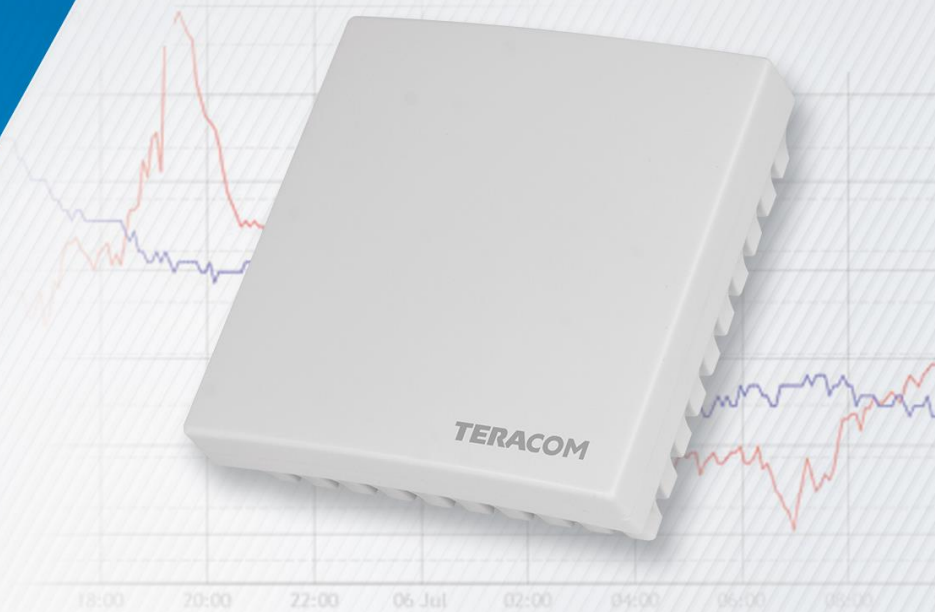




control solutions

TERACOM



TSM400-4-CP
MODBUS CO₂ and pressure sensor
Version 1.1 / August 2022

USER MANUAL

1. Short description

TSM400-4-CP is a multi-parameter sensor that supports MODBUS RTU protocol over the RS-485 interface. The sensor measures barometric pressure and CO₂ concentration. The MODBUS device integrates an advanced non-dispersive infrared sensing element (NDIR) for CO₂ measurements. The measurement principle is based on the absorption of infra-red (IR) light with specific wavelengths by CO₂ molecules. The CO₂ sensing element is temperature compensated for better accuracy. Self-calibration is available for carbon dioxide measurements. It is done if the sensor is left in fresh (around 400 ppm CO₂ concentration) air.

The basic sensing element for barometric pressure is factory calibrated and it does not require any lifetime recalibration.

The MODBUS CO₂ and pressure sensor TSM400-4-CP is housed in a slim plastic enclosure. The bottom part of the enclosure is suitable for installation on standard flush-mounted/cavity wall boxes ø68mm, with installation openings on 61 mm.

2. Features

- LED indicator for status of communication;
- Long-term stability based on digital signal processing;
- Self-calibration on fresh air for CO₂ measurements;
- RS-485 interface carrying up to 32 nodes;
- Changeable bitrate and other communication parameters;
- Firmware update via the interface.

3. Applications

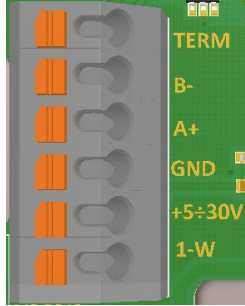
- Indoor air quality (IAQ);
- CO₂ storage facilities leakage control;
- Smart ventilation systems;
- Restaurants and breweries CO₂ level monitoring.

4. Specifications

- Physical characteristics
Dimensions: 81 x 81 x 30 mm
Weight: 66 g
- Environmental limits
Operating temperature range: -20 to 60°C
Operating relative humidity range: 5 to 95% (non-condensing)
Storage temperature range: -20 to 60°C
Storage relative humidity range: 5 to 95% (non-condensing)
Ingress protection: IP20
- Power requirements
Operating voltage range (including -15/+20% according to IEC 62368-1): 4.5 to 26 VDC
Current consumption: 25 mA@5VDC (Peak: 150 mA@5VDC)
- CO₂ measurements
Range: 400 to 5000 ppm
Accuracy: ± (40 ppm + 5 %)
Resolution: 1 ppm
Calibration: Automatic, if the sensor is exposed to fresh air for more than 30 minutes.

