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Sewi AQS/TH Modbus
Sewi TH Modbus
Indoor sensors

Technical specifications and installation instructions

Item number 30174 (Sewi AQS/TH Modbus), 30175 (Sewi TH Modbus)

elsner elektronik

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1. Description

The **indoor sensors Sewi AQS/TH Modbus and Sewi TH Modbus** measure the indoor temperature and humidity and also calculate the dew point temperature. The **Sewi AQS/TH** also records the CO2 concentration.

The devices are Modbus slaves with a RS485 interface and a RTU protocol. The Modbus master, such as PC, SPS or MC can read the **Sewi Modbus Indoor Sensors** measurement values with “Function 04h (Read Input Register)”.

Sewi TH Modbus Indoor Sensor Functions:

- Temperature measurements
- Humidity measurements
- Calculating the dew point temperature

Sewi AQS/TH Modbus Indoor Sensor Functions:

- Measuring the CO2concentration in the air
- Temperature measurements
- Humidity measurements
- Calculating the dew point temperature

Tips for Dew Point Calculation:

The sensors **Sewi Modbus** calculate the ambient dew point temperature. This value can be used for dew point monitoring. This would require another sensor for measuring the surface temperature of the wall or pipe. Also, the dew point needs to be monitored (compare with temperatures) in the Modbus master.

Monitoring predetermines the possible condensate build-up on the surface, giving a chance for timely countermeasures.

1.0.1. Deliverables

- Sensor in the housing for wall or ceiling mounting.

1.1. Specifications

Housing	Plastic
Colour	White (Cover glossy, skirting matt)
Assembly	Surface, wall or ceiling installation
Protection category	IP 30
Dimensions	Ø approx. 105mm, height approx. 32mm
Weight	Sewi AQS/TH Modbus: approx. 100g Sewi TH Modbus: approx. 75g
Ambient temperature	Mode 0 …+50°C, Storage -20 …+70°C
Ambient humidity	max. 95% RH, avoid condensation
Operating voltage	12 to 40V DC. An appropriate power supply unit can be purchased from Elsner Elektronik.

Cable cross-section	Solid conductor up to 0.8mm^2
Power	max. 15mA
Interface	RS485
Protocol	RTU
RS485 bus load	1/8 unit load according to the RS485 standard
RS485 drive output	min. 2.4V at 54 Ohm bus load (according to the 32 standard RS485 unit loads)
Sewi TH Modbus (30175):	
Temperature measurement range	-40...+80°C
Resolution (temperature)	0.1°C
Accuracy (temperature)	±1.0°C at -40...-10°C ±0.5°C at -10...+65°C ±0.7°C at +65...+85°C
Humidity measurement range	0% rH ... 100% rH
Resolution (humidity)	0.1°C
Humidity accuracy	±7.5% rH at 0...10% rH ±4.5% rH at 10...90% rH ±7.5% rH at 90...100% rH
Sewi AQS/TH Modbus (30174):	
Temperature measurement range	0°C…+50°C
Resolution (temperature)	0.1°C
Accuracy (temperature)	±0.5°C at 0...+50°C
Humidity measurement range	0% rH…90% rH
Resolution (humidity)	0.1% RH
Humidity accuracy	±7.5% rH at 0%…10% ±4.5% rH at 10...90% rH
CO_2 measurement range	0...2,000ppm
Resolution (CO_2)	1ppm
Accuracy (CO_2)*	±50ppm ±3% of the measured value

* Please note the information on *Measuring accuracy*, Page 3

The product is compliant with the provisions of the EC guidelines.

1.1.1. Measuring accuracy

The specified accuracy of CO2 measurement will be achieved after a run-in period of 24 hours (without an interruption in the power supply) when the sensor comes at least once in contact with fresh air (350 to 450ppm) during this time. There may be an incorrect measured value in the register during the run-in period.

