



fill level



water level



pressure



temperature



flow



visualization



signal converter



sensor



Sonicont USN020

Ultrasonic filling level transmitter

Non-contact measurement of filling levels in liquids, pastes and coarse bulk materials

Technical manual
10.13



Main features

Non-contact filling level measurement

- in liquids up to 2m
- in bulk materials up to 1m

Process temperature range from - 40 °C to +85 °C

Accuracy $\leq 0,2\%$

Integrated evaluation electronic

- 3-wire with current signal 0/4...20 mA
- 3-wire with voltage signal 0...10 V
- 4x PNP switch output
- Bluetooth-Interface

Enclosure and display rotatable for optimal operability in each installation position

Viewing angle optimized TFT-LCD display for best readability

Easy handling by clear menu navigation

Extensive diagnostic functions for system analysis

Measure data memory for up to 1 million measuring values

You have purchased a high-grade and modern measuring device of ACS-CONTROL-SYSTEM GmbH.

We want to give thanks for your purchase and for your confidence to us.

The actual technical manual includes instructions for installation, electrical connection and inauguration, as well as the technical data of the device.

Modifications, that answer the purpose of the technical progress, are reserved by ACS-CONTROL-SYSTEM GmbH without prior notice.

If a question occurs, that can't be answered by the listed informations, please call on our technicians team in Eggenfelden Tel: +49 8721/ 9668-0 or info@acs-controlsystem.de

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Application

The device is a non-contact electronic ultrasonic filling level transmitter for continuous measuring of filling levels in liquids, pastes and coarse bulk materials.

The use of a non-contact operating measuring systems opens a broad range of application possibilities like e.g. at aggressive process materials.

Function

The transducer of the ultrasonic sensor transmits ultrasonic pulses to the product surface. These pulses are reflected by product surface and received back by the transducer as echoes. The running time of the ultrasonic pulses from emission to reception is proportional to the distance and hence the level. The determined level is converted into an appropriate output signal and outputted as measured value.

An integrated temperature sensor compensates changes in the velocity of sound caused by temperature changes.

The interference echo suppression function ensures that interference echoes (e.g. from edges, welded joints and installations) are not interpreted as a level signal.

The measuring value is diagrammed at the display, whereby it can be selected between different display styles (digital value / manometer / chart / bar graph).

In the internal ring memory up to 1 million measuring values can be recorded durable.

The measuring value can be converted into a continuous current signal 0/4...20 mA resp. voltage signal 0...10 V or monitored by four PNP switch outputs for exceedance of limit values.

By the use of the Bluetooth interface records measuring values can be downloaded. Moreover the configuration data can be downloaded or uploaded. This allows a fast and simple configuration of multiple devices with the same preferences.

Additional functions can be realized on request:

- Real-time-clock for storing of the measuring values with time signature (data logger)
- Communication interface RS485 (different protocols, e.g. Modbus)
- Communication interface USB (Slave)
- Communication interface UART

Safety notes

Each person that is engaged with inauguration and operation of this device, must have read and understood this technical manual and especially the safety notes.

Installation, electrical connection, inauguration and operation of the device must be made by a qualified employee according to the informations in this technical manual and the relevant standards and rules.

The device may only be used within the permitted operation limits that are listed in this technical manual.

Every use besides these limits as agreed can lead to serious dangers.

The materials of the device must be chosen resp. checked for compatibility with the respective application requirements (contacting materials, process temperature). An unsuitable material can lead to damage, abnormal behavior or destruction of the device and to the resulting dangers.

The sensors may not be used as sole device for prevention of dangerous conditions in machines and plants.

This measuring device meets article 3 (3) of the EC directive 97/23/EC (pressure equipment device directive) and is designed and produced in good engineer practice.

The device meets the legal requirements of all relevant EC directives.



Using the device in a manner that does not fall within the scope of its intended use, disregarding this instruction, using under-qualified personnel, or making unauthorized alterations releases the manufacturer from liability for any resulting damage. This renders the manufacturer's warranty null and void.

Installation

The correct function of the device within the specific technical data can only be guaranteed, if the permitted process and environmental temperatures (see chapter „Technical data“) will not be exceeded.

Installation notes

Drive the system pressure free prior installation resp. deinstallation of the sensor.
The screw-in of the thread process connection by using the terminal housing, the connection plug resp. the connection cable is not permitted.
The tightening of the thread process connection may only be done at the hexagon by a suitable spanner and with the maximum permitted torque strength.
The maximum permitted torque strength is 50 Nm.
The housing can be rotated every time, also at operation, mechanically by 330°.
The display can be rotated every time electrically by 180°.

Pressure / vacuum

Gauge pressure in the vessel does not influence the measuring result. Low pressure or vacuum does, however, damp the ultrasonic pulses. This influences the measuring result, particularly if the level is very low ($\leq -0,2$ bar resp. -20 kPa).

Vapor pressure

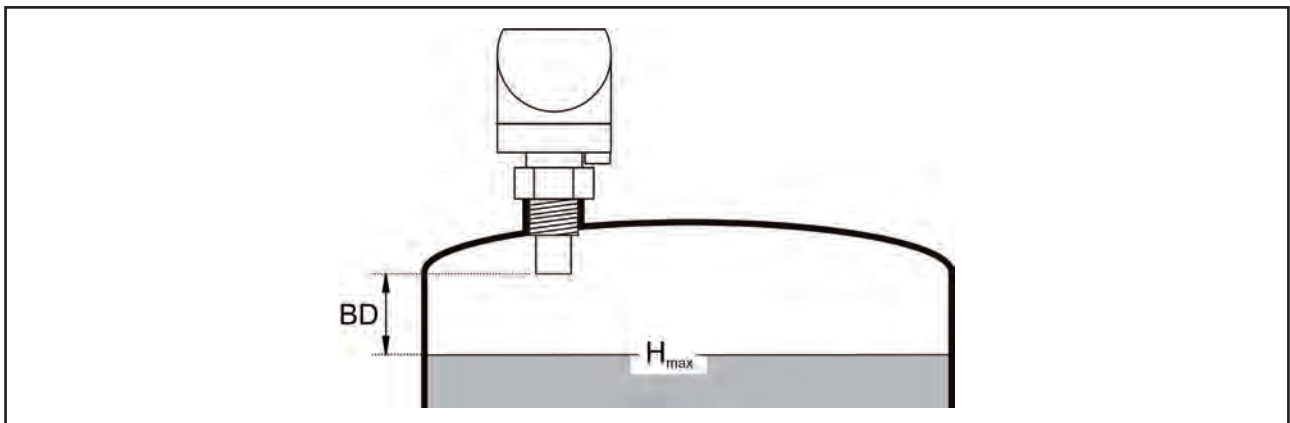
The vapor pressure at 20 °C (68 °F) gives a hint on the accuracy of the ultrasonic level measurement. If the vapor pressure at 20 °C (68 °F) is below 50 mbar, ultrasonic level measurement is possible with a very high accuracy. This is valid for water, aqueous solutions, water-solid-solutions, dilute acids (e.g. hydrochloric acid, sulfuric acid), dilute bases (e.g. caustic soda), oils, greases, slurries, pastes, etc. High vapor pressures or outgassing media (e.g. ethanol, acetone, ammonia) can influence the accuracy.

Range

The sensor range is dependent on the measuring conditions.
The maximum range can be found in the chapter "Technical Data - Input".

Blocking distance

Install the device at a height so that the blocking distance BD (see chapter "Technical Data - Input") is not undershot, even at maximum fill level.
If the blocking distance is undershot, it may cause device malfunction.



If the medium reaches the transducer, buildup can form on it and cause faulty measurements later on.

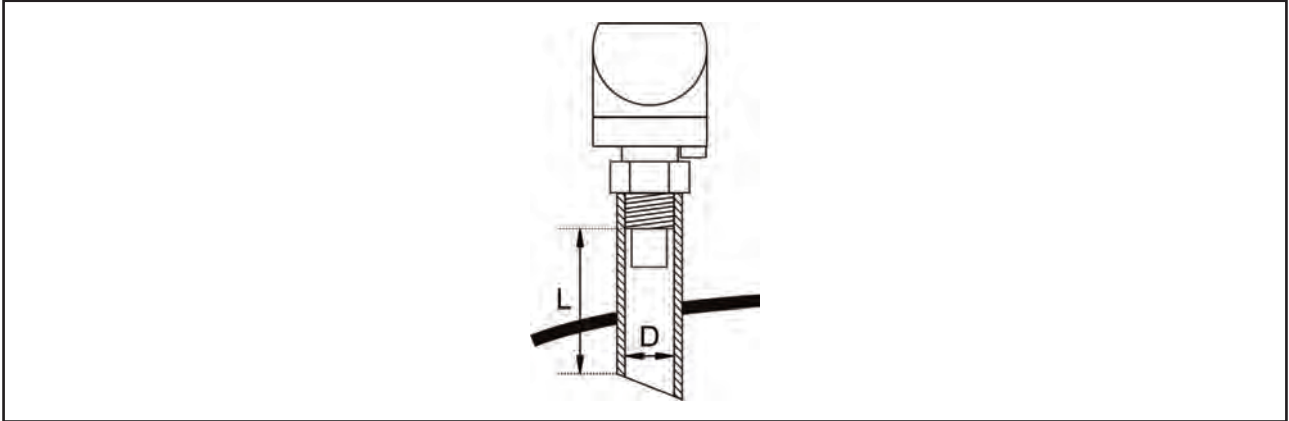
Nozzle installation

Use a pipe nozzle if you cannot maintain the blocking distance in any other way.

The interior of the nozzle must be smooth and may not contain any edges or welded joints. In particular, there should be no burr on the inside of the tank side nozzle end.

Note the specified limits for nozzle diameter and length.

To minimize disturbing factors, we recommend an angled socket edge (ideally 45°).

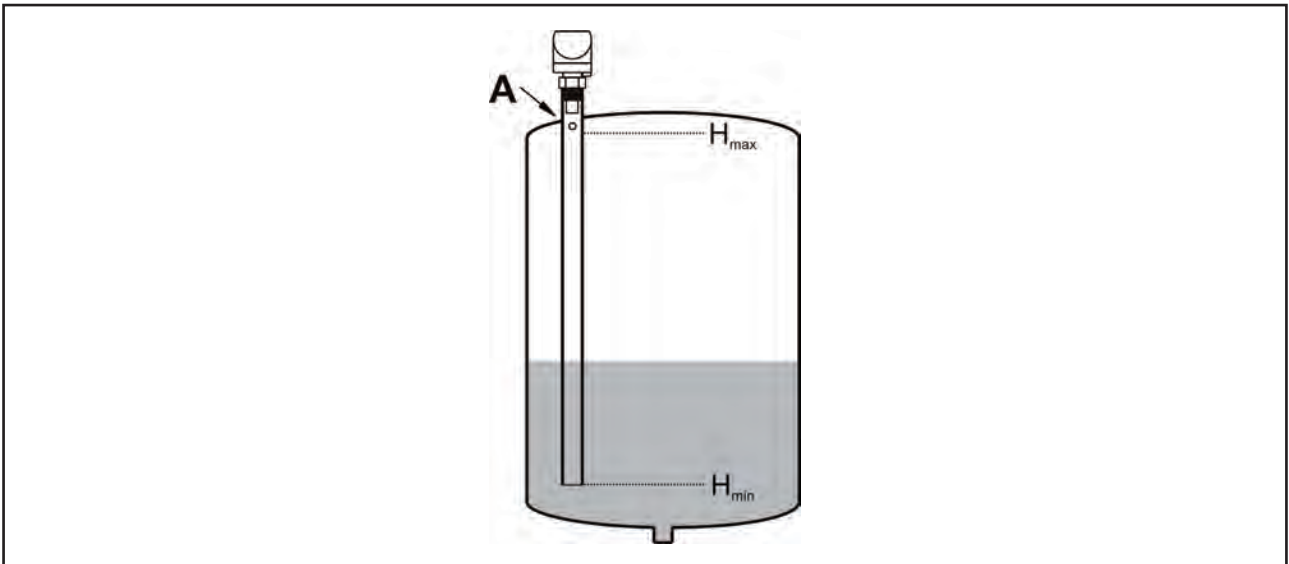


Nozzle diameter D	Maximum nozzle length L
DN50 / 2"	80 mm
DN80 / 3"	240 mm
DN100 / 4"	300 mm
≥ DN150 / 6"	400 mm

Standpipe measurement

By using a standpipe (surge or bypass tube), the influence of vessel installations, foam generation and turbulence is excluded.

Standpipes must extend all the way down to the requested min. level, as measurement is only possible within the tube.



The pipe must be provided with a sufficient venting hole (A) (Ø 5...10mm) at the upper edge.

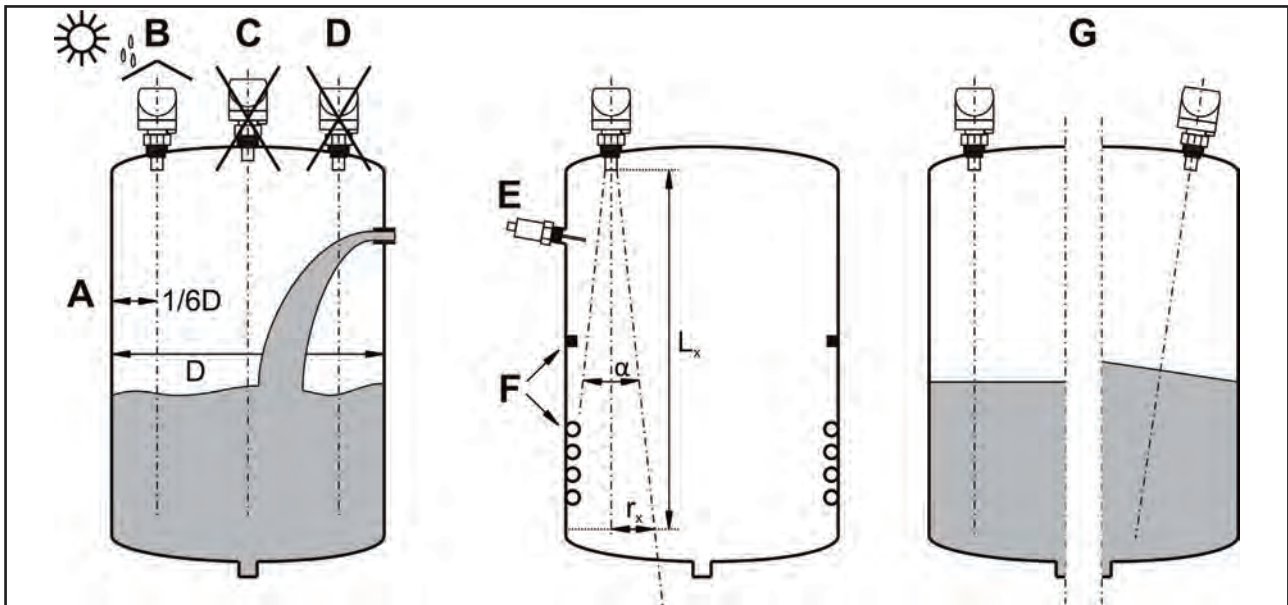
Avoid large gaps and thick welding joints when connecting the tubes.

Measurement in a standpipe is not recommended for very adhesive products.

