IRS31Pro Intelligent Road Sensor

Operational Manual

Table of contents

<3>

<4>

1 Scope of supply

The following items are included with delivery:
- Passive road sensor
- Installation aid

<5>

2 Order numbers and variant code

2.1 Product variants

Variant	Order number
IRS31Pro-UMB, 50 m cable length	8910.U050
IRS31Pro-UMB, 50 m cable length, 1 temperature depth sensor	8910.U051
IRS31Pro-UMB, 50 m cable length, 2 temperature depth sensors	8910.U052
IRS31Pro-UMB, 100 m cable length	8910.U100
IRS31Pro-UMB, 100 m cable length, 1 temperature depth sensor	8910.U101
IRS31Pro-UMB, 100 m cable length, 2 temperature depth sensors	8910.U102

In addition, there are HD-product variants with reinforced base, like 8910.U102-HD and k-variants, where the cable lengths for the 2 temperature depth sensors vary.

2.2 Accessories and spare parts

2.2.1 Accessories

Item	Order number
Calibration kit IRS31	8510.KAL
Power supply unit 24 V/100 VA	8366.USV1
ISOCON-UMB	8160.UISO
Surge protection	8379.USP
DACON8-UMB	8160.UDAC

2.2.2 Spare parts

Item	Order number
IRS31Pro sensor cap	8910.DEC
Sensor housing with cable	8510.Gxxxw[1]

[1]xxx = the last 3 digits of the product variant order numbers above, e.g. 050, 101, 102-HD, 052k.

<6>

3 About this manual

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

– Operating Manual UMB ISO Converter ISOCON
– Operating instructions surge protection

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

– ConfigTool.NET
– UMB protocol description
– Firmware

3.2 General signs and symbols
The signs and symbols used in the operating 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

<7>

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.

<8>

4 General safety instructions

4.1 Intended use
The Intelligent Road Sensor (IRSPro) is used for outdoor measurements only. It measures various values to determine the corresponding road or runway conditions.

Appropriately configured, the sensor can be used to replace its predecessor IRS31-UMB.

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 can be accessed 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.

<9>

4.7 Working on roadways

The device is installed in road- and runways. Special safety regulations apply to prevent accidents and injuries.

   ▸ Observe the national and local safety regulations for construction work.

4.8 Certification

4.8.1 Europe, USA and Canada

CE (EU)

The equipment meets the essential requirements of RED Directive 2014/53/EU.

FCC (US)

FCC part 15C statement intentional radiator

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.

The device complies with the FCC RF Radiation Exposure Statement.

IC (CA)

Canadian Radio Interference-Causing Equipment Regulation, ICES-001

The device complies with Industry Canada license-exempt RSS standard(s). 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.

<10>

5 Product description

5.1 Design and function

The passive intelligent road sensors are used for road weather monitoring. The device measures the surface temperature, water film height and salt concentration on the road. Thus the device can be used for the acquisition of a variety of measurement variables to determine the corresponding road conditions relevant for winter maintenance services.

Depending on the model, each device has up to 2 temperature depth sensors integrated.

The equipment is connected by way of a 4-pin connection cable standard length (length 50 m or 100 m, depending on the variant). The measured values are requested over the RS485 interface in accordance with UMB protocol. During commissioning, configuration and verification takes place using the ConfigTool.NET software.

5.2 Product overview
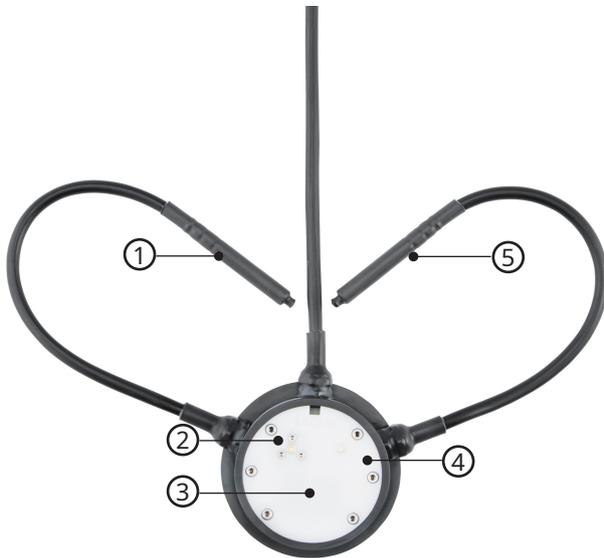
1	Temperature depth sensor 1	4	Temperature measurement
2	Conductivity measurement	5	Temperature depth sensor 2
3	Water film height measurement		

<11>

6 Transport, storage, and unpacking

6.1 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 the supplier and manufacturer.

- ▸ Keep the original packaging for any further transportation.

6.2 Storage

- ▸ Store within specified temperature ranges.

- ▸ Store in dry area.

- ▸ Store in original box where possible.

<12>

7 Installation

7.1 Mechanical installation

7.1.1 Preparing a site

i Special local, state or national regulations apply for working in and on roadways. Observe these regulations and prepare the intended installation area for the sensor accordingly .

The device must be installed in the center of the road lane. On two-lane roads the device is installed in the left-hand lane.

Holes and slits are required in the road surface for the sensor, the connection cable and the optional temperature depth sensors.

NOTICE

Damage to sensor insulation due to incorrect installation depth!

If the sensor is not installed in the correct depth, the insulation layer can be damaged and water can penetrate the sensor. This can lead to malfunctions of the sensor.

