OTT HydroMet

Lufft

an OTT HydroMet brand

SHM31 Snow Depth Sensor

Operational Manual

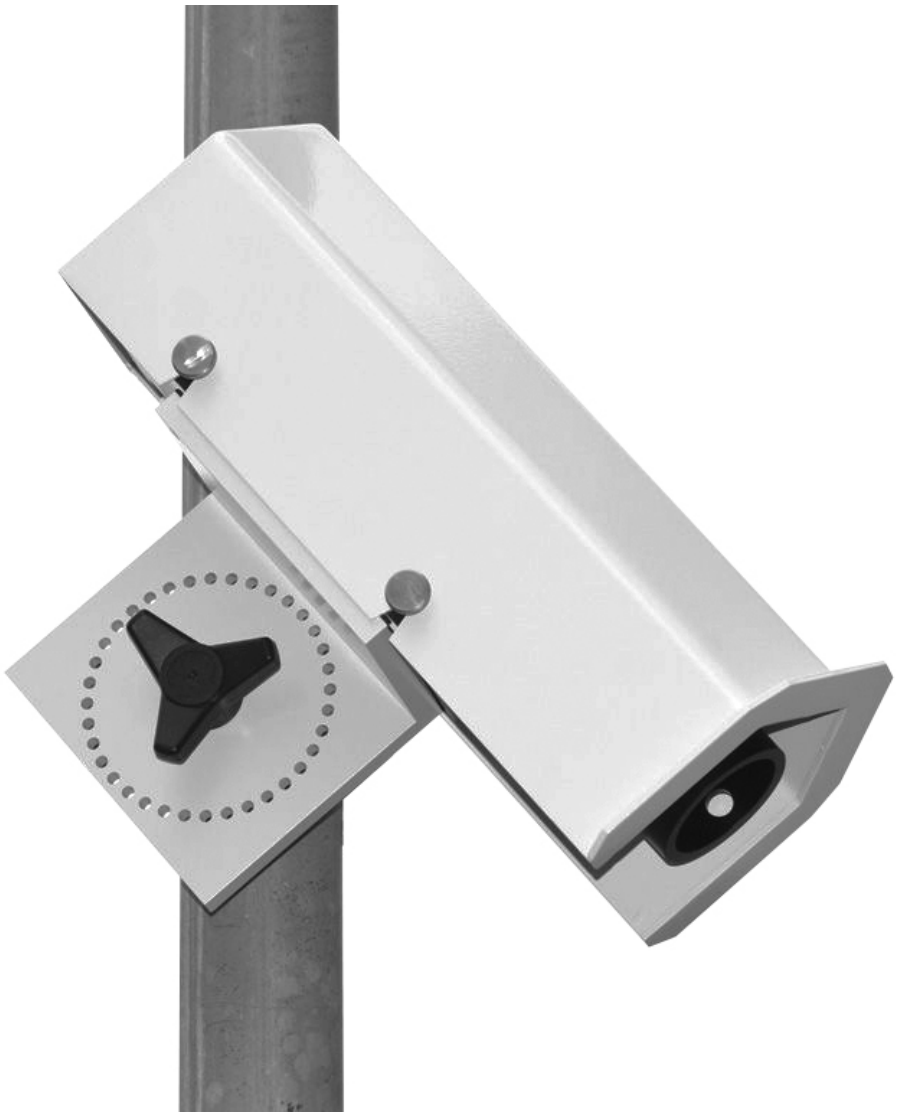

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Table of contents

1 Scope of supply

The following items are included with delivery:

- SHM31 sensor
- Test report
- Quick start guide
- USB stick with the SHM31 Operational Manual and ConfigTool.NET software

2 Order numbers and variant code

2.1 Product variants

Variant	Order number
Snow depth sensor SHM31	8365.30

2.2 Accessories and spare parts

Item	Order number
SHM mounting clamp, steel, up to 80 mm	8365.608-11
SHM mounting clamp, steel, up to 300 mm	8365.609-11
SHM mounting clamp, steel, standard up to 72 mm	8365.610-11
SHM connecting cable, 15 m	8365.KABO15
SHM connecting cable, 50 m	8365.KABO50
Reference target plates (set)	8365.KWK-SET

3 About this manual

3.1 Other applicable documents

The following documents and software contain further information on installation, maintenance and calibration:

- User Manual SHM31 Snow Depth Sensor
- UMB protocol
- ConfigTool.NET software
- Firmware

The documents and software can be downloaded at: www.otthydromet.com

3.2 General signs and symbols

The signs and symbols used in the operational manual have the following meaning:

Practical tip

i This symbol indicates important and useful information.

Action

✓ Prerequisite that must be met before performing an action.

▸ Step 1

⇨ Intermediate result of an action

▸ Step 2

⇨ Result of a completed action

List

- List item, 1st level
  - List item, 2nd level

3.3 Explanation of warnings

To avoid personal injury and material damage, you must observe the safety information and warnings in the operating manual. The warnings use the following danger levels:

WARNING

WARNING

This indicates a potentially hazardous situation. If the hazardous situation is not avoided, it may result in death or serious injuries.

CAUTION

CAUTION

This indicates a potentially hazardous situation. If the hazardous situation is not avoided, it may result in moderately serious or minor injuries.

NOTICE

NOTE

This indicates a situation from which damage may arise. If the situation is not avoided, products may be damaged.

4 General safety instructions

4.1 Intended use

The SHM31 snow depth sensor is used to measure snow level detection over long distances in all weather conditions.

4.2 Potential misuse

Any use of the product that does not comply with the intended use, be this intentional or negligent, is forbidden by the manufacturer.

- Use the product only as described in the operational manual.

4.3 Personnel qualification

The equipment described in this manual must be installed, operated, maintained and repaired by qualified personnel only.

- Obtain training from OTT HydroMet if necessary.

4.4 Operator obligations

The installer is responsible for observing the safety regulations. Unqualified personnel working on the product can cause risks that could lead to serious injury.

- Have all activities carried out by qualified personnel.
- Ensure that everybody who works on or with the product has read and understood the operational manual.
- Ensure that safety information is observed.
- File the operational manual together with the documentation of the entire system and ensure that it is accessible at all times.
- The operational manual is part of the product, forward the operational manual together with the product.

4.5 Personnel obligations

To avoid equipment damage and injury when handling the product, personnel are obliged to the following:

- Read the operational manual carefully before using the product for the first time.
- Pay attention to all safety information and warnings.
- If you do not understand the information and procedure explanations in this manual, stop the action and contact the service provider for assistance.
- Wear the necessary personal protective equipment.

4.6 Correct handling

If the product is not installed, used and maintained correctly, there is a risk of injury. The manufacturer does not accept any liability for personal injury or material damage resulting from incorrect handling.

- Install and operate the product under the technical conditions described in the operational manual.
- Do not change or convert the product in any way.
- Do not perform any repairs yourself.
- Get OTT HydroMet to examine and repair any defects.
- Ensure that the product is correctly disposed of. Do not dispose of it in household waste.

4.7 Installation and maintenance at high places

When the product is installed and maintained at high places, special safety measures must be taken to avoid personal injury.

- Observe and follow the local safety regulations.
- Use suitable safety equipment.
- Inspect the safety equipment before use.
- Secure the person mounting or maintaining the product against falling down.
- Secure the product against falling down.

4.8 Certification

CE (EU)

The equipment meets the essential requirements of EMC Directive 2014/30/EU.