Installation place

Level measurement

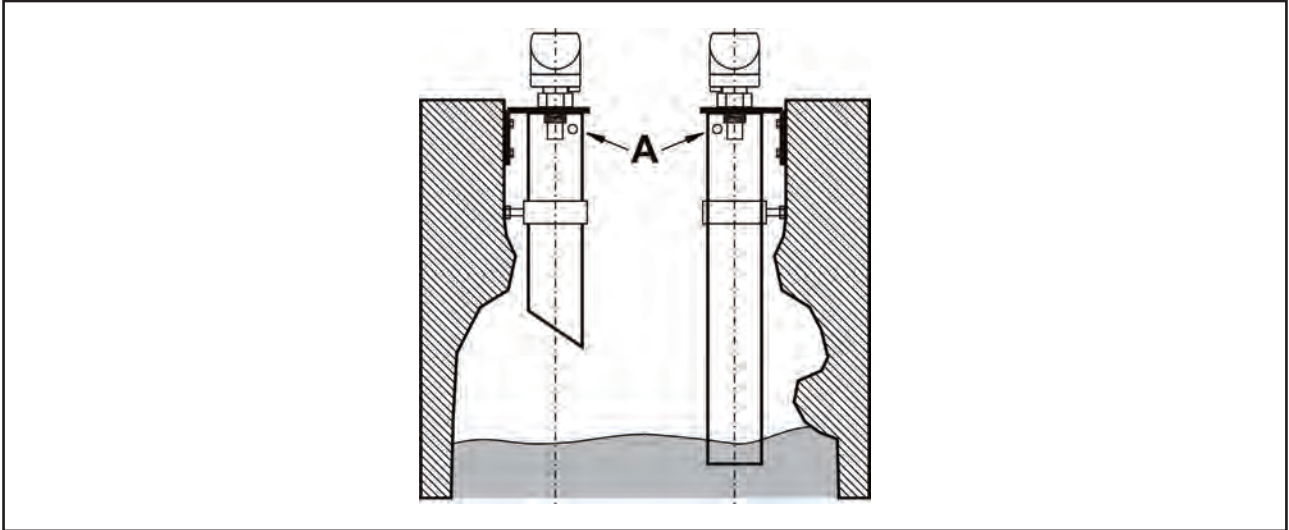
- Do not install the sensor in the middle of the tank (C). We recommend leaving a distance between the sensor and the tank wall (A) measuring 1/6 of the tank diameter. In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible down to the lowest point of the vessel bottom.
- Use a protective cover, in order to protect the device from direct sun or rain (B).
- Avoid measurements through the filling curtain (D). Through the action of filling, stirring and other processes in the vessel, dense foams which considerably damp the emitted signals may form on the product surface. If foams are causing measurement errors, the sensor should be used in a standpipe.
- If there are strong air currents in the vessel, e.g. due to strong winds in outdoor installations or air turbulence, e.g. by cyclone extraction, the device should be mount in a standpipe.
- Make sure that equipment (E) such as limit switches, temperature sensors, etc. are not located within the emitting angle α . In particular, symmetrical equipment (F) such as heating coils, baffles etc. can influence measurement. If large vessel installations such as struts or supports cause false echoes, these can be attenuated through supplementary measures. Small, inclined sheet metal or plastic baffles above the installations scatter the ultrasonic signals and avoid direct false echoes.
- Align the sensor so that it is vertical to the product surface (G).
- Never install two ultrasonic measuring devices in a tank, as the two signals may affect each other.
- To estimate the detection range, use the 3 dB emitting angle α , that can be found in the chapter „Technical Data - Input“. This radius of the detection range at an arbitrary distance L_x can be calculated by the following term: $r_x = \tan(\alpha / 2) * L_x$
Example values for L_x and r_x can be found in the chapter “Technical Data - Input”.



Installation in narrow shafts

In narrow shafts with strong interference echoes, we recommend using a stand pipe resp. an ultrasound guide pipe (e.g. PE or PVC wastewater pipe) with a minimum diameter of 100 mm. Make sure that the pipe is not soiled by accumulated dirt. If necessary, clean the pipe at regular intervals.

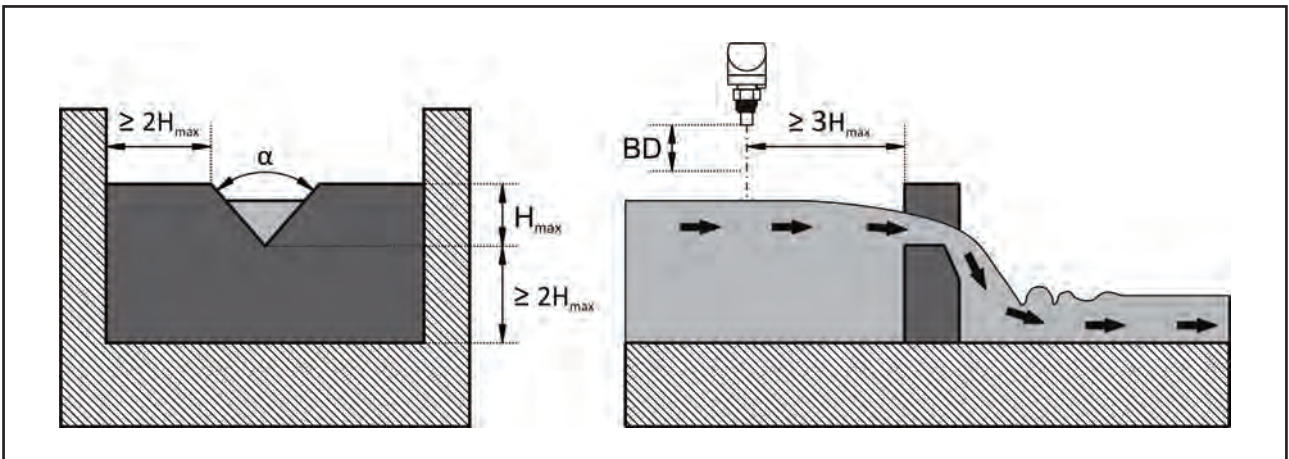
The pipe must be provided with a sufficient venting hole (A) (\varnothing 5...10mm) at the upper edge.



Flow measurement

- Install the device at the inflow side, as close above the maximum water level H_{\max} as possible (take into account the blocking distance BD).
- Position the device in the middle of the channel or weir.
- Align the sensor membrane parallel to the water surface.
- Keep to the installation distance of the channel or weir.

Example: Triangular weir



Electrical connection

The electrical connection of the device must be carried out according to the respective country specific standards.

Incorrect installation or adjustment could cause applicationally conditioned risks.

Potential equalization - earthing

The device must be grounded.

The metallic parts of the device are electrically connected with the socket of the plug M12.

Connection cable

Use only shielded signal and measurement wires and install these wires separated from power leading wires.

Connect the cable shield of a connected cable only at one side to earth, ideally at the installation place of the device.

Supply voltage

The voltage applied to the terminal contacts may not exceed the maximum permitted supply voltage to avoid damage of the electronic.

The maximum permitted supply voltage range at the respective setting is:

Signal 0/4...20mA	9...33V _{DC}
Signal 0...10V	14...35V _{DC}

All connections are reverse polarity protected.

Load resistor

Signal 4...20 mA

A load resistor, e.g. the measuring shunt of an evaluation device, requires a minimum supply voltage. Dependent on the connected supply voltage, it results in a maximum value for this resistor, where a correct function is still possible.

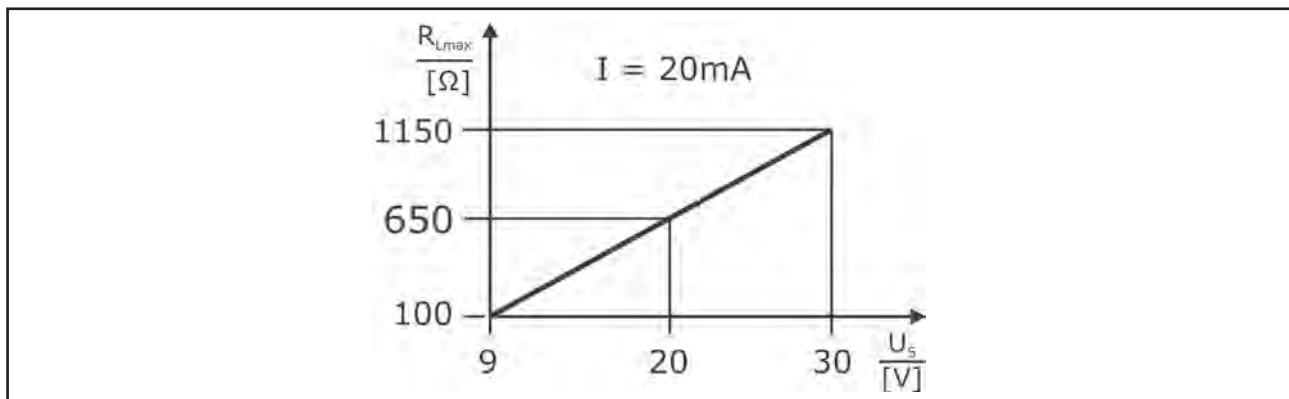
This resistor can be calculated by the following term:

$$R_{Lmax} = (U_s - 7 \text{ V}) / 20\text{mA}$$

R_{Lmax} = maximum load resistor

U_s = connected supply voltage

Load resistor characteristic



Signal 0...10 V

A load resistor, e.g. the measuring shunt of an evaluation device, requires at a definitive output voltage an output current. Due to the limitation of that output current, it results in a minimum value for this resistor, where a correct function is still possible.

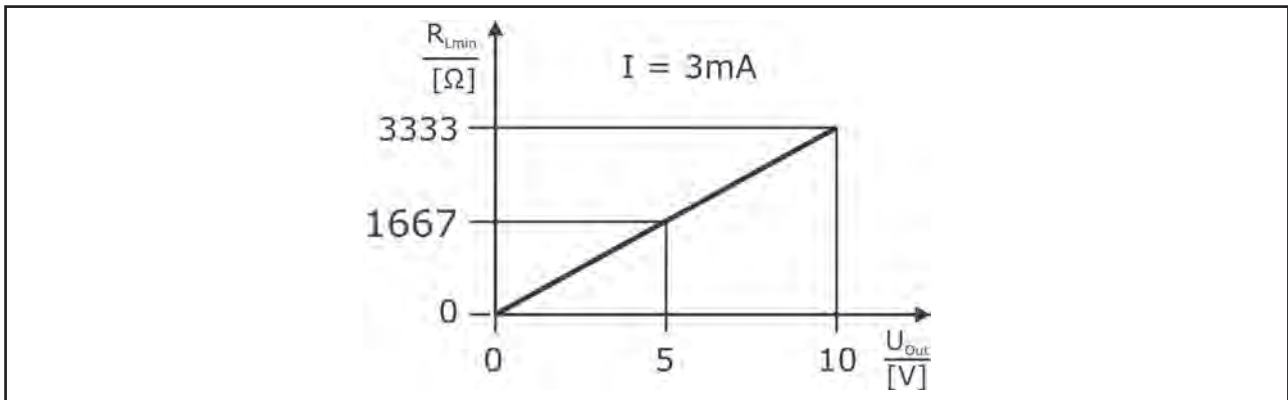
This resistor can be calculated by the following term:

$$R_{Lmin} = U_{Out} / 3mA$$

R_{Lmin} = minimum load resistor

U_{Out} = output voltage

Load resistor characteristic



Switch output

Inductive loads at the pnp switching outputs, e.g. relays or contactors may only be used with a free-wheeling diode or a RC protection circuit to avoid high voltage peaks.

The load at the PNP switching output will be connected to the terminal +terminal of the supply voltage by a semiconductor switch contactless and by this bounce-free.

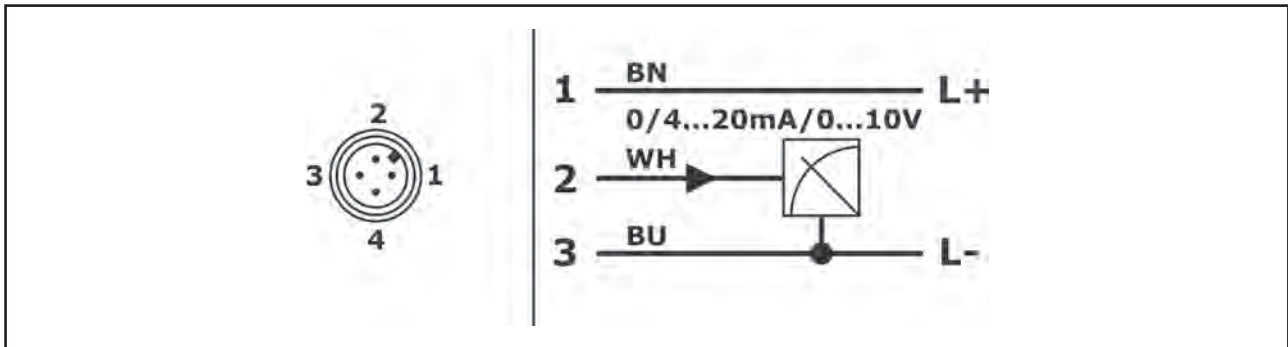
At an activated switching state a positive signal near supply voltage is feed to the output.

At deactivated switching state and at failure of supply voltage the semiconductor switch is shut off.

The PNP switching output is current limited to 0,2...0,25 A and is overload and short circuit protected.

Connection scheme

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

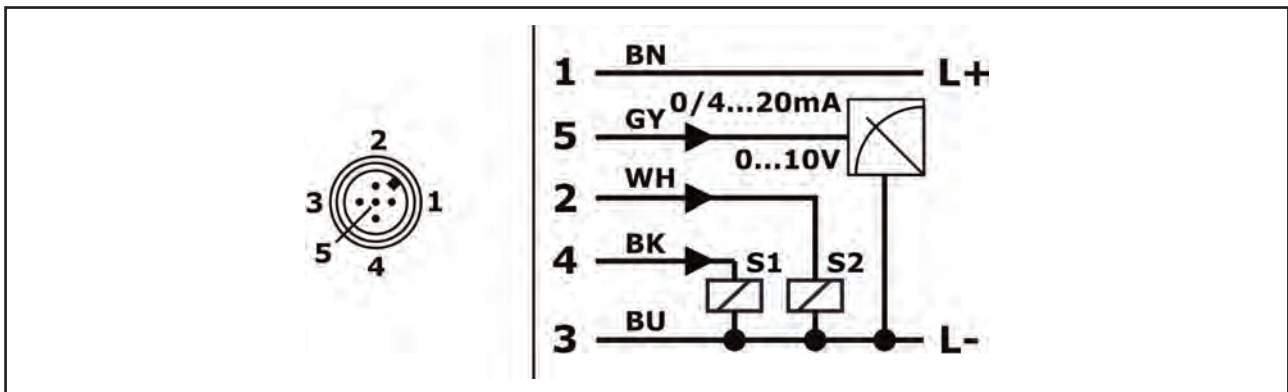


Conductor color standard connection cable M12:

BN = brown, WH = white, BU = blue

The connection cable is not enclosed in the delivery contents.

Signal 0/4...20 mA / 0...10 V / 2x PNP switch output

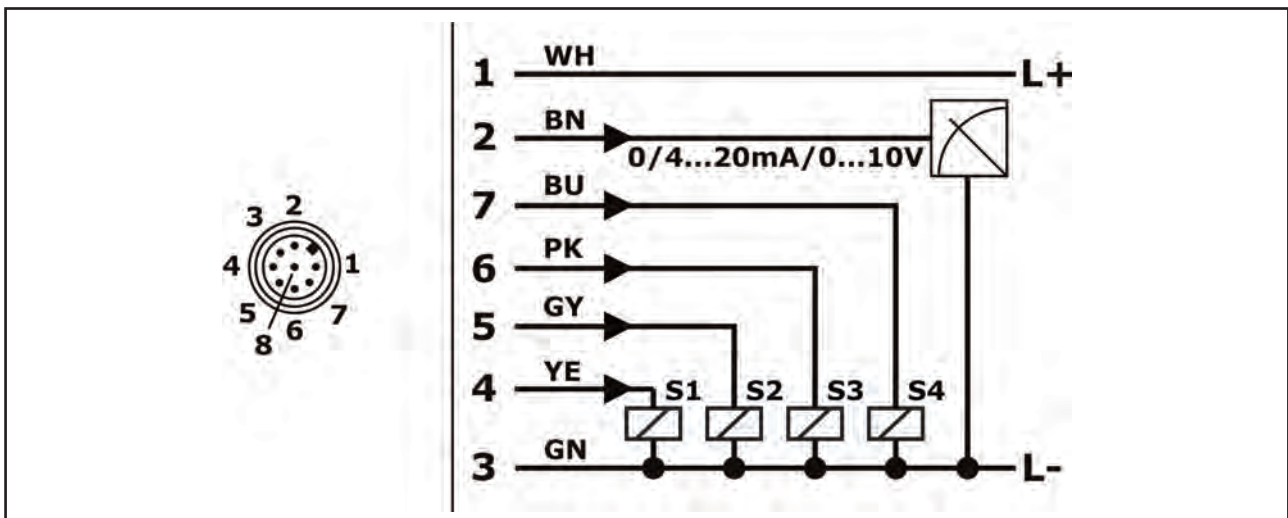


Conductor color standard connection cable M12:

BN = brown, WH = white, BU = blue, BK = black, GY = grey

The connection cable is not enclosed in the delivery contents.