▸ Ensure that a depth of 6 cm can be maintained.
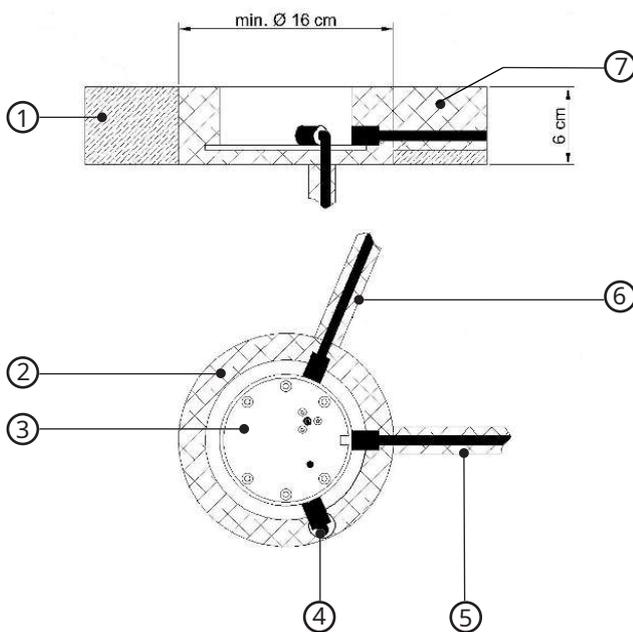
Sensor installation in the road

1	Road surface	5	Slit for connection cable
2	Hole for intelligent road sensor	6	Slit for temperature depth sensor 1
3	Intelligent road sensor	7	Casting resin concrete
4	Hole for temperature depth sensor 2		

<13>

‣ For the device: mark and drill a hole with a diameter of 16 cm and depth of 6 cm into the road surface.

‣ For the connection cable: cut a slit with the width of 2 cm and depth of 5 cm into the road surface.

Optionally one or two temperature depth sensors are installed:

ℹ One of the external temperature depth sensors is marked with a red cable flag, on which the intended installation depth is given. If the sensor is not installed in the designated depth, the channel assignment must be changed in the ConfigTool.NET software in the sensor settings [▶ 23]. This applies for example to the k-sensor variants.

‣ For one temperature depth sensor: cut a slit with a width of 2 cm, depth of 30 cm and length of 35 cm into the road surface. The slit is required at an angle of approx. 68° in relation to the connection cable slit.

‣ For two temperature depth sensors proceed as follows:

– For temperature depth sensor 1: cut a slit with a width of 2 cm, depth of 5 cm and length of 35 cm into the road surface. The slit is required at an angle of approx. 68° in relation to the connection cable slit.

– For temperature depth sensor 2: drill a hole with a diameter of 2 cm and depth of 30 cm into the road surface. The hole is required at an angle of approx. -68° in relation to the connection cable slit and approx. 20 cm from the outer rim of the device hole.

– Cut a slit with a width of 2 cm between the holes of the device and the temperature depth sensor 2.

‣ Clean the road surface.

‣ Clean the device hole, ensure there is enough space for the sensor housing and the external cable joints.

‣ Clean the road surface again using compressed air to ensure the surface is clean and dry.

7.1.2 Installing device

⚠ CAUTION

Risk of injury due to sharp edges!
The device has slightly sharp edges that can cause injury.
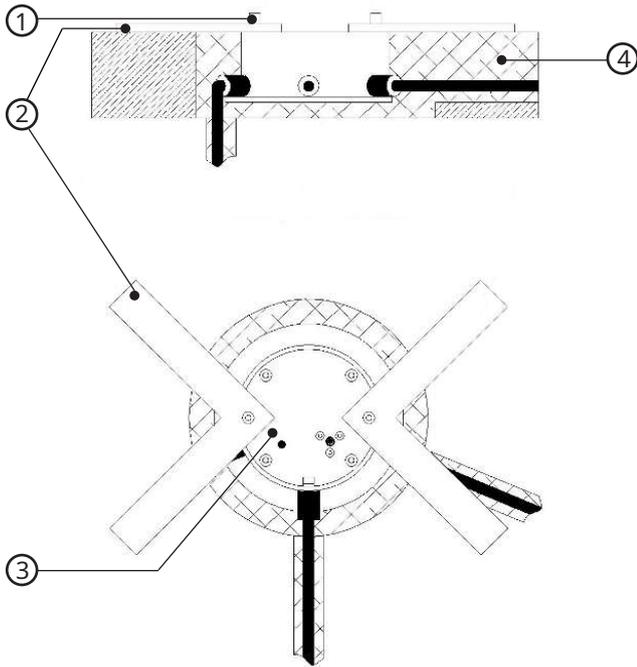
‣ Wear protective gloves during installation.

NOTICE

Damage to device due to uneven installation!
Winter service vehicles can damage the device, if it is above the road surface.

‣ Ensure that the device is flush with the road surface.

<14>

1	Fixing screw	3	Intelligent road sensor
2	Installation aid	4	Casting resin concrete

▸ Insert the device into the designated drill hole.

▸ Level the device with the road surface with the help of the installation aid. If necessary, bend the installation aid.

▸ Fill the cavities with casting resin concrete. Follow the manufacturer's instructions of the casting resin concrete.

ⓘ Use concrete casting systems, in which the temperature during the curing process remains below 80 °C (176 °F), as otherwise the device will be damaged.

▸ As soon as the casting resin concrete has hardened, remove the installation aid and the green protective foil.

▸ Insert the fixing screws of the installation aid into the holes of the device and fasten with a torque of 2 Nm.

7.2 Electrical installation

7.2.1 Installing supply cable

NOTICE

Damage due to defective cable sheathing or temperature sensor!
If the cable sheathing or the temperature sensor is defective, water can enter the device and damage it.

▸ Ensure that the cable connections are neither opened nor damaged.

▸ Do not install the device with a damaged cable.

▸ Have repairs carried out by OTT HydroMet service personnel.

▸ Place the supply cable in a protective tube.

<15>

▸ Avoid tensile stress on the cables.

