

Operating Manual ARS31-UMB

Active Road Sensor
Order No.: 8610.U050 50m cable

Status V2 (02/2010)



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Version history:

Version	Date	Edited by	Comments
V1.0	17.10.2008	LA/BR/FS	first version
V1.01	02.02.2009	FS	accuracy freezing temp. / cable length / power consumption
V1.3	25.02.2009	LA/FS/BR	adaption to actual firmware
V2	16.12.2010	BR/FS	Adaption to actual firmware, explanation "saline concentration"

1 Please read before commissioning

Before using the equipment, please read the operating manual carefully and follow the instructions in every detail.

1.1 Symbols used



Important indication concerning possible hazards to the user



Important indication for the correct functioning of the equipment

1.2 Safety instructions



- Installation and commissioning must only be carried out by suitably qualified specialist personnel.
- Never take measurements on or touch live electrical parts.
- Pay attention to the technical data and storage and operating conditions.

1.3 Designated use

- The equipment must only be operated within the range of the specified technical data.
- The equipment must only be used under the conditions and for the purposes for which it was designed.
- The safety and operation of the equipment can no longer be guaranteed if it is modified or adapted.
- Do not continue to use equipment that is obviously defective.

1.4 Guarantee

The guarantee period is 12 months from the date of delivery. The guarantee is forfeited if the designated use is violated.



1.5 Incorrect use

If the equipment is installed incorrectly

- It may not function
- It may be permanently damaged



If the equipment is not connected correctly

- It may not function
- It may be permanently damaged
- There may be a possibility of an electrical shock

1.6 Nomenclature

Tg: Freezing temperature that the sensor identified

Tu: Road surface temperature, ambient temperature

2 Device Description

Active Road Sensor ARS31 serves to determine the freezing temperature of a liquid on the road surface. It can be used to measure the following data:

- Salt concentration (NaCl, CaCl and MgCl)
- Freezing temperature (independent of mixture)

The sensor excels further due to the following features:

- Compact design and easy installation
- Low maintenance
- Parts can be replaced without uninstalling the device
- Data transfer via RS485
- Internal electrical isolation of power supply
- ESD protection on all interfaces
- Input voltage range 9V...36V
- Inverse-polarity protection

2.1 Method of Operation

ARS31 determines the freezing temperature of a liquid on the road surface by means of active cooling and heating. ARS31 allows precise determination of the freezing temperature in the absence of accurate knowledge of the type or mixture of salt.

The device operates in a temperature range from -30°C ... $+70^{\circ}\text{C}$. The freezing temperature is calculated for road surface temperatures of less than 5°C (adjustable between 2°C and 10°C). The lowest possible freezing temperature that can be calculated is about 25K under the current road surface temperature.

The sampling rate for freezing point measurement in the sensor is configurable and may be set to 10, 20, 30 or 60 minutes (default value: 20 minutes).

If there is no freezing temperature / salt concentration detected in a measuring cycle the last identified freezing temperature will be delivered for the following 40 minutes (default: 40 – interval can be adjusted). During this interval the freezing temperature can only move to 0 if the sensor definitely detects clear water on the road.

Data polling takes place through any desired host computer which supports any of the communication protocols described in Section 6 and disposes of an RS485 interface. Measurements are polled and transmitted over an RS485 interface.

The device is connected using a 4-core cable.

Windows PC software is available for configuration and measurement polling during commissioning.

3 Installation

The road sensor is installed in the middle of the carriageway. If the road has two lanes, the sensor is installed in the left hand lane.

3.1 Preparation

The sensor requires a hole of diameter $D_m > 16$ cm and depth $D_p = 6$ cm. A slit of width $W = 2$ cm and depth $D_p = 5$ cm is cut into the road for the cable.

Attention! When installing on bridges, make sure that the insulation layer is not damaged (it is not always possible to maintain a depth of 6 cm in these cases).

3.2 Installation

Warning: Do not undo the cable connections under any circumstances

You can only cut the cable at the control panel end.

The cable must be laid in a protective tube in such a way as to ensure that any expansion of the road covering does not affect the cable. The road sensor cables must not be subjected to tensile force during installation.



Warning: Damage to the cable sheath or external sensors causes water ingress into the sensor. Sensors with damaged cables must not be installed and can only be repaired by Lufft.

Install the road sensor in the hole provided in such a way that it is flush with the road surface. To do this, place the installation aid - which is already mounted on delivery - on the road surface. It may be necessary to align the sensor by bending the installation aid.



Under no circumstances must the road sensor project beyond the surface of the road covering (damage due to snow-clearers).

Fill the cavities with casting resin concrete.



Only use concrete bedding systems whose temperature remains below 80°C on hardening as otherwise the road sensor will be damaged.

After the casting resin concrete has hardened, remove the installation aid and the green protective film. Reinstall the fixing screws of the installation aid in the open holes of the sensor (torque 2 Nm).

3.3 Connecting the cable

The road sensor cable is connected in the control panel together with the power supply and the bus system, e.g. ISOCON-UMB.

The screening of the connection cable MUST be laid to ground.

Connection to the road sensor cable:

Brown	Positive power supply
White	Negative power supply
Green	RS485_A
Yellow	RS485_B

Sensor voltage output 24 V

ARS31 sensor interface



Illustration 1: ISOCON-UMB connection

Warning! Connecting the cables incorrectly will destroy the road sensor!

