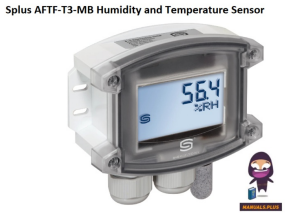


Splus AFTF-T3-MB Humidity and Temperature Sensor Instruction Manual

Contents

Splus AFTF-T3-MB Humidity and Temperature Sensor

Product Information

Model: AFTF-T3-MB

Specifications

- **Dimensions:** 116mm x 106mm x 78.5mm
- **Type:** On-wall-sensor, measuring transducer
- **Measurements:** Temperature, relative/absolute humidity, dew point, enthalpy, the mixture ratio Calibratable with Modbus connection

Product Usage Instructions

Installation

1. Mount the sensor on the desired wall location using appropriate mounting hardware.
2. Ensure the sensor is securely fixed to the wall to prevent any movement.
3. Connect the Modbus cable to the sensor for data communication.

Configuration

1. Set the bus address using the DIP switches according to the provided instructions.
2. Adjust the bus parameters for baud rate and parity based on your requirements.

Calibration

1. Perform calibration as per the specific calibration instructions provided in the manual.
2. Verify the accuracy of temperature, humidity, and other measurements after calibration.

Data Reading

1. Use the provided telegram codes to read specific data points such as temperature, humidity, dew point, etc.
2. Refer to the manual for interpreting the data values and units.

(FAQ)

- **Q:** How do I change the Modbus address of the sensor?
- **A:** To change the Modbus address, adjust the DIP switches according to the provided instructions. For example, setting DIP 1 to ON, DIP 2 to ON, and DIP 8 to ON would result in a Modbus address of 193.
- **Q:** What is the default bus parameter configuration?
- **A:** The default bus parameter configuration includes a baud rate of 9600 Baud, Even parity, and other settings as specified in the manual.

Type AFTF-T3-MB

Calibratable outside humidity and temperature sensor Type AFTF – T3 – MB, with Modbus connection, in an impact-resistant plastic housing with quick-locking screws, with a plastic sinter filter (exchangeable), to exactly detect the relative humidity (0…100% RH) and the temperature (–35…+80 °C) and to detect various parameters in humidity measurement. The international system of units SI (default) can be switched to Imperial (via Modbus). The on-wall sensor is applied in a non-aggressive, dust-free environment. It is used in refrigeration, air conditioning and clean room technology, engineering rooms, hotels and conference facilities.
A long-term stable, digital humidity and temperature sensor guarantees exact measurement results. These measurands are used to internally calculate the following parameters that can be retrieved via Modbus: relative humidity, absolute humidity, mixture ratio, dew point, enthalpy (ignoring atmospheric air pressure) and ambient temperature. Innovative Modbus sensor with galvanically separated RS485-Modbus interface, selectable bus termination resistance, DIP switch for setting the bus parameters and bus address in current-free state, internal LEDs for telegram status display, and two separate push-in terminals. The sensor is factory-calibrated; an environmental precision adjustment by an expert is possible.