Thereafter, the CO2 sensor carries out an automatic calibration every two weeks in which the smallest measured CO2 value within this period (without an interruption in the power supply) is used as the reference value for fresh air.
In order to ensure permanent accuracy, the sensor should be supplied with fresh air at least once every two weeks. This is normally the case during room ventilation.

2. Installing and commissioning

2.1. Installation notes

Installation, testing, operational start-up and troubleshooting should only be performed by an electrician.

CAUTION!
Live voltage!
There are unprotected live components inside the device.

- National legal regulations are to be followed.
- Ensure that all lines to be assembled are free of voltage and take precautions against accidental switching on.
- Do not use the device if it is damaged.
- Take the device or system out of service and secure it against unintentional use, if it can be assumed, that risk-free operation is no longer guaranteed.

The device is only to be used for its intended purpose. Any improper modification or failure to follow the operating instructions voids any and all warranty and guarantee claims.

After unpacking the device, check it immediately for possible mechanical damage. If it has been damaged in transport, inform the supplier immediately.

The device may only be used as a fixed-site installation; that means only when assembled and after conclusion of all installation and operational start-up tasks and only in the surroundings designated for it.

Elsner Elektronik is not liable for any changes in norms and standards which may occur after publication of these operating instructions.

2.2. Installation location

Install and use only in dry interior rooms!
Avoid condensation.

The indoor sensor is installed on the wall or ceiling plaster.

While selecting the location, please ensure that the **temperature, humidity and CO2** measurements are minimally distorted by external influences as possible. Possible sources of interference include:

- Direct sunlight
- Draughts from windows and doors
- Draughts from ducts coming from other rooms or the outdoors
- Warming or cooling of the building structure on which the sensor is mounted, e.g. due to sunlight, heating or cold water pipes
- Connection lines and empty ducts which lead from warmer or colder areas to the sensor

2.3. Notes on mounting and commissioning

Never expose the device to water (e.g. rain) or dust. This can damage the electronics. You must not exceed a relative humidity of 95%. Avoid condensation.

The air slots on the side must not be closed or covered.

After the operating voltage has been applied, the device will enter an initialisation phase lasting a few seconds. During this phase no information can be received or sent via the bus.

2.4. Construction of the sensor

2.4.1. Printed circuit boards/connections

ATTENTION!
Make sure the connection is correct! The interface module is damaged if the voltage supply is connected to the wrong terminal.

- Connect the power supply to 1 and 2 only.
- Use the data connections A and B exclusively for Modbus.

ATTENTION!
CO2 sensor with sensitive membrane in Sewi AQS/TH!
When handling the device, do not damage the white membrane.

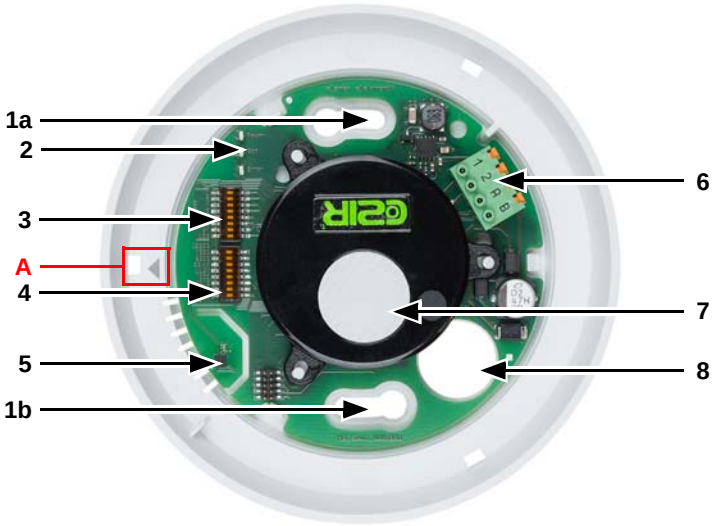

Fig. 1
1 a + b Long holes for mounting (hole distance 60mm)
2 LEDs: Green Power/Operating voltage.
Red Error/Sensor error or incorrect data.
yellow Com/Bus communication.
3 DIP switch for slave address (see detailed view)
4 interface parameter DIP switch (see detailed view)
5 Sensors for temperature, humidity
6 plug for connection, suitable for a solid conductor up to 0.8mm²
1: 12 to 40V DC (+), 2: GND (-).
Data A: Modbus D0, Data B: Modbus D1.
The reference potential for data lines is GND (-) of the power supply.
7 CO_2 sensor (only for the Sewi AQS/TH Modbus)
8 Cable bushing

