Instruction and operation manual

S211 / S215 / S220

Dew point sensor

SUO

Dear Customer,

Thank you for choosing our product.

The operating instructions must be read in full and carefully observed before starting up the device. The manufacturer cannot be held liable for any damage which occurs as a result of non-observance or non-compliance with this manual.

Should the device be tampered with in any manner other than a procedure which is described and specified in the manual, the warranty is cancelled and the manufacturer is exempt from liability.
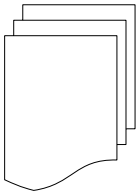
The device is destined exclusively for the described application.

SUTO offers no guarantee for the suitability for any other purpose. SUTO is also not liable for consequential damage resulting from the delivery, capability or use of this device.

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1 Safety instructions

Please check if this instruction manual matches with the product type.

Please observe all notes and instructions indicated in this manual. It contains essential information which must be observed before and during installation, operation and maintenance. Therefore this instruction manual must be read carefully by the technician as well as by the responsible user or qualified personnel.

This instruction manual must be available at the operation site of the dew point sensor at any time. In case of any obscurities or questions, regarding this manual or the product, please contact the manufacturer.

WARNING!

Compressed air!

Any contact with quickly escaping air or bursting parts of the compressed air system can lead to serious injuries or even death!

- Do not exceed the maximum permitted pressure range (see sensors label).

- Only use pressure tight installation material.

- Avoid that persons get hit escaping air or bursting parts of the instrument.

- The system must be pressure-less during maintenance work.

WARNING!

Voltage used for supply!

Any contact with energized parts of the product, may lead to a electrical shock which can lead to serious injuries or even death!

- Consider all regulations for electrical installations.

- The system must be disconnected from any power supply during maintenance work.

- Any electrical work on the system is only allowed by authorized qualified personal.

ATTENTION!

Permitted operating parameters!

Observe the permitted operating parameters, any operation exceeding this parameters can lead to malfunctions and may lead to damage on the instrument or the system.

- Do not exceed the permitted operating parameters.

- Make sure the product is operated in its permitted limitations.

- Do not exceed or undercut the permitted storage and operation temperature and pressure.

General safety instructions

- It is not allowed to use the product in explosive areas.

- Please observe the national regulations before/during installation and operation.

Remarks

- It is not allowed to disassemble the product.

- Always use spanner to mount the product properly.

ATTENTION!

Measurement values can be affected by malfunction!

The product must be installed properly and frequently maintained, otherwise it may lead to wrong measurement values, which can lead to wrong results.

Storage and transportation

- Make sure that the transportation temperature of the sensor is between -30 … +70°C.

- For transportation it is recommended to use the packaging which comes with the sensor.

- Please make sure that the storage temperature of the sensor is between -20 … +50°C.

- Avoid direct UV and solar radiation during storage.

- For the storage the humidity must be <95% rH, no condensation.

2 Registered trademarks

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3 Application

3 Application

The S211 / S215 / S220 are three industrial dew point sensors designed for measuring dew point and related parameters in compressed air or industrial gases under specified operating conditions (See next page).

Parameter	Default unit
Temperature	°C
Humidity	% rH
Dew point	°C Td
Pressure (optional)	bar (g)

Remark: You can change the units using the service kit (optional) and the SFA software.

The S211 / S215 / S220 dew point sensors are mainly used in compressed air systems in the industrial environment, and not developed to be used in explosive areas. To use them in explosive areas, please contact the manufacturer.

4 Features

- Three dew point sensor models applicable for different measuring ranges:
  - S211 measures down to -60°C Td
  - S215 measures down to -20°C Td
  - S220 measures down to -100°C Td
- Optional display for on-site values. The display can be rotated 340° horizontally to ease your access to readings.
- Various signal output options: 4 ... 20 mA 2-wire, 4 ... 20 mA 3-wire, or 4 ... 20 mA 3-wire + Modbus RTU.
- Optional integrated pressure sensor.
- IP65 casing provides robust protection in rough industrial environment.
- Very fast response time ensures safe and reliable indication whenever dew points are out of valid ranges.
- High accuracy of ± 2°C Td dew point.