TECHNICAL DATA

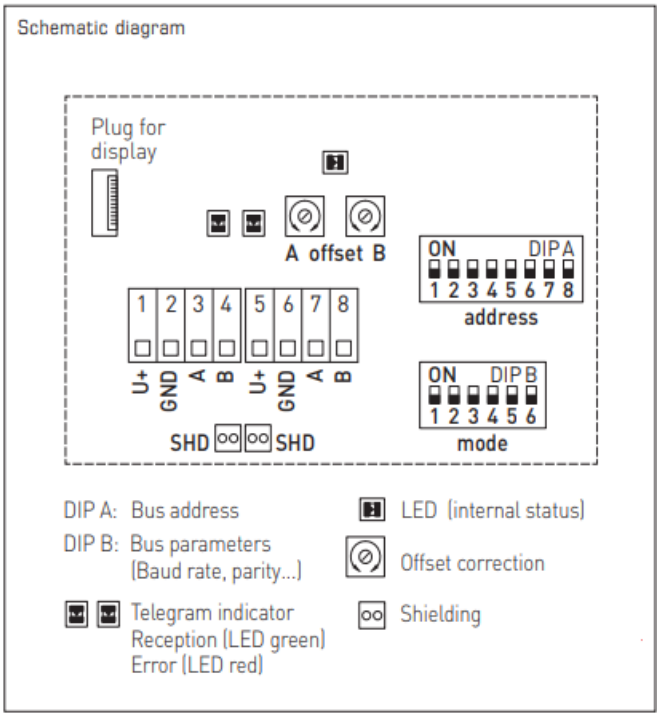
TECHNICAL DATA	
Voltage supply:	24 V AC (±20%) 15...36 V DC
Power consumption:	< 1.2 W / 24 V DC
System of units:	**SI** (default) or **Imperial** (switchable via Modbus)
Data points:	temperature [°C] [°F], relative humidity [% RH], dew point [°C] [°F], absolute humidity [g/m³] [gr/ft³], mixing ratio [g/kg] [gr/lb], enthalpy [kJ/kg] [Btu/lb]
Sensor:	**digital humidity sensor with integrated temperature sensor,** low hysteresis, high long-term stability
Protective tube:	**stainless steel V2A** (1.4301), Ø 13 mm, NL = 46 mm
Sensor protection:	**plastic** sinter filter, Ø 13 mm, L = 28 mm
Measuring range:	0...100 % RH (humidity) –35...+80 °C (temperature)
Deviation, humidity:	typically **±2.0** % (20...80 % RH) at +25 °C, otherwise ±3.0 %
Temperature deviation:	typically ±0.4 K at +25 °C
Zero point offset:	±10 % RH (humidity) ±5 °C (temperature)
Ambient temperature:	–30...+70 °C
Medium:	clean air and non-aggressive, non-combustible gases
Bus protocol:	Modbus (RTU mode), address range 0...**247** selectable
Baud rate:	9600, 19200, 38400 Baud
Signal filtering:	4 s / 32 s
Housing:	plastic, UV-resistant, material polyamide, 30 % glass-globe reinforced, with quick-locking screws (slotted / Phillips head combination), colour traffic white (similar to RAL 9016)
Housing dimensions:	108 x 78.5 x 43.3 mm (Typ 3)
Cable connection:	cable gland, plastic (2x M20x 1.5; with strain relief, exchangeable, inner diameter 8 - 13 mm)
Electrical connection:	0.2 - 1.5 mm², using push-in terminals
Process connection:	by screws
Permissible air humidity:	< 95 % RH, non-precipitating air
Protection class:	III (according to EN 60730)
Protection type:	**IP 65** (according to EN 60529)
Standards:	CE conformity, electromagnetic compatibility according to EN 61326, according to EMC Directive 2014 / 30 / EU

AFTF-T3 -MB	On-wall hu midity-	a n d	temperature sensors

Type	**Measuring Range** Humidity (switchable)	Temperature	**Danfoss** **Part Number**

AFTF-T3-MB	On-wall humidity- and temperature sensors		
Type	**Measuring Range** Humidity (switchable)	Temperature	**Danfoss** **Part Number**
Type AFTF-T3-MB	0...100 % RH (default) 0...80 g / kg (MV) 0...80 g / m³ (AH) 0...85 kJ / kg (ENT.) –20...+80 °C (TP)	–35...+80 °C –3...+176 °F	**134B9411**
ACCESSORIES			
WS-03	**Weather and sun protection hood,** 200 x 180 x 150 mm, stainless steel **V2A** (1.4301)		**134B9425**

Schematic diagram



Manual offset adjustment

- The sensors are pre-set and calibrated at the factory.
- For subsequent adjustment of the measured value,
- there are two offset potentiometers (A and B) available.
- Range of adjustment:
- (A) approx. ± 5 °C / ± 9 °F
- (B) approx. ± 10 % RH

Switchable system of units

Measurements / Data points	**SI** (default)	→	**Imperial**
Temperature	[°C]	→	[°F]
Relative humidity	[% RH]	→	[% RH]
Dew point	[°C]	→	[°F]
Absolute humidity	[g/m³]	→	[gr/ft³]
Mixing ratio	[g/kg]	→	[gr/lb]
Enthalpy	[kJ/kg]	→	[Btu/lb]

Measuring ranges	**SI** (default)	→	**Imperial**
	–35...+80 °C	→	–3...+176 °F
	0...100 % RH	→	0...100 % RH

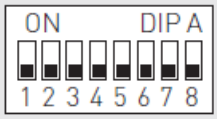
Configuration

Bus address
(binary coded, value selectable from 1 to 247)

DIP 1	DIP 2	DIP 3	DIP 4	DIP 5	DIP 6	DIP 7	DIP 8
128	64	32	16	8	4	2	1
ON	**ON**	OFF	OFF	OFF	OFF	OFF	**ON**

Example shows 128 + 64 + 1 = 193 as Modbus address.