FCC (US)

FCC Part 15, Class "B" Limits

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

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

IC (CA)

Canadian Radio Interference-Causing Equipment Regulation, ICES-003, "Class B"

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Laser

- IEC 60825-1 Laser Class 2
- FDA Accession Number

5 Product description

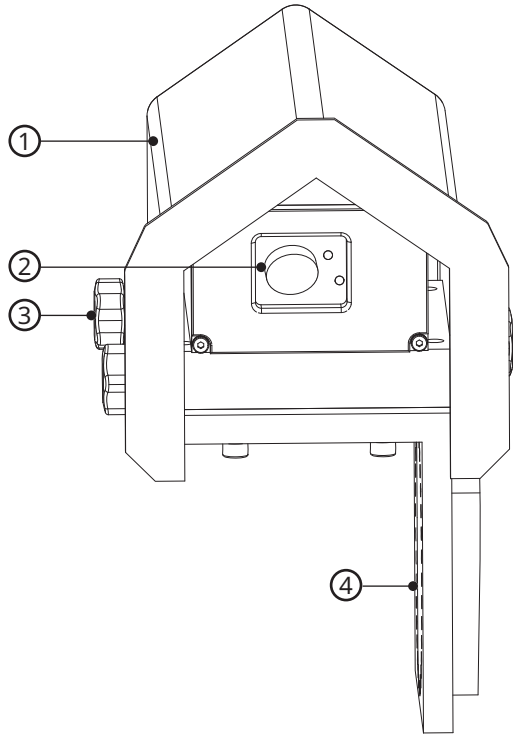
5.1 Design and function

The snow depth sensor is used for snow weather monitoring.

The device is connected by way of an 8-pin plug-in terminal and associated connection cable. The measured values are requested over the RS-485 or RS-232 interface with UMB protocols or SDI-12. During commissioning via RS-485 with UMB binary protocol, configuration and verification takes place using the ConfigTool.NET software.

The device has two integrated heating circuits. One circuit brings the laser to the right temperature and prevents fogging of the optical window. The ohter circuit can be parameterized and is used in "defrost mode" to de-ice the pane.

5.2 Product overview



1	Housing	3	Knurled screws (3x)
2	Laser	4	Perforated ring

6 Transport, storage, and unpacking

6.1 Transport

- Transport the product always in its original packaging.
- Ensure that the product is not mechanically stressed during transport.

6.2 Storage

- Store within specified temperature ranges.
- Store in dry area.
- Store in original box where possible.

6.3 Unpacking

- Carefully remove the product from the packaging.
- Check that the delivery is complete and undamaged.
- If you find any damage or if the delivery is incomplete, then immediately contact your supplier or manufacturer.
- Keep the original packaging for any further transportation.

7 Installation

7.1 Mechanical installation

7.1.1 Required tools and aids

The following tools and aids are required:

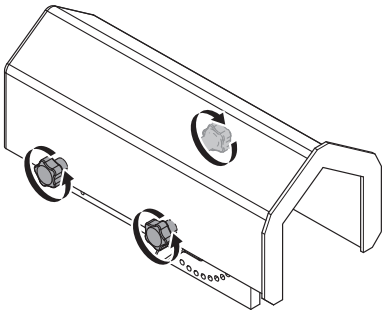
- adjustable wrench
- screwdriver for electrical connections on terminal block, size 2 x 40 mm to 2,5 x 65 mm

7.1.2 Installing device

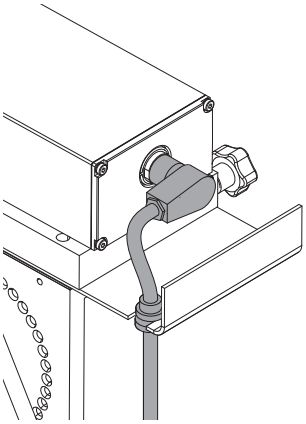
- Mount the mast clamp securely to the mast.

The sequence of the following installation is not fixed and depends on the local conditions.

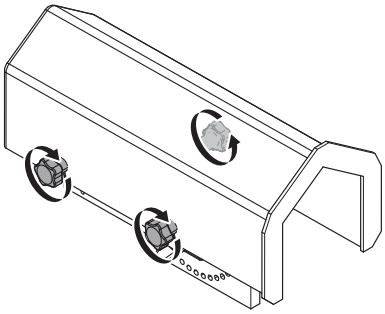
- Loosen the 3 knurled screws and remove the housing.



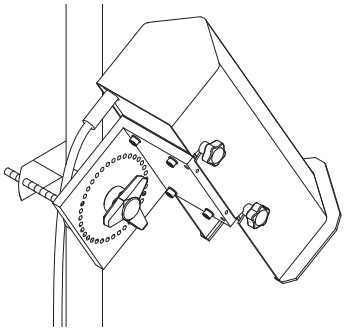
- Insert the cable with the strain relief sleeve into the recess in the side of the base plate and screw the plug tight.



- Fasten the housing with the 3 knurled screws.

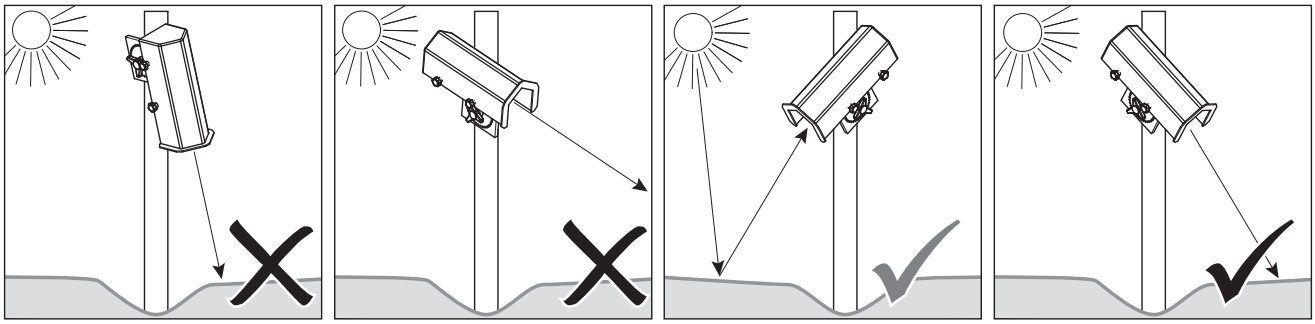


- Place the device on mast clamp pins using the 360° perforated ring and lock with the tristar knob.



7.1.3 Alinging device

- Align the device at an tilt angle (α) of 10 to 30 degrees to the surface.



This prevents that snow falling from the mast or the device itself from affecing the measured result. If an angle is too large, this causes the laser beam to hit the ground at too flat an angle, which may give a vague and inconsistent distance measurement result. The larger the tilt angle, the more the snow depth calculation is influenced by the angle measurement.

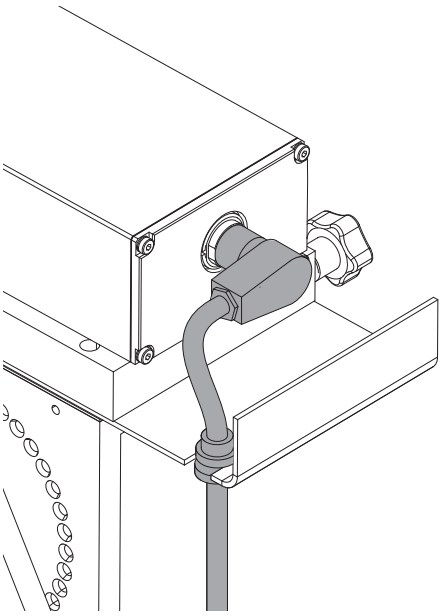
When delivered, the reference angle is used to calculate the snow depth. The reference angle is determined during the zero measurement after installation, together with the reference height.

