USH-8

Firmware Version 1.8x

Snow Depth Sensor
User Manual

Manual version: V01

한국대리점

Since1984 길우트레이딩

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Validity

This manual is valid for the snow depth sensor USH-8 programmed with firmware version 1.8x and all subversions.
The firmware version is listed in the menu "G Info" and in the boot message of the device.

CE compliance

CE

This product is in conformity with the following standards

EMV	**EN 301 489 - 1 - 3; V 1.6.1**
Safety	**EN 60950 - 1**
Health	**EN 62311**
R&TTE	**EN 300 440 - 2; V 1.2.1**

following the provision of directive R&TTE 1999/5/EC.

Safety Information

Please read this entire manual before setting up or operating this equipment. The non-compliance of this manual could result in damage to the equipment. Also in the case of non-compliance injuries of individuals cannot be excluded totally.
To make sure that the protection provided of and by this equipment is not impaired, do not use or install this equipment in any manner other than that specified in this manual.

Contents

1. General Desciption

The USH-8 sensor measures the snow depth by using sonic logging of ultrasonic pulses.

Feature of USH-8:

- **Continous and non-contact ultrasonic snow depth measurement**
- **Reliable sensor for extreme conditions**
  - Accurate measurement during snow fall and difficult reflexion by snow surface
  - Automatic de-icing of ultrasonic membrane
- **High accuracy of measurement**
  - Integrated temperature compensation
  - Intelligent measurement processing
- **Low energy consumption**
  - Standby
  - Optimal for solar powered supply
- **Easy sensor integration**
  - Analog (4-20mA) and digital interface (RS232)
  - Parameterization via a terminal program (e.g. HyperTerminal)

Fig. 1: USH-8 sensor

1.1. Measurement Cycle

The sensor switches from standby mode to measurement mode and performs a series of single measurements. The results are then internally post processed (e.g. averaging filter, …) and outputted via the analog respectively serial interface. After the measurement result was outputted the sensor switches back to its standby mode until the next measurement cycle is started in the defined measurement interval.

1.2. Principle of Measurement and Accuracy

The measurement principle is based on sonic logging. The sensor emits ultrasonic pulses that are reflected at the snow surface and then travel back to the sensor. There, the reflected pulses are registered and depending on the time it took for an individual pulse to be reflected the distance to the measured surfaced can be calculated. Because the speed of ultrasonic pulses is temperature depended the USH-8 is equipped with an integrated temperature sensor to automatically compensate for this influence.
The typical accuracy of the USH-8 is 0,1% FS (Full Scale: 8000mm).

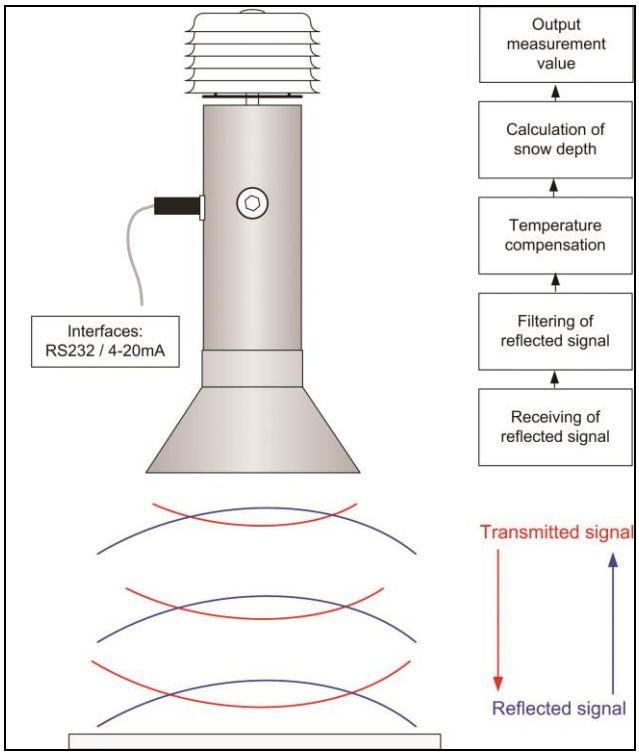

Fig. 2: Signal processing USH-8

1.3. Signal Processing and Filtering

The USH-8 sensor is designed for extreme weather conditions to enable a reliable measurement. The high energy 50kHz ultrasonic impulses and the integrated filters enable the sensor to reliably and accurately measure the snow depth even in difficult snow conditions. For example when the upper layers of the snow pack are of very low density (powder) and when it is snowing or raining.

1.4. Low Energy Consumption

Due to the integrated intelligent signal processing and the feature to automatically switch between standby and measurement mode the power consumption is decreased to a level that allows the sensor to be operated on a single battery (12Ah) for up to 24 days.

Attention: **The data logger may not switch on/off the USH8 sensor.**
The best results with the least power consumption are achieved when the USH8 is constantly supplied with a voltage of 12VDC.

The measurement results can be outputted via an analog (4-20 mA) and/or a digital interface (RS232). To further reduce the power consumption the output of measurement results can be triggered by applying a voltage to a single pin.
The typical power consumption per day is 0,5 Ah with a set measurement interval of 1 minute.

2. Hardware

2.1. Scope of delivery

2.1.1. Sensor

The sensor has already been calibrated (temperature compensation) and preconfigured prior to delivery. In addition to the customer-specific settings (interface, protocol, …), the zero point parameter for the location must be set after the installation. This is implemented easily and comfortably accessible via a terminal program (e.g. HyperTerminal).

2.1.2. Connector

The sensor is connected by a 12-pin connector. The connector is included in the scope of delivery but the cable has to be ordered separately.