MODBUS
DIP switch [A]



The device address in the range of 1 to 247 is set at DIP switch [A]. For switch positions 1 to 8 see the table on

the back!

- Address 0 is reserved for broadcast messages.
- Addresses greater than 247 must not be assigned and are ignored by the device.

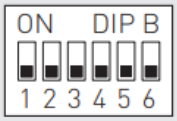
The DIP switches are binary-coded with the following values:

- DIP 1 = 128 ..... DIP 1 = ON
- DIP 2 = 64 ..... DIP 2 = ON
- DIP 3 = 32 ..... DIP 3 = OFF
- DIP 4 = 16 ..... DIP 4 = OFF
- DIP 5 = 8 ..... DIP 5 = OFF
- DIP 6 = 4 ..... DIP 6 = OFF
- DIP 7 = 2 ..... DIP 7 = OFF
- DIP 8 = 1 ..... DIP 8 = ON The switch positions shown here result in the Modbus address 128 + 64 + 1 = 193

BUS PARAMETERS

Baud rate (selectable)	**DIP 1**	**DIP 2**
9600 baud	**ON**	OFF
19200 baud	**ON**	**ON**
38400 baud	OFF	**ON**
Reserved	OFF	OFF

MODBUS
DIP switch [B]



Parity (selectable)	**DIP 3**
EVEN (numbered)	**ON**
ODD (numbered)	OFF

Parity check (on/off)	**DIP 4**
Active (1 stop bit)	**ON**
Inactive (no parity) (2 stop bits)	OFF

8N1 mode (on/off)	**DIP 5**
Active	**ON**
Inactive (default)	OFF

Bus termination (on/off)	**DIP 6**
Active	**ON**
Inactive	OFF

The baud rate (speed of transmission) is set at DIP switches 1 and 2 of DIP switch block [B]. Selectable are 9600 baud, 19200 baud, or 38400 baud – see table! Parity is set at DIP switch 3 of DIP switch block [B]. Selectable are EVEN or ODD – see the table! Parity check is activated via DIP switch 4 of DIP switch block [B]. Selectable are active (1 stop bit), or inactive (2 stop bits), i.e. no parity check – see table! The 8N1 mode is activated via DIP switch 5 of DIP switch block [B].
The functionality of DIP switch 3 (parity) and DIP switch 4 (parity check) of DIP switch block [B] is therefore deactivated. Selectable are 8N1 active or inactive (default) – see table !. Bus termination is activated via DIP switch 6 of DIP switch block [B] Selectable are active (bus termination resistance of 120 Ohm), or inactive (no bus termination) – see table!

COMMUNICATION INDICATOR
Communication is indicated via two LEDs. Error-free received telegrams are signalized by the green LED lighting up, regardless of the device address. Faulty telegrams or triggered Modbus exception telegrams are depicted by the red LED lighting up

DIAGNOSTICS
An error diagnostic function is integrated

Telegrams

Register	Parameter		Data Type	Value	Range
3×0001	Temperature	Sampling 4 s	Signed 16 Bit	– 350… +800 – 310…+1760	– 35.0… +80.0 °C – 31.0…+176.0 °F
3×0002	Temperature	Filtering 32 s	Signed 16 Bit	– 350… +800 – 310…+1760	– 35.0… +80.0 °C – 31.0…+176.0 °F
3×0003	Relative humidity	Sampling 4 s	Signed 16 Bit	0…1000	0.0. 100.0 % RH
3×0004	Relative humidity	Filtering 32 s	Signed 16 Bit	0…1000	0.0. 100.0 % RH
3×0005	Dew point	Computed value	Signed 16 Bit	0… 500 320…1220	0.0… +50.0 °C 32.0…+122.0 °F
3×0006	Absolute humidity	Computed value	Signed 16 Bit	0…800 0…349	0.0. 80.0 g / m³ 0.0. 34.9 gr / ft³
3×0007	Mixing ratio	Computed value	Signed 16 Bit	0… 800 0…5600	0.0….. 80.0 g / kg 0.0. 560.0 gr / lb
3×0008	Enthalpy	Computed value	Signed 16 Bit	0…850 0…360	0.0. 85.0 kJ / kg 0.0. 36.0 Btu / lb

Function 05 Write Single Coil

Register	Parameter				Data Type	Value	Range
0x0001	reserved						
0x0002	**System of units**	**SI**	→	**Imperial**	Bit 1	0 / 1	SI (Default) – Imperial
	Temperature Relative humidity	[°C] [% RH]	→	[°F] [% RH]			
	Dew point Absolute humidity Mixing ratio Enthalpy	[°C] [g / m³] [g / kg] [kJ / kg]	→ → → →	[°F] [gr / ft³] [gr/lb] [Btu / lb]			