Signal 0/4...20 mA / 0...10 V / 4x PNP switch output



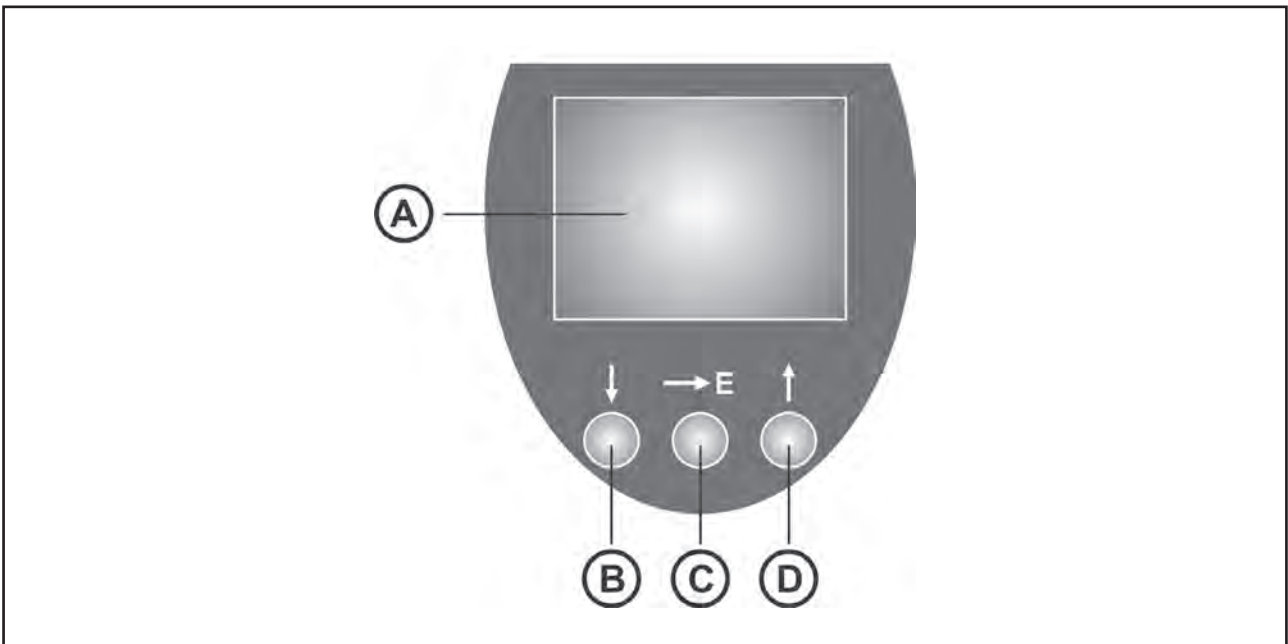
Conductor color standard connection cable M12:

WH = white, BN = brown, GN = green, YE = yellow, GY = grey, PK = pink, BU = blue, RD = red

The connection cable is not enclosed in the delivery contents.

Operation

Operation and display parts



A - LCD display

- Display of measuring value, device state and operation menu

B - Key Down

- In the selection menu navigation downwards
- In the set menu decreasing of value
- Used, in combination with the key up, for leaving selection and set menu without applying changings
- Used, in combination with the key up, for a step backwards one menu item

C - Key Enter/Shift right

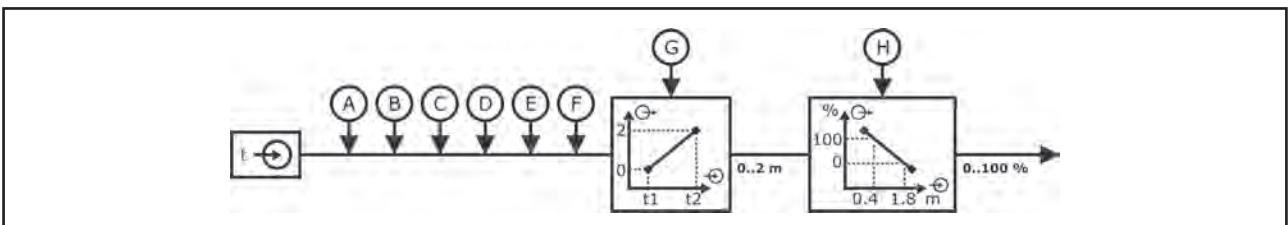
- Access to operation menu
- In the selection menu entering the selected sub menu
- In the set menu applying the new value and digit shift right

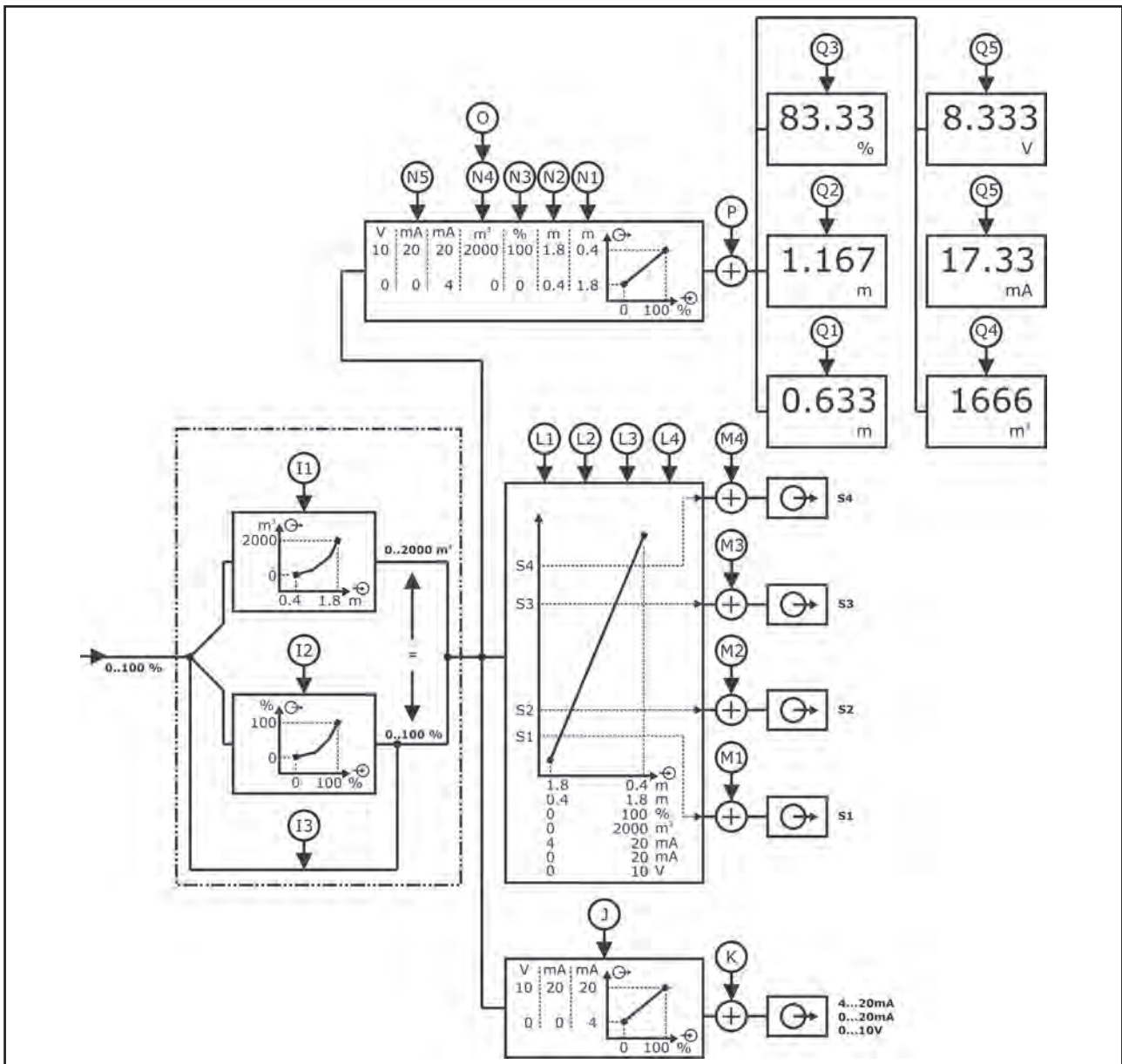
D - Key Up

- In the selection menu navigation upwards
- In the set menu increasing of value
- Used, in combination with the key down, for leaving selection and set menu without applying changings
- Used, in combination with the key down, for a step backwards one menu item

Function scheme

- A - Commissioning
- B - Vessel type
- C - Noise filter
- D - Pulse rate
- E - Limit min/max
- F - Echo loss
- G - Damping
- H - Min/Max Adjustment > e.g. 1,8..0,4 m = 0..100 %





- I1 - Linearization > Level - display scaling e.g. 0,4..1,8 m = 0..2000 m³
- I2 - Linearization > Percent 0..100 % - Lin. Percent 0..100 %
- I3 - No linearization
- J - Signal output > e.g. 0..100 % = 4..20 mA resp. 0..20 mA resp. 0..10V
- K - Error signal evaluation
- L1 - Switch / reset switch point S1
- L2 - Switch / reset switch point S2
- L3 - Switch / reset switch point S3
- L4 - Switch / reset switch point S4
- M1 - Error indication function S1
- M2 - Error indication function S2
- M3 - Error indication function S3
- M4 - Error indication function S4
- N1 - Display scaling > Distance e.g. 0..100 % = 1,8..0,4 m
- N2 - Display scaling > Fill level e.g. 0..100 % = 0,4..1,8 m
- N3 - Display scaling > Percent 0..100 % = 0..100 %
- N4 - Display scaling > scaled e.g. 0..100 % = 0..2000
- N5 - Display scaling > Signal Output 0..100 % = 4..20 mA resp. 0..20 mA resp. 0..10 V
- O - Display unit > at display scaling scaled e.g. m³
- P - Error indication display
- Q1 - Display - Distance e.g. 1,8..0,4 m
- Q2 - Display - Fill level e.g. 0,4..1,8 m
- Q3 - Display - Percent 0..100 %
- Q4 - Display - scaled e.g. 0..2000 m³
- Q5 - Display - Signal Output 4..20 mA resp. 0..20 mA resp. 0..10 V

Menu structure

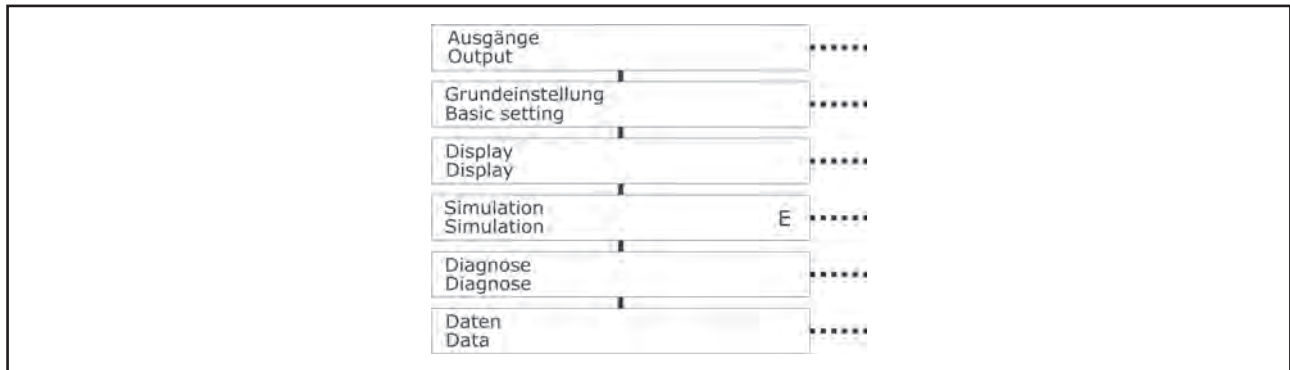
The entrance to the different function areas of the selection and set menu layer is done by the main menu (push the key Enter/Shift right for 3 seconds).

If failures are registered (see chapter diagnose/failure), these are indicated prior the jump into the main menu.

By the key Enter/Shift right the failure indication will be canceled.

The symbol E at a menu item indicates its position in the extended menu structure.

This extended menu structure can be shown in the submenu display by the menu item menu structure.



Submenu output

Settings for the function of the switch outputs and the signal output.

Submenu basic setting

Settings for the basic adaption of the device to the measuring task, e.g. adjustment, damping and linearization.

Submenu display

Settings for the adaption of the measuring value indication to the measuring task, e.g. measuring value scaling, display type, menu language and also password protection.

Submenu simulation

Settings for the simulation of the switch outputs and the signal output, e.g. for inauguration or also for failure analysis.

Submenu diagnose

Multiple information to the historical measuring activity and the device, that can be useful for system surveillance or also for failure analysis.

Submenu data

Settings for the measuring value recording and the data transmission by Bluetooth.

Navigation

The navigation in a submenu and in a selection window is done by the keys Up and Down.

The selection of a submenu and the selection of a setting in a selection menu is done by the key Enter/Shift right.

The jump backward from a submenu to the higher-level menu is done by the menu item back or by the simultaneous pushing the keys Up and Down.

The leaving of a selection menu without applying the changings is done by the simultaneous pushing the keys Up and Down.

The input of a value or text in a set menu is done digit by digit.

For the changing of the selected digit the keys Up and Down are used.

For the changing of the digit the key Enter/Shift right is used.

The applying of a set value resp. text is done by pushing the key Enter/Shift right for 3 seconds.

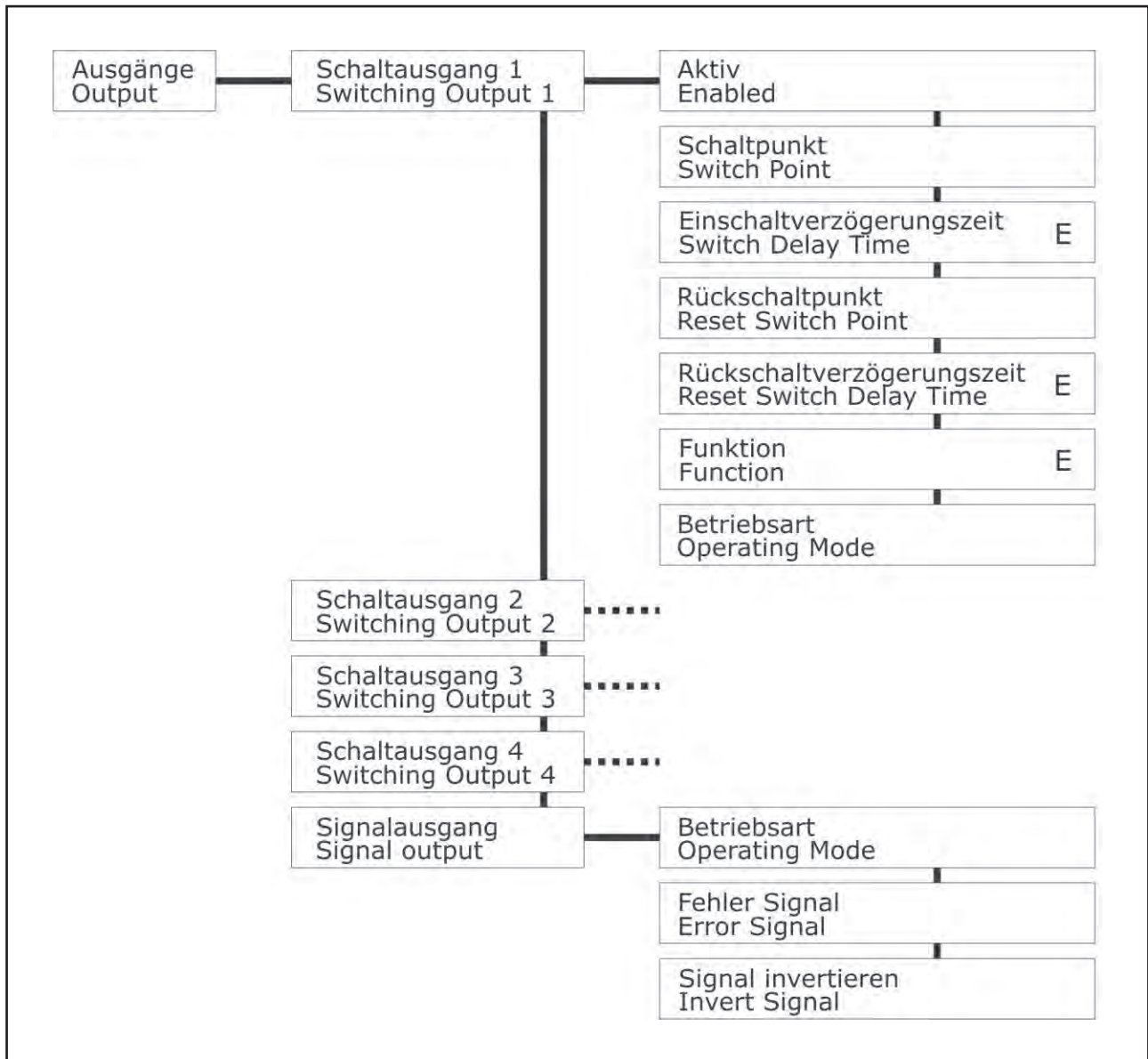
The leaving of an set menu without applying a value resp. text is done by the simultaneous pushing the keys Up and Down.