- Pressure measurements
Range: 10 to 1200 hPa
Accuracy (min): ± 1.5 (25°C, 750 hPa)
Accuracy (max): ± 2.5 (-20°C to + 85°C, 300 to 1100 hPa)
Resolution: 1 hPa
- Warranty
Warranty period: 3 years

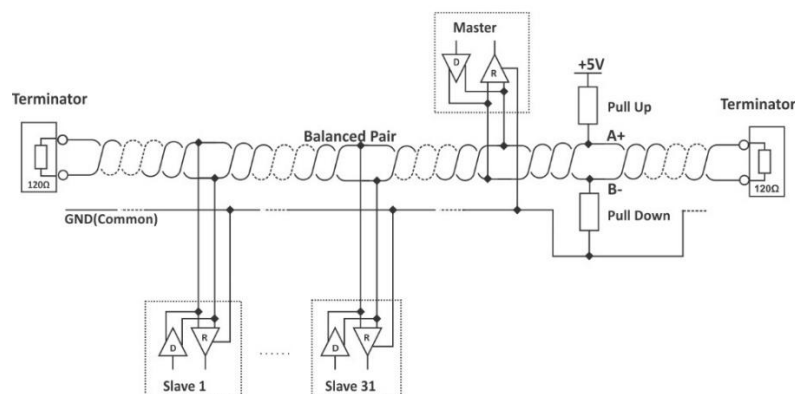
5. Pinout

	Pin	Description	UTP wires color
	1-W	Not used	
	+5÷30V	Positive power supply	Brown/White Tracer
	GND	Ground (negative) supply	Brown
	A+	Line A+ of RS-485	Blue/White Tracer
	B-	Line B- of RS-485	Blue
	TERM	For termination, connect to B-	

6. Installation

Two-Wire MODBUS definition according to modbus.org:

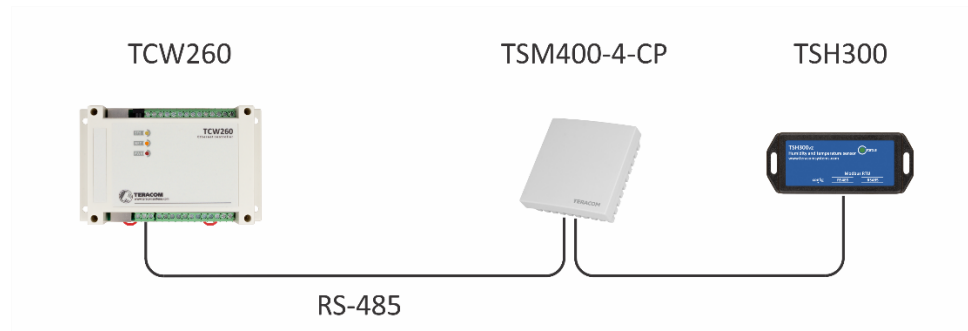
“A MODBUS solution over a serial line should implement a “Two-Wire” electrical interface in accordance with EIA/TIA-485 standard. On such a “Two-Wire” topology, at any time one driver only has the right to transmit. In fact, a third conductor must also interconnect all the devices of the bus - the common.”



Attention:

For proper operation of the interface, terminators (120 ohms resistors) must be installed at both ends of the bus. The device has a built-in 120-ohm resistor and to terminate the line, “B-” and “TERM” must be shortened.

A daisy-chained (linear) topology for multiple sensors should be used. UTP/FTP cables are mandatory for interconnection.