Function 08 Diagnostics

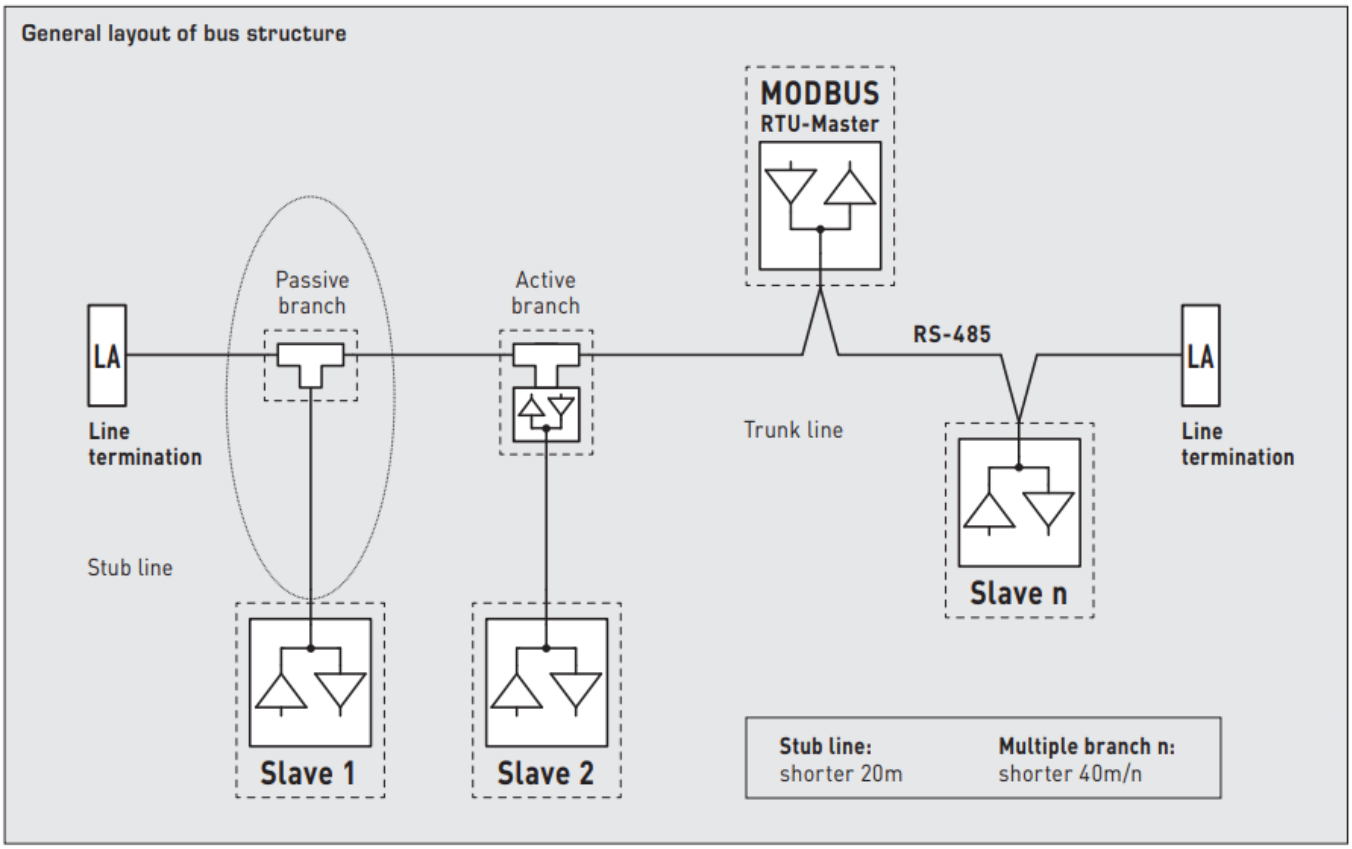
The following sub-function codes are supported