7.2.2 Extending supply cable

Shortening the supply cable is only permitted at the cabinet end of the cable. The loop impedance of the entire cable must not exceed 10 Ohm.
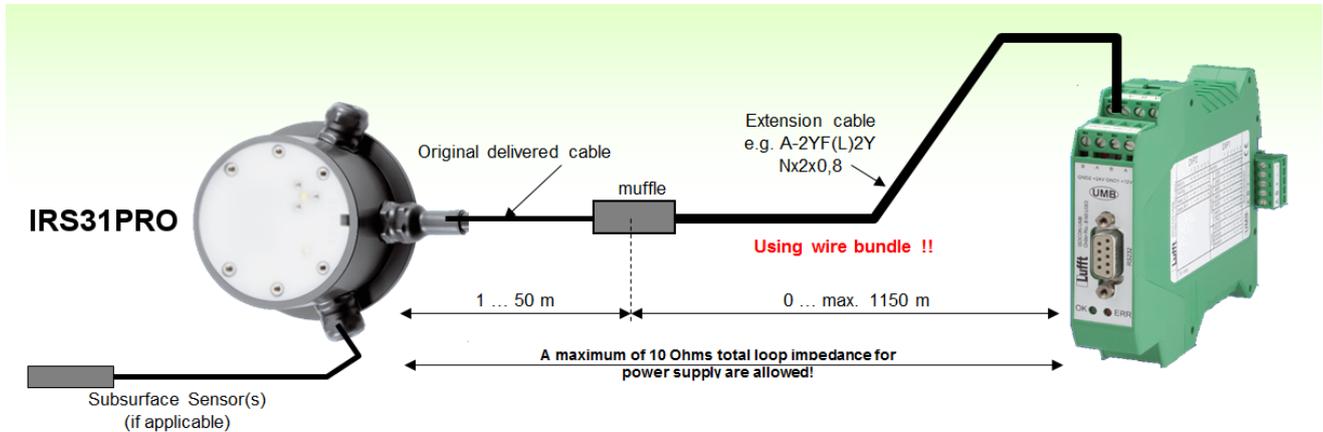
▸ Shorten the original cable after the shortest possible distance (curbside 5 m).

▸ Extend the cable by attaching an extension cable to the original cable.

Example

Extension to 100 m with a 0.5 mm^2 cable with loop impedance of 73.2 Ω/km and parallel connection of 4 wires in each case:

– At 100 m the result per wire is a loop impedance of 7.3 Ω.

– By connecting 4 wires in parallel the result is a loop impedance of 7.3 Ω / 4 = 1.83 Ω.

Recommended cable extension

Total distance (wire range)	RS485 terminator required[1]	Original cable 0.5 mm^2	Extension cable[2] 0.8 mm^2	Power supply wire bundle x times	Total wire pairs N
100 m	–	Max. 100 m	–	–	–
200 m	–	Max. 50 m	Up to 150 m	3x	4 N
300 m	–	Max. 50 m	Up to 250 m	4x	6 N
400 m	x	Max. 50 m	Up to 350 m	6x	10 N
500 m	x	Max. 50 m	Up to 450 m	7x	10 N
600 m	x	Max. 50 m	Up to 550 m	9x	10 N
700 m	x	Max. 50 m	Up to 650 m	10x	20 N
800 m	x	Max. 50 m	Up to 750 m	11x	20 N
900 m	x	Max. 50 m	Up to 850 m	13x	20 N
1000 m	x	Max. 50 m	Up to 950 m	14x	20 N
1100 m	x	Max. 50 m	Up to 1050 m	16x	20 N
1200 m	x	Max. 50 m	Up to 1150 m	17x	20 N

<16>

[1]RS485 termination resistance required means that a resistance of 120 Ohm should be connected parallel to the RS485 2-wire interface, either on the sensor inlet or sleeve.

[2]Recommended extension cable: A-2YF(L)2Y Nx2x0.8 or similar.

Core pair 2x (2 times) means 2 pairs of wires, e.g. 2x2x0.8, because 2 individual wires are 1 pair for the power supply (+ and -).

7.2.3 Connecting power supply

The road sensor supply cable is connected to the power supply in the control panel. The cable shielding must be attached to the earthing connection in the control panel.

▸ Connect the brown, white, green and yellow wires to the power supply unit.

▸ Do not connect the negative supply voltage (GND1) with the cable shield of the sensor.

7.2.4 Electrical connections

⚠ **WARNING**

Electric shock due to incorrectly connected device!

If the device is not connected correctly, it may be permanently damaged and an electric shock may result.

▸ Ensure that the device is connected correctly.

▸ Ensure that the cable shielding is connected to earth in the control cabinet.

There are two 4-pin connectors on the underside of the plastic insert. These are used to connect the supply voltage and the interface to the associated cable. Optionally, external temperature sensors are connected.

Pin assignment for supply voltage and RS485

Number	Color	Assignment
1	White	Negative supply voltage
2	Brown	Positive supply voltage
3	Green	RS485_A (+)
4	Yellow	RS485_B (-)

Supply voltage and RS485 (uncoded)

<17>
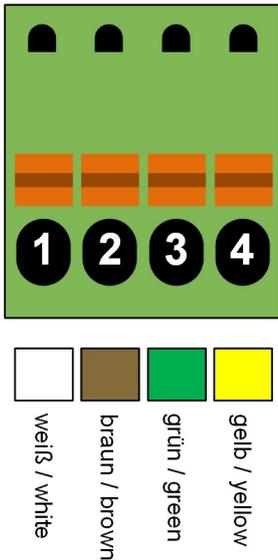
Connection of color or numerically coded cables

Pin assignment for external temperature sensors

Number	Color	Assignment
1	White	External temperature sensor right 1
2	Brown	External temperature sensor right 2
3	White	External temperature sensor left 1
4	Brown	External temperature sensor left 2