After 5 minutes of inactivity the active submenu resp. selection menu will automatically be left and a change to the measuring value indication is executed.

A jump backward is not executed from an active set menu.

Output

The symbol E at a menu item indicates its position in the extended menu structure. This extended menu structure can be shown in the submenu display by the menu item menu structure.



Switch output S1 / S2 / S3 / S4

Enabled

Each switch output can be activated resp. deactivated separately.

- Yes
- No

Default > Yes

Switch Point / Reset Switch Point

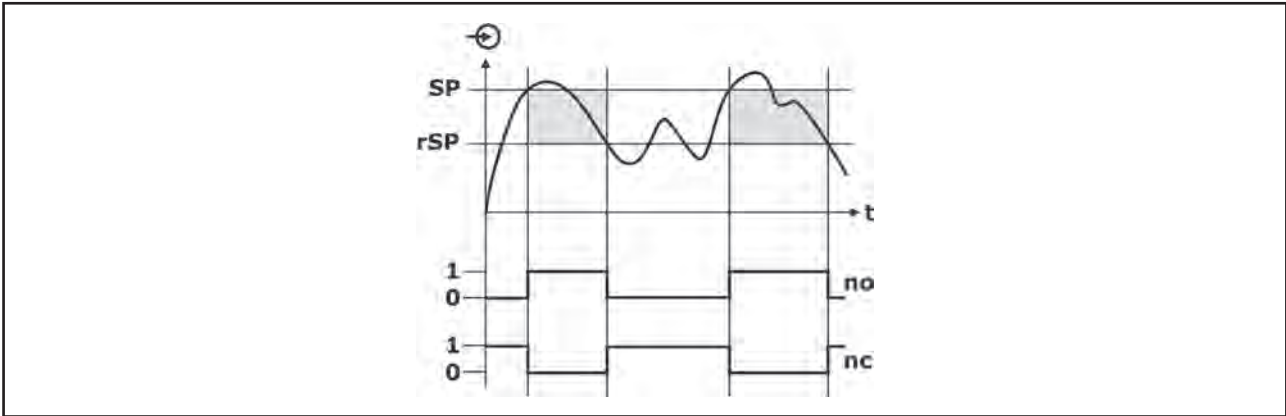
The input values refers to the set display value or acc. to display scaling.

The reset switch point must be lower or equal to the switch point.

At inverse measuring principle, e.g. distance measurement, the reset switch point must be greater or equal to the switch point.

The input range is limited to the measuring range.

Default > S1 = 20% / S2 = 40% / S3 = 60% / S4 = 80%



Switch Delay Time / Reset Switch Delay Time – extended menu structure

The activation resp. deactivation of the switch output can be biased with a delay time (resolution 0,01s), to realize simple sequence control system.

The input range is indefinite.

Default > 0s

Function – extended menu structure

Hysteresis function

The hysteresis function realizes a stable switch state, independent from system conditioned signal fluctuations around the adjusted set point.

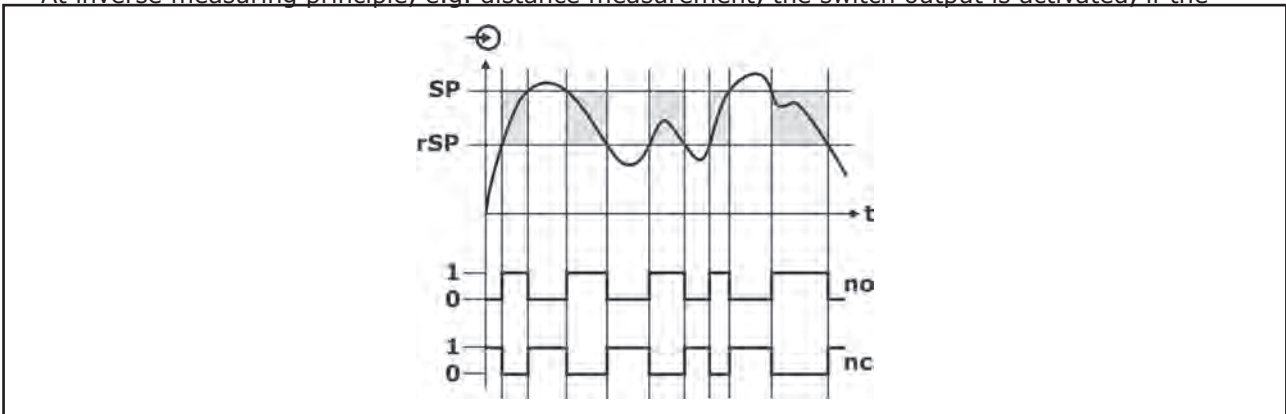
It can be used for realizing a signal controlled two-position control.

The switch range is determined by definition of switch point and reset switch point.

The switch output is activated, if the current measuring value exceeds the switch point and if the set switch point delay time has been expired.

The switch output is deactivated, if the current measuring value exceeds the reset switch point and if the set reset switch point delay time has been expired.

At inverse measuring principle, e.g. distance measurement, the switch output is activated, if the



current measuring value underrun the switch point and if the set switch point delay time has been expired.

Accordingly the switch output is deactivated, if the current measuring value exceeds the reset switch point and if the set reset switch point delay time has been expired.

Window function

The window function realizes a signal range – acceptance region –, where the switch output is set to a definitive switch state.

The switch range is determined by definition of switch point and reset switch point.

The switch output is activated, if the current measuring value is inside the area that is defined by the switch point and the reset switch point and if the set switch point delay time has been expired.

The switch output is deactivated, if the current measuring value is outside the area that is defined by the switch point and the reset switch point and if the set reset switch point delay time has been expired.

Error Indication Function

The switch output is activated, if the device has detected a failure behavior (see chapter diagnose/ failures).

Default > Hysteresis Function

Operating Mode

The operating mode defines the function direction of the switch output.

- Normal Open / NO
At the output there is no signal, if the switch condition is not fulfilled.
At the output there is a signal, if the switch condition is fulfilled.
- Normal Close / NC
At the output there is a signal, if the switch condition is not fulfilled.
At the output there is no signal, if the switch condition is fulfilled.

Default > Normal Open / NO

Signal output

The nominal values of the analogue signal (4/20 mA resp. 0/10mA resp. 0/10 V) refers to the set display nominal values 0% and 100%

Operating Mode

Defines the type of the analogue output signal

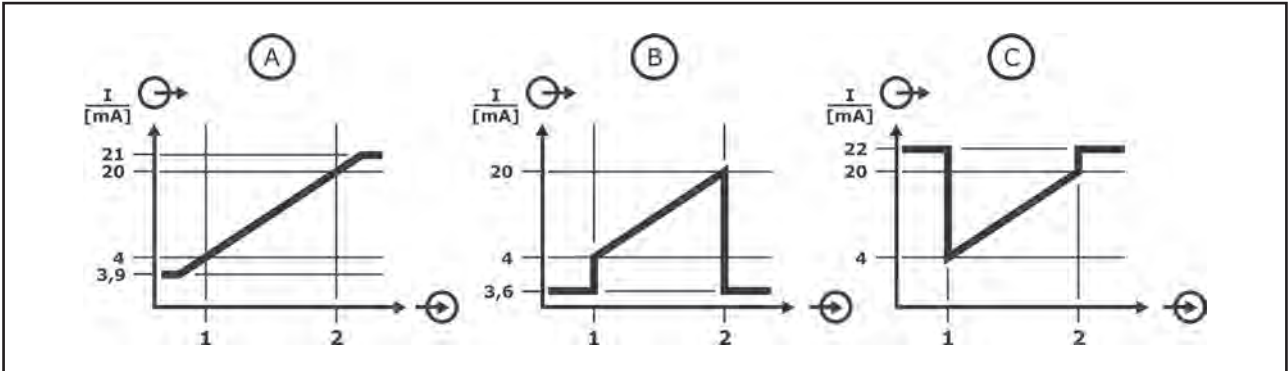
- 4-20 mA
- 0-20 mA
- 0-10V

Default > 4-20 mA

Error Signal

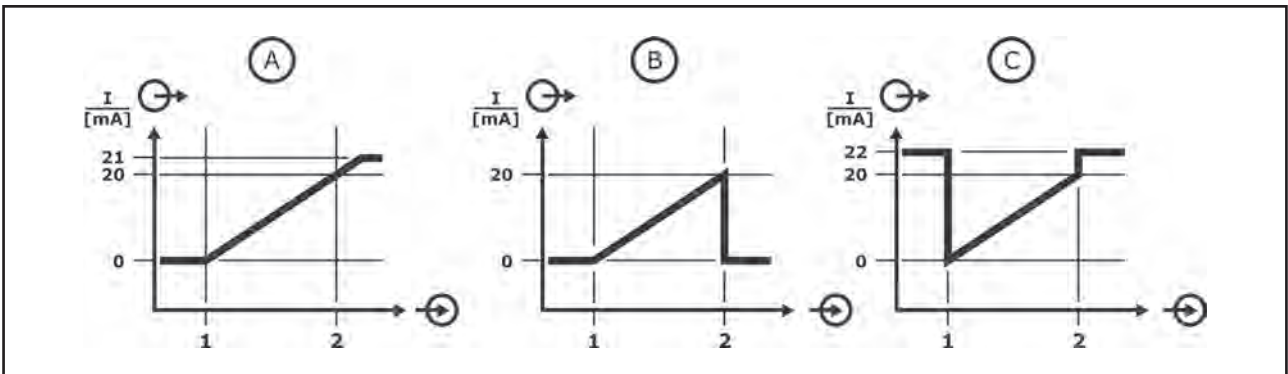
Defines, dependent on the operating mode, the analogue output signal regarding operating range and if errors (see chapter diagnose/failures) are registered.

- Operating mode 4-20mA



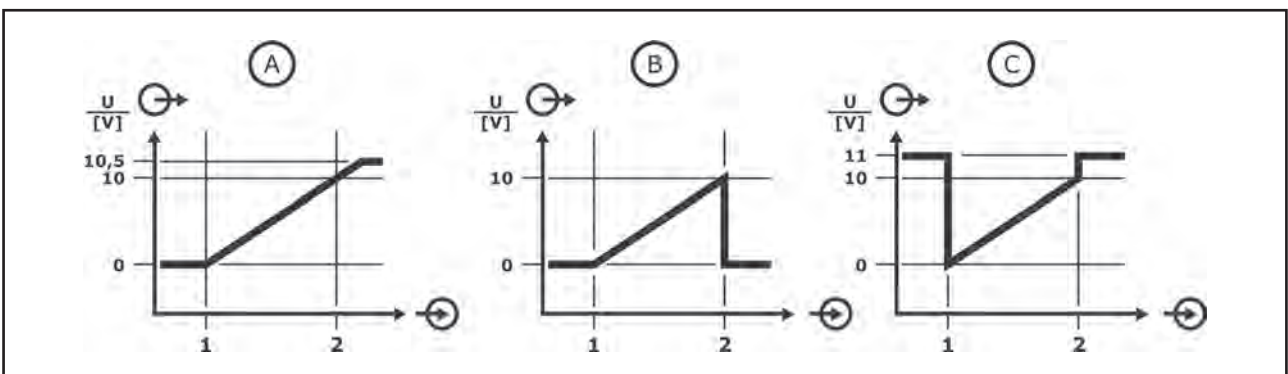
A - Off >> 3.9-21mA
 B - 3.6mA
 C - 22mA

- Operating mode 0-20mA



A - Off >> 0-21mA
 B - 0mA
 C - 22mA

- Operating mode 0-10V



A - Off >> 0-10,5V
 B - 0V
 C - 11V

Default > Off

Invert Signal

Inverts, dependent on the operating mode, the analogue output signal.

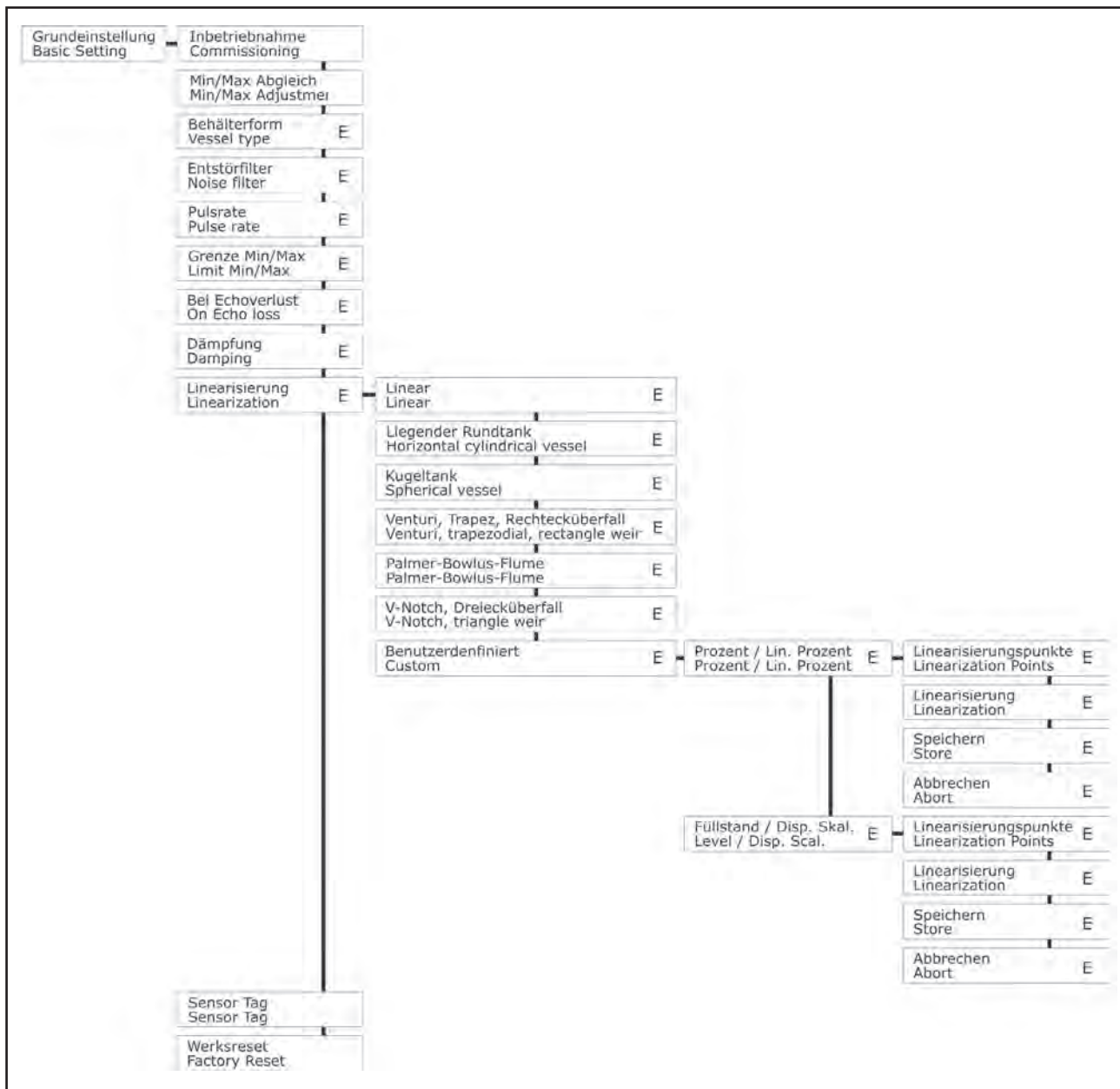
- 4-20 mA >> 20-4 mA
- 0-20 mA >> 20-0 mA
- 0-10 V >> 10-0 V

Default > No

Basic Setting

The symbol E at a menu item indicates its position in the extended menu structure.