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5 Technical data

5.1 General

CE	
Parameters	Standard unit dew point: °C Td Standard unit temperature: °C other units: °F, K Standard unit humidity: % rH Standard unit pressure: bar (g)
Principle of measurement	Capacitive method and frequency method

Measuring range	Type Range
	
	S215 Dew point : -20 ... +50°C Td
	      Relative Humidity : 0 ... 90 % rH
	      Temperature : -30 ... +70°C
	      Pressure (option) : 0 ... 1.6 MPa
	
	S211 Dew point : -60 ... +20°C Td
	      Relative Humidity : 0 ... 90 % rH
	      Temperature : -30 ... +70°C
	      Pressure (option) : 0 ... 1.6 MPa
	
	S220 Dew point : -100 ... +20°C Td
	      Relative Humidity : 0 ... 90 % rH
	      Temperature : -30 ... +70°C
	      Pressure (option) : 0 ... 1.6 MPa

Sensor	S215 / S211: Polymer S220: QCM + Polymer Temperature sensor: Pt100 Pressure sensor: Piezo resistive type
Measuring medium	Air, Argon, O_2, N_2, CO_2*
Ambient temperature	0 ... +50°C
Ambient humidity	0 ... 95% rH
Operating pressure	-0.1 ... 1.6 MPa -0.1 ... 3.5 MPa optional for S215 / S211
Casing material	Casing: Aluminium alloy Process thread: Stainless steel 1.4301 (SUS 304) Display cover: PC + ABS

Protection class	IP65
Display (optional)	0.66" OLED display for displaying the measured value and unit 340° horizontally rotatable**
Dimensions	See dimensional drawing on the page 11
Screwing thread	G ½" thread (ISO 228/1)
Weight	0.2 kg
* For CO_2, the measurement range of S211 is limited to -40°C Td ** The rotation force cannot exceed 3.0 N.m	

5.2 Electrical data

Power supply	15 ... 30 VDC
Current consumption	2-wire: 4 ... 20 mA 3-wire: 40 mA @ 24 VDC 3-wire with display: 50 mA @ 24 VDC

5.3 Output signals

Analog output	4 ... 20 mA 3-wire or 4 ... 20 mA 2-wire		
Analog output scaling	Type	Scaling	
	S211	4 mA	= -60°C Td
		20 mA	= +20°C Td
	S215	4 mA	= -20°C Td
		20 mA	= +50°C Td
	S220	4 mA	= -100°C Td
		20 mA	= +20°C Td
Modbus output	Modbus RTU		
Modbus communication	Mode: RTU Baud rate: 19200 Device address: last 2 digits of serial number Farming / parity / stop bit: 8 / N / 1 Response time: 1 second Response delay: 0 ms Interframe spacing: 7 char		

5.4 Accuracy

Accuracy	Dew point: +/- 1 °C Td (0 ... 20°C Td) +/- 2 °C Td (-60 ... 0 / +20 ... +50°C Td) +/- 3 °C Td (-100 ... -60°C Td) Temperature: ± 0.3°C Pressure: 0.5% FS
Repeatability of dew point	± 0.5°C
Stated accuracy at	Ambient/process temperature 23°C ± 3°C Ambient/process humidity <95% rH, no condensation Airflow > 2 l/min at sensor tip

6 Dimensional drawing

Ø 29.4

132.4

21

44.5

G1/2"

