealing rings/O-rings.
- Before returning the device.
- Before disposing of the device.

Requirements:

- The device is uninstalled, ⇨ Page 48.
- If the medium is a hazardous substance: The information in the safety data sheet is taken into account.
- Suitable protective equipment has been set up.
- Ein geeignetes Reinigungsmittel ist einsatzbereit.
- Ein Reinigungsplatz zum Spülen und Neutralisieren aller mediumberührten Teile ist vorbereitet.

Procedure:

1. ***CAUTION!*** Do not damage the sealing ring grooves when removing the sealing rings/O-rings.

   Remove the sealing rings/O-rings from the sealing ring grooves.
2. ***CAUTION!*** Use only cleaning agents that are compatible with the materials used to make the device.

   Thoroughly flush and neutralize all parts that come into contact with the medium using a suitable cleaning agent.
3. When disposing the device: ⇨ Page 48.
4. When continuing to use the device: ⇨ Page 46.

12.4 Replacing sealing rings/O-rings

Requirements:

- All components in contact with the medium are decontaminated, ⇨ Page 46.

Proceeding:

1. Check the sealing rings/O-rings previously used for damage and replace them if necessary.
2. Install the device, ⇨ Page 24.

12.5 Firmware update

JUMO smartCONNECT app

Requirements:

- The latest firmware was downloaded from the manufacturer's website and extracted (Product page > Downloads > Software).
- The JUMO smartCONNECT app is installed and open, ⇨ "Bluetooth ", Page 29.

Procedure:

1. Open the menu by tapping the icon ☰.
2. Select **Firmware update**.
3. Use **Select file** to open the file ***XXX.X.X.X.X.bin.***
4. Select **Start transfer**.
5. Connect the device.
   a) If Bluetooth is set to **Active** connect the device via **Nearby**.
   b) If the Bluetooth setting is set to **Restricted** connect the device using **Add new device** via NFC.
6. Confirm the transfer by clicking **Start transfer**.
7. Confirm the message with **Start transfer**.
   CAUTION! The device's display remains off during the transfer.
   The transfer progress is displayed as a percentage. The transfer takes approximately 5 minutes.
8. After the transfer is complete, select **Close**.
   The device will restart automatically.
9. Check that the device is functioning properly.

The firmware update is complete and the device is ready for use.

Troubleshooting:

If a firmware update fails, the device enters bootloader mode. The device's display remains off in this state.
Run the firmware update again. The device to be connected is displayed with the designation "Bootloader".

13 Shutdown

13.1 Uninstallation

Requirements:

- The system has been de-energized and secured against being switched on again.
- The medium circulation of the plant is stopped.
- The pipe is drained and rinsed.
- The device has cooled down.
- A clean and dry storage location has been prepared.

Procedure:

1. Manually loosen the union nut of the connecting cable from the M12 plug connection on the device.
2. Pull the connecting cable out of the M12 plug connection and remove from the working range.
3. Use suitable auxiliary equipment to detach the device.
4. ***CAUTION!*** Make sure that the seals remain in the sealing ring grooves of the process connections of the device.

   Carefully remove the device from the plant and put in a clean and dry place.

13.2 Returns

Requirements:

- Clean the device housing ⇨ Page 46.
- Clean the parts that come into contact with the medium ⇨ Page 46.

Procedure:

1. The supplementary sheet for product returns must first be completed correctly and signed. Then enclose it with the shipping documents and attach it to the packaging, ideally on the outside.
2. Use the original packaging or a suitably secure container for sending the device.

13.3 Disposal

Requirements:

- Clean the device housing ⇨ Page 46.
- Clean the parts that come into contact with the medium ⇨ Page 46.



- Do not dispose of the device or replaced parts in the trash after use.
- Delete programs and data stored on the device.
- Remove batteries, if any, if this can be done without damaging the device.
- Dispose of the device and the packaging material in a responsible and environmentally friendly manner.
- Observe the country-specific laws and regulations for waste treatment and disposal.

In accordance with Directive 2012/19/EU on Waste from Electrical and Electronic Equipment, manufacturers are obliged to offer the option of returning waste equipment. Request the return from the manufacturer.

UL approval has been submitted.

Device version with SPE, without UL approval

Designation	Part no.
SPE network cable 1 m (with M12 connector)	30062458
SPE network cable 2 m (with M12 connector)	30062457
SPE network cable 5 m (with M12 connector)	30062456
SPE network cable 10 m (with M12 connector)	30062455
SPE connector according to IEC 63171-2 (IP20)	30062461
T-piece with PEKA connection DN 25, EHEDG	00643555
T-piece with PEKA connection DN 32, EHEDG	00643574
T-piece with PEKA connection DN 40, EHEDG	00643576
T-piece with PEKA connection DN 50, EHEDG	00643579
T-piece with PEKA connection DN 65, EHEDG	00643580
T-piece with PEKA connection DN 80, EHEDG	00643581
T-piece with PEKA connection DN 100, EHEDG	00643582
Service deployment	00427970
Preconfiguration (Service)	00427968
JUMO smartCONNECT (App)	00770436

Device version with SPE, with UL approval

Designation	Part no.
SPE network switch 4-port (10BASE-T1L)	30062113
SPE network switch 8-port (10BASE-T1L)	30062447

15 Open-source software

The device software and/or device components were developed using open-source software.

Insofar as the respectively applicable license terms justify a claim on the provision of source code or other information, JUMO GmbH & Co. KG will provide the source code and the license texts on a conventional data carrier at the cost incurred for the provision of the data carrier.

This offer is valid for three years after the software is made available. This offer is valid beyond that time to the extent specified in the license terms.

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