This extended menu structure can be shown in the submenu display by the menu item menu structure.



Commissioning

The commissioning function can be used to adapt the device to the constructive conditions. Therefore the device must be operated in its finally installed position at the lowest possible known filling level.

After setting the vessel type the detected measuring value must be confirmed or possibly corrected. Afterwards the detection of the envelope curve for the error echo suppression is processed. Error echoes causing installations, positioned below the filling level when processing the commissioning function, cannot be detected.

Min/Max-Adjustment

The min/max-adjustment set the measuring range limits.

2 points are defined, that set the ratio of the measured distance signal and the operating range of the device.

The current measuring value is indicated in the display.

The input of the measuring range limits 0% and 100% are not mandatory. Values within the measuring range e.g. 11% and 87% can be also input. In this case there is an automatic calculation to 0% resp. 100%. The higher the difference between these points, the more precise is the following calculation.

The min/max-adjustment is relevant for linearization, signal output and display scaling.

- Lower adjustment value
- Upper adjustment value

The input range is indefinite.

Default > Lower calibrated measuring value = 0% / Upper calibrated measuring value = 100%

Vessel type – extended menu structure

The selection of the vessel type is important for the internal selection of the calculation algorithm, which must be used.

A wrong vessel type can lead to wrong measuring results.

- Dome ceiling
- Horizontal cylindrical
- Stilling tube
- Open vessel
- Sphere
- Flat ceiling

Default > Dome ceiling

Noise filter – extended menu structure

The noise filter allows the cut out of e.g. cyclic recurring error signals e.g. of an agitator.

Multiple measuring values are detected and evaluated simultaneously.

The use of the noise filter extends the actualization time of display and outputs by the factor of the number of measurements.

The use of a higher noise filter at fast changing systems, e.g. small container can lead to wrong measurement results.

- low – 1 measurement, no filter
- medium – 4 measurements
- high – 8 measurements

Default > low

Pulse rate – extended menu structure

The pulse rate defines the measurement velocity resp. the repetition rate of the ultrasonic measurement pulses.

The use of a slower pulse rate (t_p) can be used for energy saving and also for conservation of the sensor (reduction of component stress due to high energetic ultrasonic signals).

The use of a slower pulse rate extends the actualization time of display and outputs by the respective factor.

- very fast – maximum pulse rate (see chapter „Technical Data“) x factor 1
- fast – maximum pulse rate (see chapter „Technical Data“) x factor 0,5
- slow – maximum pulse rate (see chapter „Technical Data“) x factor 0,25

Default > very fast

Limit min/max – extended menu structure

If the measuring value exceeds the limits of the Min/Max-Adjustment, these limits are kept at activated function. An exceedance is not possible.

At deactive function measurement values besides the limit values are output.

This function is especially useful at a flow measurement to avoid negative flow measuring values.

- deactive
- active

Default > deactive

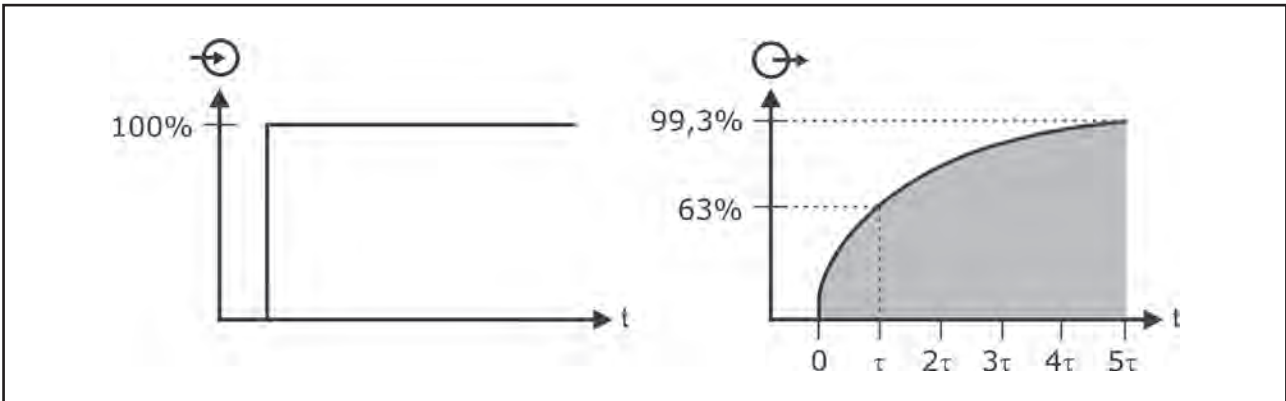
On echo loss – extended menu structure

If no measuring signal can be detected, e.g. due to a too high distance or a strong deviation of the ultrasonic signal, up to the next valid measuring signal alternatively the last detected measuring value can be hold or the minimum resp. maximum adjusted limit value can be output.

- hold
- maximum measuring range
- minimum measuring range

Default > hold

Damping – extended menu structure



The damping influences the reaction speed of display, output signal and switch output at a change of the measuring signal.

The behavior of display and output signal follows an exponential characteristic with the damping time constant t .

Within the time period t the output signal increases respectively by 63% of the existing deviation.

With 99,3%, the end value is nearly achieved after $5 t$.

The set time equals $5 t$.

The measuring rate depends directly on the set damping.

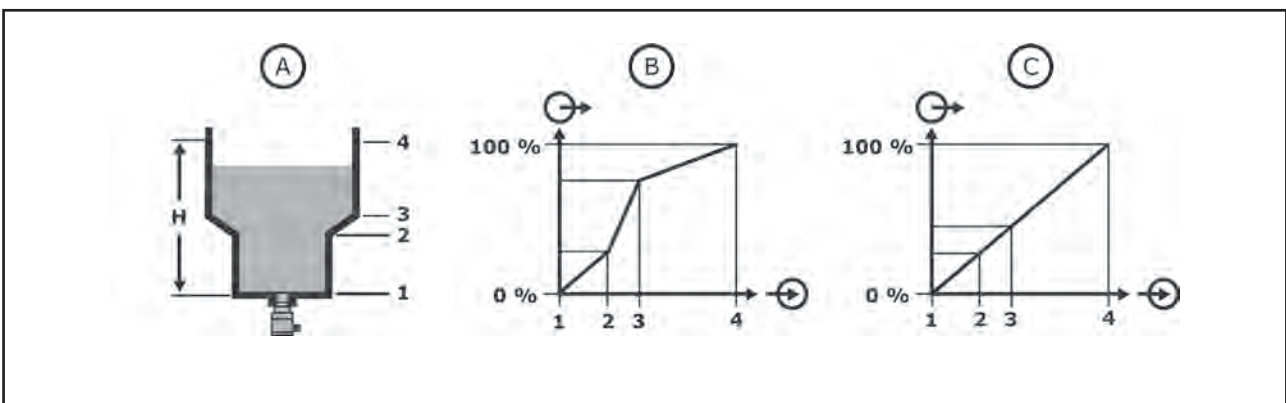
- Damping $0s \gg$ Measuring rate $100x/s \gg$ Resolution 12 bit
- Damping $0,02s \gg$ Measuring rate $50x/s \gg$ Resolution 16 bit
- Damping $0,05s \gg$ Measuring rate $20x/s \gg$ Resolution 18 bit
- Damping $0,15s \gg$ Measuring rate $7,5x/s \gg$ Resolution 20 bit
- At damping values $\geq 0,15s$ the resolution remains at 20 bit constantly.

The input range is indefinite.

Default > 1 sec

Linearization – extended menu structure

Due to the integrated linearization function it is possible, to linearize a measuring signal e.g. for volume calculation of conical or horizontal cylindrical vessels or also for flow calculation.



A - Tank with linearization points 1 / 2 / 3 / 4

B - Characteristic distance - level not linearized

C - Characteristic distance - level linearized

Predefined linearization curves

- Linear - no linearization

Volume linearization

- Horizontal cylindrical vessel
- Spherical vessel

Flow linearization

- Venturi, trapezoidal weir, rectangle weir
- Palmer-Bowlus-Flume
- V-Notch, triangle weir

Free linearization characteristic with up to 40 points

- Custom

Default > Linear

Input mode custom defined linearization

- Percent / Linearized Percent
- Filling level / Display Scaling
- CSV-file via Bluetooth-interface

The percentual input (referring to the measuring range) is only possible without applying measuring value, whereby the input in filling level and display scaling e.g. liter can be done without applying measuring signal as well as with applying measuring signal.

At the linearization without applying measuring signal, for each linearization point a needed signal value (in percent or filling level) is input and referred to the needed output value (in percent or primary unit) that must be also input.

At the linearization with applying measuring signal, for each linearization point the current measuring value is captured and referred to the output value (acc. to display scaling) that must be input.

- Linearization Points
The number of linearization points for the complete measuring characteristic must be defined. The input range is limited to values from 2 to 40.
Default > 2
- Linearization
At the input mode percent / linearized percent the input signal refers percentual to the measuring range, that is defined at the min./max. adjustment for 0% and 100%. The output signal must also be considered percentual.
At the input mode filling level / display scaling the input signal refers to the filling level (inverted distance). The output signal refers to the display range, that is defined in the display scaling.
The complete characteristic, eventually also the measuring range end values 0% and 100% must be defined, cause the measuring range end values from the min./max. adjustment are not copied into the linearization table.
The input range is indefinite.
Default > Linearization point 1 > 0.000% = 0.000% resp. 0.000bar / Linearization point 2 > 100.000% = 100.000% resp. 1.000bar
- Store
Input linearization points are not automatically stored loss-protected.
To store one or also more linearization points loss-protected, the function store must be executed.

Sensor TAG

Due to the Sensor TAG different devices can be differentiated. At the indicator type digital the Sensor TAG is indicated in the display.

The Sensor TAG is added automatically to the Bluetooth-name, to allow the device identification when using multiple devices in reception range.

Up to 19 characters can be input.

The input range is indefinite.

Default > no Sensor TAG allocated

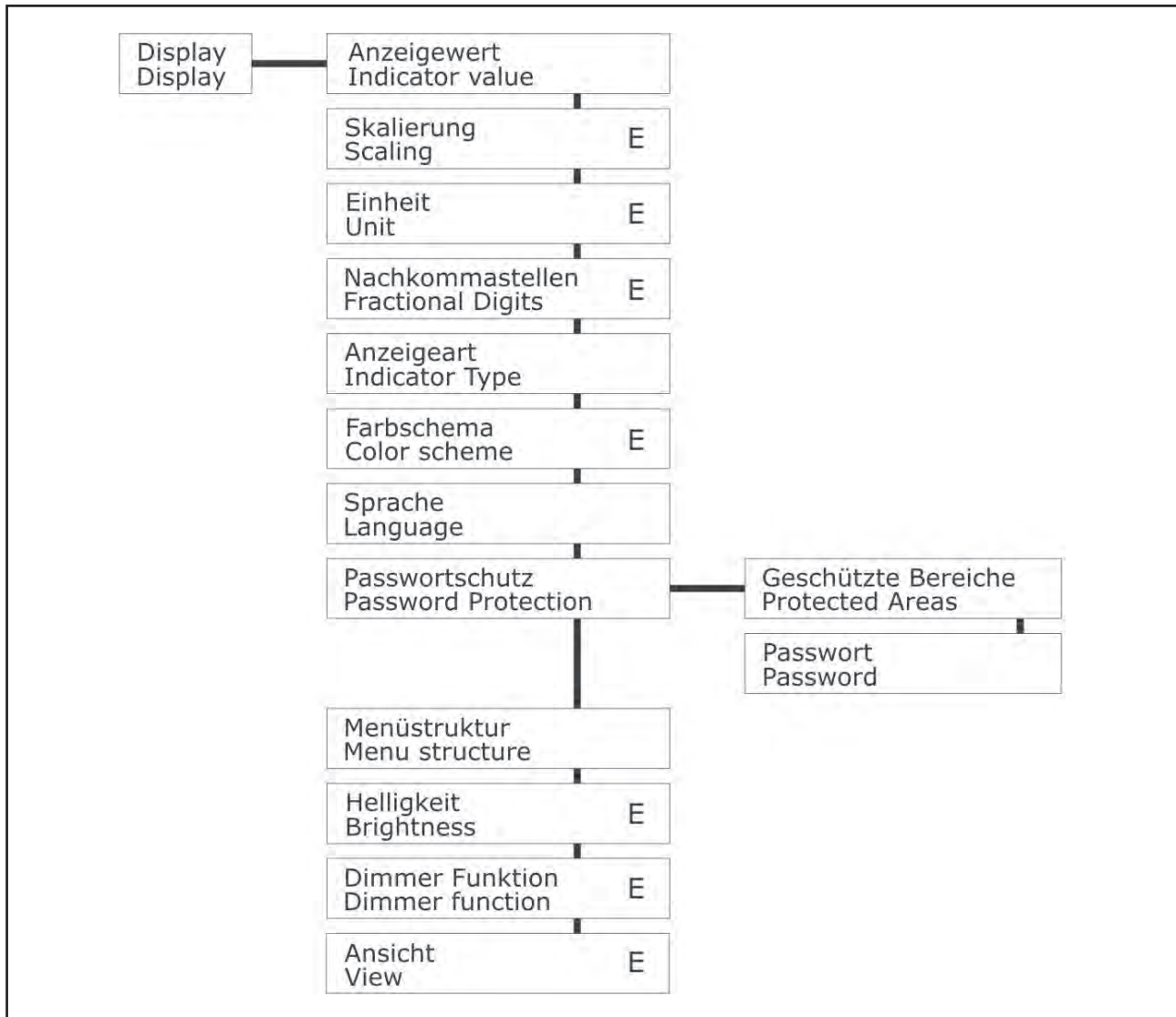
Factory Reset

The factory reset changes all settings to default values.
The factory reset does not concern:

- Diagnose data
- Historical measuring data
- Storage interval
- Custom defined linearization

Display

The symbol E at a menu item indicates its position in the extended menu structure. This extended menu structure can be shown in the submenu display by the menu item menu structure.



Indicator value

The measuring value can be alternatively displayed as distance, as filling level, percentual, with any desired scaling referring percentual to the measuring range or by displaying the analogue output value.

- Distance
- Filling level
- Percent
- Scaled
- Signal output

Default > Distance

Scaling – extended menu structure

This menu item is only available at indicator value scaled.

By defining a scaling the measuring range can be rescaled into any desired numerical range. This allows e.g. the indication of the volume in liter.

The current measuring value is indicated in the display.

The input of the measuring range limits 0% and 100% are not mandatory. Values within the measuring range e.g. 11% and 87% can be also input. In this case there is an automatic calculation to 0% resp. 100%.

- Lower display value
- Upper display value

The input range is indefinite.

Default > Measuring value 0.000% = Display 0.000 / Measuring value 100.000% = Display 1.000

Unit – extended menu structure

This menu item is only available at indicator value scaled

If a scaled indicator value is used, additionally an unit can be selected, that is indicated in the display (not at indicator type vertical bargraph).

The unit is only indicated as text and is not included into calculations.

There are multiple predefined units in different categories available.

Mass

- kg / t / lb

Volume

- l / hl / m³ / in³ / gal / ft³

Height

- mm / cm / m / in / ft

Pressure

- mbar / bar / Pa / kPa / MPa / Psi / Torr / mmH₂O

Flow

- l/s / l/min / l/h / m³/s / m³/min / m³/h / lb/s / gal/s

Custom defined

Up to 10 characters can be input.