A Mark for aligning the cover

2.4.2. Housing from the outside

Fig. 2
A Recess to open the housing.

When closing the housing, the recess aligns to the marking on the skirting

2.5. Assembly

Fig. 3

Open the housing. To do this, carefully lift the cover from the skirting. Start at the recess (Fig. 2: A).

Fig. 4

Lead the power cable through the cable bushing in the skirting.

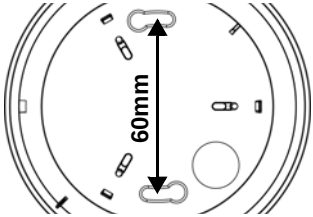

Fig. 5

Screw the skirting to the wall or the ceiling.

Hole distance 60mm.

Fig. 6
Connect the power supply
1 (+)/2 (GND, -) and data lines
A (Modbus D0) / B (Modbus D1)
to their designated terminals.
The reference potential for data lines is GND (-) of the power supply.

ATTENTION!
Make sure the connection is correct! The interface module is damaged if the voltage supply is connected to the wrong terminal.

- Connect the power supply to 1 and 2 only.
- Use the data connections A and B exclusively for Modbus.

Fig. 7

Close the housing by positioning the cover and snapping it into place. Position the recess in the cover over the marking on the skirting (Fig. 1+2: A).

2.6. Bus communication

2.6.1. Bus load

The RS485 transceiver used has a 1/8 standard RS485 bus load (1/8 unit load) and can achieve at least 2.4V at 54 Ohm. It is operated in the location of a bus with 32 users with standard bus load. If users with less than the standard bus load are connected to an RS485 bus, then the bus can be operated with more users. For instance, if users with a 1/8 bus load are connected, then up to 32×8 = 256 users can be connected to the bus.

2.6.2. Setting the bus communication

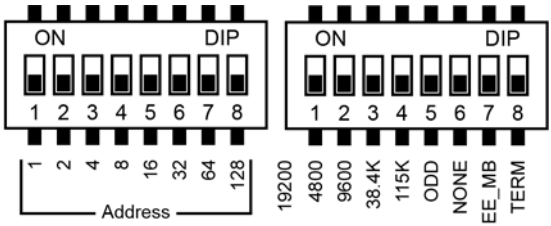

Fig. 8:
Detailed view of the DIP switches

If all DIP switches are in the OFF position (factory setting), the following parameters are set:
Address: 1
Baud rate: 19,200
Parity: Even
Timing: Off

Setting the slave address:

The slave address is set in the 8-bit DIP switch “address”. Address 1 is selected, if all switches are at OFF. Address 0 is reserved for broadcast information. Addresses larger than 247 are invalid.

The address has binary coding. So, for example, switches 1, 2, 3, 4 and 6 need to be set to ON for address 47.

Interface parameters:

The interface parameters are set in the second 8-bit DIP switch. If the first 4 switches are set to OFF, the binary rate setting is 19,200 baud. If one of these switches is set to ON, it has the corresponding baud rate.

Parity: If both switches are “ODD” and “NONE” on “OFF”, the parity is EVEN. Only “ODD” or “NONE” can switch the corresponding parity check.

“EE MB” switch: without function
“TERM” switch: Bus termination 124 Ohms

3. Maintenance

The air slots on the side must not get dirty or covered. As a rule, it is sufficient to wipe the device with a soft, dry cloth twice a year.