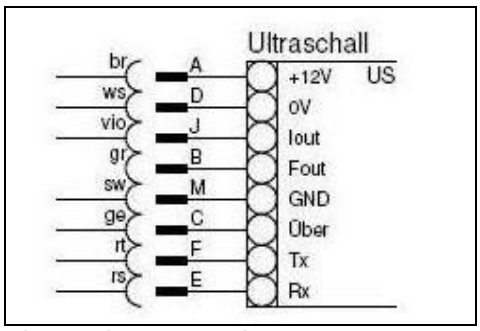

Fig. 3: Plug connection

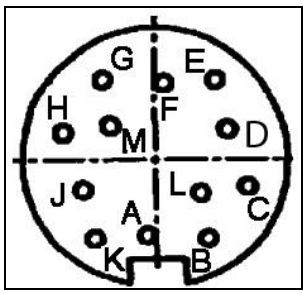

Fig. 4: Connector pin assignment, male

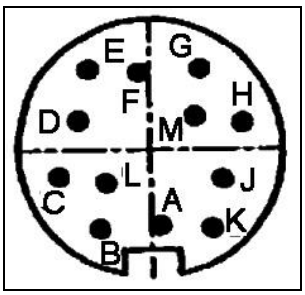

Fig. 5: Connector pin assignment, female

Pin	Cable[*]	Name	Description
A	Brown	+12V (11V-15V DC)	Supply voltage
B	Green	Impulse output	
C	Yellow	Trigger / Handshake	Pin to activate/deactivate analog interface
D	White	GND	Ground for power supply and signal
E	Pink	RX	Receive Data
F	Red	TX	Transmit Data
G	Blue	RTS	Request to Send
H	Grey	PSEN	Pin to program the sensor
J	Violet	Analog output: 4 -20 mA	Analog output 4 - 20 mA
K	Grey/pink	Temp-	Connection for external temperature sensor [**]
L	Blue/red	Temp+	Connection for external temperature sensor [**]
M	Black	GND	Ground for power supply and signal

** Litz wire color when using the „Sommer"-cable*
*** Not available in the basic version of the sensor*

2.1.3. Documents

Following documents are included

- Manual incl. CE- Declaration of Conformity and RoHs- Declaration of Conformity.

3. Installation

3.1. Qualification of the Measurement Site

Due to environmental influences like the terrain and weather patterns selecting the correct site for an installation is essential to get results that are applicable to a region.

3.1.1. Qualification of the Area

The terrain of the measurement site should show the following characteristics:

- Flat area
- Sheltered from wind
- Safe from avalanches
- No steep slopes, troughs, edges or boulders next to the measurement spot

Ideally the measurement site is a large and flat area with a representative snow cover for the region. For an optimal measurement the sensor is mounted perfectly perpendicular to the ground respectively snow cover.

A terrain edge next to the ultrasonic measurement spot has a negative impact on the measurement results: Every edge of a building, tree, fence or rock can cause snow drift and therefore influence the snow cover.

If the measurement spot is located on a (steep) slope the snow cover could move over time or abruptly.

3.1.2. Preparation of the Measurement Site

The surface material of the measured spot must be representative of the area to be surveyed since different materials cause different defrosting processes and may thereby lead to an undesired influence on the measurement results. When the sensor is installed in a natural terrain the recommended surface materials are fine gravel or rubble.

The diameter and minimum distance of the measurement spot to the mast have to be considered when the planning the measurement site to prevent undesired reflections (see tab. 1 / fig. 6).

If the measurement site is planned to be protected by a fence, the distance of the snow depth sensor to the fence needs to be taken into account. Any barrier located next to the measurement spot can falsify the results by producing snow drift.

3.1.3. Assembly and Mounting Height

The optimal mounting height of the sensor is 3m or more. The maximum mounting height is 10,5m. When planning the installation the size of the resulting measurement spot has to be taken into account. The higher the sensor is mounted the bigger the diameter of the measurement spot (see fig. 6). This diameter must be considered when designing the mast and dimensioning the length of the arm on which the sensor is mounted: When objects like the mast base are located in the measured area they can cause unwanted reflections and therefore can lead to incorrect measurement results.

3.1.4. Cable

Recommendation	Shielded data cable LIYCY 12 x 0,25 mm²
Attention:	Take into account the voltage drop when using a long cable. The voltage at the sensor must be at least 10.5 VDC. The recommended cable should be used for a maximum length of 10m.
Tip:	It makes sense to use a 12-pin data cable to integrate the serial interface in one cable. Then the serial interface is also routed into the switch cabinet. In case of a maintenance visit a notebook can be easily connected to the serial interface of the USH-8 and a terminal program used to access and adjust the sensor parameters.

3.1.5. Power Supply / Consumption

Requirement:	Supply voltage: 10.5 to 15 VDC Power consumption: max. 200 mA during measurement period (measurement period about 3 seconds); < 1 mA (Standby-Mode) Power consumption: 0,5 Ah / day (measurement interval 1min)
Attention:	The sensor needs a minimum supply voltage of 10.5 VDC, if the supply voltage is less than 10.5 VDC the measurement accuracy might be reduced.

3.1.6. Interface

Analog:	Output: Snow depth 4 - 20 mA Resolution: 12 Bit Max. burden: 300 Ω
Digital:	Output: Snow depth; air temperature; quality flag RS 232; serial interface Protocol: various ASCII formats
Preparation:	Sommer recommends using a 12pin data cable to integrate the power supply, analog interface (if used) and the serial interface (RS232) in one cable and route this cable into the switch cabinet. In case of a maintenance visit a notebook can be easily connected to the serial interface of the USH-8 and a terminal program used to access and adjust the sensor parameters.

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4. Quick user guide

4.1. Overview

1.	Mounting sensor on the mast	*Chapter 4.2*
2.	Connect cable to USH-8 and 12 VDC power supply	*Chapter 4.3*
3.	Connect sensor via the serial interface to a laptop	*Chapter 4.3*
4.	Start a terminal program on the laptop and connect to the sensor	*Chapter 4.4*
5.	Parameterization and setup	*Chapter 4.5, 4.7, 4.8*
6.	Function checkl	*Chapter 4.9*

4.2. Mounting height

The distance between sensor and measurement surface (e.g. surface of snow cover) has to be greater than 900mm. The required minimum distance between the sensor and the mast / base is listed in table 1. Consider the maximum expected snow depth of the snow cover at the measurement site!

4.3. Power supply

The supply voltage of the sensor is 10.5 to 15 VDC.

Attention: The data logger must not switch on/off the power supply of the sensor. The sensor works with its own measurement interval and continuously outputs the last measured value. Alternatively a measurement output can be triggered by activating and applying a voltage to a trigger pin.
The sensor switches automatically between measurement and stand-by-mode to save on power consumption. If the data logger switches on/off the power supply of the sensor an inaccurate measurement can occur, because the intelligent measurement processing of the USH-8 is always reset.

Two modes are available to transmit the measured value to the data logger

- Default (delivery): After each measurement the value is outputted continuously via the analog (4-20mA) / digital interface (RS232) – for more information see chapter 7.1.11 Menu B: Handshake (value=0).
- When a voltage (+12VDC) is applied to the trigger pin the analog/digital interface is activated and the last measured value is transmitted – for more information see7.1.11 Menu B: Handshake.