The input range is indefinite.

Default > no text allocated

Fractional Digits – extended menu structure

The measuring value can be formatted by the use of fractional digits.

Is the indication of the measuring value with the current fractional digits number not possible, a change to the correct fractional digits number is executed automatically.

The input range is limited to values from 0 to 3.

Default > 3

Indicator Type

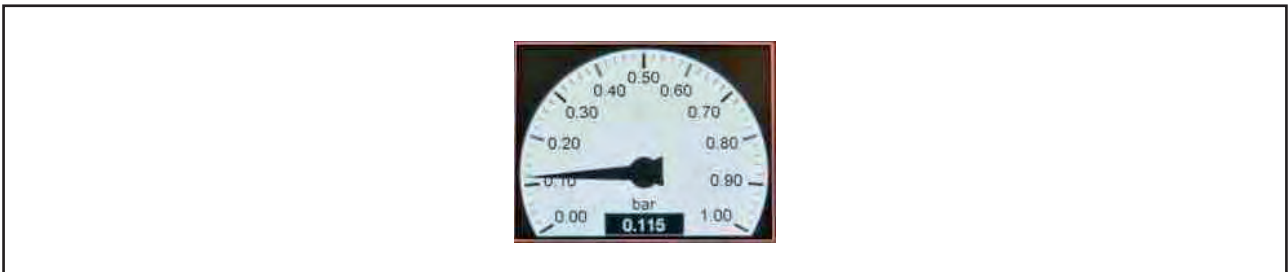
Dependent on the requirements the measuring values can be indicated in different types.

- Digital



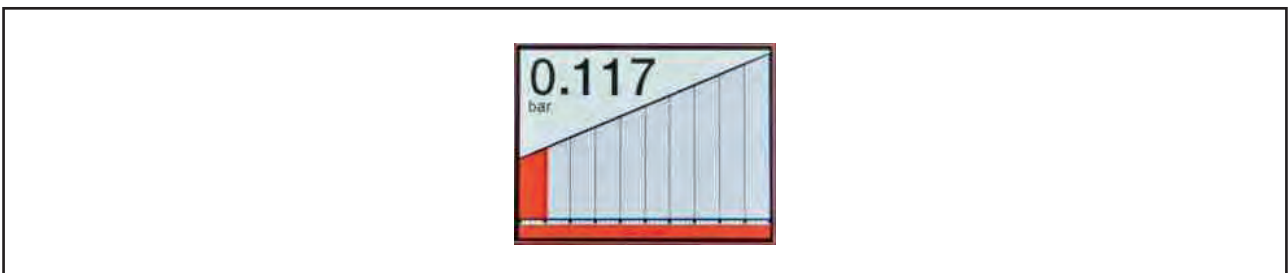
Switch points, active or deactive
Sensor TAG
Digital measuring value
Unit
Horizontal scaled bargraph
Mark of switch points at the bargraph

- Manometer



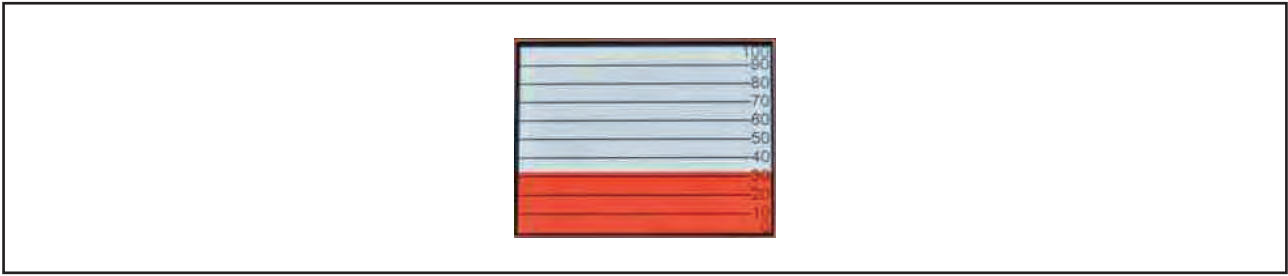
Round pointer scale
Mark of the switch points at the pointer scale
Unit
Digital measuring value

- Bargraph

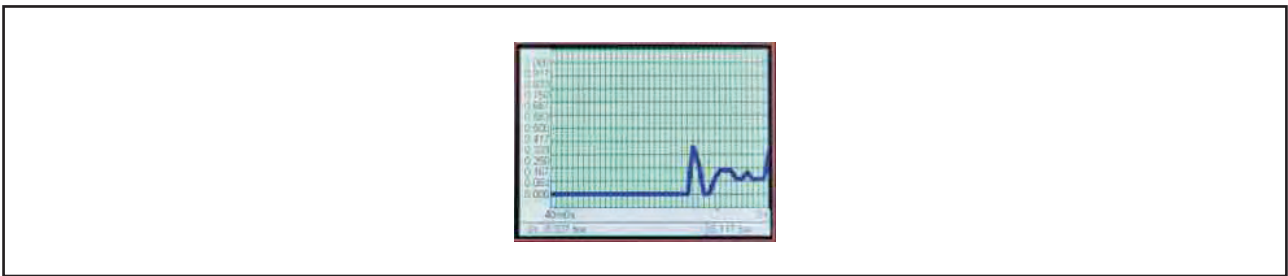


Digital measuring value
Unit
Horizontal scaled bargraph

- Vertical Bargraph



- Vertical percentual scaled bargraph
- Chart



Scaled graphical measuring value-to-time-window

Selected historical digital measuring value with unit und time distance in days/hours/minutes/seconds

Digital measuring value with unit

Navigation of a measuring value cursor with cursor keys within the graphic window.

By simultaneous pushing the keys Up and Down (minimum 3 seconds) the point of time in days/

hours/minutes/seconds can be input, where the cursor should be positioned.

After 5 minutes of inactivity the measuring value cursor is automatically set to 0s.

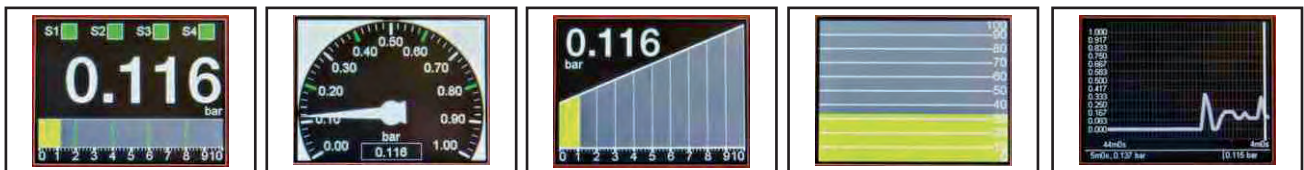
Default > Digital

Color Scheme – extended menu structure

For the adaption of the display to the requirements 6 color schemes are available.

- Standard / Black / Blue / Red / Green / Yellow

Color scheme black



Default > Standard

Language

The menu navigation can be done in the following different languages.

- Deutsch
- English

Default > Deutsch

Password Protection

For the protection of the settings against unauthorized persons individual or all main menu items can be protected by a password.

At each activation of the main menu the password protection is active.

An unknown or forgotten password can be erased by use of a service code and an activation code. These codes can be requested at the manufacturer.

Protected Areas

- Output
- Basic Setting
- Display
- Simulation
- Diagnose
- Data

Default > all No

Password

Up to 10 characters can be input.

The input range is indefinite.

Default > no Password allocated

Menu Structure

For a breakdown illustration of the menu navigation different menu items (**mark E in the menu structures overview**) are arranged in a removable extended structure.

To achieve access to all functions of the device, the extended menu structure must be activated.

- Normal
- Extended

Default > Normal

Brightness – extended menu structure

For the adaption of the display to the requirements the brightness of the backlight can be varied in a wide range.

At a brightness higher than 60 a limitation of the permitted environmental temperature must be obeyed At an input value of 0 a minimum residual brightness is already present.

The input range is limited to values from 0 to 100.

Default > 75

Dimmer function – extended menu structure

To reduce the supply current and also to minimize the system typical aging influences on the brightness of the backlight an automatic dim after 5 minutes of inactivity (no key touch) can be activated.

- 0% / 10% / 20% / 30% / 40% / 50% / Off

Default > Off

View – extended menu structure

For the adaption of the display to the requirements of the installation situation the view of the display can be rotated by 180°. In combination with the mechanical rotatability of app. 330° a readability from all directions in all installation positions is possible.

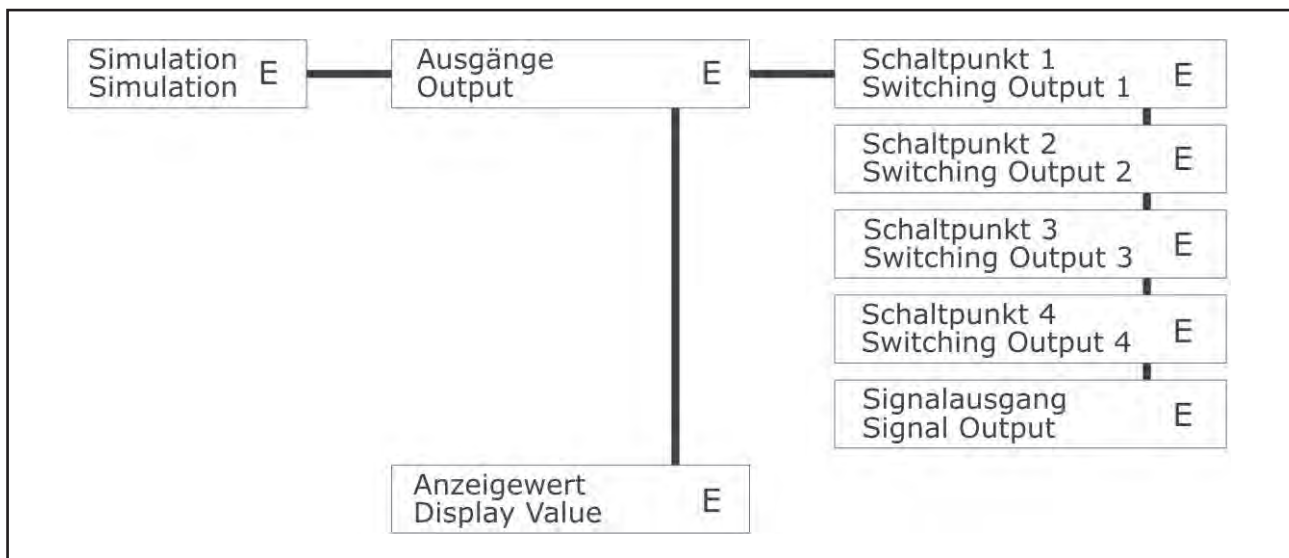
- Normal
- 180°

Default > Normal

Simulation – extended menu structure

The symbol E at a menu item indicates its position in the extended menu structure.

This extended menu structure can be shown in the submenu display by the menu item menu structure.



Output

Switch Output

The switch output is activated resp. deactivated regardless of an already existing activation and also regardless of delay times.

Signal Output

At the signal output an analogue signal is output regardless of the current measuring value. The input range is limited, dependent on the set Operating Mode.

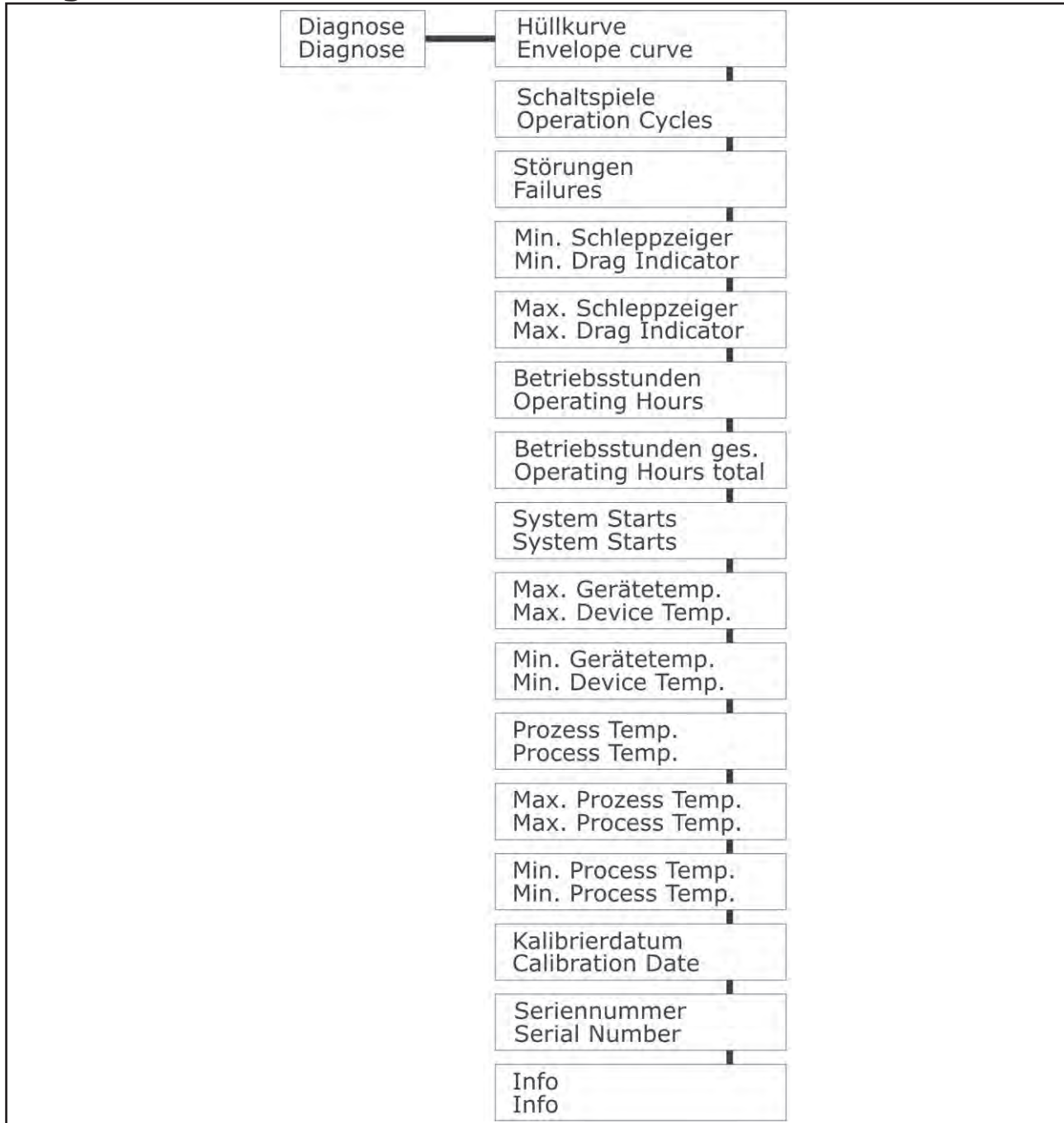
- 3.600 – 22.00 mA (4-20 mA)
- 0.000 – 22.00 mA (0-20 mA)
- 0.000 – 11.00 V (0-10 V)

Display Value

The display value can be simulated, whereby all following functional steps (signal output, switch output) are also simulated acc. to the settings.

The input range is limited to the set measuring range.

Diagnose



Envelope curve

The current measuring signal is displayed as curve.

The envelope curve is displayed, below those the measuring signal is ignored.

The valid measuring signal is marked by a vertical mark.

Downright the characteristic curve the current distance value is displayed with unit m and the corresponding measured signal level in dB.

Cursor resp. Zoom mode

Below and left of the characteristic curve the position of a shiftable cursor is indicated.

A simple left-right-arrow-symbol allows a shift of the cursor by the keys Up resp. Down.

By simultaneous pushing of the keys Up and Down it is switched to the zoom mode for the x-axis. This is indicated by a doubled left-right-arrow-symbol.

The zoom is referring to the current cursor position.

The display of the envelope curve is canceled by pushing the key Enter/Shift right for 3 seconds.

Operation Cycles

The number of operation cycles per switch output is indicated.

An operation cycle is a complete change of the switch state till back to the start state, thus deactive - active - deactive.

Failure

The device registrates multiple of short time or also continuous existing functional failures in type and frequency of occurrence.