Ø 30

SW27
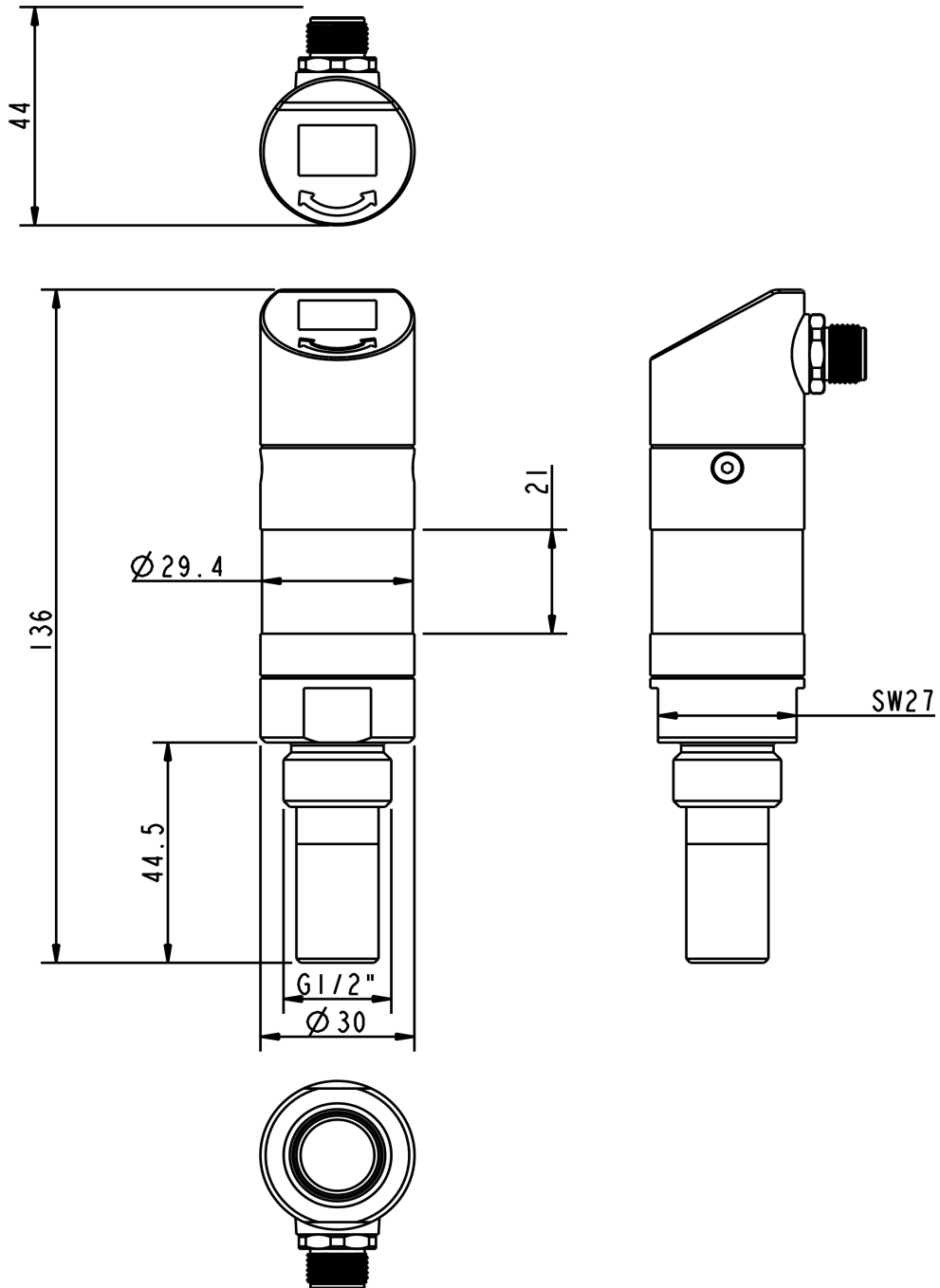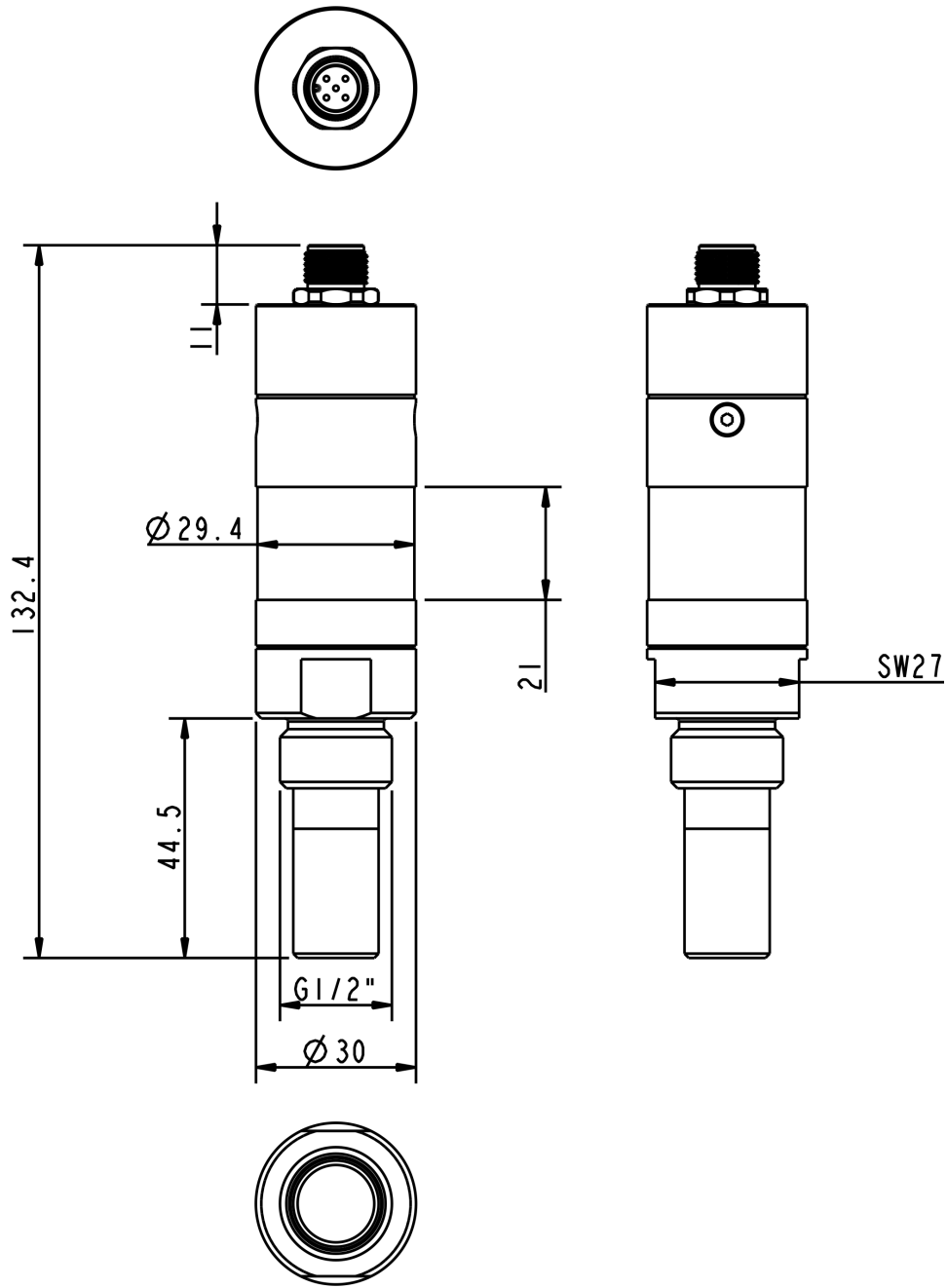
7 Determination of the installation point