External temperature sensors (coding pin 1)
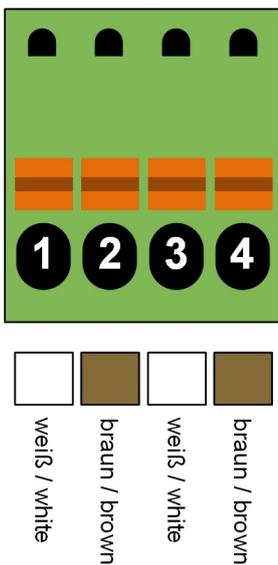
Connection of color or numerically coded cables

7.2.4.1 Connecting devices in SDI-12 mode

The RS485 interface can be switched to SDI-12 via the sensor configuration. Depending on the cable connection, the cable shielding must be attached to the earthing connection in the control panel differently.

Power supply by the SDI-12 bus

Number	Color	Assignment
1	White	SDI-12_GND
2	Brown	SDI-12 + 12 V
3	Green	Not connected
4	Yellow	SDI-12 signal

Pin assignment: Supply voltage and SDI-12

i   The SDI12_GND is not attached to the earthing connection.

▸ Connect the white, brown and yellow wires to the power supply unit.

Isolated power supply

Number	Color	Assignment
1	White	Negative power supply
2	Brown	Positive power supply
3	Green	SDI-12_GND
4	Yellow	SDI-12 signal

Pin assignment: Supply voltage and SDI-12

i   The power supply is not attached to the earthing connection.

▸ Connect the line 3 (green) only if the SDI-12 logger is DC-isolated from the power supply.

7.2.5 Supply voltage
The supply voltage is 12 V DC. The power supply unit used must be approved for operation with equipment of protection class III (SELV). Operation with a supply voltage of 24 V DC is not permitted.

7.2.6 RS485 Interface
The device has an electrically isolated, half-duplex, 2 wire RS485 interface for configuration, measurement polling and the firmware update. The RS485 interface has a default baud rate of 19200 (no parity, 8 data bits, 1 stop bit), but other baud rates are supported (adjustable baud rates: 1200, 2400, 9600, 38400).

7.2.7 Connecting ISOCON-UMB converter
The ISOCON-UMB communication module converts RS485 into RS232.

<19>
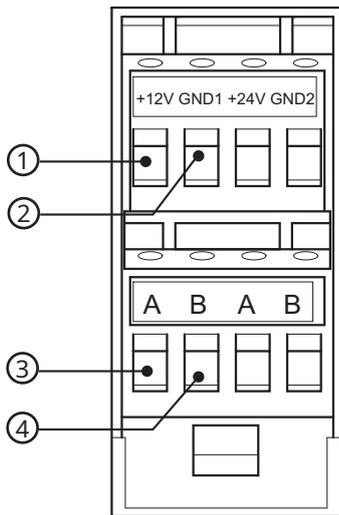
1	Brown: positive supply voltage +12 V	3	Green: RS485 interface A
2	White: negative supply voltage GND1	4	Yellow: RS485 interface B

- ▸ Connect the brown, white, green and yellow wires to the ISOCON-UMB converter.
- ▸ Refer the operating manual UMB ISO converter ISOCON.

7.2.8 Installing surge protection
The surge protection serves to protect the device against voltage spikes.
- ▸ Install the surge protection between the device and ISOCON-UMB converter.
- ▸ Refer the operating instructions of the surge protection.

<20>

8 Commissioning

8.1 Set up device

After the equipment has been installed and connected correctly, the device begins autonomously to take measurements.

The following is required for configuration and testing purposes:

– Windows® PC with serial interface
– ConfigTool.NET software

Proceed as follows for commissioning:

▸ Check for correct equipment operation on site by carrying out a measurement request with the aid of the ConfigTool.NET software.
▸ Check the road condition with dry and wet sensor.
▸ If several road sensors are operated on a UMB network, assign a unique device ID to each sensor.

8.2 Configuration and testing

For configuration and testing OTT HydroMet Fellbach GmbH provides the proprietary software ConfigTool.NET. ConfigTool.NET can also be used to update the firmware of the device.

▸ Download the ConfigTool.NET software: www.lufft.com/resources/
▸ Install the software on the computer.
▸ Get familiar with the software in general.
▸ Ensure to always use the latest version of ConfigTool.NET.
▸ During configuration and testing, disconnect other devices that poll the UMB-Bus, e.g. modem or LCOM.
▸ Ensure that the connection settings of ConfigTool.NET are conform to the settings of the device.

ℹ The operation of the ConfigTool.NET is described in detail in the help function of the Windows® PC software. For this reason only the menus and functions specific to the device are described below.

8.2.1 Factory settings

The device is delivered with the following settings:

Specification	Value
Class ID	9 (cannot be modified)
Device ID	1 (gives address 9001h = 36865d)
Baud rate	19200
RS485 protocol	UMB binary
Calculation interval	6 measurements
Water film moisture threshold	10 µm
Water film wetness threshold	200 µm

8.3 Selecting device

▸ Select the type of sensor.

⇨ The intelligent road sensor appears in the selection menu as *IRS31Pro-UMB* (Class ID 9).

<21>

▸ Confirm with **Save/Exit**.