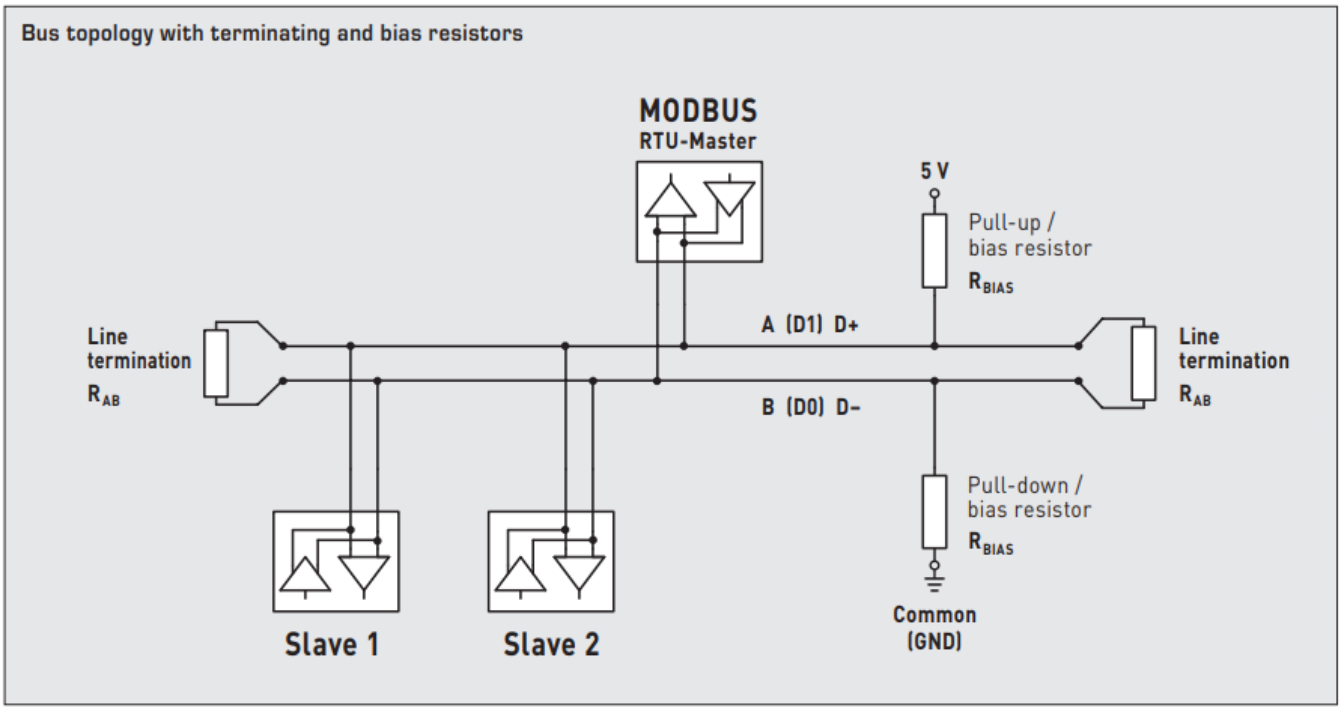
Sub Function Code	Parameter	Data Type	Answer
00	Echo of transmission data (Loopback)		Echo data
01	Restart Modbus (Reset listen-only mode)		Echo telegram
04	Activation listen-only mode		No answer
10	Delete counter		Echo telegram
11	Counter bus telegrams	Unsigned 16 Bit	All valid bus telegrams
12	Counter communication errors (Parity, CRC, frame errors, etc.)	Unsigned 16 Bit	Faulty bus telegrams
13	Counter exception telegrams	Unsigned 16 Bit	Error counter
14	Counter slave telegrams	Unsigned 16 Bit	Slave telegrams
15	Counter telegrams without answer	Unsigned 16 Bit	Broadcast messages (address 0)

Function 17 Report Slave ID Composition of answer telegram

Byte No.	Parameter	Data Type	Answer
00	Number of bytes	Unsigned 8 Bit	6
01	Slave ID (device type)	Unsigned 8 Bit	16 = **Type AFTF-T3-MB**
02	Slave ID (device class)	Unsigned 8 Bit	30 = Humidity
03	Status	Unsigned 8 Bit	255 = RUN, 0 = STOP
04	Version number (release)	Unsigned 8 Bit	1…9
05	Version number (version)	Unsigned 8 Bit	1…99
06	Version number (index)	Unsigned 8 Bit	1

Installation





Terminating resistors may only be installed at the ends of the bus line. In networks with repeaters not more than two line terminations are allowed. Line termination at the device can be activated via DIP switch 6.
The bias resistors for bus level definition in the resting state are usually activated at the Modbus master/repeater. The maximum number of subscribers per Modbus segment is 32 devices. When the number of subscribers is greater, the bus must be subdivided into several segments separated by repeaters. The subscriber address can be set from 1 to 247. For the bus line, a twisted-pair cable data line / power supply line and copper mesh wire shield must be used. Therefore, the line capacitance should be less than 100 pF / m (e.g. Profibus cable).