- Echo lost - No measurable echo signal available
- Over Range - exceeding the signal output range (dependent on Operating Mode)
20.5 mA (4-20 mA)
20.5 mA (0-20 mA)
10.5 V (0-10 V)
- Under Range - exceeding the signal output range (dependent on Operating Mode)
3.8 mA (4-20 mA)
-0.4 mA (0-20 mA) – theoretical value
-0.5 V (0-10 V) – theoretical value
- S1/2/3/4 Error – functional failure at the switch output
Output signal present, although switch output is deactive (an external voltage is applied or device failure)
Output signal not present, although switch output is active (device failure)
Short circuit at switch output, although switch output is deactive (device failure)
- S1/2/3/4 Short Circuit - short circuit at switch output
Sig. out break - wire break at signal output on signal output not connected at Operating Mode
4-20 mA resp. 0-20 mA

Min./Max. Drag Indicator

The drag indicator is used for detection and indication of the minimum and maximum registered measuring values.

The drag indicator can be separately reset by pushing the key Shift right/Enter.

Operating Hours

The operating hours of the device since the last device start-up are detected.
The indication is done in hours.

Operating Hours total

The operating hours of the device since the first device start-up are detected.
The indication is done in hours.

System Starts

The number of the occurred system starts resp. device restarts is registered.

Min./Max. Device Temperature

The minimum and maximum temperature of the electronic in the area of the terminal enclosure (not the process temperature) is registered.

Process Temperature

The current process temperature in the area of the transducer is registered.

Min./Max. Process Temperature

The minimum and maximum process temperature in the area of the transducer is registered.

Calibration Date

Indication of the date (format DDMMJJ), the calibration by factory is done.

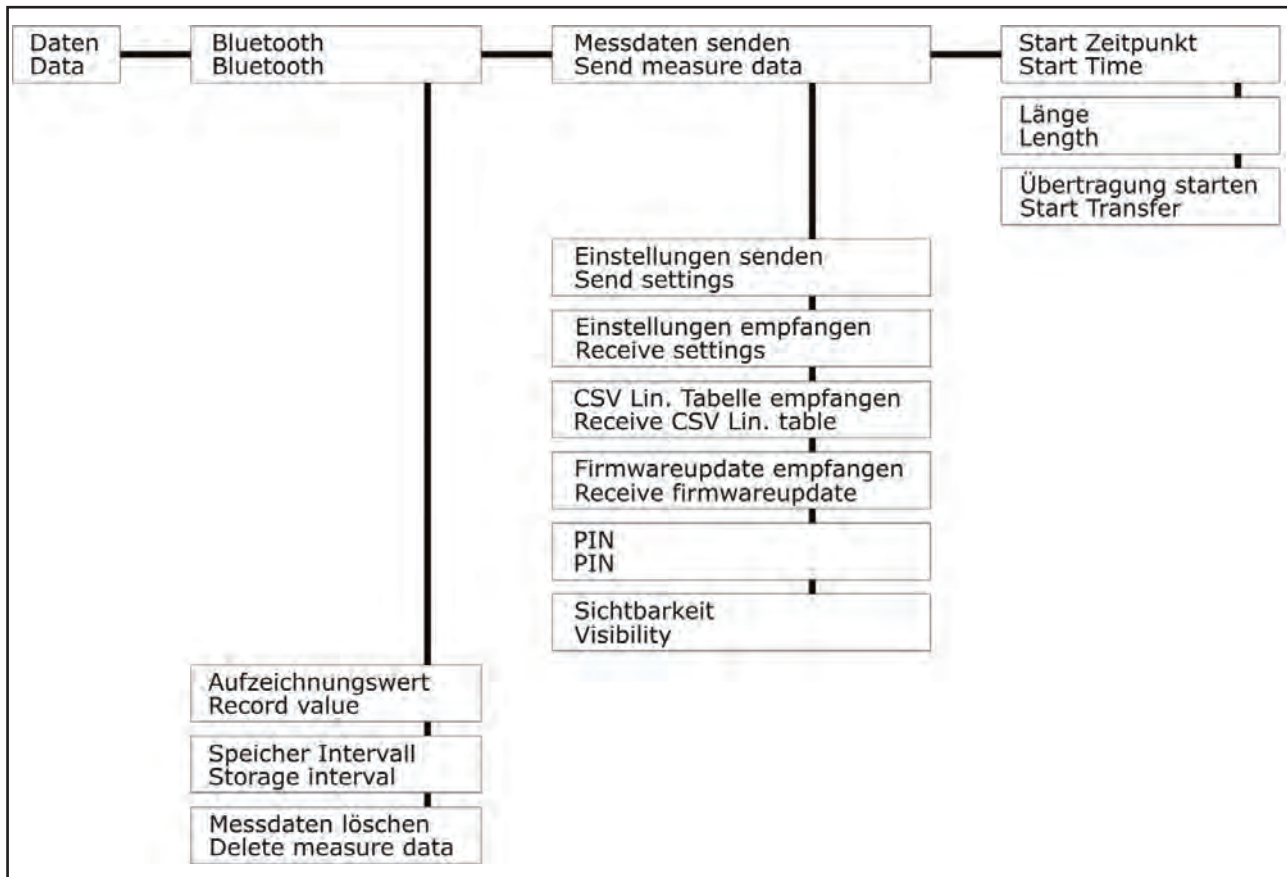
Serial Number

Indication of the serial number of the device.

Info

Indication of manufacturer data and firmware version

Data



The device is able to record app. one million measuring values loss-protected. The recording is made in ring memory method, whereas after an overflow the oldest measuring values are overwritten next.

The stored measuring values can be displayed graphically in the indicator type chart or exported as CSV-file per Bluetooth-interface.

By the Bluetooth-interface the download resp. upload of setting, linearization or firmware files is possible.

Bluetooth

For the Bluetooth-communication two authentication methods are available.

- Unprotected transmission
No PIN is used
Cause the device does only receive/send files only after selection in the menu, this is the most simple and recommended way of transmission.
If no PIN is used, each communication is uncoded, but the devices must not connected together.
- Protected resp. encoded transmission
A PIN is used.
If a PIN is used, the devices must be connected together for a transmission. The procedure differs depending on the end device.
A PIN must be input and the visibility must be switched to on.
Afterwards the connection can be made at the end device.
In the end device the same PIN must be used, that is input in the device.
After the file transmission the visibility should be switched to off.
Note: For a definite identification of the devices it is recommended to use a Sensor TAG.

Send measure data

The recorded measuring values can be transmitted as a CSV-file to a Bluetooth end device. For the selection of the measuring values that should be transmitted, the start time and the length must be defined.

- Start Time
For the transmission, the time of the last resp. the newest measurement, that should be transmitted, must be defined.
The time can be alternatively set in the indicator type chart by the measuring value cursor or the current measuring value can be used.
Default > Cursor
- Length
For the transmission, the length of the time window, that should be transmitted, must be defined.
The time window goes backwards to past, referring to the start time.
Default > 00d01h00m00s
- Start Transfer
End devices with Bluetooth-ability are searched and after selection and approval the measuring values are transmitted.

Send/receive settings

The current settings can be transmitted to or received from a Bluetooth end device as a configuration file.

Configurations can be also sent directly from device to device.

At the transmission of settings some parameter are not transmitted.

- Sensor TAG
- Storage interval
- Historical data
- Diagnose data
- Factory calibration data

Receive CSV Lin. table

To simplify enormous linearization procedures directly at the device, it is possible to generate a linearization table as CSV-file and transmit it into the device.

There are different tank calculation programs available to calculate the linearization of a tank form comfortably.

The CSV-file must match a defined formatting.

- Comments can be marked with a leading *.
- Separator Tab
- Decimal separator dot or comma.
- First value percentual filling level, second value linearized percent.
- Table length maximum 40

Example file

```
*****  
* Container type: spherical tank  
* d=1000,000  
* 0% = 0,000  
* 100% = 100,000  
*****  
0,00 0,00  
3,13 0,29  
6,25 1,12  
9,38 2,47  
12,50 4,30  
15,63 6,56  
18,75 9,23  
21,88 12,26  
25,00 15,63  
28,13 19,28  
31,25 23,19  
34,38 27,33  
37,50 31,64  
40,63 36,10  
43,75 40,67  
46,88 45,32  
50,00 50,00  
53,13 54,68  
56,25 59,33  
59,38 63,90  
62,50 68,36
```

65,63 72,67
68,75 76,81
71,88 80,72
75,00 84,38
78,13 87,74
81,25 90,77
84,38 93,44
87,50 95,70
90,63 97,53
93,75 98,88
96,88 99,71
100,00 100,00

Receive firmwareupdate

The internal software of the device (firmware) can be updated by a new firmware, that could include functional improvements, functional extensions, new functions or also customer specific modifications. At the file transmission the safety of the power supply must be ensured. A power fail can lead to a completely irreversible device failure.

PIN

For a protected resp. encoded data transmission a PIN must be input. The input range is limited to values from 000000 to 999999.
Default > no PIN allocated

Visibility

To transmit a file to the device, it must be visible in the Bluetooth network. Other end devices can identify only visible devices.
Default > Off

Record value

The measuring value can be alternatively recorded as distance, as filling level, percentual, with any desired scaling referring percentual to the measuring range or by displaying the analogue output value.

- Distance
- Filling level
- Percent
- Scaled
- Signal output

Default > Distance

Storage interval

The storage interval defines the time interval between two measuring values, that should be stored in the measuring value memory.
A change of the storage interval erases all existing stored measuring values.
The input range is limited to values from 1 to 99999.
Default > 60 s

Delete measure data

All existing stored measuring values in the measuring value memory are erased.

Start-up procedure

Level measurement

The filling level is calculated by the device due to the distance of the filling material surface to the sensor.

Sub menu Basic Setting

- Commissioning
- Min/Max Adjustment

Sub menu Display

- Indicator value fill level

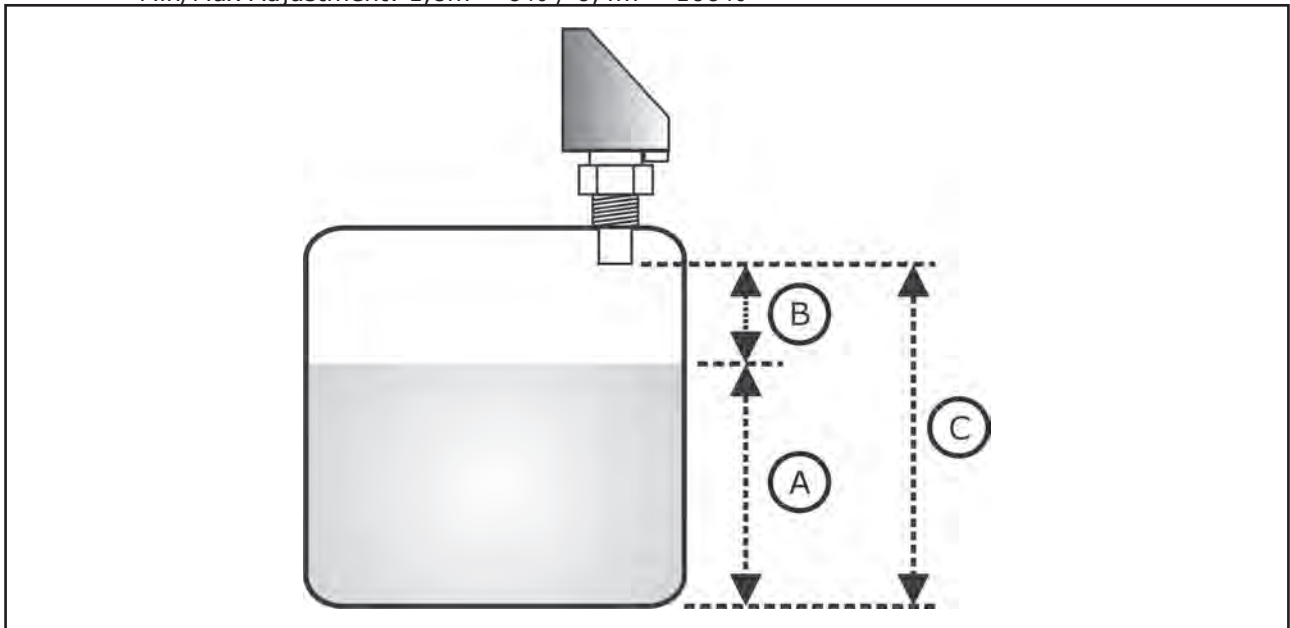
Example

Measurement task

- Distance Sensor - container bottom: 1,8m
- Minimum filling level: 0m >> distance 1,8m - 0m = 1,8m
- Maximum filling level: 1,4m >> distance 1,8m - 1,4m = 0,4m

Settings

- Process commissioning
- Min/Max Adjustment: 1,8m = 0% / 0,4m = 100%



- A - Filling level
- B - Distance sensor – filling material surface
- C - Distance sensor – container bottom

Volume measurement

For the indication of the tank volume a display scaling can be made.
If a nonlinear tank style is used, a linearization must be set.
Predefined linearization curves for some tank styles are available.

Sub menu Basic Setting

- Commissioning
- Min/Max Adjustment
- Linearization

Sub menu Display

- Indicator value Scaled
- Unit
- Scaling - ration percent / tank volume

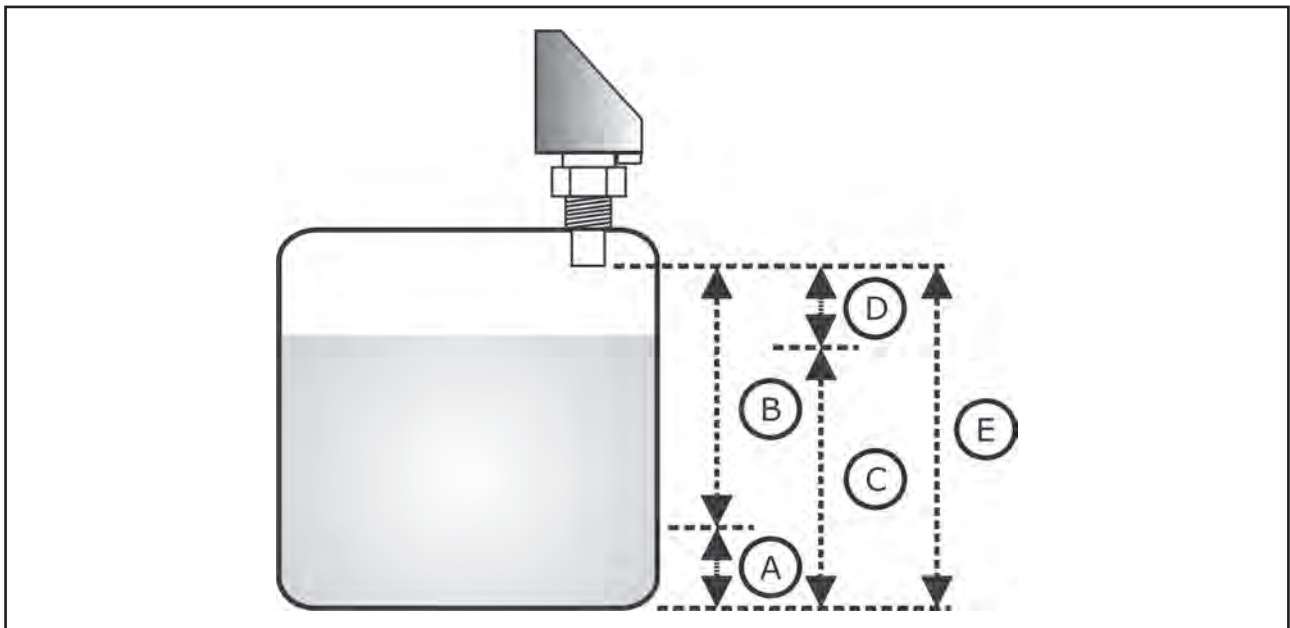
Example

Measurement task

- Distance Sensor - container bottom: 1,8m
- Container: Cylinder - linear volume
- Minimum filling level: 0,2m >> distance 1,8m - 0,2m = 1,6m
- Maximum filling level: 1,2m >> distance 1,8m - 1,2m = 0,6m
- Minimum volume: 0 liter
- Maximum volume: 2000 liter

Settings

- Process commissioning
- Min/Max Adjustment: 1,6m = 0% / 0,6m = 100%
- Display Indicator value: Scaled
- Display Unit: l
- Display Scaling: 0% = 0 l / 100% = 2000l
- Linearization: Linear



- A - Minimum volume
- B - Distance at minimum volume
- C - Maximum volume
- D - Distance at maximum volume
- E - Distance sensor - container bottom

Flow measurement

For the indication of the flow amount a display scaling can be made.
If a nonlinear flow opening style is used, a linearization must be set.
Predefined linearization curves for some flow opening styles are available.