8.4 General settings

Parameter	Description
Device-ID	Factory setting: 1 Assign the IDs for the devices in ascending order.
Description	To differentiate the devices enter a description, e.g. the location.
Linespeed	Transmission speed of the RS485 interface Factory setting: 19200 DO NOT change for operation with ISOCON-UMB.
Protocol	Communication protocol of the device: UMB-Binary, UMB-ASCII
Timeout	In the event of a temporary changeover of the communication protocol, the system switches back to the configured protocol after this time (in minutes).

i If the baudrate is changed, after saving the configuration on the device, the device communicates at the new baudrate. When operating the device in a UMB network with ISOCON-UMB, this baudrate must not be changed; otherwise the device is no longer addressable and can no longer be configured.
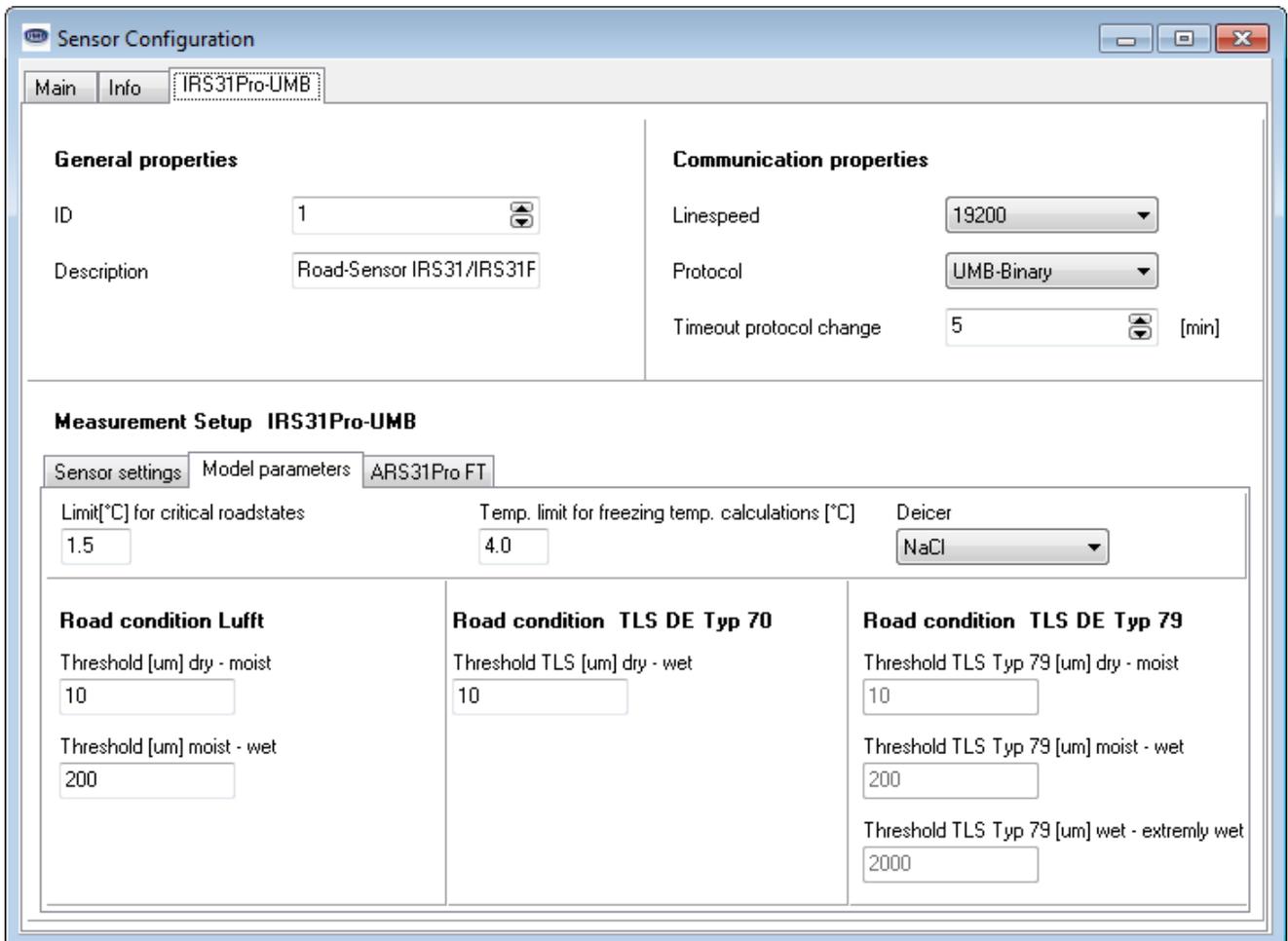
<22>

8.5 Specific settings

8.5.1 Interval and temperature settings

Parameter	Description
Measurement interval	The sampling rate indicates how often a new measurement cycle is started. This value is configurable and can be set at 10, 20, 30 or 60 seconds. Factory setting: 10 seconds
Number of samples for average	The number of measurements that are used to generate the moving average. This can be configured between 1 and 20. Factory setting: 6
Swap channel assignment for external temperature sensors	This option is used to swap the assignment of the external temperature sensors.
IRS31 compatibility mode	This option switches the sensor into compatibility mode to IRS31-UMB. The setting compatibility mode to IRS31-UMB changes the class ID of the sensor to the class ID of an IRS31-UMB. In the IRS31-UMB compatibility mode the sensor possesses an IRS31-UMB compatible channel list and road condition coding.

<23>

Parameter	Description
Freezing temperature correction factor	This factor influences the calculation of the freezing temperature (non-linear). Factory setting: 1 A factor between 0 and 1 increases the freezing temperature. A factor greater than 1 reduces the freezing temperature. Example: Measured freezing temperature -7 °C; factor 0.5: freezing temperature -2.69 °C.
Freezing temperature mode	This mode determines the output of the freezing temperature, when the road temperature is above the temperature limit for freezing temperature calculations or the water film height is below the dry threshold. This setting does not apply to IRS31 compatibility mode. The output of the freezing temperatures in compatibility mode is compatible with firmware version 5.2 of the IRS31-UMB. O: the freezing temperature is transmitted as long as water film height is above the dry threshold, otherwise the freezing temperature of -0.1 °C is reported. 1: the freezing temperature is transmitted as long as the sensor can measure it (also below the dry threshold), otherwise the freezing temperature of -0.1 °C is reported. 2: the freezing temperature is transmitted as long as water film height is above the dry threshold, otherwise the error value 55h (85d) is reported. When the temperature is above the temperature limit for freezing temperature calculations, the error value 55h (85d) also is reported. This error message means that the sensor is unable to measure due to ambient conditions.