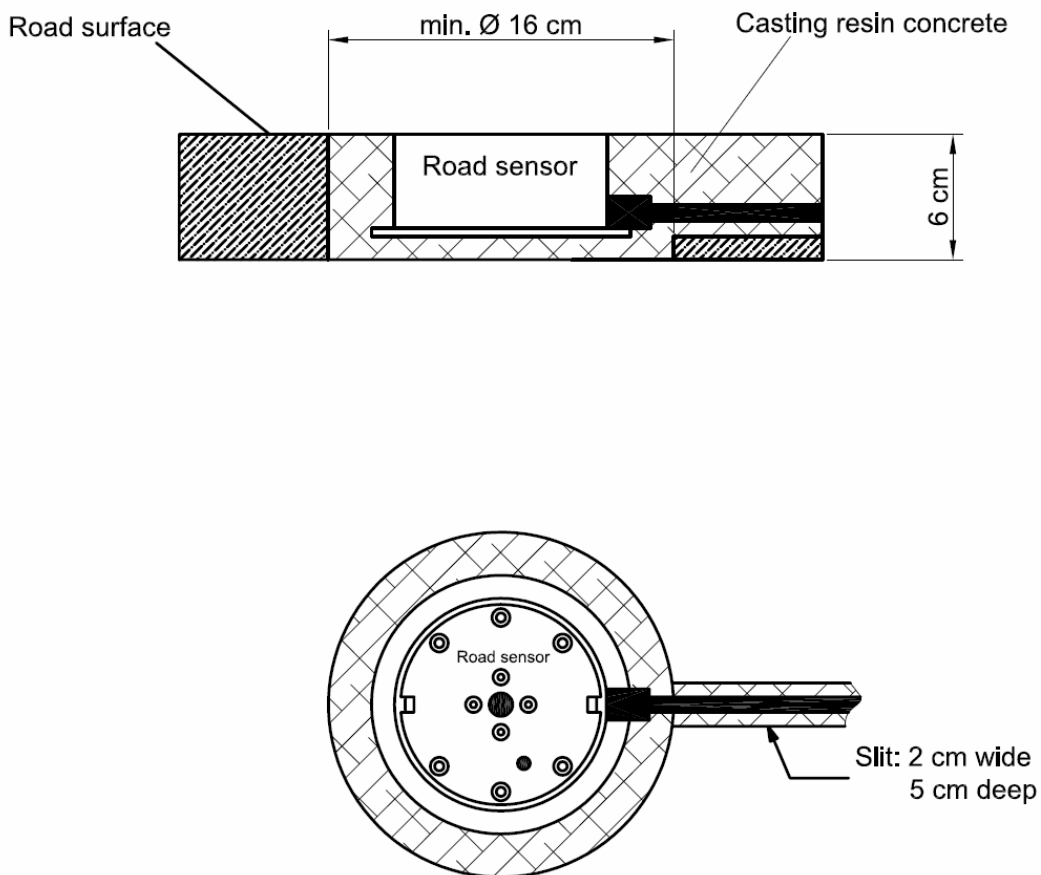


Illustration 2: Installation of ARS31 in the road

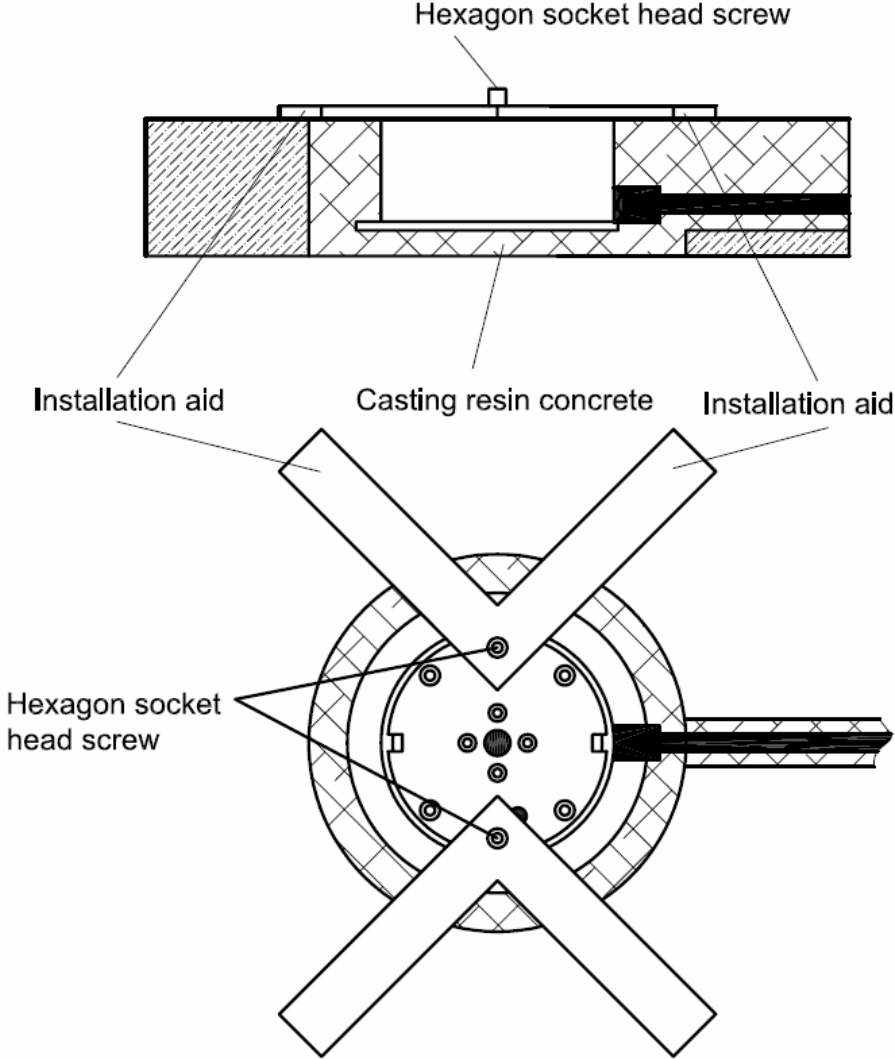


Illustration 3: Installing the ARS31

3.4 Commissioning and testing

After the device has been installed and connected correctly, the ARS31-UMB is initialized and measurement begins.

The functionality of the road sensor must be checked after it has been installed. The sensor must be connected to an evaluation unit (e.g. PC with UMB-ConfigTool) for this purpose. Communication between sensor and evaluation unit must be checked for perfect operation.

4 Maintenance

Maintenance should be carried out on the road sensor once annually. This includes the visual inspection of the housing. It is recommended to clean the surface of the sensor if it is heavily soiled. Sensor replacement is recommended in the event of significant mechanical damage to the sensor which could affect the water tightness of the housing. This also applies if the sensor's plastic insert is severely worn.

4.1 Replacing the sensor system

If the road sensor's plastic insert becomes unusable due to mechanical effects, or the sensor is damaged, the plastic insert can be replaced with no need to replace the entire housing.



Attention: Only replace the sensor system when the road is dry

To uninstall the plastic insert, remove all six hexagon socket head screws. There is a small opening on the edge of the cover suitable for inserting a screwdriver. This allows you to lift out the plastic insert. Make sure that the connection cable on the underside of the sensor has not broken off. The connectors must be pulled out without putting a strain on the cable.



The housing must be cleaned thoroughly before installing the new sensor. Even small impurities on the seat of the seal can cause the sensor to fail in the long term. No moisture must be trapped in the housing!

On connecting the connector to the new sensor, make sure that you do not touch the sensor electronics. Electrostatic discharge (ESD) destroys the sensor.