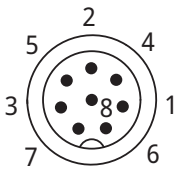
i Further information can be found in the User Manual SHM31 Snow Depth Sensor.

7.2 Electrical installation

7.2.1 Electrical connections

There is an 8-pin plug on the device's housing. This serves to connect the supply voltage and the data interface via the connection cable.





Pin assignment

Number	Color	Assignment	Comment
1	Pink	RS-232_TX	RS-232 transmission line
2	Yellow	B_RS-485 / SDI-12	RS-485 B / SDI-12 data line
3	Red	EXT_TRIG_IN	Heating release +
4	Gray	GND	RS-232 / RS-485 ground
5	Green	A_RS-485	RS-485 A
6	Blue	RS-232_RX	RS-232 receiving line
7	White	V_IN_-	Supply voltage – SDI-12 ground
8	Brown	V_IN_+	Supply voltage +

7.2.2 Grounding device

There is no secure, electrically conductive connection to a grounded mast via the screw joints and mast clamp.

- Connect the shielding of the device's connection cable to ground in the switch box.

7.2.3 Setting heating

The device can be configured such that the heating is only switched on after a positive voltage signal has been applied, typically 5 – 12 V DC with 12 V DC operating voltage or 24 V DC with 24 V DC operating voltage. This allows the heating to be operated in battery mode, for example, regardless of the internal heating configuration.

8 Commissioning

8.1 Switching on the device

WARNING

Risk of eye injury due to laser beams!

Looking directly into the laser beam can injure the eyes.

- Do not look directly into the laser beam.
- Observe the laser beam indirectly.

As soon as the device is supplied with power, it starts its internal measuring cycle and can be addressed over RS-232, RS-485 or SDI-12. After the sensor is switched on, it will require a start-up time of a few seconds before communication is possible.

- Connect the device to power.
- Use a sheet of paper to check that the laser is transmitting.

8.1.1 Factory settings

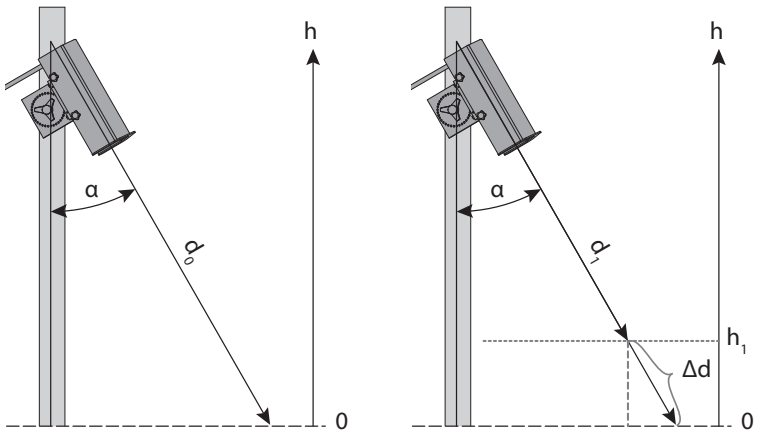
The current measured values are measured values averaged over 60 seconds. A new measurement is performed internally every 10 seconds. For the current measured values, averages are taken and provided for 6 out of these 10 seconds.The measured values labelled avg, min and max are output as averages over 10 minutes with the default settings.

8.1.2 Settings over RS-232 or RS-485

To address the device via RS-232, a terminal program with the UMB-ASCII protocol can be used. For communication via RS-485, the UMB ASCII 2.0 or the UMB binary protocol can be selected. For setting up the device via RS-485, the ConfigTool.NET software with UMB binary protocol is recommended.

8.1.3 Performing automatic zero measurement

The automatic zero measurement is used to measure the distance d_0 to the surface and the installation angle α. The measured values are stored in the internal memory as reference values.



- Communicate the existing snow depth to the device as an offset value.
- To perform the zero measurement with the ConfigTool.NET software, refer to Calibrating the device [▶ 21].

8.2 Configuration using ConfigTool.NET

For configuration and testing OTT HydroMet Fellbach GmbH provides the proprietary software ConfigTool.NET. The ConfigTool.NET software can communicate over a serial, a Bluetooth or a network interface and allows the following communication steps:

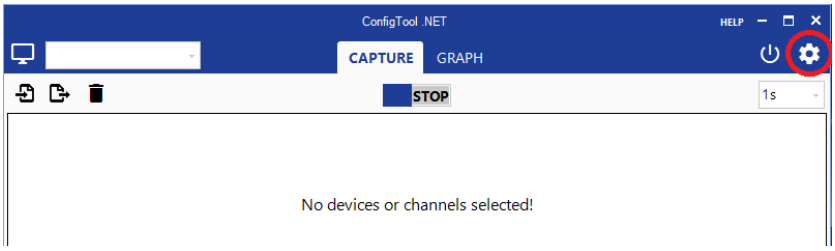
- Reading out the device's individual UMB channels
- Automatically querying, graphically displaying and storing the measured data
- Performing firmware updates
- Controlling the device using parameter lists
- Control commands, such as determining reference values, defrost mode, etc.

To use the ConfigTool.NET software, the following steps must be taken:

- Download the ConfigTool.NET software at: www.otthydromet.com
- Install the software on the computer.
- Get familiar with the software in general.
- Ensure to always use the latest version of ConfigTool.NET.
- Ensure that the connection settings of ConfigTool.NET are conform to the settings of the device.

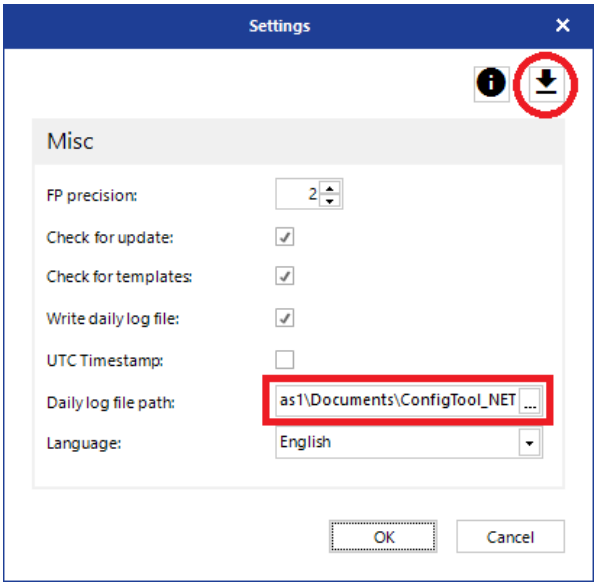
8.2.1 Basic installation with ConfigTool.NET and serial interface

- Install and launch the current ConfigTool.NET software.
- Click the *Settings* icon on the start page.