4. Transfer protocol

4.1. Sewi TH Modbus (30175):

4.1.1. Function 04H Read Input Register TH-AP Modbus

Before the first measurement and in case of a faulty sensor, all registers are at “-32768”.

Register	Parameter	Data Type	Data Value	Range
0	Temperature	Signed 16Bit	-400 to +1,250	-40 to +125°C
1	Relative humidity	Signed 16Bit	0 to 1,000	0 to 100%
2	Dew point temperature	Signed 16Bit	-400 to +1,250	-40 to +125°C

4.1.2. Query string from the master

Byte no.	Variable		Explanation
0	Slave address	xx	
1	Command	04H	Read Input Registers
2	Start Address High Byte	xx	Register start address
3	Start Address Low Byte	xx	
4	Word Count High Byte	xx	Number of registers to read
5	Word Count Low Byte	xx	
6	CRC Low Byte	xx	
7	CRC High Byte	xx	

Example query string for reading all data for slave address 1:
01H, 04H, 00H, 00H, 00H, 03H, B0H, 0BH

4.1.3. Output string for the master

Before the first measurement and in case of a faulty sensor, all registers are at "-32768".

Byte no.	Register address	Variable		Explanation
0		Slave address	xx	
1		Command	04H	Read Input Register
2		Number of bytes	xx	Master requirement * 2
3	0	Temperature High Byte	xx	with prefix, value/10 = Temperature xx.x°C
4		Temperature Low Byte	xx	
5	1	Relative Humidity High Byte	xx	Value/10 = relative humidity xx.x%
6		Relative Humidity Low Byte	xx	
7	2	Dew point Temperature High Byte	xx	with prefix, value/10 = Dew point Temperature xx.x°C
8		Dew point Temperature Low Byte	xx	
9		CRC Low Byte	xx	
10		CRC High Byte	xx	

4.2. Sewi AQS/TH Modbus

4.2.1. Function 04H Read Input Register TH-AP Modbus

Before the first measurement and in case of a faulty sensor, all registers are at "-32768".

Register	Parameter	Data Type	Data Value	Range
0	Temperature	Signed 16Bit	-400 to +1,250	-40 to +125°C
1	Relative humidity	Signed 16Bit	0 to 1,000	0 to 100%
2	Dew point temperature	Signed 16Bit	-400 to +1,250	-40 to +125°C
3	CO_2	Signed 16Bit	200 to +2,001	200 to +2,001

4.2.2. Query string from the master

Byte no.	Variable		Explanation
0	Slave address	xx	
1	Command	04H	Read Input Registers
2	Start Address High Byte	xx	Register start address
3	Start Address Low Byte	xx	

Byte no.	Variable		Explanation
4	Word Count High Byte	xx	Number of registers to read
5	Word Count Low Byte	xx	
6	CRC Low Byte	xx	
7	CRC High Byte	xx	

Example query string for reading all data for slave address 1:
01h, 04h, 00h, 00h, 00h, 04h, F1h, C9h

4.2.3. Output string for the master

Before the first measurement and in case of a faulty sensor, all registers are at "-32768".

Byte no.	Register address	Variable		Explanation
0		Slave address	xx	
1		Command	04H	Read Input Register
2		Number of bytes	xx	Master requirement * 2
3	0	Temperature High Byte	xx	Value/10 = with prefix, Temperature xx.x°C
4		Temperature Low Byte	xx	
5	1	Relative Humidity High Byte	xx	Value/10 = relative humidity xx.x%
6		Relative Humidity Low Byte	xx	
7	2	Dew point Temperature High Byte	xx	Value/10 = with prefix, Dew point Temperature xx.x°C
8		Dew point Temperature Low Byte	xx	
9	3	CO_2 High Byte	xx	Value = CO_2 in xxx ppm
10		CO_2 Low Byte	xx	
11		CRC Low Byte	xx	
12		CRC High Byte	xx	