The seal must be greased with silicone grease prior to insertion. The seal must not bend out of line on installing the plastic cover. You should also make sure that the thermal conducting foil on the under edge of the housing is not displaced during installation. The plastic cover must be inserted into the housing without the use of force. There is only **one possible installation position**: the aperture on the sensor's copper head must point in the direction of the cable gland on the housing. The threads of the fixing screws must be greased. First lightly screw in the screws and then tighten evenly (torque 2 Nm)

4.2 Connections

4.2.1 Cable

See Section 3.3 Installation – Connecting the cable

4.2.1.1 Power supply

The ARS31 power supply is 24DC (9.... 36V VDC). The power supply unit used must be approved for operating devices of protection class III (SELV).

4.2.1.2 RS485 interface

The device has a half-duplex, 2-wire RS485 interface with the following settings:

Data bits: 8
 Stop bit: 1
 Parity: none
 Adjustable baud rates: 1200, 2400, 9600, 19200, 38400 (standard: 19200 bit/s)

The screened cable MUST be laid to ground in the control cabinet



If the device is not connected properly:

- It may not function correctly
- It may be permanently damaged
- There is a danger of electric shock under certain circumstances

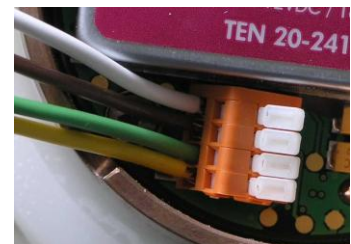
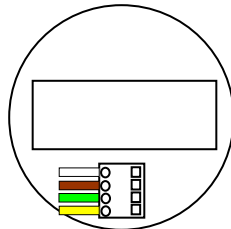
4.2.2 Connections in the housing

There is a single 4-pole terminal block on the underside of the plastic insert. This serves to connect the power supply and the interface to the associated cable.

Power supply connection assignment/RS485:

Pin Assignment

1	GND	white
2	V+, 24 V	brown
3	A (Rx+)	green
4	B (Rx-)	yellow



The data and power supply cables are connected via a 4-pole terminal block. Cable type LI-2YCYv2X2X0.5 is used.

Cable labeling on the pins is based on DIN 47100.

The screened cable must be laid to the ground circuit connector in the control panel.

5 Configuration

Lufft provides PC software for configuration purposes (UMB-Config-Tool). You can set the device according to your requirements with the aid of this software.

5.1 Factory settings

The factory settings of the ARS31 are as follows:

Device ID:	1
Class ID	4
Baud rate:	19200
RS485 protocol:	binary

5.2 Using PC configuration software

The main functions of the configuration software are described in detail in the Online Help. For this reason only the sensor-specific menus and functions are described here.