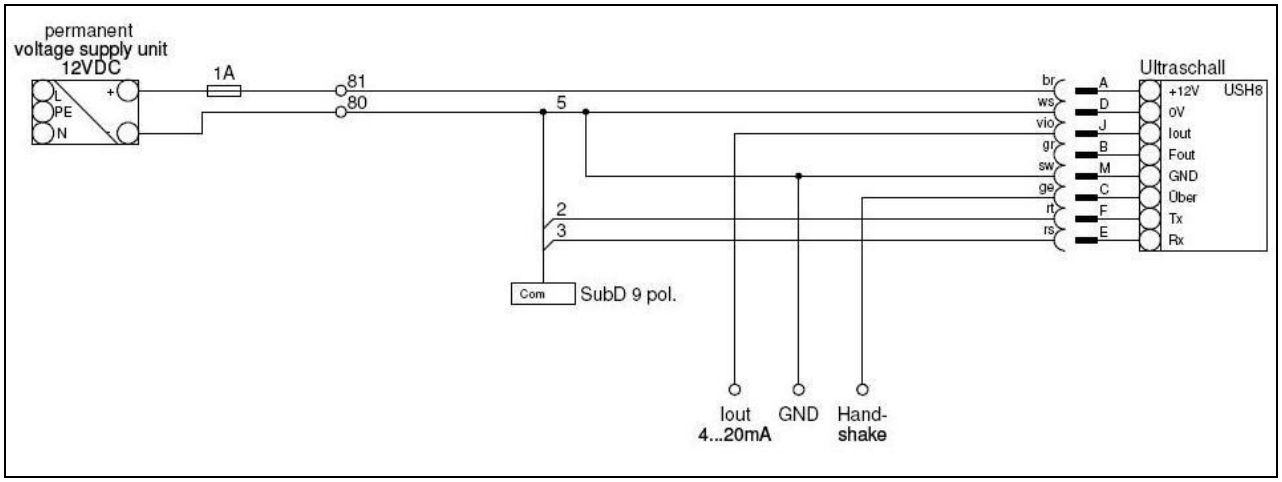


Fig. 6: Power supply and data transmission via "trigger pin" (Handshake)

4.4. Connection for parameterization

To connect to the sensor a serial connection is established between the serial interface (RS232) of the sensor and a computer. If the computer does not offer a serial interface Sommer recommends using a “USB to RS232”-adapter. When the sensor is connected with the computer a terminal program (e.g. HyperTerminal) is used to set the sensor parameters.

Example: MS Windows XP© :

Start → Programs → Accessories → Communication → HyperTerminal

Use the following COM-Port settings in the terminal program of your choice.

Parameter	Value
Bits / second	9600 Baud
Data bits	8 Bits
Stop bits	1 Stop bit
Parity	No parity
Flow control	None

Tab. 1: Default values serial interface (RS232)

Sommer recommends using the above listed default settings for the serial interface.
The USH-8 serial interface parameters can be changed via the sensor menu. For more information see chapter 7.1.14.

4.5. Parameterization menu

To access the USH-8 parameter menu establish a serial connection with the device and open the corresponding COM port with a terminal program.
After the connection was successfully established input three questions marks (“???”) in quick succession to open the parameter menu (see following figure). Depending on the state of the sensor it can take up to 30 seconds until the menu is displayed.
To select a parameter input the leading character in the same line (e.g. 7 for zero point). Now the current setting and the corresponding unit for the selected parameter are displayed.
A different value can now be inputted and saved by pressing the “Enter” key. Press “ESC” to quit in case you do not want to change the selected parameter.
This method can be used to set every parameter shown in the menu to the desired value. Data entered in the menu via the keyboard is not case sensitive, i.e. upper case or lower case letters are irrelevant.

Exit the menu by pressing "X". The sensor then performs a measurement, outputs the measured value, changes to standby mode and performs another measurement after the selected interval has elapsed.

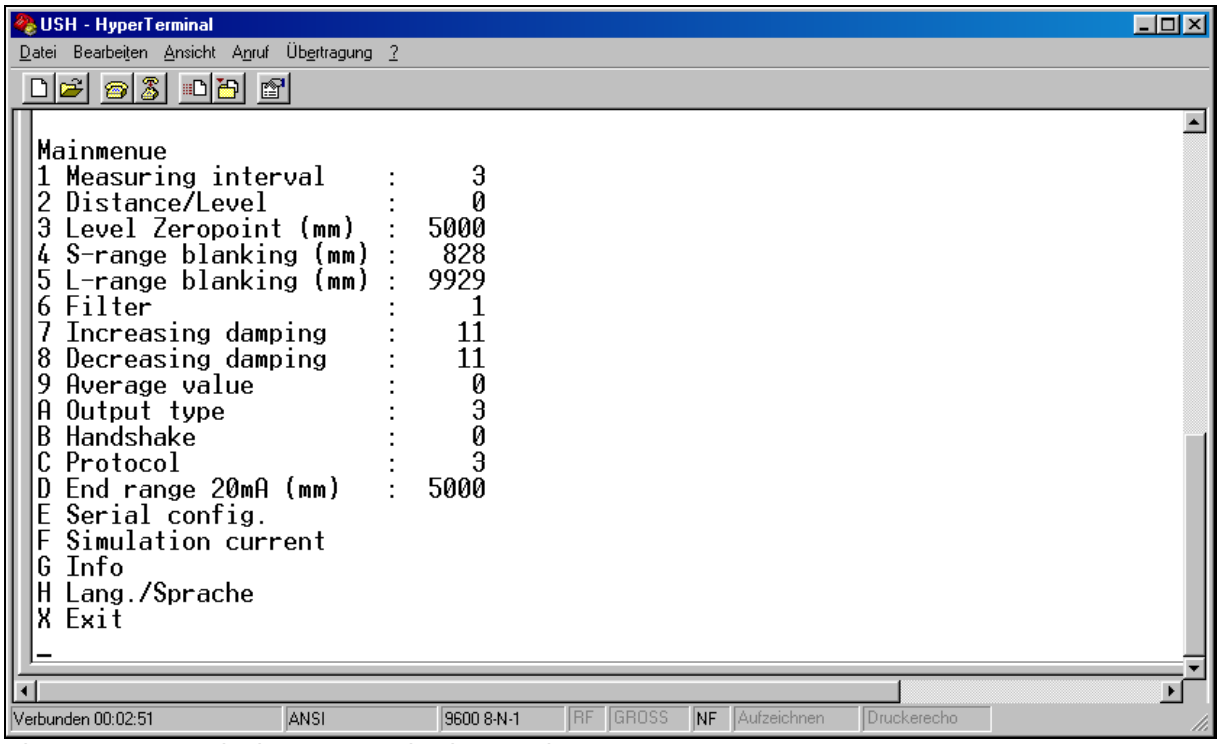
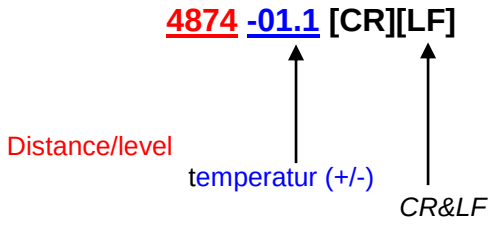