Installation and Commissioning

Devices are to be connected under dead-voltage conditions. Devices must only be connected to safety extra-low

voltage. Consequential damages caused by a fault in this device are excluded from warranty or liability. These devices must be installed and commissioned by authorised specialists. The technical data and connecting conditions shown on the device labels and in the mounting and operating instructions delivered together with the device are exclusively valid. Deviations from the catalogue representation are not explicitly mentioned and are possible in terms of technical progress and continuous improvement of our products. In case of any modifications made by the user, all warranty claims are forfeited. Operating this device close to other devices that do not comply with EMC directives may influence functionality. This device must not be used for monitoring applications, which serve the purpose of protecting persons against hazards or injury, or as an EMERGENCY STOP switch for systems or machinery, or for any other similar safety-relevant purposes. Dimensions of enclosures or enclosure accessories may show slight tolerances on the specifications provided in these instructions. Modifications of these records are not permitted. In case of a complaint, only complete devices returned in original packing will be accepted.

Notes regarding mechanical mounting and attachment:
Mounting shall take place while observing all relevant regulations and standards applicable to the place of measurement (e.g. such as welding instructions, etc.). Particularly the following shall be regarded:

- VDE / VDI directive technical temperature measurements, measurement set-up for temperature measurements.
- The EMC directives must be adhered to.
- It is imperative to avoid parallel laying of current-carrying lines.
- We recommend to use shielded cables with the shielding being attached at one side to the DDC / PLC.

Before mounting, make sure that the existing thermometer‘s technical parameters comply with the actual conditions at the place of utilization, in particular in respect of:

- Measuring range
- Oscillations, vibrations, and shocks are to be avoided (< 0.5 g)

Notes on commissioning:
This device was calibrated, adjusted and tested under standardised conditions. When operating under deviating conditions, we recommend performing an initial manual adjustment on-site during commissioning and subsequently at regular intervals. Commissioning is mandatory and may only be performed by qualified personnel!

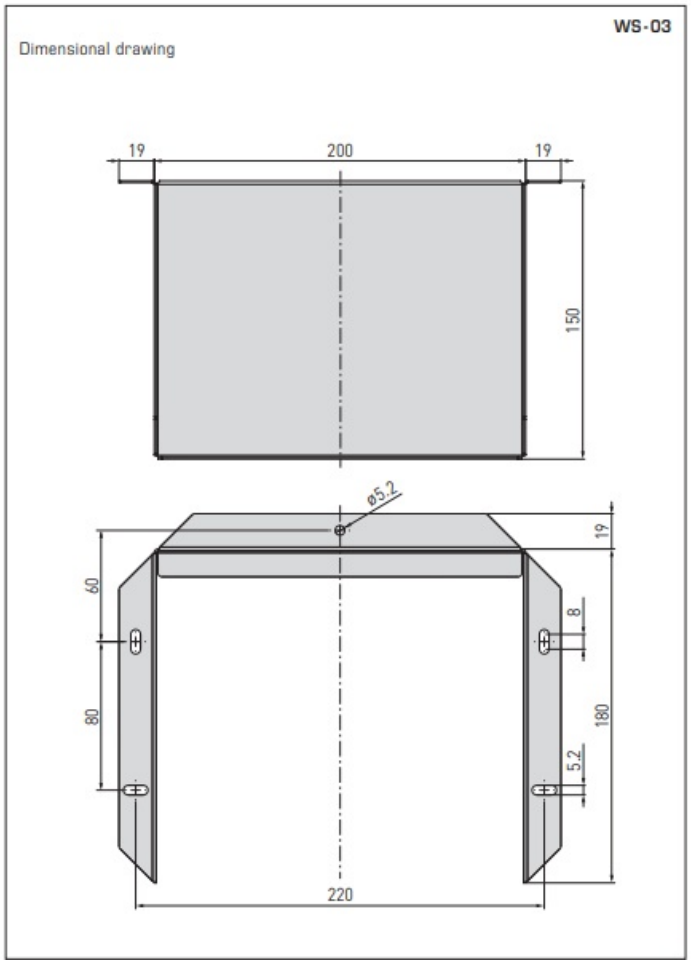
Important notes
Our “General Terms and Conditions for Business“ together with the “General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry“ (ZVEI conditions) including supplementary clause “Extended Retention of Title“ apply as the exclusive terms and conditions. In addition addition, the following points are to be observed:

- These instructions must be read before installation and putting in operation and all notes provided therein are to be regarded!
- A suitable weather and sun protection hood must be used when installed outdoors.
- Devices must only be connected to safety extra-low voltage and under dead-voltage conditions. To avoid damages and errors the device (e.g. by voltage induction) shielded cables are to be used, laying parallel with current-carrying lines is to be avoided, and EMC directives are to be observed.
- This device shall only be used for its intended purpose. Respective safety regulations issued by the VDE, the states, their control authorities, the TÜV and the local energy supply company must be observed. The purchaser has to adhere to the building and safety regulations and has to prevent perils of any kind.
- No warranties or liabilities will be assumed for defects and damages arising from improper use of this device.