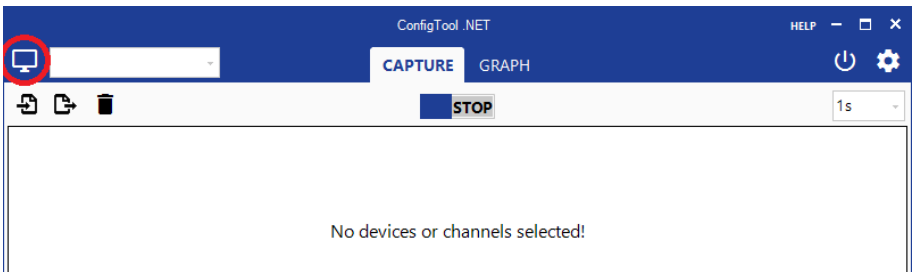


⇨ The *Settings* window appears.

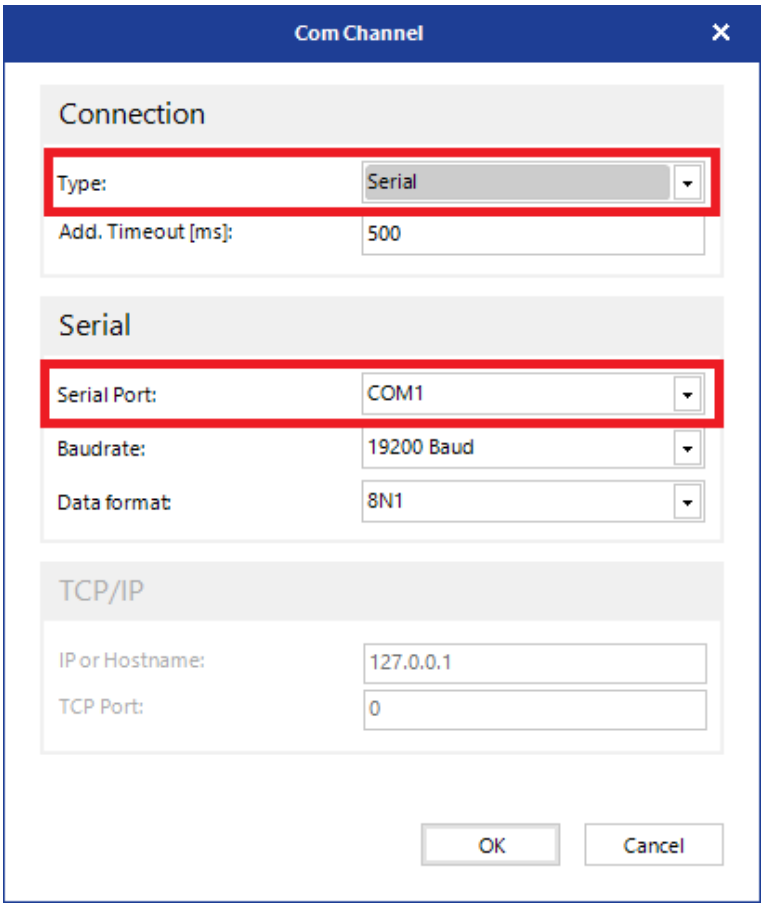
- If necessary, create or select the *Daily log file path* where ConfigTool.NET should save the log file for the measurements.



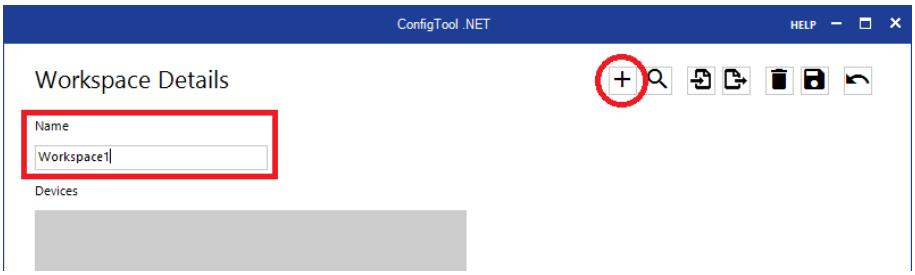
- Use the device template download function to update the list of available UMB channels.
- Confirm the changes with **OK**, or click on **Cancel** to return to the start screen.
- To create a new workspace, click the *Edit Workspaces* icon. Different workspaces can be set up to manage sensor settings and measurements.



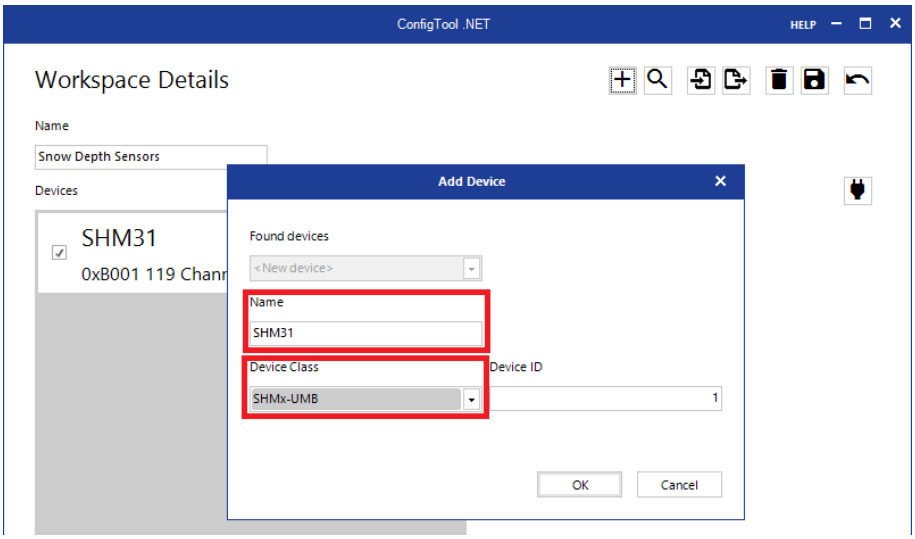
- Make the following connection settings. The connection settings must be made for each new workspace.



- Confirm the changes with **OK**.
  - ⇨ The *Workspace Details* page appears.
- Enter a *Name* for the workspace.

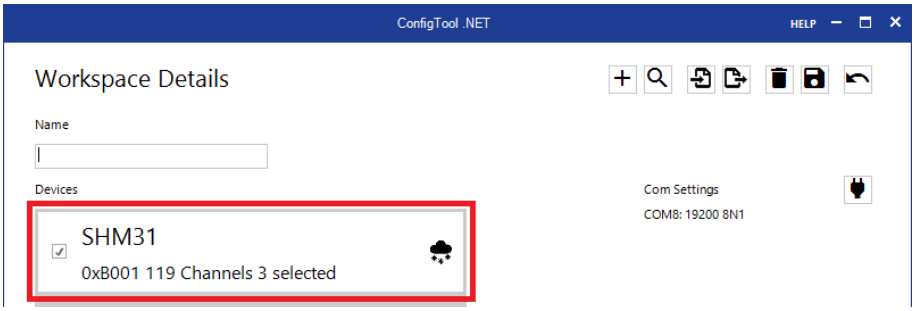


- To assign a device to the new workspace, click the *Add Device*  icon.
  - ⇨ The *Add Device* window appears.
- Enter a *Name* for the device.