Sub menu Basic Setting

- Commissioning
- Min/Max Adjustment
- Linearization

Sub menu Display

- Indicator value Scaled
- Unit
- Scaling - ration percent / flow amount

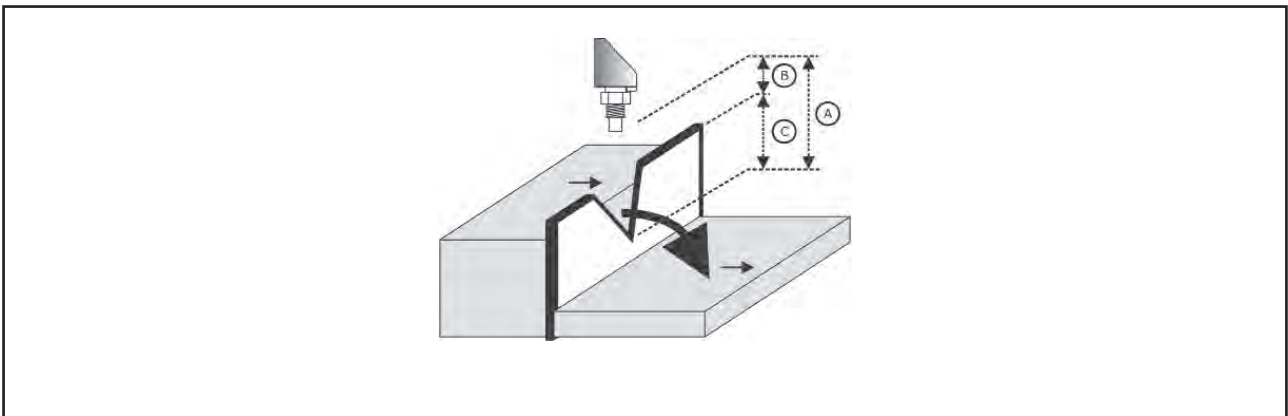
Example

Measuring task

- Style: Triangle weir
- Level minimum flow: 0,95m at 0 l/s
- Level maximum flow: 0,45m at 69 l/s

Settings

- Process commissioning
- Min/Max Adjustment: 0,95m = 0% / 0,45m = 100%
- Display Indicator value: Scaled
- Display Unit: l/s
- Display Scaling: 0% = 0 l/s / 100% = 69l/s
- Linearization: triangular weir



- A - Distance at minimum flow
- B - Distance at minimum flow
- C - Maximum water level H_{\max}

Maintenance

The device is free of maintenance.

Special substances can lead to solid coatings on the membrane.

Seized depositions can lead to faulty measurement results.

In the case of coat forming liquids the membrane must be regularly cleaned e.g. with clear water.

Don't use sharp tools or aggressive chemicals for cleaning.

Repair

A repair may only be carried out by the manufacturer.

If the device must be sent back for repair, the following informations must be enclosed:

- An exact description of the application.
- The chemical and physical characteristics of the product.
- A short description of the occurred error.

Before returning the device for repair, the following measures must be proceeded:

- All adhesive product residues must be removed. This is especially important, if the product is unhealthily, e.g. caustic, toxic, carcinogenic, radioactive etc.
- A returning must be refrained, if it is not possible by 100% to remove the unhealthily product completely, because e.g. it is penetrate into cracks or is diffused through plastic.

Technical Data

Auxiliary power supply

Supply voltage U_s	Preference output 0/4...20 mA 9..30 V _{DC} , reverse polarity protected Preference output 0...10 V 14..30 V _{DC} , reverse polarity protected
Residual ripple U_{pp}	$\leq 2 V_{pp} / U_{Smin} \leq U_s \leq U_{Smax}$
Supply current I_{In}	Preference output 0/4...20 mA ≤ 110 mA ($U_s = 9$ V / $I_o/S1/S2/S3/S4$ 0mA / Bluetooth Off) ≤ 130 mA ($U_s = 9$ V / $I_o/S1/S2/S3/S4$ 0mA / Bluetooth On) ≤ 70 mA ($U_s = 30$ V / $I_o/S1/S2/S3/S4$ 0mA / Bluetooth Off) ≤ 80 mA ($U_s = 30$ V / $I_o/S1/S2/S3/S4$ 0mA / Bluetooth On) Preference output 0...10 V ≤ 65 mA ($U_s = 14$ V / $U_o/S1/S2/S3/S4$ 0mA / Bluetooth Off) ≤ 80 mA ($U_s = 14$ V / $U_o/S1/S2/S3/S4$ 0mA / Bluetooth On) ≤ 50 mA ($U_s = 30$ V / $U_o/S1/S2/S3/S4$ 0mA / Bluetooth Off) ≤ 60 mA ($U_s = 30$ V / $U_o/S1/S2/S3/S4$ 0mA / Bluetooth On)

Output Signal 0...20mA

Operating range I_{Out}	0 mA ... 21 mA, max. 22 mA
Permitted load R_l	$\leq (U_s - 7 V) / 20mA$
Step response time T_{90}	≥ 200 ms ($t_d = 0s / t_p = 200ms$)
Start-up time t_{On}	$\leq 1s$

Output Signal 4...20mA

Operating range I_{Out}	3,9 mA ... 21 mA, min. 3,6mA, max. 22 mA
Permitted load R_l	$\leq (U_s - 7 V) / 20mA$
Step response time T_{90}	≥ 200 ms ($t_d = 0s / t_p = 5Hz$)
Start-up time t_{On}	$\leq 1s$

Output Signal 0...10V

Operating range U_{Out}	0 ... 10,5 V, max. 11 V
Permitted load R_l	$\geq U_{Out} / 3mA$
Step response time T_{90}	≥ 200 ms ($t_d = 0s / R_l = 10kR / t_p = 5Hz$)
Start-up time t_{On}	$\leq 1s$

Output Switch output

Function	PNP switching to +L
Output voltage U_{Out}	$U_{Out} \geq U_s - 2 V$
Output current I_l	0... ≤ 250 mA, current limited, short circuit protected
Step response time T_{90}	≥ 200 ms ($t_d = 0s / t_p = 5Hz$)
Rise time T_{90}	$< 30 \mu s$ ($R_l < 3 kR / I_{Out} > 4,5$ mA)
Start-up time t_{On}	$\leq 1s$
Switch cycles	$\geq 100.000.000$

Output Bluetooth-Interface

Version	Bluetooth 2.1 + EDR
Specification	Class 2
Transmit power	$\leq 2,5mW/4dBm$
Range	$\leq 10m$

Input

Measuring range	<i>Liquids</i> up to 2m <i>Bulk materials</i> up to 1m
Blocking distance BD	≤ 0,15m (typ. 0,06m)
Operating frequency	125kHz
Emitting angle α	10° ±2° at -3 dB
Detection radius r _x	r _x = 0,044m (L _x = 0,5m / α = 10°) r _x = 0,087m (L _x = 1,0m / α = 10°) r _x = 0,131m (L _x = 1,5m / α = 10°) r _x = 0,175m (L _x = 2,0m / α = 10°)
Pulse rate t _p (measure cycle time)	5Hz (200ms) / 2,5Hz (400ms) / 1,25Hz (800ms)

Measuring accuracy

Reference conditions	EN/IEC 60770-1
	T _v /T _p = 25 °C, relative humidity 45...75 %, environmental air pressure 860..1060 kPa
	Ideal reflective surface No interference reflections within signal beam
	Warm-up time = 240 s
	Supply voltage U _s = 24 V _{DC} ±0,1V

Characteristic deviation ³⁾	≤ ±2mm or ±0,2% of set measuring range ¹⁴⁾
Influence of supply voltage	<i>Preference output 0/4...20 mA</i> ≤ ±0,01% FS ²⁾ / 10V <i>Preference output 0...10 V</i> ≤ ±0,06% FS ²⁾ / 10V
Load influence	<i>Preference output 0/4...20 mA</i> ≤ ±0,01% FS ²⁾ / 100R <i>Preference output 0...10 V</i> ≤ ±0,05% FS ²⁾ / 1mA
Temperature deviation	Mean T _k ⁴⁾ Zero ≤ ±0,06% FS ²⁾ / 10 K

²⁾ Referring to nominal measuring span resp. full scale (FS)

³⁾ Nonlinearity + Hysteresis + Reproducibility

⁴⁾ T_k = Temperature coefficient

¹⁴⁾ whichever is greater

Process conditions

Process temperature	-40°C...+85°C
Process pressure	-0,3...2 bar

Environmental conditions

The permitted environmental temperature range results from the combination of standard range and expansion, whereby the range is defined by the narrowest limitation.

Environmental temperature	-20°C...+50°C <i>Expansion</i> Backlight LCD ≤ 80% >> -20°C...+60°C Backlight LCD ≤ 60% >> -20°C...+70°C
Protection	IP68 [≤ 1 mWs-1h] (EN/IEC 60529)
Climatic classification	4K4H [-20...+55°C / 4...100%] (EN/IEC 60721-3-4)
Shock classification	15 g [11ms] (EN/IEC 60068-2-27)
Vibration classification	4 g [10 - 500 Hz] (EN/IEC 60068-2-6)
EM compatibility	Operation device class B / Industrial range (EN/IEC 61326)
Weight	0,7 kg

Materials - process wetted

Sensor	PVDF
Process connection	Steel 1.4404 (316L) / 1.4571 (316Ti)
Gaskets	EPDM – ethylene-propylene-dienmonomere

Materials - not process wetted

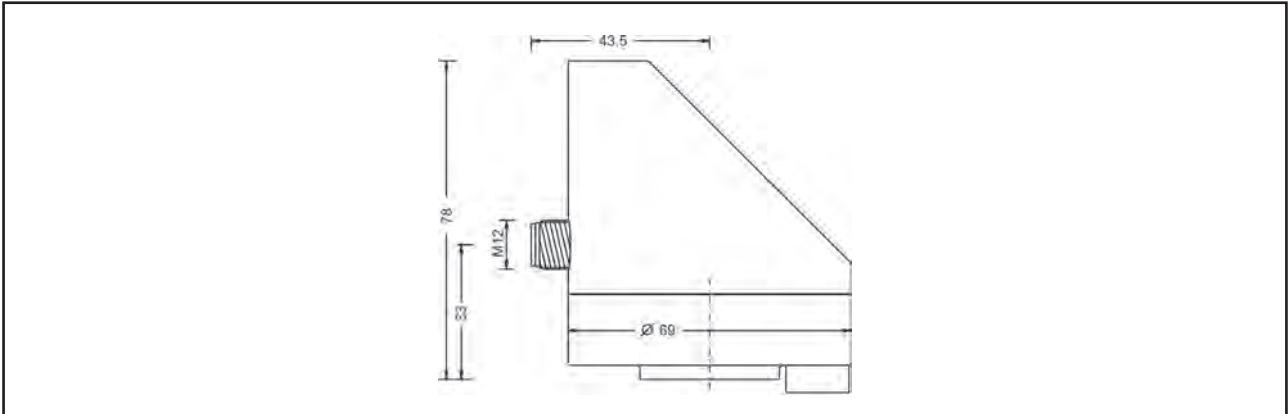
Terminal enclosure	CrNi-steel
Control panel surface	PC / PES
Electrical connection part	Device plug PUR
Pressure compensation element	Enclosure PBT Membrane PES
Gaskets	FPM – fluorelastomere (Viton®)

Data memory

Memory size	1 million measuring values
Memory system	Ring memory
Memory rate	1...99999 s

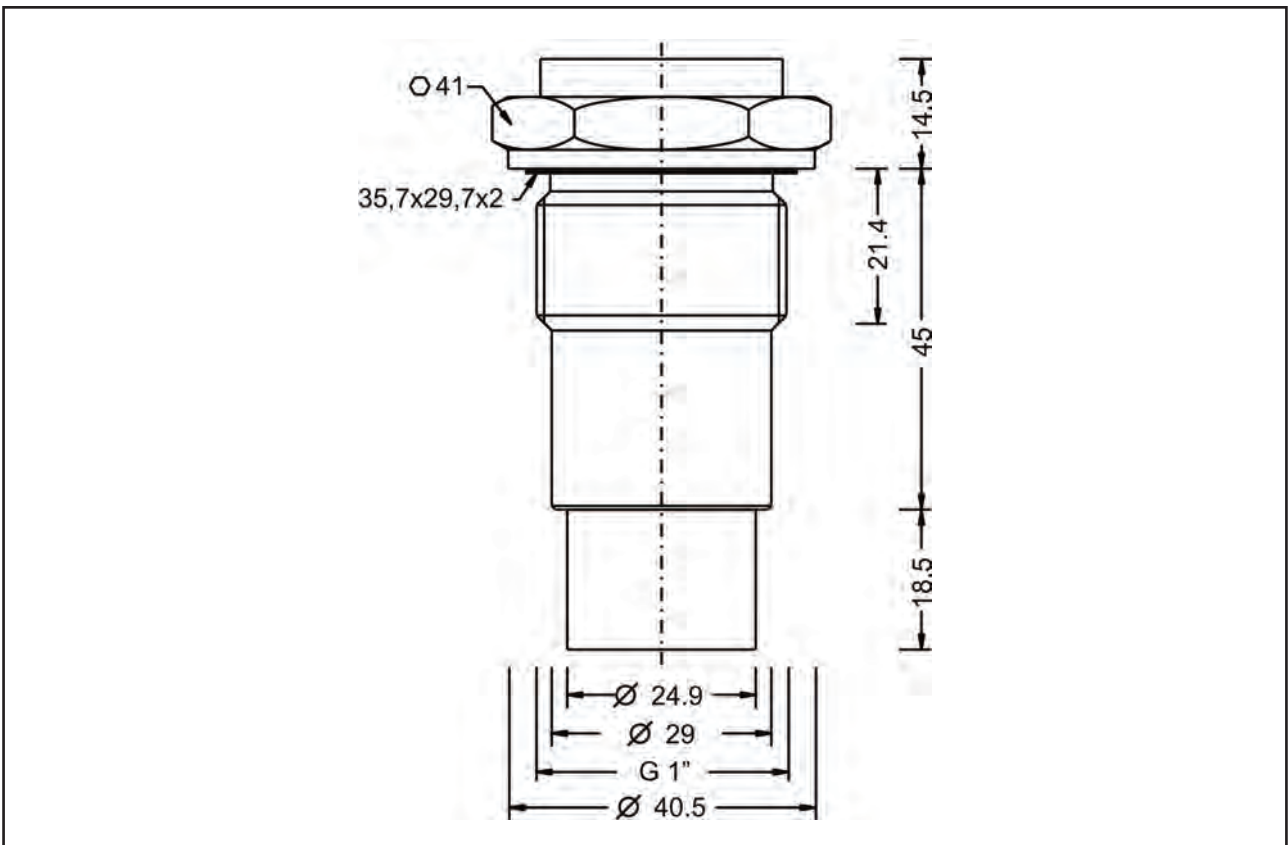
Dimension drawings

Terminal enclosure



Process connection

Type G10 - G 1" ISO 228-1



Order Code

	Type
USN020	Standard
	Process connection
G10	G 1", ISO 228-1
	Electronic - output
M	3-wire, signal 0/4...20mA - 0...10V
K	3-wire, signal 0/4...20mA - 0...10V, 2x PNP
R	3-wire, signal 0/4...20mA - 0...10V, 4x PNP
	Electronic - function
0	without
1	Bluetooth-Interface
Y	others
	Material process connection (process wetted)
P	PVDF / Steel 1.4404/316L or 1.4571/316Ti
	Material terminal enclosure
C	CrNi-steel
	Electrical connection
S	Plug M12

Sonicont	USN020	G10		P	C	S
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Installation material and connection cable are not enclosed in contents of delivery.

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