Fig. 7: HyperTerminal - parameterization - main menu USH-8

4.6. Output measurement value

The sensor outputs the measurement values via the analog and digital interfaces (default settings).
The digital interface output is by default set to use the standard protocol:



4.7. Default values

The USH-8 sensor is delivered with following default settings:

Main menue		**Serial configuration**	
1 Measuring interval:	10	1 Baud rate:	9600
2 Distance/Level:	1	2 Data bits:	8
3 Level Zeropoint (mm):	5000	3 Stop bits:	1
4 S-range blanking (mm):	828	4 Parity:	0
5 L-range blanking(mm):	9999	5 RTS on time :	10
6 Filter :	1	6 HD receive window:	0
7 Increasing damping:	20	7 Immediately confirmation:	0
8 Decreasing damping:	10	X Exit	
9 Average value:	0		
A Output type:	3	**Protocol**	
B Handshake:	0	1 Protocol Type:	0
C Protocol:	0	2 Device address:	0
D End range 20mA (mm):	5000	3 Station number:	99
E Serial config.		4 mm/cm output.:	0
		5 Normal / Polling:	0
		X Exit	

4.8. Setting-up operation

The Sensor can only measure the distance to the snow surface. To get a level output the sensor needs to “know” to what distance (“Zero point”) it has to relate the measurement results to. The level is then internally calculated (“Zero point” – “distance” = “depth of snow”, using the terms shown in figure 9) and outputted accordingly.

To calculate the snow depth, the distance between USH-8 and the soil (“Zero point”) has to be inputted in the device menu.

The USH-8 measures the distance to the soil. If there is a snow cover it measures the distance to that cover.

To output the snow depth the measured distance to the snow cover is subtracted from the zero point distance. Now the USH-8 can output the snow depth.

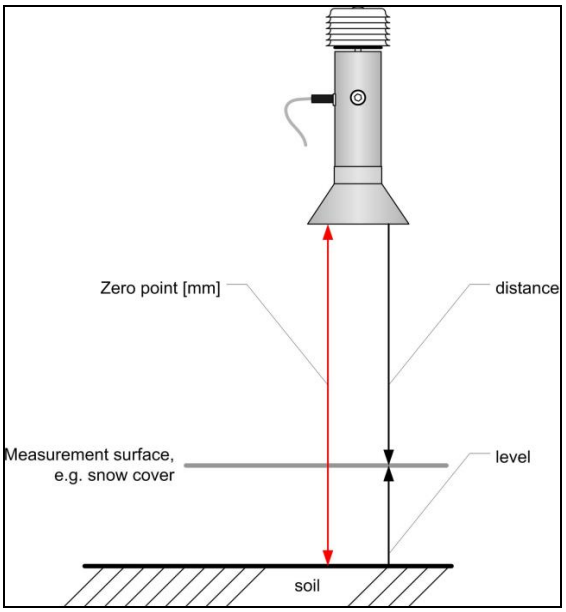


Fig. 8: Level zero point in [mm]

4.9. Check measurement

To check the sensor a test measurement is useful. When there is no snow cover during the installation of the sensor perform a measurement of the soil which should result in a level output of 0 cm.
Now place a box with a flat top underneath the sensor and switch the USH-8 off and then on again. This step is necessary to prevent the parameters “Increasing damping”, “Decreasing damping” and “Average value” to influence the measurement result.
A measurement will be performed and the distance/level outputted.

Attention: After the first measurement is done and the e.g. toolbox is placed under the sensor and the next measurement is initiated a reset of the sensor should be done (switch power on/off). If you don´t want to switch on/off the sensor you have to set the parameter “Increasing damping, “Decreasing damping” and “Average value” to zero (0). We recommend to reset the modem, no reparametrization is required.

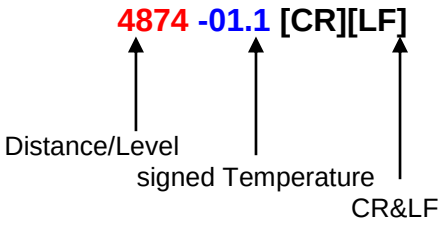
5. Protocols for digital interface

5.1. Output type / Output format of measured values

The measurement results can be transferred via the RS232 and/or the analog output.
When using the serial interface several output protocols are available. Selecting a protocol is described in chapter 6.1.12.1.

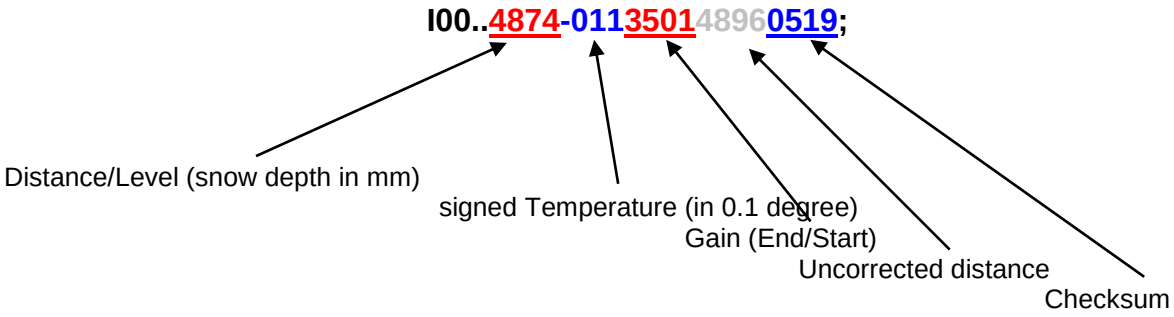
5.1.1. Standard protocol

The standard protocol is a simple and easy-to-implement protocol. Measured values are outputted separated by spaces.