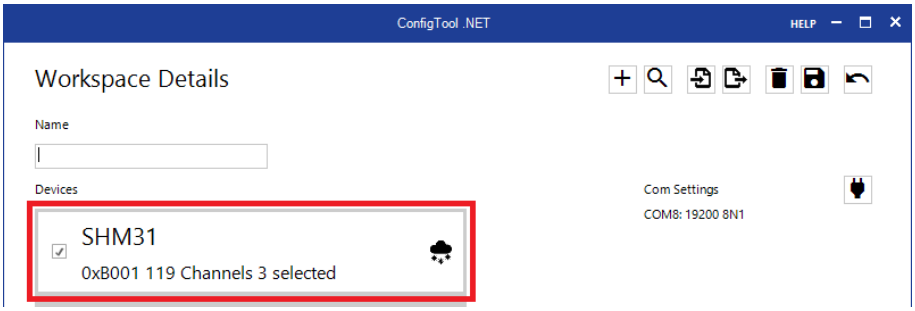
- Select the *SHMX-UMB* from the *Device Class* drop-down menu.
- Confirm the changes with **OK**.

⇨ The device appears under *Devices* on the *Workspace Details* page.

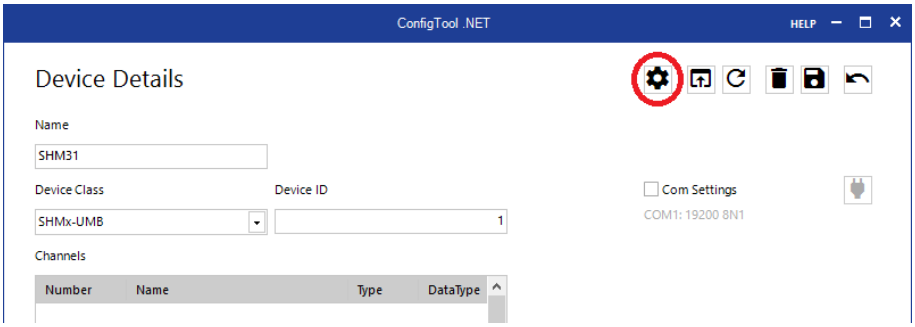


8.2.2 Calibrating the device

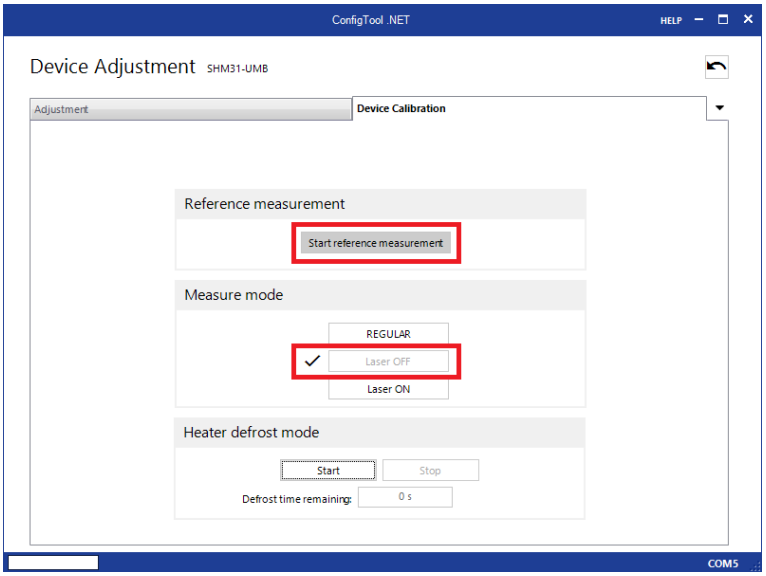
- Click the device row on the *Workspace Details* page to open the *Device Details* page.



- Click the *Settings* icon to open the *Device Settings* page.



- On the *Device Settings* page click the *Calibration*  icon.
  - ⇨ The *Device Adjustment* page appears.
- Select the *Device Calibration* tab.

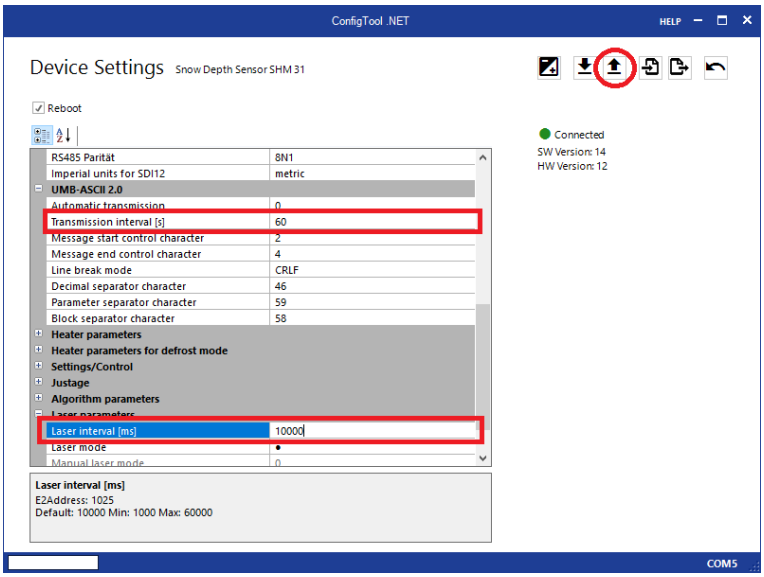


- Click the **Start reference measurement** button.
  - ⇨ The device measures its angle and distance from the ground and use the measured values as references for future measurements. This process takes about 2 minutes. The device is calibrated for measurement.
- Click the *Back*  icon to return to the *Device Settings* page.

8.2.3 Setting parameters

Once the device is calibrated, additional parameter can be set on the *Device Settings* page.

- To open the *Device Settings* page, see section Calibrating the device [▶ 21].
- Set the *Transmission interval [s]* in the *UMB-ASCII 2.0* section. This value determines how often the device will provide new snow depth.



- To set the device's measurement interval, use the *Laser interval [ms]* in the *Laser parameters* section. All individual measurements taken within a transmission interval are averaged over this period of time.

> The laser interval must not be less than 5,000 ms, as the duration of a single measurement can be significantly longer under certain conditions, such as a dark target surface.

- Ensure that the Reboot checkbox is activated.
- Click the  icon to transfer the changes to the device.
  - ⇨ The device is automatically restarted once the changes have been transferred. The device's settings are updated.
- Click the *Back*  icon to return to the *Device Details* page.

8.2.3.1 Device parameters

The following table shows the adjustable parameters of the *Device Settings* page

Parameter	Default value	Range	Description
Device parameter			
Device-ID	1	1 to 255	To be set when using more than one device in the bus (e.g. UMB or SDI-12)
Description	snow depth sensor	max. char. 39	–
Station-ID	0	0 to 99999	Additional ID (optional)
Baudrate	19200	1200 to 57600	Communication Baudrate
Protocol	umb-binary	umb-binary, umb-ascii 2.0, sdi-12,modbus	The communication protocol used by the device

Parameter	Default value	Range	Description
Timeout for protocol change [min.]	10	1 to 60	Duration after which the protocol is being reactivated in the case of a temporary changeover.
RS-485 Parity	8n1	8n1, 8e1, 7e1 (sdi-12), 8n2	Serial port parity setting
Imperial units for SDI-12	metric	metric, sdi-12 us-units	–
UMB-ASCII 2.0			
Automatic transmission	0	0 to 99	0 = polling mode 1 = available data telegram
Transmission interval [s]	60	0 to 65535	Processing rate for measurements (calculation of snow depth, averages, etc. and preparing the data string for transmission)
Message start control character	2	0 to 127	Protocol start character
Message end control character	4	0 to 127	Protocol end character
Line break mode	crlf	cr, lf	Protocol line feed character
Decimal separator char.	46	0 to 127	Decimal mark character used
Parameter separator character	59	0 to 127	Parameter delimiter character used
Heater parameters			
Operating mode of the window heater	automatic	off, automatic, defrost	Heater mode for the sensor window
Operating mode of the block heater	automatic	automatic	Heater mode for the sensor housing
Target temperature of the window heater [°C]	20	-50 to +50	Mean target temperature of window
Target temperature of the block heater [°C]	7.5	-50 to +50	Mean target temperature of housing
Hysteresis for window heating [°C]	2.5	0 to 5	Switching point below (heating on) and above (heating off) target temperature
Hysteresis for block heating [°C]	2.5	0 to 5	Switching point below (heating on) and above (heating off) target temperature
Voltage threshold of heating [V]	17	12 to 19	If internal supply voltage exceeds this value, heaters are operated in 24 V mode instead of 12 V mode.
Heating control via external input	disabled	enabled, disabled	If enabled wire heating release (+) needs to be connected to (+)
Heater parameters for defrost mode			
Target temperature of the window heater defrost mode [°C]	25	-50 to +50	The window heater will maintain the selected temperature during defrost mode.
Target temperature of the block heater defrost mode [°C]	35	-50 to +50	The block heater will maintain the selected temperature during defrost mode.