5.2.1 Configuration

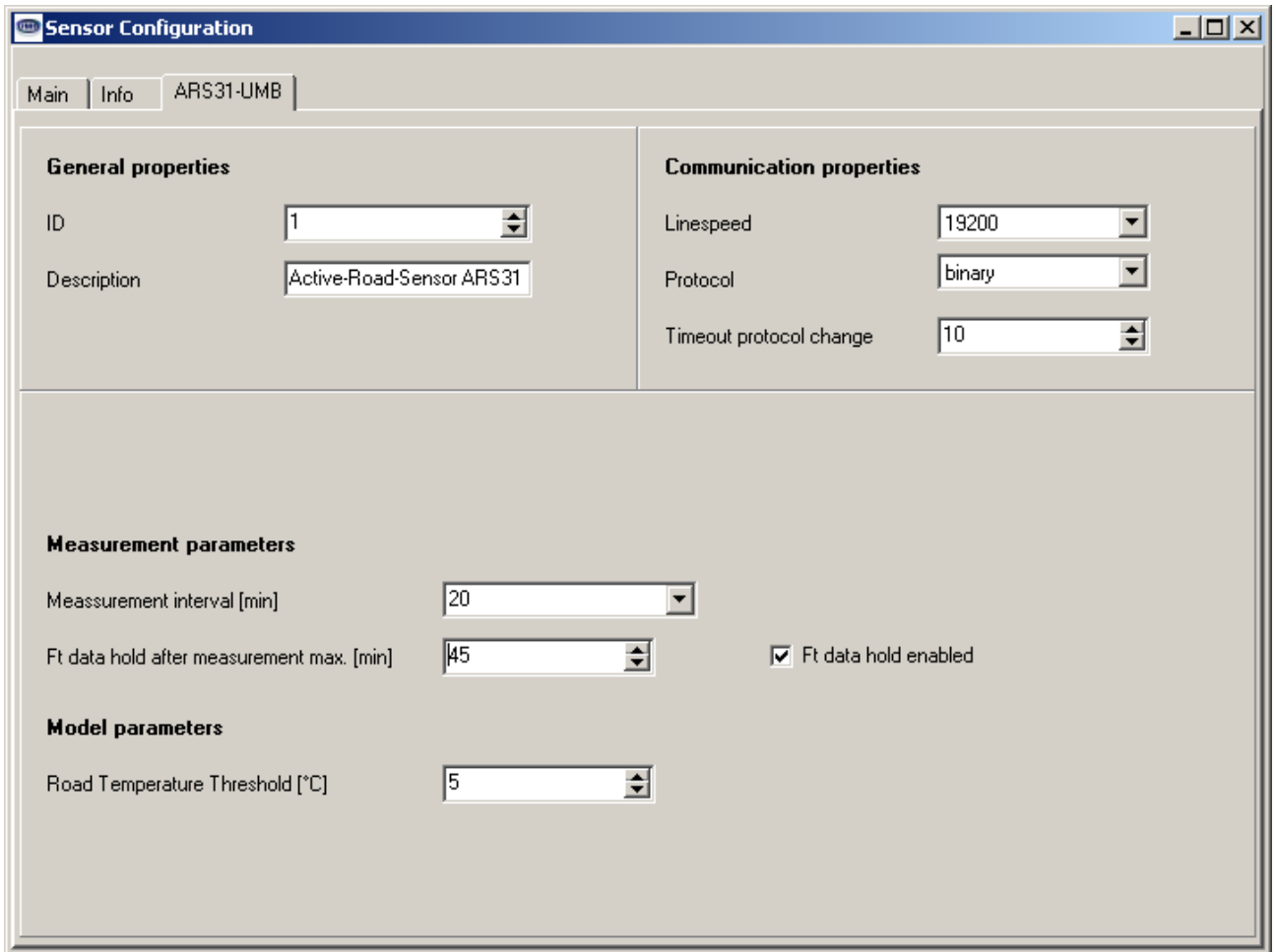
After loading an ARS31-UMB configuration, all relevant settings and values can be adjusted.

If several ARS31 devices are operated on a UMB network, the ID must be changed before connection to the network, as each device requires a unique ID. IDs are allocated in ascending order, beginning with number one.

The measuring rate indicates how often a new measuring cycle is started. This value is configurable and can be set to 10, 20, 30 or 60 minutes (default value: 20 min.)

If there is no freezing temperature / salt concentration detected in a measuring cycle the last identified freezing temperature will be delivered for the following 40 minutes (default: 40 – interval can be adjusted). During this interval the freezing temperature can only move to 0 if the sensor definitely detects clear water on the road. The interval for maintaining the freezing temperature can be configured in the UMB-Config-Tool and can adopt values between 20 and 120 minutes (default 40 minutes). The function can be deactivated by unticking the option “GfT data hold”.

The detection of the freezing temperature starts with road temperatures below the road temperature threshold. If the road is warmer than this threshold, no freezing temperature will be detected. The threshold can be configured between 2°C and 10°C.