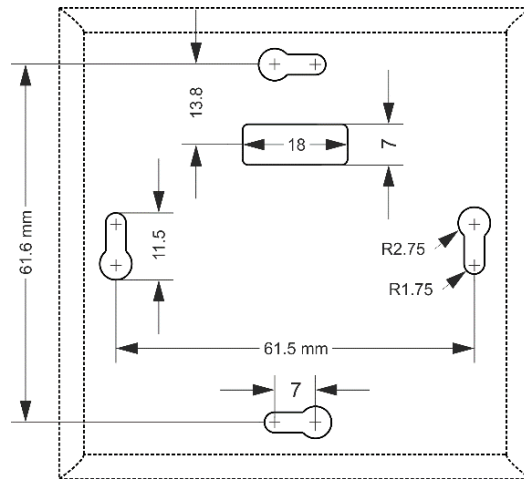


7. Installation tips

The location and the mounting position of the sensor have a direct effect on the accuracy of the measurement. The tips below will ensure good measuring results:

- Sensor shall be installed about 1.2-1.4 m above the floor;
- To avoid solar radiation, the sensor should not be installed next to windows or directly in the sunlight;
- Sensors shall be installed in a place with sufficient air circulation.

TSM400-4-CP sensor is intended for installation on a cavity wall box with 68mm diameter and 61 mm screw spacing.



8. Status indicator

The status of the device is shown by a single LED, located inside the box:

- If the LED blinks for a period of 1 second, the sensor works properly;
- If the LED blinks for a period of 3 seconds, there isn't communication with the controller;
- If the LED doesn't blink, there isn't a power supply.

9. Factory default settings

Disconnect the sensor from the bus (switch off the power supply).

Press and hold the "config" button. Don't release the button, connecting the sensor to the bus (switch on the power supply).

The "status" LED will be ON for 3 seconds and after this will flash for 7 seconds. After the 10-th second the LED will be ON.

Release the button. The sensor will restart with factory default settings.

10. Firmware update

The firmware of the sensor can be updated with a Teracom controller which supports MODBUS RTU or MBRTU-Config software. For more details, ask your dealer.

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)
Sub-family number	R	3	14	40015	40001	16-bit uns. integer	1	0xC9
FW version	R	3	15	40016	40001	16-bit uns. integer		
Vendor URL	R	3	16	40017	40001	64 bytes UTF-8		teracomsystems.com
Float test value (MSWF)	R	3	82	40083	40001	32-bit float		-9.9(0xC11E6666)
Float test value (LSWF)	R	3	84	40085	40001	32-bit float		-9.9(0xC11E6666)
Signed integer test value	R	3	86	40087	40001	16-bit sig. integer		-999(0xFC19)
Signed integer test value (MSWF)	R	3	87	40088	40001	32-bit sig. integer		-99999(0xFFFFE7961)
Signed integer test value (LSWF)	R	3	89	40090	40001	32-bit sig. integer		-99999(0xFFFFE7961)
Unsigned integer test value	R	3	91	40092	40001	16-bit uns. integer		999(0x03E7)
Unsigned integer test value (MSWF)	R	3	92	40093	40001	32-bit uns. integer		99999(0x0001869F)
Unsigned integer test value (LSWF)	R	3	94	40095	40001	32-bit uns. integer		99999(0x0001869F)
CO ₂ , ppm	R	3	106	40107	40001	32-bit float		
Pressure, hPa	R	3	108	40109	40001	32-bit float		
CO ₂ , ppm	R	3	206	40207	40001	32-bit float		
Pressure, mmHg	R	3	208	40209	40001	32-bit float		
CO ₂ , ppm	R	3	603	40604	40001	16-bit uns. integer		
Pressure, hPa	R	3	604	40605	40001	16-bit uns. integer		
CO ₂ , ppm	R	3	703	40704	40001	16-bit uns. integer		
Pressure High, mmHg x 100	R	3	704	40705	40001	16-bit uns. integer		
Pressure Low, mmHg x 100	R	3	705	40706	40001	16-bit uns. integer		

MSWF - Most significant word first - (bits 31 ... 16), (bits 15 ... 0); LSWF - Least significant word first - (bits 15 ... 0), (bits 31 ... 16);

PDU address - Actual address bytes used in a Modbus Protocol Data unit

A “NaN” value is returned for unavailable floating-point values (e.g., in case of measurement error)

* The settings will take effect after restarting the device by power-off, power-on.

12. Recycling

Recycle all applicable material.



Do not dispose of with regular household refuse.