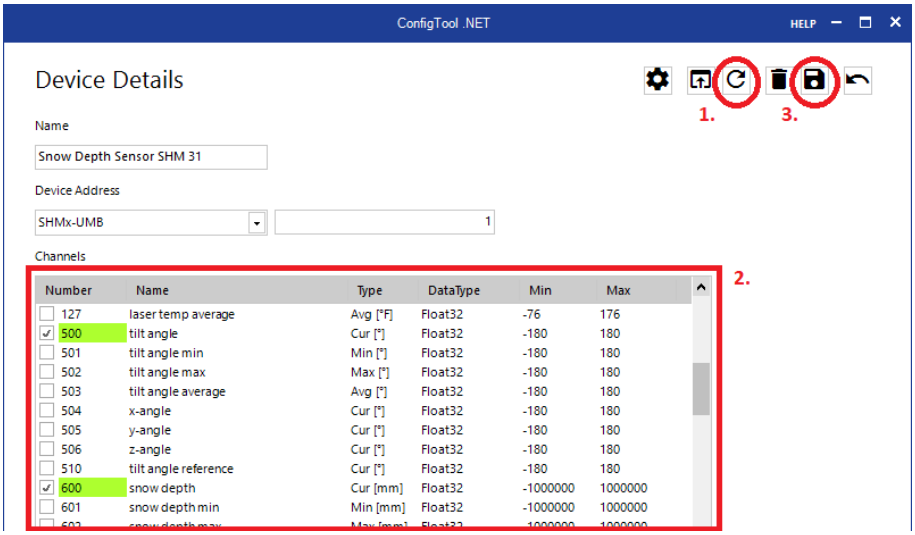
Parameter	Default value	Range	Description
Hold time for window defrost [min.]	15	1 to 255	Select the duration of the window defrost procedure.
Hold time for block defrost [min.]	15	1 to 255	Select the duration of the housing defrost procedure
Automatic defrost after startup	no	n/y	–
Settings/Control			
Standby	–	–	Not yet implemented
Auto start command	MST	MST, LON	Boot up mode for the sensor MST = starting measurements LON = laser on
Scaling factor	1	1 to 40000	Change of units, e.g. meter (sf = 1) to foot (sf = 3.2808399). After a change of the scaling factor SCF the parameters AOF, MSD and the distance value in the telegram are converted into the new units.
Channel average count	10	1 to 120	Number of measurements used to calculate the values for averaged UMB channels (*_avg) and the min/max values
Justage			
Reference height [mm]	0	-20000 to 20000	Will be automatically set during the device calibration procedure or can be set manually.
Reference angle [°]	0	-180 to +180	Will be automatically set during the device calibration procedure or can be set manually.
Algorithm parameters			
Use accelerometer angle	0	0.1	0 = use reference angle from calibration 1 = use the sensors accelerometer value as reference during each measurement
Signal threshold for snow	130	0 to 255	Sets the signal intensity as threshold for the snow-flag
Maximum snow depth change [mm]	20	-10000 to 10000	Maximum of allowed snow depth changes between two measurements. Use 10000 as value for installation to prevent error messages due to vast changes in measured distances (e.g. due to obstruction).
Accept time for changed snow depth [s]	600	0 to 65535	Time interval for the snow depth value to be accepted, allthough exceeding the sensors maximum snow depth change rate.

Parameter	Default value	Range	Description
Laser parameters			
Laser interval [ms]	10000	1000 to 60000	Time interval for the laser-measurement of the sensor. Use below 5000 ms is not recommended.
Laser mode	–	–	Not yet implemented

8.2.4 Checking function

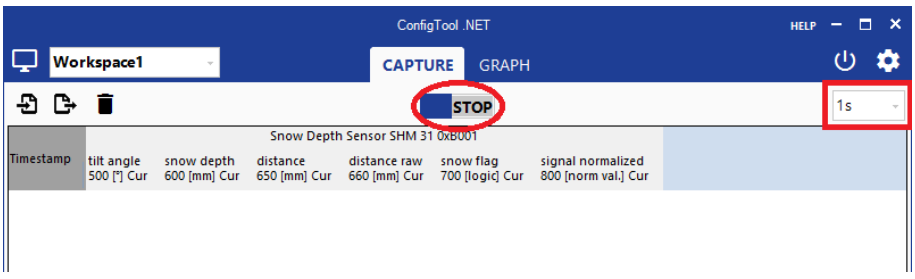
To check the functionality of the device, all channels that ConfigTool.NET can read can be selected. For an initial sensor check, channels 500, 600, 650, 660 700 and 800 are recommended. The channel selection can be changed at any time.

- Click the *Load Channel List*  icon on the *Device Details* page.



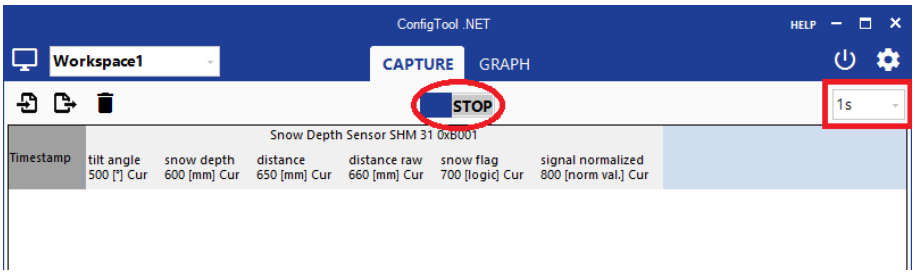
- Select the desired channels.
- Click the *Save Device*  icon.
  - ⇨ The *Workspace Details* page appears.
- Click the Save Workspace  icon.

⇨ The start page appears with columns for device channels measured values.



8.2.5 Starting measurement

- Select how often to poll the device for measured values from the *Measurement query rate* drop-down menu on the right-hand side of the start page.



  ⇨ The measured values are written to the log file at the selected interval. The interval does not change the device's measuring sequence previously defined in the device settings.

- To start the measuremet, move th switch in the middle of the start page to the *RUN* position.

⇨ The device's measured values appears at the selected interval.

> To prevent data clones, do not set the query rate lower than the transmission interval. The sensor returns the available measured values.

8.3 Communication over UMB or Modbus mode

The device can be operated with various protocols, e.g. UMB-ASCII 2.0. Further information on the protocols and the full description of the UMB channels, or the ASCII 2.0 and Modbus protocol can be found in the User Manual SHM31 Snow Depth Sensor.

