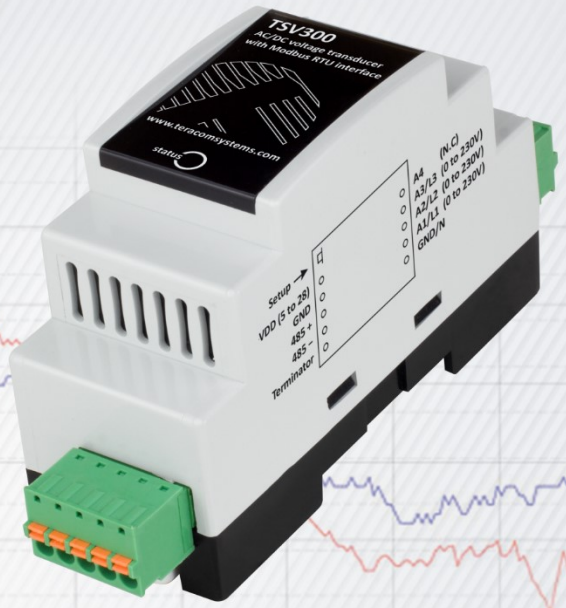
control solutions
TERACOM



TSV300

AC/DC voltage transducer with Modbus RTU interface

Revision 1.1 / March 2024

USER MANUAL

www.teracomsystems.com

1. **Short description**

   TSV300 is an AC voltage transducer engineered for precise voltage measurements. Equipped with true RMS functionality, it seamlessly accommodates 50 and 60Hz nets. The transducer can also be used for DC voltage measurement and monitoring.

   With an impressive 24-bit resolution and accuracy surpassing 0.5%, this transducer ensures reliable data acquisition. The design includes a robust 1500Vrms working isolation voltage, prioritizing safety.

   Supporting MODBUS RTU communication, it provides data in both 16-bit integer and 32-bit floating point formats. TSV300 is your trusted solution for accurate and versatile AC or DC voltage measurements.

2. **Features**

   - 24-bit ADC with DSP processing
   - RS-485 interface supporting up to 63 nodes
   - LED indicator displaying communication status
   - Robust 1500Vrms working isolation
   - Integrated 120-ohm termination resistor
   - Firmware update capability via the interface

3. **Applications**

   - Power monitoring systems: TSV300 is ideal for monitoring AC voltage in power distribution systems, ensuring efficient and reliable power supply.
   - Renewable energy systems: In solar or wind power installations, the transducer can be used to measure AC voltages accurately, contributing to the optimization of energy production.
   - Industrial automation: The module can play a vital role in industrial automation systems, providing accurate voltage measurements for equipment monitoring and control.
   - Smart grids: TSV300 can be integrated into smart grid systems to monitor and manage AC voltage levels, contributing to the stability and reliability of the grid.

4. **Specifications**

   - Physical characteristics
     Dimensions: 35x86x59mm (2 module enclosure)
     Weight: 75g
     Mounting: On 35 mm DIN top-hat rail
   - Environmental limits
     Operating temperature range: -20 to 60°C
     Operating relative humidity range: 10 to 90% (non-condensing)
     Storage temperature range: -25 to 65°C
     Storage relative humidity range: 5 to 95% (non-condensing)
     Ingress protection: IP40 (connections IP20)
   - Power supply
     Operating voltage range (including -15/+20% according to IEC 62368-1): 5 to 28VDC
     Current consumption: 15mA@12V
   - Inputs
     Input voltage range: 0 to 264VAC or 0 to ±370VDC
     Input frequency: 0 to 60Hz
     Input resistance: >2.4MOhm
   - Accuracy
     Accuracy: ±0.5%
   - Measurement cycle
     Measurement cycle for all channels: 400±80ms
   - Interface
     Protocol: Modbus RTU
     Physical layer: RS-485 serial line
     Number of bus transceivers: up to 63
     Bus cable: Twisted, shielded, 2×0.5mm²
     Response time ≤ 50ms

       Master response time-out ≥ Response time + Answer time
       The answer time depends on the number of bits and the baud rate.