8.5.2 Threshold settings

<24>

Parameter	Description
Limit [°C] for critical road states	Critical road conditions such as ice, wet/moist with salt can occur below this threshold.
Temperature limit for freezing temperature calculations [°C]	The freezing temperature is calculated when the measured road surface temperature is less than or equal to the set threshold temperature. Factory setting: 4 °C
Deicer	The freezing temperature of the used deicer is included in the model calculations for the road conditions. It therefore has an effect on the derived channels.
Threshold [µm] dry-moist	When the water film height lies below the set threshold, the device transmits the road surface condition "dry" (provided that no ice is detected) and no longer calculates the freezing temperature. Factory setting: 10 µm
Threshold [µm] moist-wet	The threshold lies between the road surface conditions "moist" and "wet".
Threshold TLS [µm] dry-wet	For adaptation to the different thresholds in the different versions of TLS; for TLS2012: 10 µm, for TLS 2003 and older: 30 µm

8.6 Configuring IRS31-UMB compatibility mode

IRS31Pro-UMB is set to IRS31-UMB compatibility mode to address a sensor with the class ID of an IRS31-UMB, query measurement channels of an IRS31-UMB and query the IRS31 encoded road conditions.

The following system requirements apply for adding an IRS31-UMB to the measurement setup:

– ConfigTool.NET with at least one IRS31Pro-UMB and IRS31-UMB

▸ Enable or disable *IRS31 compatibility mode*.

<25>
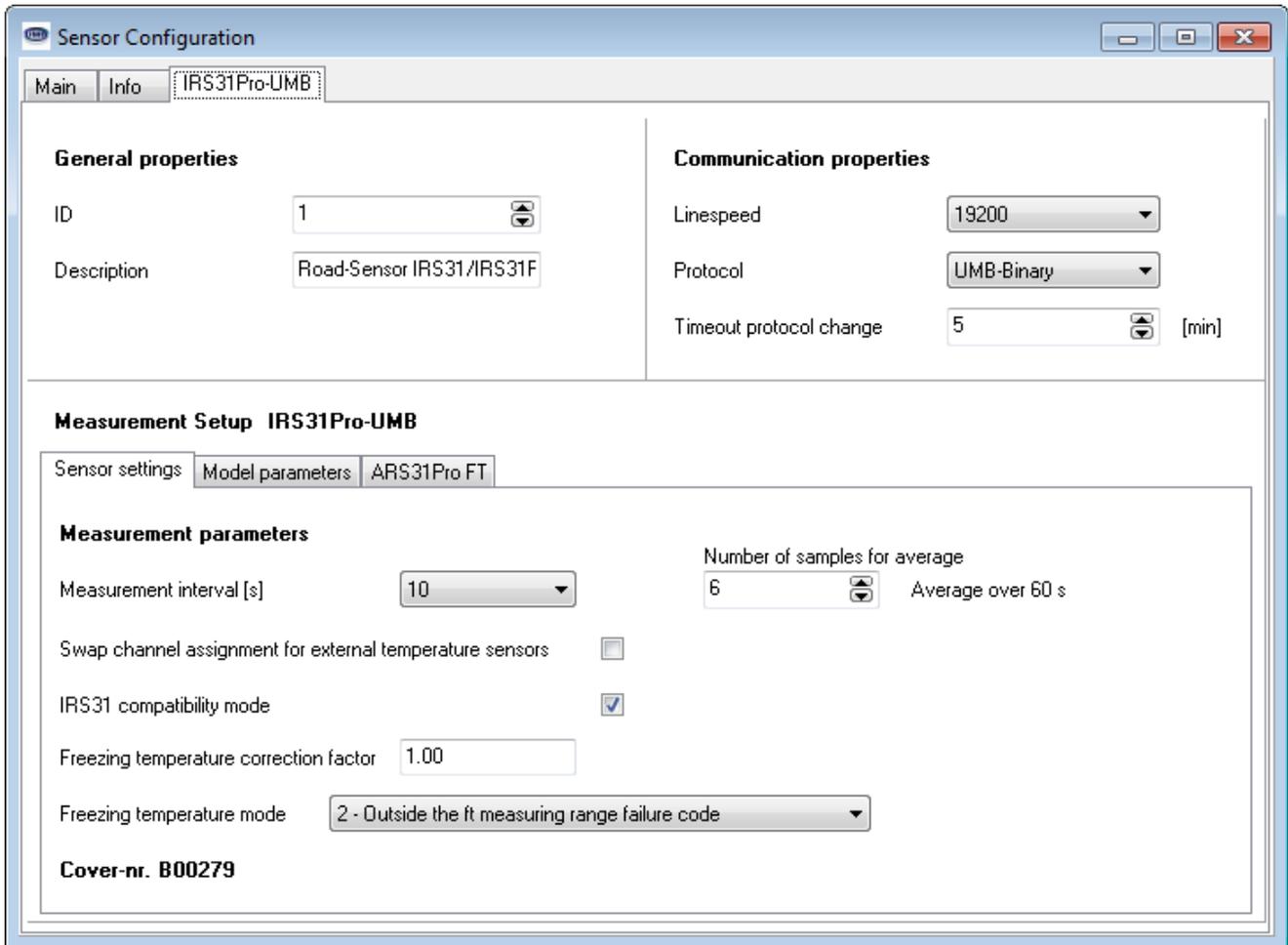
ℹ️ When configuring a measurement station with IRS31-UMB sensors, the activation of the *IRS31 compatibility mode* should not cause double addressing. If necessary, change the ID.