9 Maintenance

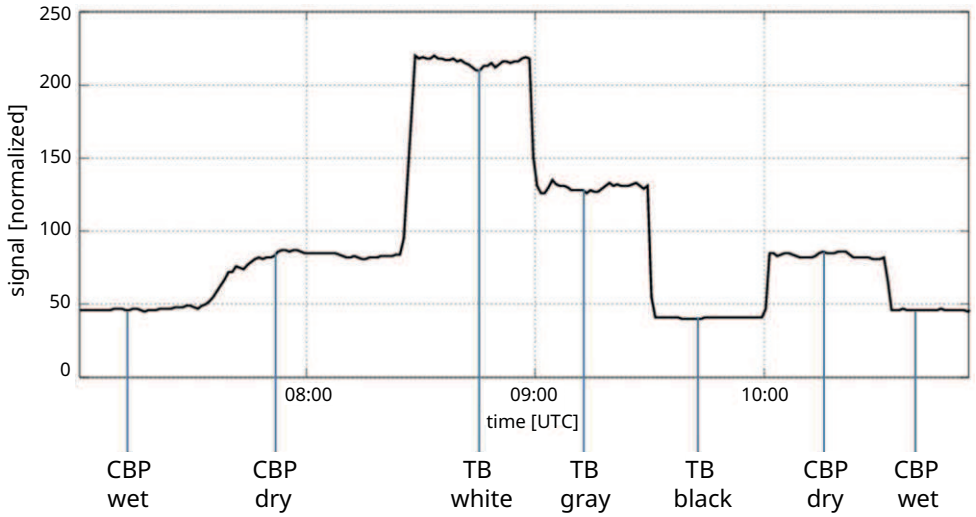
9.1 Checking signal quality

If the device seems to be measuring insufficiently, the quality of the signal can be checked with the target plate set (8365.KWK-SET).

The set consists of the following DIN A4-sized plastic plates:

- White card in protective cover with approx 85 % reflectance
- Black card in protective cover with approx 6 % reflectance

The signal intensity can be tested with the distance as a function of the target plates and different reflectivities. The curves in the figure below show the different signal intensities determined with different target plates. The reflectivity of the white and black target plates corresponds to the light and dark targets that are stored in the device for five different distances during factory normalization.



Variation of the signal intensity using different target plates. BP: Base plate, TP: Target plate

The measurements were obtained with the following mesurement setup:

Checking the signal quality with the white card

The domain for the signal intensity (signal normalized) is between 0 and 255. The sensors are set to achieve a value of approximately 50 for the black plate and 200 for the white plate. The exact values for the calibration are documented in the factory certificate.

In this sample measurement, these values were compared with the measured values on the concrete slab in dry and wet conditions. Another card with a 50 % reflectance was also used.

The device tolerance in signal intensity is in the order of 20 %. This allows a rough distinction to be made between a dark surface (grass, asphalt) and snow coverage. The threshold is stored in the sensor at 130 as the default value and can be adjusted if necessary. The "snow flag" = 1 is set above the threshold. It is zero below the threshold.

9.2 Cleaning the target plate set

- Clean the cards with water and some washing-up liquid.
- Do not use any harsh cleaning products or solvents.
- Remove residual moisture or residues of cleaning products with a lint-free cotton cloth.

9.3 Cleaning the front glass pane

CAUTION

Risk of slight burns due to warm surface!

As soon as the device is connected to the power supply, the device starts to heat up. Touching the warm surface can be painful and can cause fright.

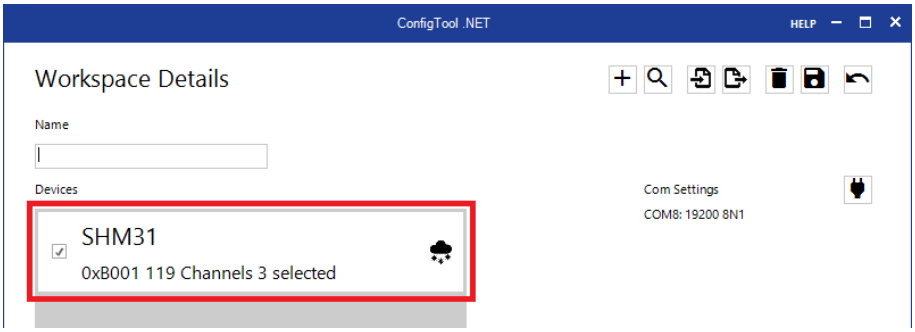
- Disconnect the device from the power supply and allow it to cool down.
- Wear protective gloves.

- Clean the glass pane of the transmitter or receiver with a damp, wrung out cloth.
- Dry the pane with a dry lint-free cloth.
- Remove dust and dirt from the housing.

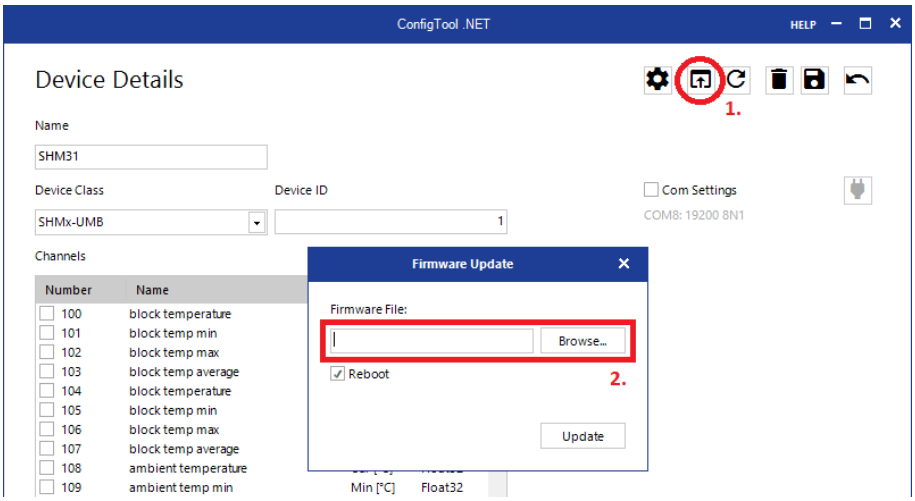
9.4 Updating firmware

The firmware can be updated with the ConfigTool.NET software. The firmware is valid for all types of the device. The description of the update can be found in the ConfigTool.NET software.

- Download the latest version of the firmware and the ConfigTool.NET software: www.otthydromet.com/en/software_firmware
- Launch ConfigTool.NET and switch to the *Workspace Details* menu.
- Select the SHM31 from the *Devices* list.



- Click on the update icon (1) and select the downloaded *Firmware File* (2) in the *Firmware Update* window.



- Ensure that the check box *Reboot* is selected. Otherwise, only the firmware is transferred, but the device does not work with the new firmware.
- Click on **Update**.

10 Troubleshooting

10.1 Error elimination

Error	Possible cause	Corrective action
Device cannot be queried or is not responding	Incorrect connection	▸ Check the power supply. ▸ Check the cable. ▸ Check the interface connection. If necessary, use the RS-232 interface to determine whether the error is only with the RS-485 interface.
Device provides implausible values	– Transmitting and receiving window is dirty – Laser beam is reflected back into the laser – Target is ambiguous, e.g. due to a water column on the substrate	▸ Clean the front glass pane. ▸ Check whether the device is mounted correctly. ▸ Check the reference values.