Connectors
Interface: 3.81mm pitch screwless pluggable for 28 to 16 (AWG) / 0.081 to 1.31 (mm²) wires
Inputs: 5mm pitch screwless pluggable for 28 to 16 (AWG) / 0.081 to 1.31 (mm²) wires

- Isolation
  Maximum working isolation voltage: 1500Vrms
- Warranty
  Warranty period: 3 years

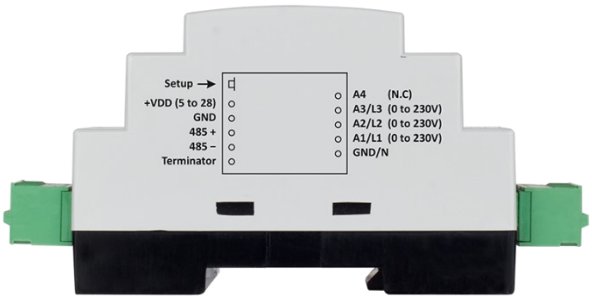
5. Status indicator

The device status is indicated through a single LED positioned behind the semitransparent front panel:

- Steady blinking of the LED for 1 second indicates proper sensor functionality.
- A 3-second blink pattern signals a lack of communication with the controller.
- If the LED remains off, it indicates a lack of power supply to the device or an inactive state.

6. Pinout

- 5-pins connector interface
  1 – +VDD (5 to 28)
  2 – GND
  3 – RS485+
  4 – RS485-
  5 – Terminator
- 5-pins connector inputs
  1 – A4/N.C.
  2 – A3/L3
  3 – A2/L2
  4 – A1/L1
  5 – GND/N

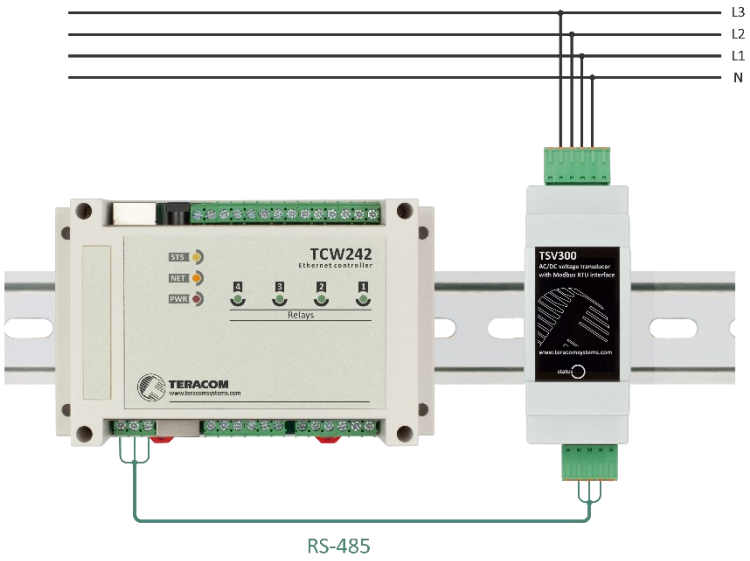


7. Installation

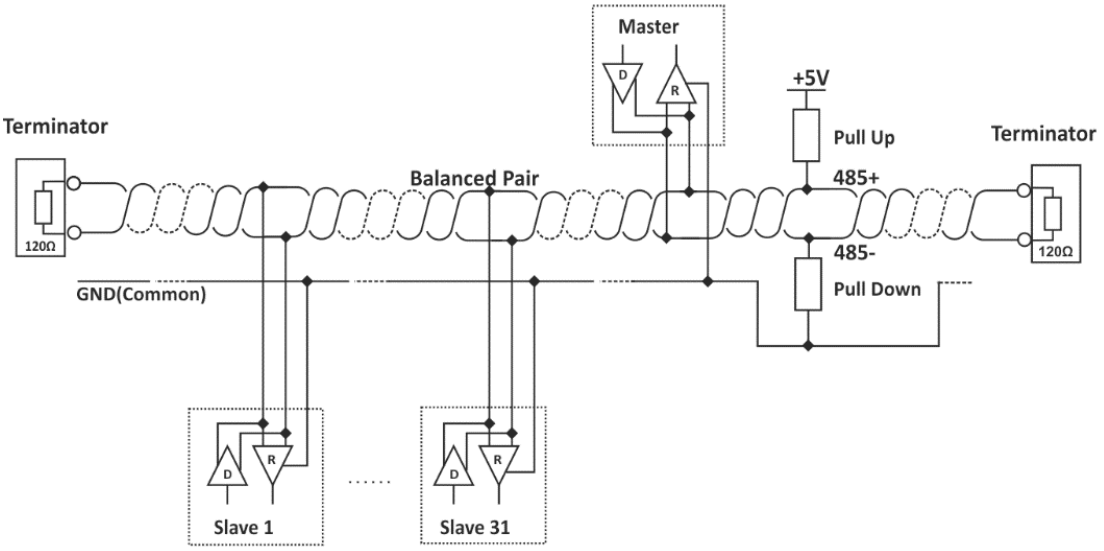
Qualified personnel must install the device. It shouldn't be installed outside directly.
The installation process involves mounting the device, connecting it to the RS-485 bus, attaching inputs, supplying power, and configuring it through the master.