- Consequential damages caused by a fault in this device are excluded from warranty or liability.
- These devices must be installed and commissioned by authorised specialists.
- The technical data and connecting conditions of the mounting and operating instructions delivered together with the device are exclusively valid. Deviations from the catalogue representation are not explicitly mentioned and are possible in terms of technical progress and continuous improvement of our products.
- In case of any modifications made by the user, all warranty claims are forfeited.
- This device must not be installed close to heat sources (e.g. radiators) or be exposed to their heat flow. Direct sun irradiation or heat i rradiation by similar sources (powerful lamps, halogen spotlights) must absolutely be avoided.
- Operating this device close to other devices that do not comply with EMC directives may influence functionality.
- This device must not be used for monitoring applications, which serve the purpose of protecting persons against hazards or injury, or as an EMERGENCY STOP switch for systems or machinery, or for any other similar safety-relevant purposes.
- Dimensions of housing or housing accessories may show slight tolerances on the specifications provided in these instructions.
- Modifications of these records are not permitted.
- In case of a complaint, only complete devices returned in original packing will be accepted.

Commissioning is mandatory and may only be performed by qualified personnel! These instructions must be read before installation and commissioning and all notes provided therein are to be regard!

DIMENSION



WS-03

Weather and sun protection
(optional)

subject to errors and technical changes. All statements and data herein represent our best knowledge at date of publication. They are only meant to i nform about our products and their application potential but do not imply any warranty as to certain product characteristics. Since the devices are used under a wide range of different conditions and loads beyond our control, their particular suitability must be verified by each customer and/or end user. Existing property rights must be observed. We warrant the faultless quality of our products as stated in our General Terms and Conditions