10.2 Error codes

The status codes can be retrieved in the UMB channels 4100 and 4101. The status is also output in the UMB-ASCII 2.0 data telegram.

Error code	Description
E15	Laser: Signal too weak; distance too short
E16	Laser: Signal too strong (mirror reflection effect)
E17	Laser: Background light level too strong
E18	Laser: Measurement disturbed (precipitation, movement, etc.)
E19	Laser switched off due to too many timeouts
E20	Laser communication error (unknown command)
E21	Laser communication error (interface)
E22	Laser communication error (invalid response)
E23	Laser temperature below -15 °C
E24	Laser temperature above +50 °C
E31	Hardware error; EEPROM checksum incorrect (device must be sent in for repair)
E32	Laser: Hardware error; EEPROM checksum incorrect (device must be sent in for repair)
E51	Laser: APD power failure (scattered light or hardware error)
E52	Laser current too high; defective laser (device must be sent in for repair)
E53	Mathematics (division by 0)
E54	Laser: Hardware error (device must be sent in for repair)
E55	Hardware error (sensor must be sent in for repair)
E61	Hardware error in the interface
E62	Incorrect value in the interface communication (SIO parity error)
E63	SIO overflow; check time for output signals in application software

Error code	Description
E64	SIO framing error; serial interface parameter not set correctly to 8N1
E65	Evaluation routine: In some cases, measurements in the calculation interval were ignored because they would have exceeded the maximum permitted change in snow depth.
E66	Evaluation routine: The most recently valid snow depth was output, as all measurements in the calculation interval would have exceeded the maximum permitted snow depth change.
E67	Measurement was cancelled by 'MEN'
E68	No valid telegram available yet (e.g. after starting the measurement with 'MST')
E70	Evaluation routine could not read settings
E71	Evaluation routine has not received any data from the laser
E72	Evaluation routine has no valid laser temperature values
E73	Evaluation routine has no valid block temperature values
E74	Evaluation routine has no valid outside temperature values
E75	Evaluation routine has no valid laser distance measurement values
E76	Evaluation routine: G-sensor vector is an invalid length
E77	Evaluation routine is using the reference angle, as the current angle is invalid
E78	Evaluation routine: Signal calibration: signal_high □ signal_low
E79	Evaluation routine: Signal calibration: Signal too small
E80	Evaluation routine: Signal calibration: Signal too large
E81	Evaluation routine: Signal calibration: no angle correction, as angle > 90 degrees
E82	Evaluation routine: channel_average_count too large
E83	Evaluation routine could not initialise ring buffer for avg / min / max channels

11 Repair

11.1 Customer support

- Have repairs carried out by OTT HydroMet service personnel.
- Only carry out repairs yourself, if you have first consulted OTT HydroMet.
- Contact your local representative: www.otthydromet.com/en/contact-us
- Include the following information:

– instrument model
– instrument serial number
– details of the fault or problem
– examples of data files
– readout device or data acquistion system
– interfaces and power supplies
– history of any previous repairs or modifications
– pictures of the installation
– overview of the local environment conditions

12 Notes on disposing of old devices

Member States of the European Union

In accordance with the German Electrical and Electronic Equipment Act (ElektroG; national implementation of EU Directive 2012/19/EU), OTT HydroMet takes back old devices in the Member States of the European Union and disposes of them in the proper manner. The devices that this concerns are labeled with the following symbol:

- For further information on the take-back procedure contact OTT HydroMet:

OTT HydroMet Fellbach GmbH
Service & Technical Support
Gutenbergstraße 20
70736 Fellbach
Germany
phone: +49 711 518 22 0
email: met-support@otthydromet.com

All other countries

- Dispose of the product in the proper manner following decommissioning.
- Observe the country-specific regulations on disposing of electronic equipment.
- Do NOT dispose of the product in household waste.

13 Technical data

13.1 General technical data

Specification	Value
Laser classification	Laser Class 2 (IEC 60825-1:2014)
Protection type	IP68
Operating temperature range Without heating	-40 to +50 °C -10 to +50 °C (laser inactive ≤ -15 °C)
Storage temperature range	-25 to +70 °C
Humidity range	0 to 100 %
Housing	Sheet aluminum

13.2 Electrical data

Specification	Value
Power supply	12 or 24 V DC, tolerance ±15 %
Power consumption with heating	18 W
Average consumption without heating	0.7 W
Average consumption with 10 s measurement interval and window heating	3.4 W
MTBF @ 25 °C / 40 °C	88 000 h / 50 000 h
Connection cable length while using the RS-232 interface	≤ 15 m

13.3 Data transfer

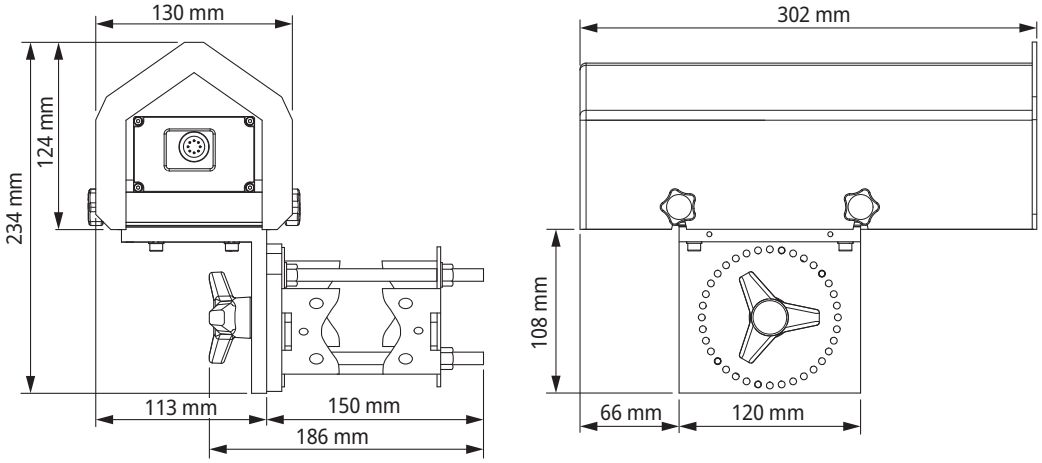
Specification	Value
Interface/Protocol*	RS-485 (half-duplex, two-wire) – UMB binary protocol (19200 Bd, variable) – UMB-ASCII 2.0 – Modbus RTU – Modbus ASCII SDI-12 – SDI-12 protocol RS-232 – UMB-ASCII 2.0 protocol (9600 Bd, fixed)
Data transfer	Polling – UMB – UMB-ASCII 2.0 – SDI-12 – Modbus Auto send function – UMB-ASCII 2.0

* RS-485 and SDI-12 share the same connectors and cannot be used in parallel. RS-232 uses separate connectors and can be operated in parallel with RS-485 or SDI-12.

13.4 Measuring range and accuracy

Specification	Value
Snow depth	0 to 15 m
Mounting distance to surface	0.1 to 16 m
Tilt angle to the vertical position	10° to 30°
Accuracy	± (5 mm + 0.06 %)
Repeatability	0.6 mm
Precision, reproducibility	5 mm
Signal intensity (normalized)	0 to 255

13.5 Dimensions and weight



Specification	Value
Dimensions unpacked (l x w x h)	302 x 130 x 234 mm
Dimensions packed	400 x 240 x 180 mm
Weight unpacked	2.35 kg
Weight packed	3.4 kg
Housing	2 mm

OTT HydroMet

Contact Information