Warning! Power off before wiring.

Ensure that wires are securely attached to terminals and tightened. Improper wiring or configuration can cause permanent damage to TSV300 or connected equipment.



According to modbus.org, the two-Wire MODBUS definition is:
“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 for transmitting. In fact, a third conductor must also interconnect all the devices of the bus - the common (ground).”



It is highly advisable to use a daisy-chain (linear) topology along with UTP/FTP cables when connecting multiple sensors. To ensure the interface functions correctly, terminators (120-ohm resistors) must be installed at both ends of the bus. The device comes equipped with a built-in 120-ohm resistor, and for bus termination, the terminals "485-" and "Term" should be shortened.

8. Factory default settings

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

- Disconnect the power supply.
- Press and hold the "Setup" button.
- While holding the button, reconnect the power supply.
- The status LED will remain ON for 3 seconds, then flash for 7 seconds, and finally turn ON again.
- Release the button. The device will restart with the factory default settings.

9. Firmware update

The device's firmware can be updated either by a Teracom controller with MODBUS RTU support or through MBRTU-Update software.

To activate the sensor's update mode, follow these steps:

- Disconnect the sensor from the bus and disconnect the power supply.
- Press and hold the "Setup" button.
- While holding the button, reconnect the power supply without releasing the button.
- The status LED will be ON for 3 seconds. If, within these 3 seconds, the button is released and pressed 3 times, the device will enter update mode.
- In update mode, the status LED will remain ON continuously.

Important: The sensor can only be updated when it is the only device on the bus.

10. Modbus address table

Register name	R/W	FC	PDU decimal address	Logical decimal address	Data size	Default	Valid values
Holding registers							
RS-485 address	R/W	3,6,16	10	40011	16-bit uns. integer	1	1 to 247
Baud rate *	R/W	3,6,16	11	40012	16-bit uns. integer	19200	2400, 4800, 9600, 19200, 38400, 57600
Parity, data, stop bits *	R/W	3,6,16	12	40013	16-bit uns. integer	1	1=E81, 2=O81, 3=N81
Data order	R/W	3,6,16	13	40014	16-bit uns. integer	1	1=MSWF (MSW, LSW) 2=LSWF (LSW, MSW)
Device code	R	3	14	40015	16-bit uns. integer		0x0101
FW version	R	3	15	40016	16-bit uns. integer		
Vendor URL	R	3	18	40019	64 bytes UTF-8		teracomsystems.com