Sensor Configuration

Main | Info | ARS31-UMB

General properties

ID: 1

Description: Active-Road-Sensor ARS31

Communication properties

Linespeed: 19200

Protocol: binary

Timeout protocol change: 10

Measurement parameters

Measurement interval [min]: 20

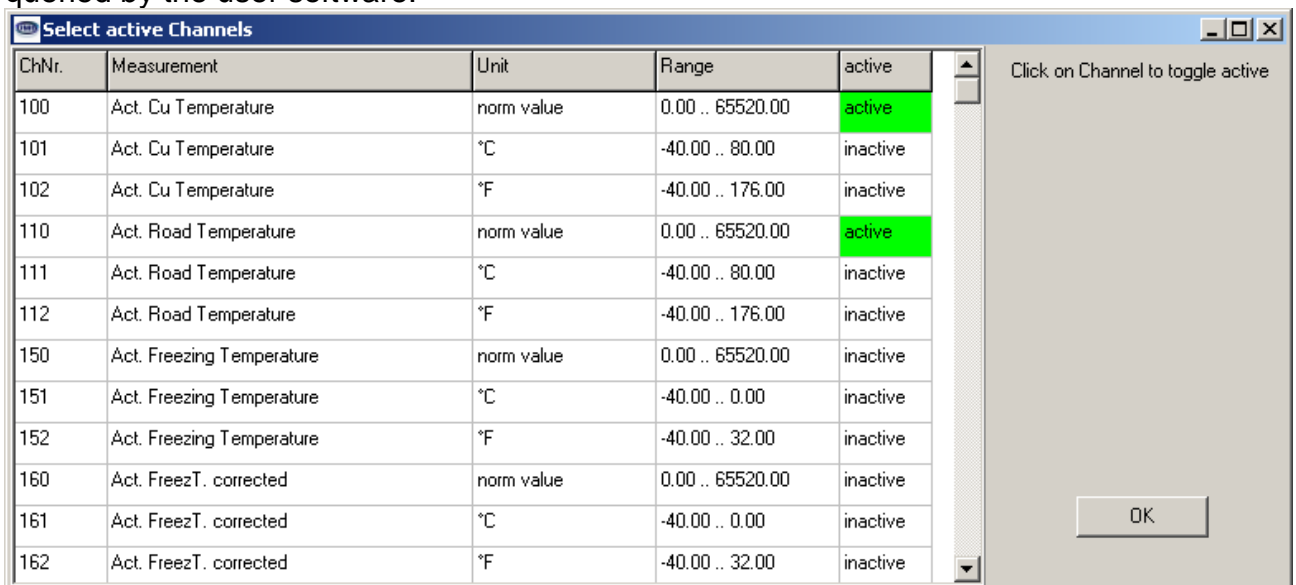
Ft data hold after measurement max. [min]: 45 Ft data hold enabled

Model parameters

Road Temperature Threshold [°C]: 5

5.2.2 Measurement polling channels

You can activate the measurement polling channels for the UMB-Config-Tool by clicking on the respective channel. This setup has no influence on the channels which can be queried by the user software.



Select active Channels

ChNr.	Measurement	Unit	Range	active
100	Act. Cu Temperature	norm value	0.00 .. 65520.00	active
101	Act. Cu Temperature	°C	-40.00 .. 80.00	inactive
102	Act. Cu Temperature	°F	-40.00 .. 176.00	inactive
110	Act. Road Temperature	norm value	0.00 .. 65520.00	active
111	Act. Road Temperature	°C	-40.00 .. 80.00	inactive
112	Act. Road Temperature	°F	-40.00 .. 176.00	inactive
150	Act. Freezing Temperature	norm value	0.00 .. 65520.00	inactive
151	Act. Freezing Temperature	°C	-40.00 .. 0.00	inactive
152	Act. Freezing Temperature	°F	-40.00 .. 32.00	inactive
160	Act. FreezT. corrected	norm value	0.00 .. 65520.00	inactive
161	Act. FreezT. corrected	°C	-40.00 .. 0.00	inactive
162	Act. FreezT. corrected	°F	-40.00 .. 32.00	inactive

Click on Channel to toggle active

OK

5.3 Firmware update

The description of the firmware update can be found in the instructions for the UMB configuration tool.

New firmware is uploaded via the RS485 interface. It is not necessary to open the housing for this purpose. However, firmware uploads must take place at a temperature between 0 and 60°C. The update is controlled by means of PC software.

6 Communication

Communication takes place with the ARS31 over a 2-wire half-duplex RS485 interface with the aid of the ISOCON-UMB. The bus is not terminated with a resistor due to dissipation in the ARS31. The use of PC software from Lufft for purposes of maintenance and diagnosis makes an RS485-RS232 or RS485-USB converter superfluous.

The protocol is based on meteorological sensor communications protocol. This contains bus-compatible binary protocol which requires a strict master-slave principle and is enabled on delivery. The ARS31 is a slave and only responds to requests. AN ASCII protocol is available for rudimentary measurement polling only.

Depending on the device configuration, the calculated freezing point can be requested in binary or ASCII protocol.

6.1 Binary protocol

This operating manual only includes one example of an online data request. Please refer to the current version of the document *Communications Protocol for Meteorological Sensors (UMB protocol)* for details of the mode of operation.

6.1.1 Framing

The data frame is constructed as follows:

1	2	3 - 4	5 - 6	7	8	9	10	11 ... (8 + len) optional	9 + len	10 + len 11 + len	12 + len
SOH	<ver>	<to>	<from>	<len>	STX	<cmd>	<verc>	<payload>	ETX	<cs>	EOT

SOH	Control character for the start of a frame (01h) 1 byte
<ver>	Header version number, e.g.: V 1.0 → <ver> = 10h = 16d; 1 byte
<to>	Receiver address, 2 bytes
<from>	Sender address, 2 bytes
<len>	Number of data bytes between STX and ETX; 1 byte
STX	Control character for the start of payload data transmission (02h); 1 byte
<cmd>	Command; 1 byte
<verc>	Version number of the command; 1 byte
<payload>	Data bytes; 0 – 210 bytes
ETX	Control character for the end of payload data transmission (03h); 1 byte
<cs>	Checksum, 16 bit CRC; 2 bytes
EOT	Control character for the end of the frame (04h); 1 byte
Control character: SOH (01h), STX (02h), ETX (03h), EOT (04h).	