In order to maintain the accuracy stated in the technical data, the sensor must be installed correctly. The gas must flow on to the sensor tip, otherwise it will lead to wrong measurement values. For further instructions, please read chapter 8 carefully.

Please consider that enough space exists at your site for a convenient installation.

> **ATTENTION!**
>
> **Wrong measurement is possible if the sensor is not installed correctly.**

- The sensor is for indoor use only! At an outdoor installation, the sensor must be protected from solar radiation and rain.

- It is strongly recommend not to install S211 / S215 / S220 permanently in wet environment, which usually exists right after a compressor outlet.

8 Installation

Before installing the sensor, please make sure that all components listed below are included in your package.

Qty	Description	Item no. (Model dependent)		
1	Sensor	S215	S211	S220
		S699 1215	S699 1211	S699 1220
		S699 2215	S699 2211	S699 2220
		S699 3215	S699 3211	S699 3220
1	Depending on orders: M12 plug or M12 cable	Plug: C219 0059 Cable: A553 0104/A553 0105		
1	Instruction manual	No P/N		
1	Calibration certificate	No P/N		

Remark: The item number of the model varies depending on the chosen measurement range and signal output.

8.1 Installation requirements

The flowing air or gas must pass the sensor tip for a proper measurement. This can be realized with a measurement chamber.

For an installation without the measuring chamber, you must insert the sensor to the required depth, as described in section 8.2.

8.2 Installation procedure

The following steps explain the procedure of an appropriate installation.