Parameter	Description
IRS31-UMB ID	The ID of the IRS31-UMB sensor Class ID = 1
Number of samples for average	Number of measurements that are used to generate the moving average can be configured. Factory setting: 6, setting range: 1...20 Deactivate the moving average with setting: 1
Limit (°C) for critical roadstates	Relevant for determination of the road condition states. Factory setting: 1.5 °C Road surface conditions above this limit are detected as "dry", "damp" and "wet"; below this limit there are the additional conditions "freezing wet" and "critical".

Examples of IRS31-UMB settings

8.6.1 Example: Creating addresses

If, for example, a road sensor IRS31Pro-UMB is to be addressed with the device ID 1, the ID is put together as follows:

– class ID for the IRS31Pro-UMB is 9 (= 9h)

– device ID is 1 (= 1h)

<26>

– together the class and device ID gives address 9001h = 36865d

Activating the compatibility mode changes the class ID to 1:
- class ID for the IRS31Pro-UMB is 1 (= 1h)
- device ID is 1 (= 1h)
- together the class and device ID gives address 1001h = 4097d

8.7 Configuring coupling with ARS31 or ARS31Pro

When the coupling IRS31 with ARS31 or ARS31Pro is active, IRS31Pro-UMB uses the mixture independent freezing temperature from the appropriate ARS31-UMB or ARS31Pro-UMB. With active coupling, IRS31Pro-UMB delivers the status code 0x36h = 54d (channel_off) on every freezing temperature and salt concentration channel.

The device must be configured for the selected type of additional sensor to enable the correct evaluation of the measurement data.

The following system requirements apply for coupling IRS31Pro with ARS31 or ARS31Pro:
- ConfigTool.NET with at least one IRS31Pro-UMB and appropriate ARS31-UMB or ARS31Pro-UMB
- For ARS31-UMB or ARS31Pro-UMB one of the channels (150, 151, 152, 153, 154, 155, 160, 161, 162 or 1065) must be polled cyclically using the UMB binary protocol
- Configuration of ID for ARS31-UMB or ARS31Pro-UMB in IRS31Pro-UMB

ℹ︎   The coupling can also be done in the *IRS31 compatibility mode*.

▸ Enable or disable *Freezing temperature mode*.

<27>

Parameter	Description
Freezing temperature mode	The use of the freezing temperature of an ARS31-UMB or ARS31Pro-UMB can be enabled or disabled.
ARS31-UMB ID	The ID of the ARS31-UMB or ARS31Pro-UMB sensor from which the freezing temperature channels are monitored. In default setting (= 0) all connected ARS31-UMB or ARS31Pro-UMB are evaluated.
ARS31-UMB timeout	Time after which a IRS31Pro-UMB resets a freezing temperature reported by the connected ARS31-UMB or ARS31Pro-UMB. After timeout the IRS31Pro-UMB uses freezing temperature of -0.1 °C. This usually should be a time interval 3 to 5 times the time between 2 measurement queries of an ARS31-UMB or ARS31Pro-UMB.
State of coupling	Channel 950 The current state of the freezing temperature acquisition from the ARS31-UMB or ARS31Pro-UMB can be determined.: O = Mode off 1 = Mode on, freezing temperature of a ARS31-UMB or ARS31Pro-UMB received 2 = Mode on, freezing temperature of ARS31-UMB or ARS31Pro-UMB not received

ARS31-UMB or ARS31Pro-UMB freezing temperature settings

8.8 Testing
The functions of the device can be tested with the software ConfigTool.NET by polling various channels.

<28>

‣ Activate the desired channels.
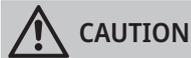

Channels for measurement polling

ℹ The ConfigTool.NET software is provided for test and configuration purposes only. The tool is not suitable for the permanent acquisition of measurement data. For this purpose the use of professional software is recommended, e.g. Lufft SmartView3.

<29>

9 Maintenance

9.1 Maintenance schedule

> ⚠️ **CAUTION**

Health hazard due to electromagnetic radiation!
The device generates an electromagnetic field that can be harmful to health and can cause cardiac pacemakers to malfunction.

▸ Disconnect the device from the power supply before working on it.

The frequency of cleaning is dependent upon the local weather and environmental conditions.

The following maintenance intervals are recommended:

Interval	Activity	Performed by
Annually	▸ Carry out a visual inspection of the housing. ▸ Clean the sensor surface using isopropanol and a lint-free cloth if dirty. ▸ Never process the electrodes with sandpaper or wire brush.	Operator

9.2 Replacing sensor
If water gets into the housing of the sensor, the sensor with housing and cable must be replaced. If the sensor cap (white sensor element) becomes unusable due to mechanical damage or the sensor electronics are damaged, the sensor cap (8910.DEC) can be replaced without changing the entire housing.

ℹ️ Replace the sensor only, when the road is dry.

▸ Unscrew all 6 hexagonal screws.

▸ Insert a screwdriver into the small opening on the edge of the cover of the plastic assembly.

▸ Lift the plastic assembly out.

▸ Remove the plug connections. Do not touch the electronics of the sensor.

▸ Clean the housing and protect from moisture.

▸ Remove the sealed protection cover of the new drying agent bag. The sticker indicates its functionality (blue: ok; pink: the drying agent is spent).

▸ Immediately, insert the drying agent bag in the housing.

▸ Cover the new seal with silicone grease.

▸ Fit the seal into the housing.

▸ Connect the plug connectors to the new sensor. Do not touch the electronics of the sensor.

▸ Insert the plug connections. Do not touch the electronics of the sensor.