6.1.2 Addressing of class and device ID

Addressing takes place using a 16 bit address. This is divided into sensor class ID and device ID.

Address (2 bytes = 16 bits)			
Bits 15 – 12 (top 4 bits)		Bits 11 – 0 (bottom 12 bits)	
Class ID (0 to 15)		Device ID (0 – 4095)	
0	Broadcast	0	Broadcast
4	ARS31-UMB Active Road Sensor	1 - 4095	Available
15	Master or control devices		

ID = 0 is provided as broadcast for classes and devices respectively. Hence it is possible to transmit a broadcast on a specific class. However, this only makes sense if there is only one device of this class on the bus.

6.1.3 Examples for creating addresses

If, for example, an ARS31-UMB is to be given device address ID 0001, this is done as follows:

Class ID for ARS is 4d = 4h

Device ID is e.g. 001d = 001h

Putting the class and device IDs together gives an address of 4001h (16385d).

6.1.4 Example of a binary protocol request

If, for example, a request for the current freezing temperature (measurement range -40 ... 0) is to be placed from a PC to a road sensor with device ID 0001, this is done as follows:

Sensor:

Class ID for **road sensor** is 4 = 4h

Device ID (serial number) is 0001 = 001h

Putting the class and device IDs together gives a destination address of 4001h.

PC:

Class ID for **PC (master device)** is 15 = Fh

PC ID is e.g. 1 = 001h

Putting the class and PC IDs together gives a sender address of F001h

The length <len> for the online data request command 4d = 04h,

the command for the online data request is 23h and

the version number of the command is 1.0 = 10h.

The channel number is shown under <payload>; as can be seen from the channel list, the current freezing temperature (-40°C ... 0°C) in channel 151d = 97h

The calculated CRC is C4D6h

The request to the device:

SOH	<ver>		<to>		<from>		<len>	STX	<cmd>	<verc>	<channel>		ETX	<cs>		EOT
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
01h	10h	01h	40h	01h	F0h	04h	02h	23h	10h	97h	00h	03h	D6h	C4h	04h	

The response from the device:

SOH	<ver>	<to>		<from>		<len>	STX	<cmd>	<verc>	<status>	<channel>		<typ>
1	2	3	4	5	6	7	8	9	10	11	12	13	14
01h	10h	01h	F0h	01h	40h	0Ah	02h	23h	10h	00h	97h	00h	16h

<value>				ETX	<cs>		EOT
15	16	17	18	19	20	21	22
66h	66h	96h	C1h	03h	FFh	EAh	04h

<status> = Device o.k.

<typ> = Data type of the following value; 16h = float (4 bytes, IEEE format)

<value> = C1966666h corresponds to float value -18.8°C.

The freezing temperature is -18.8°C .

Correct data transmission can be checked with the aid of the checksum (EAFFh).



Important: Little endian (Intel, lowbyte first) applies when transmitting word and float variables of such as, for example, addresses or the CRC. This means first the LowByte, then the HighByte.

6.1.5 CRC calculation

The CRC is calculated in accordance with the following rules:

Standard: CRC-CCITT

Polynomial: $1021\text{h} = x^{16} + x^{12} + x^5 + 1$ (LSB first mode)

Start value: FFFFh

(Attention: Contrary to earlier Lufft protocols, the start value for CRC calculations is not 0h but rather FFFFh in accordance with CCITT)

Further information is available in the description of a CRC calculation in UMB Protocol.

6.2 ASCII protocol

Easy communication with devices is provided by using the ASCII protocol.

ASCII protocol serves exclusively for online data requests and is not secured by a CRC.

The device does not respond to incomprehensible ASCII commands.

Using ASCII protocol, the measurements can be polled in a simple, insecure manner with the aid of a terminal program. However, the sensor can only be configured by way of the binary protocol. The output format is fixed and not user-configurable. You can find an exact description in the document *Communication Protocol for Meteorological Sensors*.

After the HyperTerminal has started, select File -> Properties -> Settings -> ASCII Configuration. Enter 1 ms for the character delay.

6.2.1 Construction

ASCII commands are introduced by the character '&' and ended with the character CR (0Dh). There is always a blank space (20h) between the individual blocks; this is represented by an underscore '_'. Characters which represent an ASCII value are in simple inverted commas.

6.2.2 Example of an ASCII request

If, for example, you want to request the current freezing temperature of a road sensor with device ID (serial number) 0001 from a PC, this is done as follows:

A measurement of a specific channel is requested with command "M".

Request: '&'_<ID>⁵'M'_<channel>⁵ CR

Response: '\$'_<ID>⁵'M'_<channel>⁵<value>⁵ CR

<ID>⁵ Device address (5-digit decimal with leading zeros)

<channel>⁵ Gives the channel number (5-digit decimal with leading zeros)

<value>⁵ Measurement (5-digit decimal with leading zeros); a standardized measurement from 0 – 65520d. 65521d – 65535d define various error codes

Example:

Request: & 16385 M 00151

This request polls channel 151 of the device with the address 4001h.