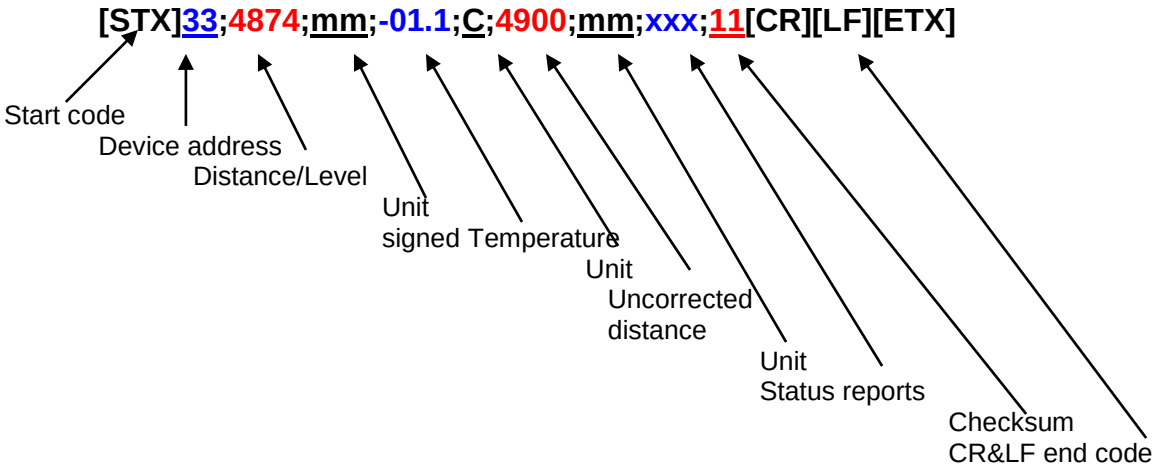
5.1.2. Protocol 1

Using this protocol measured values are outputted with 4 digits each.



5.1.3. Protocol 2

If this protocol is selected, the output format is as follows:



The semicolon between individual values is interpreted as a delimiter.

Protocol 2 status messages:

000 - OK
990 - No echo after powering up
999 - Erroneous measurement

5.1.4. Spectrum

This protocol contains the results included in protocol 1 and additionally uncorrected measurement results. The measured values are separated with the '|' character.

Example:
I00..1635022730061572042F;|00|09|04|09| |06|30|1572|1569|1572|....|1572|1569|1572

5.2. Checksums

5.2.1. Protocol 1 checksum

In protocol 1, the checksum is the total of the ordinal numbers of all the characters before the checksum (viewable in an ASCII table).
e.g.: I01..00000000000000230040B;
I is character 73, 0 is character 48, 1 is character 49, . is character 46 etc. The checksum is therefore 73+48+49+46+46+48+48+... = 1035 dec or 040B hex.

5.2.2. Protocol 2 checksum

This checksum is calculated from the total sum of all characters (alphanumeric characters and control codes such as STX, ETX, CR, LF but excluding checksum bytes themselves). The two's complement of this total is found and the low-order byte is taken from this. The high-order and low-order half byte, converted into readable ASCII characters, form the checksum.

5.3. Polling mode

The USH-8 can operate in automatic or polling mode. If automatic mode is selected, measured values are sent using the selected protocol after every measurement. In polling mode, measured values are outputted within 10-20 ms after receiving the poll command.

The interval between signals sent to the USH-8 must not exceed 1 s, otherwise they are not accepted.

The device address can be set via the menu (see Section 3.2.12.2). The ultrasonic sensor can only be addressed via the device address.

5.3.1. Switch polling mode on/off

Polling mode can be set to two different modes. The first mode is obtained via the menu, see Section 3.2.12.5. The second mode is obtained through commands sent via the RS232 interface. The format of these commands is as follows:

Switch polling mode on: **:DeviceaddressMP;**
Reset to automatic mode: **:DeviceaddressMA;**

Example using device address 33: **:33MP;** Polling mode on
:33MA; Automatic mode

5.3.2. Poll command

The poll command has the following format:

:Deviceaddress;

The device address must consist of two ASCII characters, e.g.: **:33;**

6. Parameterization

6.1. Main menu

6.1.1. Menu item 1: Measuring interval

Function: The measuring interval is the time interval in which a measurements are performed. An interval consists of a measuring and a standby phase.

Unit: 1/10 minute

Example: 1 = 6 s

Setting range: 1 (6 s) to 9999 (999.9 minutes, 16.665 hours)

6.1.2. Menu item 2: Distance/Level

Function: Toggles between measurement of distance and measurement of level (=snow depth).

Setting range: Distance = 0
Level measurement = 1

6.1.3. Menu item 3: Zero point (mm)

The sensor needs an onsite calibration to measure the snow depth – it is necessary to define the distance between the sensor and the soil.

Function: This parameter is used to define the zero point for level (snow depth) measurements. This parameter is only significant if the "Distance/Level" parameter is set to 1.

Unit: mm

Setting range: 828 min. (short range) to 9999 max.

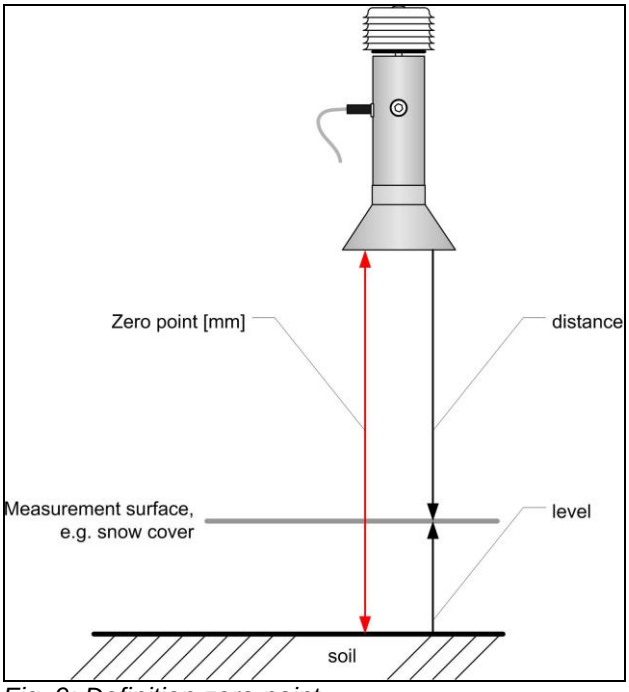


Fig. 9: Definition zero point

6.1.4. Menu item 3: S-range blanking (mm)

Function: This parameter can be used to blank short-range echoes. All echoes from objects which are closer than the value of this parameter are discarded. The range of values entered is converted to match the internal time base of the processor and output in the menu.

Unit: mm

Setting range: 828 min. to 9000 max.