▸ Carefully insert the plastic cover plate without canting the seal.

▸ Grease the thread of the new fixing screws.

▸ Lightly fasten the screws and then tighten evenly with a torque of 2 Nm.

<30>

9.3 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.lufft.com/resources/.

▸ Install the update on a Windows® PC.

ℹ︎ For IRS31-Pro-UMB a firmware update can still be carried out, when *IRS31 compatibility mode* is activated, but the sensor IRS31-Pro-UMB must be selected. Accordingly, to update the firmware of an IRS31-UMB, the sensor IRS31-UMB must be selected in the *IRS31 compatibility mode*. The current name of the sensor can be checked under tab *Info* in section *Name*.

<31>

10 Troubleshooting

10.1 Error elimination

Error	Possible cause	Corrective action
Device does not allow polling or does not respond	Device does not work properly	‣ Check the power supply. ‣ Check the interface connection.
Device does not allow polling or does not respond	Incorrect device ID is applied	‣ Check if the correct device ID is assigned. Devices are delivered with ID 1.
Device delivers implausible values	–	‣ Check if the sensor installation instructions are met.
Device transmits error value 24h (36d)	A channel is being polled that is not available on this device type	–
Device transmits error value 28h (40d)	Device is in the initialization phase following startup	‣ Wait until the first measurement is complete.
Device transmits error value 50h (80d)	Device is being operated above the limit of the specified measuring range	–
Device transmits error value 51h (81d)	Device is being operated below the limit of the specified measuring range	–
Device transmits error value 55h (85d)	Road temperature is too high to measure the freezing temperature	–
Device transmits error value 55h (85d)	Water film height is too low to measure the freezing temperature	–
Device transmits error value 55h (85d)	Firm layer of ice is on the sensor, thus freezing temperature cannot be measured	–
Device transmits error value 2Bh (43d)	Fault in one of the variables on which the channel is based	–
Device transmits error value 36h (54d)	Coupling IRS31-ARS31 is active and a freezing temperature or saline concentration channel of the sensor is queried	–
Device transmits error value 54h (84d)	One-time occurrence of internal measurement error	–
Device transmits error value 54h (84d)	Permanent occurrence of internal measurement error	‣ Check whether the installation notes and the power supply correspond to specifications.
Device transmits error value 32h (50d)	–	‣ Report any malfunction to the representative of OTT HydroMet.
Device transmits error value 33h (51d)	–	‣ Report any malfunction to the representative of OTT HydroMet.

<32>

Error	Possible cause	Corrective action
Device does not transmit the freezing temperature	The sensor is too warm	–
Device does not transmit the freezing temperature	The sensor is dry	–
Device does not transmit the freezing temperature	The sensor is covered with ice	–
Device transmits an unknown error value	–	▸ Report any malfunction to the representative of OTT HydroMet.

<33>

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

<34>

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.

<35>

13 Technical data

13.1 General technical data

Intelligent road sensor

Specification	Value
Protection class	III (SELV)
Protection type	IP68
Operating temperature range	-40 to +80 °C
Humidity range	0 to 100 %
Altitude above sea level	3000 m
Storage temperature range (in packaging)	-40 to +70 °C
Humidity range (non-condensing, in packaging)	0 to 95 %

External temperature depth sensor

Specification	Value
Protection type	IP67

13.2 Electrical data

Intelligent road sensor

Specification	Value
Power supply	12 V DC
Operating voltage range	0.75 to 1.15 * power supply
Current consumption	Typically approx. 8.5 mA (sampling rate 10 s)
	Typically approx. 5 mA (sampling rate 1 min) at 12 V DC
Inrush current	Approx. 1 A (5 ms) at 12 V DC

Radar module

Specification	Value
Frequency	2.435 to 2.465 Ghz
Power consumption	10 mW

13.3 Dimensions and weight

Specification	Value
Dimensions (diameter x height)	120 x 50 mm

<36>

Specification	Value
Weight (without cable and without external temperature depth sensor)	Approx. 800 g

13.4 Measuring range and accuracy

Road surface temperature

Specification	Value
Measurement process	NTC
Measuring range	-40 °C to +80 °C
Resolution	< 0.02 °C (-20 °C to +20 °C), otherwise +/-0.1 °C
Accuracy	+/-0.1 °C (-20 °C to +20 °C), otherwise +/-0.2 °C
Sampling rate	10 sec to 60 sec
Units	°C; °F

Water film height

Specification	Value
Measurement process	Radar
Measuring range	0 to 4000 µm
Resolution	> 0.01 mm
Accuracy	0.2 mm to 4 mm: > +/-30 %
Sampling rate	10 sec to 60 sec
Units	µm, mil

Freezing temperature

Specification	Value
Measurement process	Calculated from saline concentration
Measuring range	-40 °C to 0 °C
Resolution	0.1 °C
Accuracy (Wfh > 50 µm)	0 °C to -2.5 °C (+/-0.5 °C), otherwise +/-20 % from mv (with NaCl)
Sampling rate	10 sec to 60 sec
Units	°C; °F

Ice percentage

Specification	Value
Measurement process	Passive
Measuring range	0 to 100 %

<37>

Specification	Value
Resolution	0.1 %
Sampling rate	10 sec to 60 sec
Units	%

Saline concentration

Specification	Value
Measurement process	Passive
Measuring range	0 to 100 %
Resolution	0.1 %
Accuracy (Wfh > 50 µm)	0 °C to -2.5 °C (+/-0.5 °C), otherwise +/-20 % f. mv (with NaCl)
Sampling rate	10 sec to 60 sec
Units	%

Friction

Specification	Value
Measurement process	Calculated from ice percentage
Measuring range	0 to 1
Resolution	0.01
Sampling rate	10 sec to 60 sec

<38>

<39>

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Contact Information