Bus address, binary coded

1	□□□□□□□■	51	□□■□□□□■	101	□■□□□□□■	151	■□□□■□□■	201	■■□□□□□■
2	□□□□□□■□	52	□□■□□□■□	102	□■□□□□■□	152	■□□□■□■□	202	■■□□□□■□
3	□□□□□□■■	53	□□■□□□■■	103	□■□□□□■■	153	■□□□■□■■	203	■■□□□□■■
4	□□□□□■□□	54	□□■□□■□□	104	□■□□□■□□	154	■□□□■■□□	204	■■□□□■□□
5	□□□□□■□■	55	□□■□□■□■	105	□■□□□■□■	155	■□□□■■□■	205	■■□□□■□■
6	□□□□□■■□	56	□□■□□■■□	106	□■□□□■■□	156	■□□□■■■□	206	■■□□□■■□
7	□□□□□■■■	57	□□■□□■■■	107	□■□□□■■■	157	■□□□■■■■	207	■■□□□■■■
8	□□□□■□□□	58	□□■□■□□□	108	□■□□■□□□	158	■□□□■□□□	208	■■□□■□□□
9	□□□□■□□■	59	□□■□■□□■	109	□■□□■□□■	159	■□□□■□□■	209	■■□□■□□■
10	□□□□■□■□	60	□□■□■□■□	110	□■□□■□■□	160	■□□□■□■□	210	■■□□■□■□
11	□□□□■□■■	61	□□■□■□■■	111	□■□□■□■■	161	■□□□■□■■	211	■■□□■□■■
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13	□□□□■■□■	63	□□■□■■□■	113	□■□□■■□■	163	■□□□■■□■	213	■■□□■■□■
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16	□□□■□□□□	66	□□■■□□□□	116	□■□■□□□□	166	■□□■□□□□	216	■■□■□□□□
17	□□□■□□□■	67	□□■■□□□■	117	□■□■□□□■	167	■□□■□□□■	217	■■□■□□□■
18	□□□■□□■□	68	□□■■□□■□	118	□■□■□□■□	168	■□□■□□■□	218	■■□■□□■□
19	□□□■□□■■	69	□□■■□□■■	119	□■□■□□■■	169	■□□■□□■■	219	■■□■□□■■
20	□□□■□■□□	70	□□■■□■□□	120	□■□■□■□□	170	■□□■□■□□	220	■■□■□■□□
21	□□□■□■□■	71	□□■■□■□■	121	□■□■□■□■	171	■□□■□■□■	221	■■□■□■□■
22	□□□■□■■□	72	□□■■□■■□	122	□■□■□■■□	172	■□□■□■■□	222	■■□■□■■□
23	□□□■□■■■	73	□□■■□■■■	123	□■□■□■■■	173	■□□■□■■■	223	■■□■□■■■
24	□□□■■□□□	74	□□■■■□□□	124	□■□■■□□□	174	■□□■■□□□	224	■■□■■□□□
25	□□□■■□□■	75	□□■■■□□■	125	□■□■■□□■	175	■□□■■□□■	225	■■□■■□□■
26	□□□■■□■□	76	□□■■■□■□	126	□■□■■□■□	176	■□□■■□■□	226	■■□■■□■□
27	□□□■■□■■	77	□□■■■□■■	127	□■□■■□■■	177	■□□■■□■■	227	■■□■■□■■
28	□□□■■■□□	78	□□■■■■□□	128	□■□■■■□□	178	■□□■■■□□	228	■■□■■■□□
29	□□□■■■□■	79	□□■■■■□■	129	□■□■■■□■	179	■□□■■■□■	229	■■□■■■□■
30	□□□■■■■□	80	□□■■■■■□	130	□■□■■■■□	180	■□□■■■■□	230	■■□■■■■□
31	□□□■■■■■	81	□□■■■■■■	131	□■□■■■■■	181	■□□■■■■■	231	■■□■■■■■
32	□□■□□□□□	82	□□■□□□□■	132	□■■□□□□□	182	■□■□□□□□	232	■■■□□□□□
33	□□■□□□□■	83	□□■□□□■□	133	□■■□□□□■	183	■□■□□□□■	233	■■■□□□□■
34	□□■□□□■□	84	□□■□□□■■	134	□■■□□□■□	184	■□■□□□■□	234	■■■□□□■□
35	□□■□□□■■	85	□□■□□■□□	135	□■■□□□■■	185	■□■□□□■■	235	■■■□□□■■
36	□□■□□■□□	86	□□■□□■□■	136	□■■□□■□□	186	■□■□□■□□	236	■■■□□■□□
37	□□■□□■□■	87	□□■□□■■□	137	□■■□□■□■	187	■□■□□■□■	237	■■■□□■□■
38	□□■□□■■□	88	□□■□□■■■	138	□■■□□■■□	188	■□■□□■■□	238	■■■□□■■□
39	□□■□□■■■	89	□□■□■□□□	139	□■■□□■■■	189	■□■□□■■■	239	■■■□□■■■
40	□□■□■□□□	90	□□■□■□□■	140	□■■□■□□□	190	■□■□■□□□	240	■■■□■□□□
41	□□■□■□□■	91	□□■□■□■□	141	□■■□■□□■	191	■□■□■□□■	241	■■■□■□□■
42	□□■□■□■□	92	□□■□■□■■	142	□■■□■□■□	192	■□■□■□■□	242	■■■□■□■□
43	□□■□■□■■	93	□□■□■■□□	143	□■■□■□■■	193	■□■□■□■■	243	■■■□■□■■
44	□□■□■■□□	94	□□■□■■□■	144	□■■□■■□□	194	■□■□■■□□	244	■■■□■■□□
45	□□■□■■□■	95	□□■□■■■□	145	□■■□■■□■	195	■□■□■■□■	245	■■■□■■□■
46	□□■□■■■□	96	□□■□■■■■	146	□■■□■■■□	196	■□■□■■■□	246	■■■□■■■□
47	□□■■□□□□	97	□□■■□□□■	147	□■■■□□□□	197	■□■■□□□□	247	■■■■□□□□
48	□□■■□□□■	98	□□■■□□■□	148	□■■■□□□■	198	■□■■□□□■		
49	□□■■□□■□	99	□□■■□□■■	149	□■■■□□■□	199	■□■■□□■□		
50	□□■■□□■■	100	□□■■□■□□	150	□■■■□□■■	200	■□■■□■□□		

Documents / Resources

	Splus AFTF-T3-MB Humidity and Temperature Sensor [pdf] Instruction Manual AFTF-T3-MB, AFTF-T3-MB Humidity and Temperature Sensor, Humidity and Temperature Sensor, Temperature Sensor, Sensor

References

- S+S Regeltechnik | Ihr sensorik Partner
- User Manual