Response: \$ 16385 M 00151 62899

With the standardization for the freezing temperature the following calculation then results:

62899d corresponds to $-40 + (0 + 40) * 62899 / 65520 = -1.6 \text{ }^\circ\text{C}$

6.3 Channel assignment for the data request

The channel assignment described here applies to the online data request in binary protocol.

All channels in the mapping standard are transmitted in ASCII protocol.

Channel no.	Measurement variable	Unit	Data Type	Measuring Range
100	Act. Cu Temperature	MS	unsigned short	0 ... 65520
101	Act. Cu Temperature	°C	float	-40 ... +80°C
102	Act. Cu Temperature	°F	float	-40 ... 176°F
110	Act. Road Temperature	MS	unsigned short	0 ... 65520
111	Act. Road Temperature	°C	float	-40 ... +80°C
112	Act. Road Temperature	°F	float	-40 ... 176°F
150	Act. Freezing Temperature	MS	unsigned short	0 ... 65520
151	Act. Freezing Temperature	°C	float	-40 ... 0°C
152	Act. Freezing Temperature	°F	float	-40 ... +32°F
160	Act. FreezT.corrected	MS	unsigned short	0 ... 65520
161	Act. FreezT.corrected	°C	float	-40 ... 0°C
162	Act. FreezT.corrected	°F	float	-40 ... +32°F
801	Act. SalineConcentr.NaCl	%	float	0 ... 100
803	Act. SalineConcentr.CaCl	%	float	0 ... 100
805	Act. SalineConcentr.MgCl	%	float	0 ... 100
900	Status GFT-Measuring		unsigned short	0 ... 3
1049	TLS DE-Type 49 FG3 (FBT)	TLS FG3 DE 49	signed short	-300 ... +800
1052	TLS DE-Type 52 FG3 (RS) NaCl	TLS FG3 DE 52	unsigned char	0 ... 100
1065	TLS DE-Type 65 FG3 (GT)	TLS FG3 DE 65	signed short	-300 ... 0
3001	TLS DE-Type 52 FG3 (RS) MgCl	TLS FG3 DE 52	unsigned char	0 ... 100
3002	TLS DE-Type 52 FG3 (RS) CaCl	TLS FG3 DE 52	unsigned char	0 ... 100

Legend:

MS ... Mapping standard

Difference between channels “saline concentration” 801, 803, 805 and TLS-channels 1052, 3001, 3002:

The channels 801, 803 and 805 deliver saline concentration in percent by weight. For example a solution of NaCl with a freezing temperature of -5.3°C reports a measurement value of 8% on the saline concentration channel 801. The channels 1052, 3001 and 3002 are based on the saturation of salt in liquid. For example a solution of NaCl with a freezing temperature of -5.3°C reports a measurement value of approx. 36% (8/22 in [%]) on channel 1052. The maximum saturation of NaCl in water is about 22 percent by weight.

Difference between corrected and uncorrected measurement channels:

In the case of uncorrected channels, the status of the channel in the UMB protocol is used to classify the measurements; if, for example, the ambient temperature is too high the status can not be 0 (e.g.: 84, the possible error codes are specified in the document *Communication Protocol for Meteorological Sensors*); in this case the freezing temperature is neither calculated nor transmitted.

In the case of corrected channels the status is transmitted on channel 900. If it is not possible to calculate the freezing temperature, this is then transmitted as 0°C (or its equivalent in other units).

Status generation and freezing temperature on the corrected channel:

- If it is not possible to calculate the FT status because the ambient temperature is greater than the temperature set for the sensor (factory setting 5°C), the FT status is set to 0 and the freezing temperature value is set to 0°C.
- If it is not possible to calculate the FT status because the road is dry, the FT status is set to 1 and the freezing temperature value is set to 0°C.
- When a valid FT is calculated, the FT status is set to 2 and the freezing temperature value is set to the calculated value.
- If it is not possible to calculate the FT for other reasons the FT status is set to 3 and the freezing temperature value is set to 0°C.

If it is not possible to calculate the freezing temperature, “0” is transmitted for freezing temperature and “255” is transmitted for “residual salt” on the TLS channel.

A sensor with firmware 1.4 on factory settings will deliver a value of -0.1°C in channel 1065 (freezing temperature TLS) whenever the road is wet and without salt. This value replaces the 0°C that was given until firmware release 1.3.

The reason for this change is that in the (German) “Bundesdatenverteiler” (12/2010) the TLS compliant combination of 0°C freezing temperature and 0% residual salt are causing errors in the visualization.

