control solutions
TERACOM

TSH300v3
Modbus RTU humidity and temperature sensor

Version 1.15/October 2024

USER MANUAL

www.teracomsystems.com

1. Short description

TSH300v3 (successor to the TSH300) is a combined temperature and humidity sensor featuring an RS-485 interface with support for the Modbus RTU protocol. The device does not require an external power supply, as it is powered directly through the interface.
The sensor incorporates advanced signal processing components and provides a fully calibrated digital output. It uses a capacitive element for measuring relative humidity, while temperature is monitored via a band-gap sensor. Both measurements are processed through a 12-bit analog-to-digital converter (ADC), ensuring superior signal accuracy and quality.
The TSH300v3 is supplied with a 1-meter standard patch cable with RJ45 connectors.

2. Features

- RS-485 interface supporting up to 32 nodes
- LED indicator for communication status
- Configurable bitrate and other communication parameters
- Firmware updates via the RS-485 interface.

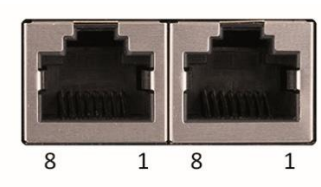
3. Applications

- Humidity and temperature logging in server rooms and data centers
- Environmental quality monitoring and assessment
- Monitoring in building management systems (BMS)
- Humidity and temperature logging for mobile operator facilities, vineyards, greenhouses, and more.

4. Specifications

- Physical characteristics
  Dimensions: 85 x 35.1 x 23.5mm
  Weight: 40g
- Environmental limits
  Operating temperature range: -20 to 60°C
  Operating relative humidity range: 10 to 90% (non-condensing)
  Recommended operating range: 20% to 80% RH (non-condensing), within -10°C to 60°C
  Prolonged operation outside of these ranges may result in sensor drift, with a slow recovery time.
  Long term drift typical: ±0.25%RH/year, ±0.05°C/year
  Higher drift may occur in contaminant-heavy environments (e.g., vaporized solvents, adhesives).
  Storage temperature range: -20 to 60°C
  Storage relative humidity range: 10 to 90% (non-condensing)
  Ingress protection: IP20
- Power requirements
  Operating voltage range (including -15/+20% according to IEC 62368-1): 4.5 to 26VDC
  Current consumption: 5mA@5VDC
- Humidity measurements
  Accuracy (min): ±3.0%RH (in 20 to 80 %RH range)
  Accuracy (max): ±5.0%RH (in 10 to 90 %RH range)
  Resolution: 0.1%RH
- Temperature measurements
  Accuracy (min): ±0.4°C (in -10 to +60°C range)
  Accuracy (max): ±0.6°C (in -20 to +60°C range)
  Resolution: 0.1°C
- Interface
  Response time ≤ 50ms
  Master response time-out ≥ Response time + Answer time
  The answer time depends on the number of bits and the baud rate
- Warranty
  Warranty period: 3 years

5. Pinout



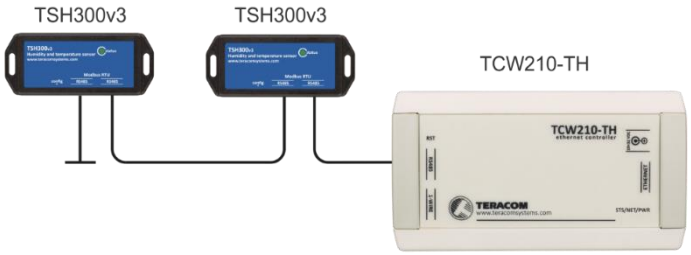
Pin	Description	UTP wires color
1	not connected (most right)	Orange/White Tracer
2	not connected	Orange
3	not connected	Green/White Tracer
4	RS485-	Blue
5	RS485+	Blue/White Tracer
6	not connected	Green
7	+VDD	Brown/White Tracer
8	GND	Brown

6. Installation

A daisy-chain (linear) topology should be used for connecting multiple sensors. UTP/FTP cables with RJ-45 connectors are required for interconnection, following the standard ANSI/TIA/EIA T568B wiring scheme. It is recommended to use standard patch LAN cables.

Attention:

The last sensor in the chain must have a 120-ohm terminator installed in its free RJ-45 socket. The terminator is delivered with the controller.



7. Installation tips

The last sensor in the chain must have a 120-ohm terminator installed in its free RJ-45 socket.

- The terminator is delivered with the controller.

8. Status indicator

The device status is indicated by a single LED located on the front panel:

- If the LED blinks at 1-second intervals, the sensor is operating properly;
- If the LED blinks at 3-second intervals, there is no communication with the controller;
- If the LED does not blink, the device is not powered.