Installation with the measurement chamber
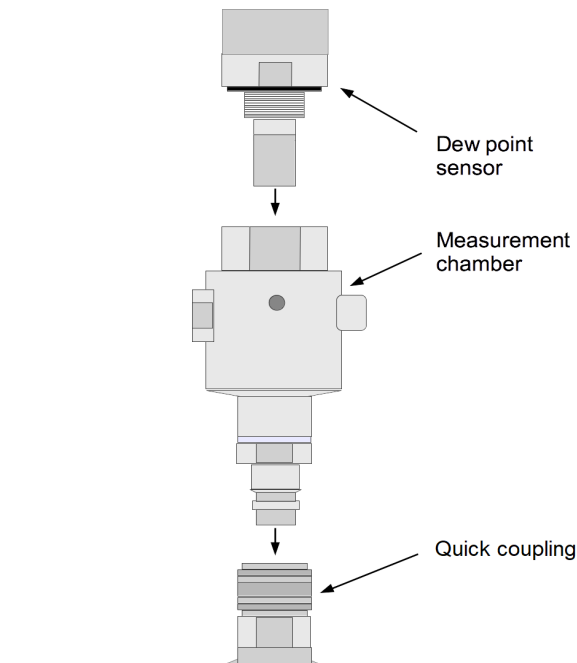
1. Insert the sensor into the measurement chamber and tighten it.

2. Connect the measurement chamber (with the sensor attached) to the quick coupling.

Installation without the measurement chamber
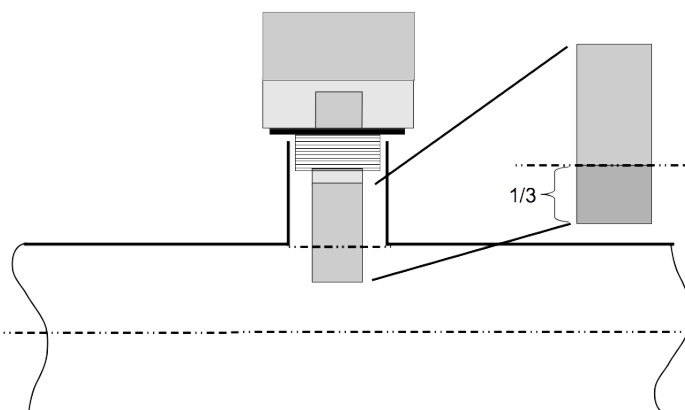
- Install the sensor only if the system is pressure-less.

- Please check the size of the nozzle and make sure not less than 1/3 of the sensor tip is inside of the pipe.

- The inner thread must be G 1/2".

Remarks
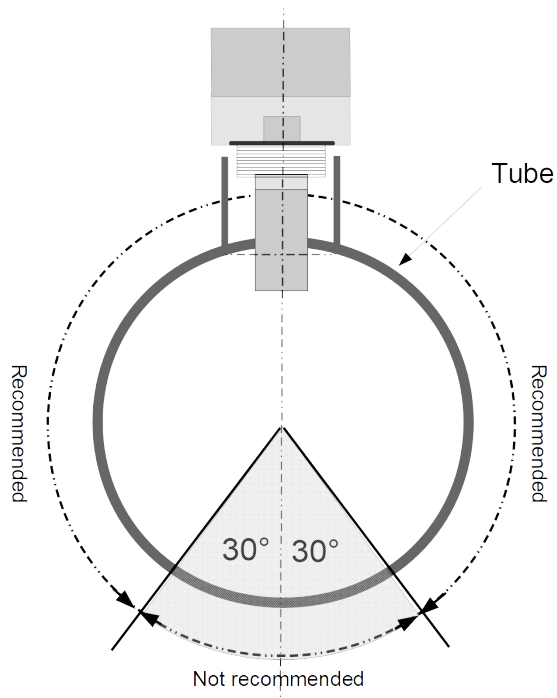
Please install the sensor only in the recommended area, as shown in the left picture.

The angle between the sensor and the centre vertical line of the tube must be greater than 30°.

An upside down installation is not permitted.

Removal of the sensor

Unscrew the sensor off the measurement chamber or from the nozzle. Please make sure that the system is pressure-less before the sensor is removed.