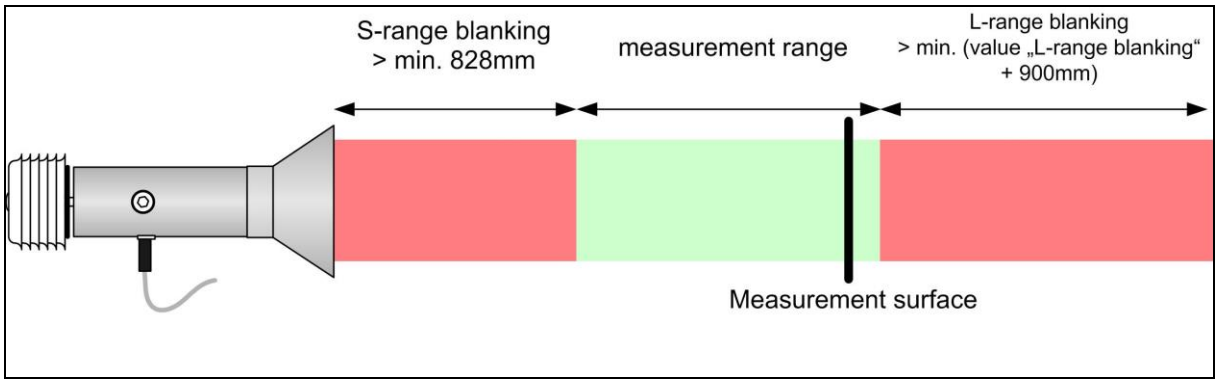


Fig. 10: Definition of measurement range in interaction with parameter “S-range blanking” and “L-range blanking”.

6.1.5. Menu item 4: L-range blanking (mm)

Function: All echoes from objects which are further away than the set L-range blanking are blanked. The range of values entered is converted to match the internal time base of the processor and output in the menu.

Unit: mm

Setting range: 900 min. - 9999 max.; the value must be at least 900mm greater than the value in the S-range blanking parameter.

6.1.6. Menu item 6: Filter

Function: This parameter is used to get more stable measurement results by blanking stationary echoes. This filter’s impact, compared with the “Averaging” option, produces an even more stable measurement value. If the filter is activated, the calculation of the measured value is made by 20 measurement cycles (280 individual measurements) via use of a distance bandpass filter (for the filtering of faulty measurements released through for example driftwood, persons or animals).

Setting range:

Filter off	= 0	
Filter average	= 1	Average value of the last 14 measurements. Recommended filter setting
Filter min	= 2	Minimal value of the last measurement is used
Filter V-Komp.	= 3	

6.1.7. Menu item 7: Increasing damping

Function: Specifies the maximum value by which a measured value can change in one minute.

Unit: 1/10 mm/min

Setting range: 0 (off) to 1000 mm/min

6.1.8. Menu item 2: Decreasing damping

Function: Same as above, but for decreasing.

Unit: 1/10 mm/min

Setting range: 0 (off) to 1000 mm/min

6.1.9. Menu item 9: Average value

Function: This parameter is used to enable or disable a moving average output. This moving average value is calculated over 8 measurement results and is used to smooth the measurement signal. When using the option Sommer advises deactivating the filter (menu item 6).

Setting range: Average value off = 0
Average value on = 1

6.1.10. Menu item A: Output type

Function: This parameter can be used to select the type of measured-value output. 5 types are available: serial data output, analog output (4-20 mA), impulse output, analog output with serial data and impulse output with serial data.

Attention: *If Impulse output is selected, measured values are not temperature compensated!*

Setting range:

Serial data output	= 0
Analog output	= 1
Impulse output	= 2
Analog output + data	= 3
Impulse output + data	= 4

6.1.11. Menu item B: Handshake (Trigger-Pin)

Function: Handshake can be used to externally trigger a measurement and/or enable the analog or impulse output. As soon as the Handshake input is switched ON (High, +5 – 30 V), a measurement is started and/or the output is enabled. As soon as the Handshake input is switched OFF (Low), the output is disabled again.

Setting range:

without function	= 0
Triggers just output	= 1
Triggers meas. + outp.	= 2

6.1.12. Menu item C: Protocol menu

6.1.12.1. Menu item 1: Protocol type

Function: The type of protocol is selected here; see Section 1.3 for details of the various protocols.

Setting range:

Standard protocol	= 0
Protocol 1	= 1
Protocol 2	= 2
Spectrum	= 3

6.1.12.2. Menu item 2: Device address

Function: To set the device address in protocol 2. The device address is used as a device identifier in protocol 1.

Setting range: 00 to 99

6.1.12.3. Menu item 3: Complex Key

Function: In protocol 1, a 2-digit number can be specified instead of two dots. The dots become visible again with this protocol if 00 is entered.

Setting range: 00 to 99, 00 is interpreted as ..

6.1.12.4. Menu item 4: mm/cm output

Function: Distance/level output in mm or cm, this setting only applies when protocol 2 is selected.

Setting range: mm = 0
cm = 1

6.1.12.5. Menu item 5: Auto./Polling

Function: Output of the measured values can be set here. In auto mode, measured values are outputted after every measurement. In polling mode, the last measured values stored are outputted whenever the poll command is received (see 1.5.2).

Setting range: Auto.mode = 0
Polling = 1

6.1.13. Menu item D: End range 20mA (mm)

Function: Describes the end range for the 4-20 mA analog output. If this value is reached or exceeded as a distance, the analog output is 20 mA.

Unit: mm

Setting range: 828 min. (due to short-range blanking) up to 9999 max.

6.1.14. Menu item E: Serial configuration

The settings for the RS232 interface can be adjusted in this menu. The standard settings are:
9600 bauds, 8 bits, no parity, 1 stop bit, no protocol.

6.1.14.1. Menu item 1: Baud rate

Function: To set the baud rate. 1200, 2400, 4800, 9600 and 19200 bauds are possible.

Setting range: 1200 = 0
2400 = 1
4800 = 2
9600 = 3 Default
19200 = 4

6.1.14.2. Menu item 2: Data bits

Function: 7 or 8 bits can be selected. If 7-bit mode is selected, the parity must also be set.

Setting range: 7 data bits = 0
8 data bits = 1

6.1.14.3. Menu item 3: Stop bits

Function: The number of stop bits can be selected here. If 8-bit mode + parity is used, only one stop bit is possible.

Setting range: stop bit 1 = 0
stop bits 2 = 1

6.1.14.4. Menu item 4: Parity

Function: To set the parity. None, even and odd parity are possible.