6.4 Mapping standards

Mapping standard	Temperature measurement range
0 – 65520	-40 ... +80°C
	-40 ... +176°F
	Freezing temperature measurement range
	-40 ... +0°C
	-40 ... +32°F
	Salt concentration measurement range
	0 ... 100 weight %

7 Technical data

7.1 Measurements

7.1.1 Freezing temperature

Measurement range:	-20 ... 0°C (Tu=0°C) or Tu-20°C, higher value applies
Accuracy:	±0,5°C RMS for Tg > -15 °C, or ±1,5°C RMS for Tg < -15 °C
Resolution:	0.1°C
De-icing agent:	Any desired de-icing agent; however the electrical conductivity of the solution must be > 1 mS/cm

7.1.2 Saline concentration

Measurement range:	0 ... 100%
Accuracy:	Computed from the freezing temperature
Resolution:	0.1%
De-icing agent:	Any desired de-icing agent; however the electrical conductivity of the solution must be > 1 mS/cm

7.1.3 Status of freezing temperature measurement

Transmitted on Channel 900:	
0 ->	Start conditions not fulfilled
1 ->	Sensor surface dry
2 ->	Freezing temperature was calculated
3 ->	Freezing temperature was not calculated

7.1.4 Road surface temperature

Principle:	NTC
Measurement range:	-30 ... 70°C
Accuracy:	Quantitative statement only as errors arise due to self-heating
Resolution:	0.1°C

7.2 Storage conditions (complete sensor)

Permissible storage temp.:	-30°C ... +70°C
Permissible relative humidity:	0 ... 100% RH

7.3 Operating conditions

Permissible operating temp.:	-30°C ... +70°C 0°C... +60°C for firmware update only
Permissible relative humidity:	0 ... 100% RH
Perm. height above sea level:	3000 m

7.4 Electrical data

Power supply:	24 VDC ± 10%
Current- and power consumption:	approx. 1,25A / 30 W at 24VDC
Protection class:	III (SELV)

7.5 Interfaces

4-core connection cable with power supply and RS485 (2-wire, half-duplex) for configuration and measurement requests. Ex works cable type LI-2YCYv2X2X0.5.

7.6 Mechanical data (excluding cable)

Dimensions (W x H x D):	Ø 120mm; height: 50mm
Weight:	approx. 900g
Protection class:	IP68

8 EC Certificate of Conformity

Product: Active Road Sensor in combination
with UMB ISO Converter ISOCON-UMB
Type: ARS31-UMB (Order No.: 8610.Uxxx)
UMB ISO- Converter ISOCON-UMB (Order –No.: 8160.Uxxx)

We herewith certify that the above mentioned equipment complies in design and construction with the Directives of the European Union and specifically the EMC Directive in accordance with 89/336/EC and the Low Voltage Directive in accordance with 73/23/EC.

The above mentioned equipment conforms to the following specific EMC Standards:

EN 61000-6-2:2005 Part 6-2: Generic Standards – Immunity for Industrial Environments:

EN 61 000-4-2	ESD
EN 61 000-4-3	Radiated electromagnetic field
EN 61 000-4-4	Burst
EN 61 000-4-5	Surge
EN 61 000-4-6	Line-conducted interference
EN 61000-4-8	Magnetic field immunity 50Hz

EN 61000-6-3:2001 Part 6-3: Generic Standards – Emission Standard for Residential, Commercial and Light Industrial Environments
IEC / CISPR 22 Class B



Fellbach, 17.10.2008

Axel Schmitz-Hübsch

9 Troubleshooting

Description	Cause / remedy
The sensor will not allow polling requests.	<ul style="list-style-type: none"> - Sensor (no dummy cover) installed - Check power supply voltage in the connection (terminal) box and on the sensor - Check interface connection - False device ID → check ID - RS485 cable A / B reversed - False baud rate set (sensor, ISOCON-UMB) - False protocol set or used (binary, ASCII)
Freezing temperature is not calculated.	<ul style="list-style-type: none"> - Start conditions not fulfilled (road temperature above set temperature) - Sensor surface dry - Measurement cycle not yet completed (lasts up to 10 minutes) - Interference during calculation of freezing temperature due to external influences in critical phases of the measurement cycle - Sensor surface heavily soiled - Green protective foil not removed
Determined freezing temperature is reset after a few minutes	<ul style="list-style-type: none"> - Sensor is resetting - Power supply overloaded - Unstable power supply - Related to an LCOM-UMB: Misconfiguration of LCOM, thereby resetting the UMB-Modules every x minutes (default is 15 Minutes)
Salt concentration channel delivers error message	<ul style="list-style-type: none"> - Start conditions not fulfilled (road temperature above set temperature) - Sensor surface dry - Measurement cycle not yet completed (lasts up to 10 minutes) - Interference during calculation of freezing temperature due to external influences in critical phases of the measurement cycle - Sensor surface heavily soiled - Green protective foil not removed

10 Service and maintenance

Service and maintenance should only be carried out by trained specialist personnel. The recommended service interval is 12 months.

The device must be disconnected from the power supply whilst service and maintenance work is being carried out.

11 Disposal



The device must be disposed of in accordance with European Directives 2002/96/EC and 2003/108/EC (waste electrical and electronic equipment). Waste equipment must not be disposed of as household waste. For environmentally sound recycling and the disposal of your waste equipment please contact a certified electronic waste disposal company.

12 Manufacturer

In matters of guarantee or repair please contact:

G. Lufft Mess- und Regeltechnik GmbH

Gutenbergstraße 20

70736 Fellbach

P.O. Box 4252

70719 Fellbach

Germany

Phone: +49 711 51822-0

Hotline: +49 711 51822-52

Fax: +49 711 51822-41

E-mail: info@lufft.de

or your local distributor.

12.1 Technical Support

Our hotline is available for technical questions via the following e-mail address:

hotline@lufft.de

You can also consult frequently asked questions at <http://www.lufft.com/> (menu header: FAQs).