8.3 Electrical connection

Connection pins of the M12 plug
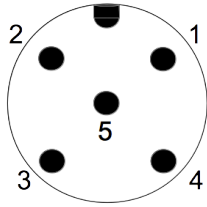
Connection pins
(View onto the connector)

Pin assignment of the M12 plug

Sensor models: S699 1215 / S699 1211 / S699 1220
Output signal: 2-wire Analog output

Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
SDI	$-V_B$ (Analog loop)	$+V_B$ (Analog loop)	N/A	N/A
brown	white	blue	black	grey

Sensor models: S699 2215 / S699 2211 / S699 2220
Output signal: 3-wire Analog output and SDI

Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
SDI	$-V_B$	$+V_B$	$+I$ 4 ... 20 mA	NA
brown	white	blue	black	grey

Sensor models: S699 3215 / S699 3211 / S699 3220
Output signal: 3-wire Analog output and Modbus RTU

Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
$+I$ 4 ... 20 mA	$-V_B$	$+V_B$	D+ Modbus RTU	D- Modbus RTU
brown	white	blue	black	grey

Legend to pin assignment

SDI	Digital signal (internal use)	+I	Active 4 … 20 mA signal
$-V_B$	Negative supply voltage	NA	Not applicable
$+V_B$	Positive supply voltage	D+	Modbus RTU data +
		D-	Modbus RTU data -

ATTENTION!

Do not screw the M12 plug using force. Otherwise, it may damage the connecting pins.

9 Signal outputs

9.1 Analog output

Depending on the model, the sensor provides a 2-wire or 3-wire analog output. The analog output ranges 4 … 20 mA.

- The 2-wire analog output is a current loop (loop-powered sensor).
- The 3-wire analog output is an active current output.

9.1.1 Scaling

The following table shows the standard scaling of the analog output.

Type	Scaling	
S211	4 mA	= -60°C Td
	20 mA	= +20°C Td
S215	4 mA	= -20°C Td
	20 mA	= +50°C Td
S220	4 mA	= -100°C Td
	20 mA	= +20°C Td

For other ranges, please contact the manufacturer. The analog output can be allocated to the temperature, dew point, and humidity.

9.2 Modbus RTU output

Mode	: RTU
Baud rate	: 19200
Device address	: Last two digits of serial number
Framing / parity / stop bit	: 8 / N / 1
Response time	: 1 second
Response delay	: 0 ms
Inter-frame spacing	: 7 char

Remark: If your application needs other settings, please state it in the order or use the Service Kit to configure the sensor settings on site.

9.2.1 Holding Register table for Modbus RTU

Modbus Register Address	Channel description	Read/ Write	Data Type	Data Length
2000	Group ID	R	INT16U	2-Byte
2001	Device ID	R	INT16U	2-Byte
2002	Serial number	R	INT32U	4-Byte
2004	FW/HW	R	INT16U	2-Byte
2005	Calibration date	R	DOUBLE	8-Byte
2009	Valid days from calibration date	R	INT16U	2-Byte
2010	Measuring Channel number	R	INT16U	2-Byte
2011	Device name	R	string	16-Byte
2100	Alternative humidity unit	R/W	INT16U	2-Byte
2101	Static pressure (in bar(g))	R/W	FLOAT	4-Byte
2103	Atmospheric pressure (in hPa)	R/W	FLOAT	4-Byte
2200	Unit+Resolution+Data type of Dew point	R	INT16U	2-Byte
2201	Unit+Resolution+Data type of Alternative humidity	R	INT16U	2-Byte
2202	Unit+Resolution+Data type of Pressure	R	INT16U	2-Byte
2203	Unit+Resolution+Data type of Temperature	R	INT16U	2-Byte
2300	Status	R	INT16U	2-Byte
2301	Channel Value of Dew point	R	FLOAT	4-Byte
2303	Channel Value of Alternative humidity	R	FLOAT	4-Byte
2305	Channel Value of Pressure	R	FLOAT	4-Byte
2307	Channel Value of Temperature	R	FLOAT	4-Byte

- "Unit+Resolution+Data type" Channel

- First byte is unit.

- Second byte:

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Data type: 0 float 1 4-byte unsigned integer 2 double				Resolution: 0 0 1 0.0 2 0.00 3 0.000 4 0.0000			

- "Status" channel

The highest bit is used for indicating if any sensor setting is changed by users. The rest bits are used for indicating if the measuring channels that follows the Status channel are working properly or not.