Setting range: None = 0
Even = 1
Odd = 2

6.1.14.5. Menu item 5: RTS on time

Function: RTS on time can be used to clock the RTS signal. RTS on time specifies how soon the RTS signal is switched on before sending the data. Once the data has been sent, the RTS line remains active for 10 ms. If a time of 0 is entered, the RTS line clocks the data on the TX line.

Unit: ms

Setting range: 0 to 600 ms

6.1.14.6. Menu item 6: HD receive window

Function: Enables a half-duplex-mode for RS-485 or special radio networks. After every “Carriage-Return” the transmission of measurement values is interrupted until the defined time has passed.

Unit: ms

Setting range: 0 to 600 ms

6.1.14.7. Menu item 7: Immediately confirmation

Function: Here the user can set whether interface settings are to be accepted immediately or only after a reset. If settings are accepted immediately, modified settings become valid on exiting the menu. The settings of the terminal program must then be modified.

Setting range: After reset = 0
Valid immediately = 1

6.1.15. Menu item F: Simulation current

Function: This parameter can output a value via the analog output. The desired distance is entered and this is then displayed by the 4-20 mA analog output. If the parameter End range is adjusted, the analog output also changes. The analog output remains active until the main menu is exited. If the distance entered exceeds the defined end range 20 mA are outputted.

Unit: mm

Setting range: 0 to 9999

6.1.16. Menu item G: Info

Function: When this menu item is selected, the device name, software version and serial number are outputted.

6.1.17. Menu item H: Lang./Sprache

Function: Toggles the menu language, choice of German or English.

Setting range: German = 0
English = 1

6.1.18. Menu item X: Exit

Function: The parameter menu is exited and the sensor starts its measurement cycle (measurement followed by standby).

7. USH-8 Technical specifications

Name	Description
Measurement range – snow depth	Measurement range: 0 to 8 m; resolution: 1 mm; accuracy: 0.1 % (FS) Measurement principle / sensor: ultrasonic (Frequency 50 kHz; beam width 12°)
Measurement range – temperature	Measurement range: -35 °C to +60 °C; resolution: 0.1 °C; non-linearity: ≤0.15 % Measurement principle / sensor: semiconductor (external sensor in air-cooled radiation shield)
Functions	Distance or depth measurement (configurable)
Interface – analog	Distance / snow level Signal: 4 to 20 mA (configurable); resolution: 12 bit; max. load 300 Ω
Interface – digital	Distance / snow level and air temperature Interface: RS 232; data transfer rate: 1.2 to 19.2 kBd Protocol: various ASCII protocols
Supply	Supply voltage: 11 to 15 V DC Current consumption: 200 mA max. (measurement phase, approx. 3 s); 5 mA (standby) Power consumption: 0.5 Ah / day (with 1-minute measuring interval)
Lightning protection	Discharge capacity: built-in lightning protection with 0.6 kA discharge capacity
Range of application	Operating temperature: -35 °C to +60 °C
Housing	Basic dimensions: diameter: 80 mm; length: 230 mm Thermal shield dimensions: diameter: 110 mm; length: 120 mm Material: anodised aluminium, natural finish Total weight: 2 kg
Protection rating	IP 66
Installation	Mast-mounting device for 61 mm (2") pipe

8. FAQ

8.1. No values

Problem: False parameterization of “S-range blanking”

Solution 1: Check the parameter “S-range blanking“ and in case of doubt use the default settings

Solution 2: The value for parameter “S-range blanking” must be greater than 828mm (default setting). Is the measurement surface closer than 828mm to the sensor then the sensor measures false or the sensors outputs the value “9999”

Problem: False parameterization of “L-range blanking”

Solution: The value for parameter “L-range blanking” have to be greater than the distance to the measurement surface or the grassroots (soil). If the sensors receive reflexion signals which are in the range of the “L-range blanking” these signals are filtered. The target (measurement surface) have to be within the measurement range.

To receive valid measurement values the measurement range have to be larger than 900mm. The value for the “L-range blanking” has to greater than the “S-range blanking” plus 900mm.