9. Factory default settings

To reset the sensor to its factory default settings, follow these steps:

- Disconnect the sensor from the bus (power supply off).
- Press and hold the "config" button.
- While holding the button, reconnect the sensor to the bus (power supply on).
- The "status" LED will turn ON for 3 seconds, then blink for 7 seconds. After 10 seconds, the LED will remain ON.
- Release the "config" button. The sensor will restart with its factory default settings.

10. Firmware update

The firmware of the sensor can be updated using a Teracom controller that supports MODBUS RTU or the MBRTU-Update software.

11.Modbus address table

Register name	R/W	FC	PDU Address (Decimal)	Logical Address (Decimal)	Offset (Decimal)	Data size	Default	Valid values
RS-485 address	R/W	03/06	10	40011	40001	16-bit uns. integer	1	1-247
Baud rate*	R/W	03/06	11	40012	40001	16-bit uns. integer	19200	2400, 4800, 9600, 19200, 38400, 57600
Parity, data, stop bits *	R/W	03/06	12	40013	40001	16-bit uns. integer	1	1=E81, 2=O81, 3=N81
Data order	R/W	03/06	13	40014	40001	16-bit uns. integer	1	1=MSWF (MSW, LSW) 2=LSWF (LSW, MSW)
Device code	R	03	14	40015	40001	16-bit uns. integer		0x00CD
FW version	R	03	15	40016	40001	16-bit uns. integer		
Vendor URL	R	03	18	40019	40001	64 bytes UTF-8		teracomsystems.com
Float test value (MSWF)	R	03	82	40083	40001	32-bit float		-9.9(0xC11E6666)
Float test value (LSWF)	R	03	84	40085	40001	32-bit float		-9.9(0xC11E6666)
Signed integer test value	R	03	86	40087	40001	16-bit sig. integer		-999(0xFC19)
Signed integer test value (MSWF)	R	03	87	40088	40001	32-bit sig. integer		-99999(0xFFFE7961)
Signed integer test value (LSWF)	R	03	89	40090	40001	32-bit sig. integer		-99999(0xFFFE7961)
Unsigned integer test value	R	03	91	40092	40001	16-bit uns. integer		999(0x03E7)
Unsigned integer test value (MSWF)	R	03	92	40093	40001	32-bit uns. integer		99999(0x0001869F)
Unsigned integer test value (LSWF)	R	03	94	40095	40001	32-bit uns. integer		99999(0x0001869F)
Temperature °C	R	03	100	40101	40001	32-bit float		
Humidity %RH	R	03	102	40103	40001	32-bit float		
Dew point °C	R	03	104	40105	40001	32-bit float		
Temperature °F	R	03	200	40201	40001	32-bit float		
Humidity %RH	R	03	202	40203	40001	32-bit float		
Dew point °F	R	03	204	40205	40001	32-bit float		
Temperature °C x 100	R	03	400	40401	40001	16-bit sig. integer		
Humidity %RH x 100	R	03	401	40402	40001	16-bit uns. integer		
Dew point °C x 100	R	03	402	40403	40001	16-bit sig. integer		
Temperature °F x 100	R	03	500	40501	40001	16-bit sig. integer		
Humidity %RH x 100	R	03	501	40502	40001	16-bit uns. integer		
Dew point °F x 100	R	03	502	40503	40001	16-bit sig. integer		
Temperature multiplier **	R/W	03/16	2101	42102	40001	32-bit float	1.000	
Temperature offset °C **	R/W	03/16	2103	42104	40001	32-bit float	0.000	
Temperature offset °F **	R	03	2105	42106	40001	32-bit float	0.000	
Humidity multiplier **	R/W	03/16	2111	42112	40001	32-bit float	1.000	
Humidity offset **	R/W	03/16	2113	42114	40001	32-bit float	0.000	

* The settings will take effect after restarting the device by powering it off and then on again.
** Measured sensor values can be adjusted using a multiplier and an offset.
The corrections are calculated as follows:

Corrected Temperature (°C) = Measured Temperature (°C) × Temperature Multiplier + Temperature Offset (°C)
Corrected Humidity = Measured Humidity × Humidity Multiplier + Humidity Offset

Using a multiplier and an offset allows precise adjustments to the sensor readings, ensuring accurate temperature and humidity values. It is important to note that the multiplier and offset are applicable exclusively in degrees Celsius. After obtaining the corrected temperature in Celsius, it can be converted to Fahrenheit.

The PDU address refers to the actual address bytes used in a Modbus Protocol Data Unit.
The displayed logical decimal addresses are calculated using an offset of 40001 for holding registers.

MSWF - Most significant word first - (bits 31 … 16), (bits 15 … 0); LSWF - Least significant word first - (bits 15 … 0), (bits 31 … 16);
If a floating-point value is not available, the returned value is “NaN” (Not a Number), e.g. in case of measurement error.
If a 16-bit signed integer value is unavailable, the returned value is “-32768”, e.g. in case of measurement error.