Bit	Description
5	0: Sensor settings have never been changed since last reading from the master. 1: Sensor settings have been changed since last reading from the master
0	0: The 1st measuring channel that follows the Status channel (addressed 2301) is working properly. 1: This measuring channel is not working properly.
1	0: The 2nd measuring channel that follows the Status channel (addressed 2303) is working properly. 1: This measuring channel is not working properly.
2	0: The 3rd measuring channel that follows the Status channel (addressed 2305) is working properly. 1: This measuring channel is not working properly.
3	0: The 4th measuring channel that follows the Status channel (addressed 2307) is working properly. 1: This measuring channel is not working properly.
4 … 14	Not used

In the response message that the device returns to the master:

- Function code:03

- Multi-Byte data orders are as follows.

| 2-byte	4-byte	8-byte
Byte1 Byte0	Byte1 Byte0 Byte3 Byte2	Byte1 Byte0 Byte3 Byte2 Byte5 Byte4 Byte7 Byte6

10 Optional accessories

10.1 Measuring chambers

There are different types of measuring chambers for example Measuring chamber with quick connector, by-pass chamber with in and out connection, measuring chamber for dryer installation, or high pressure chamber.

For more information, please contact your distributor or the manufacturer.

10.2 Service kit

The service kit is used to connect the sensor with a PC. Through the service software that is installed on the PC, sensor parameters such as analog output scaling, alarm values, units can be easily changed.

The diagram below shows the connection when using the optional service kit. Please make sure that either the dew point sensor or the service kit is connected to the power supply because the USB port on the PC cannot supply enough power for both of them.
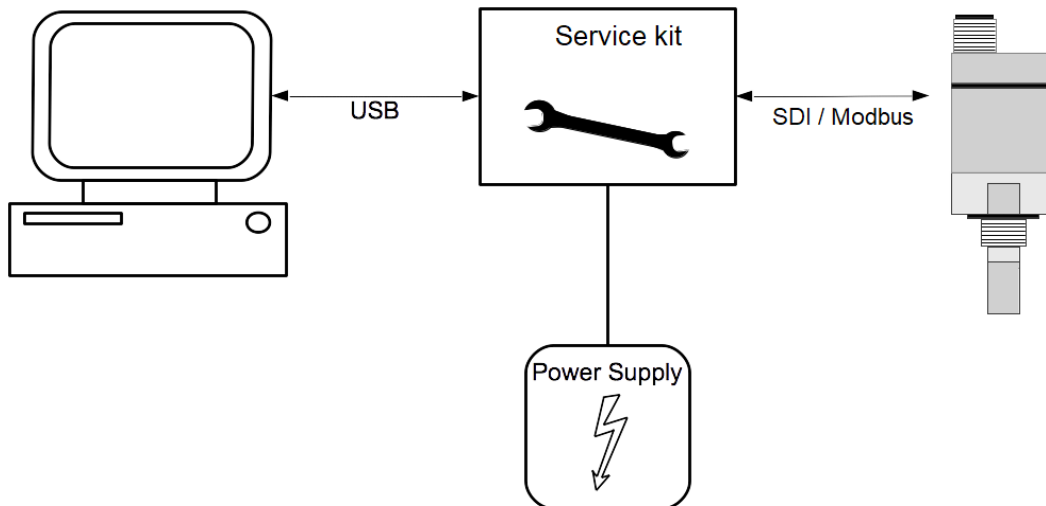
11 Calibration

The sensor is calibrated ex work. The exact calibration date is printed on the certificate that is supplied together with the sensor. The accuracy of the sensor is regulated by the on-site conditions, and parameters such as oil, high humidity, and other impurities can affect the calibration and furthermore the accuracy. Therefore we recommend you calibrate the instrument at least once per year. The calibration is excluded from the instrument warranty. Please contact the manufacturer for details.

12 Maintenance

Please observe from time to time the sinter cap. If it appears to be dirty, it is recommended to replace it for this please contact the manufacturer.

ATTENTION!

Contaminated filters can lead to longer response time and to wrong measurements.

13 Disposal or waste

Electronic devices are recyclable material and do not belong in the household waste.
The sensor, the accessories and its packings must be disposed according to your local statutory requirements.
The dispose can also be carried by the manufacturer of the product, for this please contact the manufacturer.

.SUTO

SUTO iTEC GmbH
Grißheimer Weg 21
D-79423 Heitersheim
Germany

Tel: +49 (0) 7634 50488 00
Fax: +49 (0) 7634 50488 19
Email: sales@suto-itec.com
Website: http://www.suto-itec.com

SUTO iTEC (ASIA) Co., Ltd.
Room 10, 6/F, Block B, Cambridge Plaza
188 San Wan Road, Sheung Shui, N.T.
Hong Kong

Tel: +852 2328 9782
Fax: +852 2671 3863
Email: sales@suto-itec.asia
Website: http://www.suto-itec.com