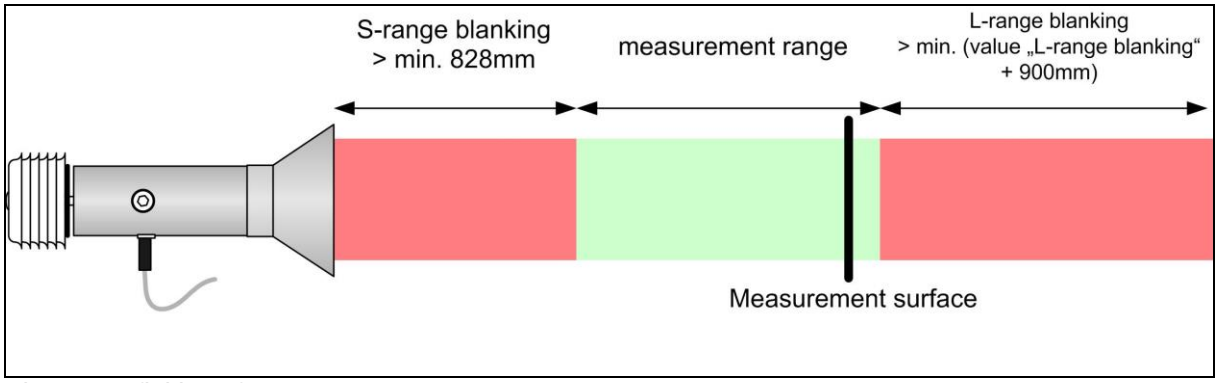


Fig. 11: Definition of measurement range

8.2. Measures always the same measurement values

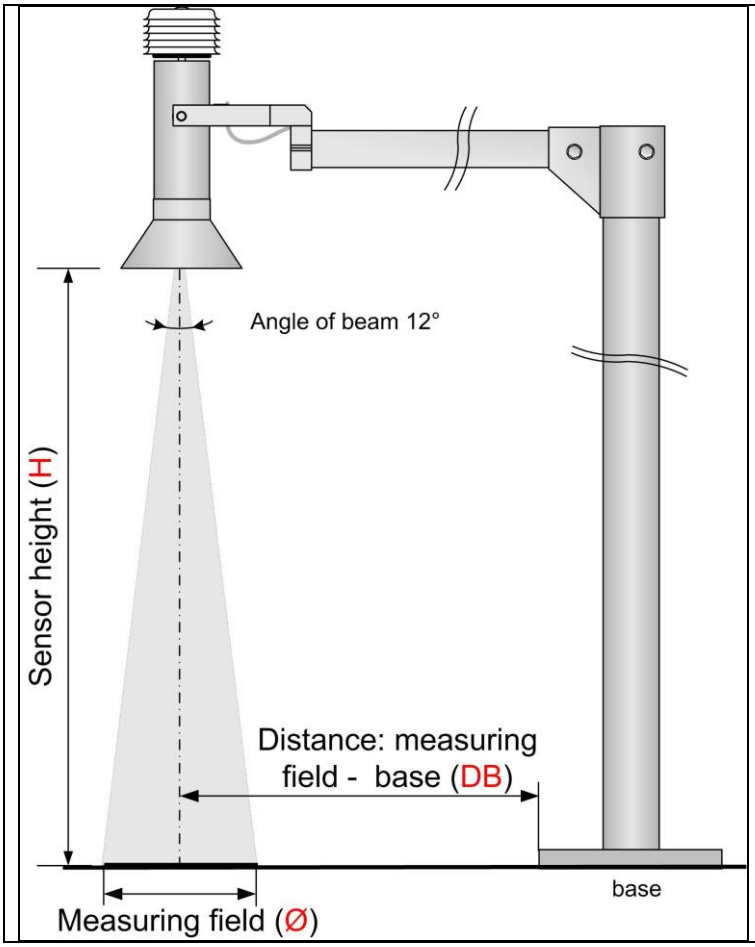
Problem: The sensor receive an echo from the “S-range blanking”-range. The sensor filter these echos (reflexion signal) and outputs the last valid measurement value until the sensor receives a valid echos which is outside the “S-range blanking”-range.

Solution: Within the “S-range blanking”-range no object should be placed there – remove the object (e.g. snow drift,…)! After a reset of the sensor (swith power off/on) you receive again valid measurement values. If the distance between the snow cover and sensor sensor to close (snow cover is within “S-range blanking”-range) you have to mount the sensor higher.

8.3. Inaccuracy measurement values

Problem: Vage focus of measurement field.
If an object is within the field of view of the sensor (e.g. base of the mast, clamp of another sensor, snowdrift because of surrounding fence, terrain ridge etc.) the sensor cannot exactly detect the right measurement surface. The sensor measures inaccurately.

Solution: Check the setup of the measurement site: distance measuring field to base



H (m)	Ø (m)	AF (m)
2	0,6	1,0
3	1,0	1,2
4	1,3	1,4
5	1,6	1,6
6	1,9*	1,8
7	2,2	2,0
8	2,5	2,2

8.3.1. Fence around measurement site

Problem: To keep out animals, people,… from the measurement site often a fence is installed. Often the distance between fence and the measuring field is to close and snow drift can occur.

Solution: Increase the distance between fence and measuring field or re-position the sensor.

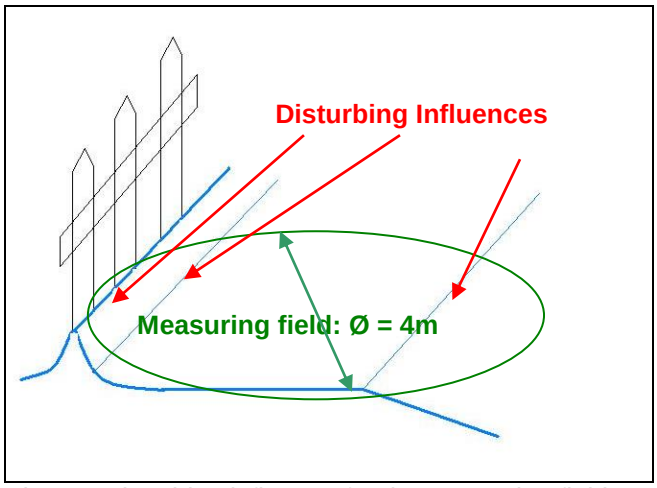


Fig. 12: Disturbing influence for the measuring field

8.4. Sensor outputs incorrect measurement values

Problem: After a re-positioning of the sensor incorrect measurement values are outputted.

Solution: By default the sensor uses an increasing and decreasing damping filter. If the measurement value changes too much from one measurement to the next the filters limit the increase/decrease of the measurement value. To reset this filter switch the sensor off and then on again. This will cause the internal memory to be cleared and the next measurement result will not be influenced by the last measurement.

8.5. Measurement in a room for e.g. testing

Problem: The sensor measures false.

Solution: In principle the sensor can also measure in a room or closed channel. Because of the surrounding walls and the ceiling disturbing reflections of the ultrasonic pulses can occur and influence the measurement results. Change the setting of the parameter “signal strength” in the special service menu or call SOMMER support.

9. RoHs – Declaration of Conformity

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RoHS-Konformitätserklärung

Die Richtlinie 2002/95/EG der Europäischen Union zur Beschränkung und Verwendung bestimmter gefährlicher Stoffe in elektrischen und elektronischen Geräten (RoHS), tritt am 1. Juli 2006 in Kraft. Dabei handelt es sich namentlich um folgende Substanzen:

Blei (Pb)
Cadmium (Cd)
Hexavalentes Chrom (CrVI)
Polybromierte Biphenyle (PBB)
Polybromierte Diphenylether (PBDE)
Quecksilber (Hg)

Sommer GmbH & Co KG erklärt hiermit, dass ab Juli 2006 sämtliche unserer Produkte RoHS-konform produziert werden sofern sie in den Anwendungsbereich dieser Regelung fallen.

RoHS Declaration of Conformity

Directive 2002/95/EC of the European Union on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) becomes operative as from the 1st of July, 2006. Following substances namely are involved

Lead (Pb)
Cadmium (Cd)
Hexavalent chromium (CrVI)
Polybrominated biphenyls (PBB)
Polybrominated diphenyl ethers (PBDE)
Mercury (Hg)

Sommer GmbH & Co KG herewith declares that its products from July 2006, will be manufactured RoHS conformable, if the products are consistent with the application range of this declaration

Koblach, 1. Juli 2006

Wolfram Sommer
Geschäftsführer

10. CE – Declaration of Conformity

Konformitätserklärung
Declaration of conformity
Déclaration de conformité

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erklärt in alleiniger Verantwortung, dass das Produkt
declare under our sole responsibility that our product
declare sous sa seule responsabilité que le produit

USH-8

auf das sich diese Erklärung bezieht, mit den folgenden Normen übereinstimmt
to which this declaration relates is in conformity with the following standards
auquel se réfère cette declaration est conforme aux norms

EN 61326

gemäß den Bestimmungen der Richtlinie
following the provision of Directives
conformément aux disposition des Directives

89/336 EWG

Koblach, den 10.05.2004

Wolfram Sommer
Geschäftsführer