Float test value (MSW)	R	3	82	40083	32-bit float		-9.9(0xC11E6666)
Float test value (LSW)	R	3	84	40085	32-bit float		-9.9(0xC11E6666)
Signed integer test value	R	3	86	40087	16-bit sig. integer		-999(0xFC19)
Signed integer test value (MSW)	R	3	87	40088	32-bit sig. integer		-99999(0xFFFE7961)
Signed integer test value (LSW)	R	3	89	40090	32-bit sig. integer		-99999(0xFFFE7961)
Unsigned integer test value	R	3	91	40092	16-bit uns. integer		999(0x03E7)
Unsigned integer test value (MSW)	R	3	92	40093	32-bit uns. integer		99999(0x0001869F)
Unsigned integer test value (LSW)	R	3	94	40853	32-bit uns. integer		99999(0x0001869F)
Input AC voltage 1	R	3	100	40101	32-bit float		
Input AC voltage 2	R	3	102	40103	32-bit float		
Input AC voltage 3	R	3	104	40105	32-bit float		
Input AC voltage 1 min.	R	3	120	40121	32-bit float		
Input AC voltage 2 min.	R	3	122	40123	32-bit float		
Input AC voltage 3 min.	R	3	124	40125	32-bit float		
Input AC voltage 1 max.	R	3	140	40141	32-bit float		
Input AC voltage 2 max.	R	3	142	40143	32-bit float		
Input AC voltage 3 max.	R	3	144	40145	32-bit float		
Input AC voltage 1 x 100	R	3	400	40401	16-bit uns. integer		
Input AC voltage 2 x 100	R	3	401	40402	16-bit uns. integer		
Input AC voltage 3 x 100	R	3	402	40403	16-bit uns. integer		
Input AC voltage 1 min. x 100	R	3	420	40421	16-bit uns. integer		
Input AC voltage 2 min. x 100	R	3	421	40422	16-bit uns. integer		
Input AC voltage 3 min. x 100	R	3	422	40423	16-bit uns. integer		
Input AC voltage 1 max. x 100	R	3	440	40441	16-bit uns. integer		
Input AC voltage 2 max. x 100	R	3	441	40442	16-bit uns. integer		
Input AC voltage 3 max. x 100	R	3	442	40443	16-bit uns. integer		
Input DC voltage 1	R	3	500	40501	32-bit float		
Input DC voltage 2	R	3	502	40503	32-bit float		
Input DC voltage 3	R	3	504	40505	32-bit float		
Input DC voltage 1 min.	R	3	520	40521	32-bit float		
Input DC voltage 2 min.	R	3	522	40523	32-bit float		
Input DC voltage 3 min.	R	3	524	40525	32-bit float		
Input DC voltage 1 max.	R	3	540	40541	32-bit float		
Input DC voltage 2 max.	R	3	542	40543	32-bit float		
Input DC voltage 3 max.	R	3	544	40545	32-bit float		
Input DC voltage 1 x 100	R	3	600	40601	16-bit uns. integer		
Input DC voltage 2 x 100	R	3	601	40602	16-bit uns. integer		
Input DC voltage 3 x 100	R	3	602	40603	16-bit uns. integer		
Input DC voltage 1 min. x 100	R	3	620	40621	16-bit uns. integer		
Input DC voltage 2 min. x 100	R	3	621	40622	16-bit uns. integer		
Input DC voltage 3 min. x 100	R	3	622	40623	16-bit uns. integer		
Input DC voltage 1 max. x 100	R	3	640	40641	16-bit uns. integer		
Input DC voltage 2 max. x 100	R	3	641	40642	16-bit uns. integer		
Input DC voltage 3 max. x 100	R	3	642	40643	16-bit uns. integer		
Input AC voltage 1 multiplier	R	3	2101	42102	32-bit float	1.000	
Input AC voltage 1 offset	R	3	2103	42104	32-bit float	0.000	
Input AC voltage 2 multiplier	R	3	2111	42112	32-bit float	1.000	

Input AC voltage 2 offset	R	3	2113	42114	32-bit float	0.000	
Input AC voltage 3 multiplier	R	3	2121	42122	32-bit float	1.000	
Input AC voltage 3 offset	R	3	2123	42124	32-bit float	0.000	
Input DC voltage 1 multiplier	R	3	2201	42202	32-bit float	1.000	
Input DC voltage 1 offset	R	3	2203	42204	32-bit float	0.000	
Input DC voltage 2 multiplier	R	3	2211	42212	32-bit float	1.000	
Input DC voltage 2 offset	R	3	2213	42214	32-bit float	0.000	
Input DC voltage 3 multiplier	R	3	2221	42222	32-bit float	1.000	
Input DC voltage 3 offset	R	3	2223	42224	32-bit float	0.000	
Reset min and max values	R/W	3,6	1000	41001	16-bit uns. integer		

* The settings will take effect after restarting the device by power off, power on.
MSW - Most significant word first - (bits 31 … 16), (bits 15 … 0);
LSW - Least significant word first - (bits 15 … 0), (bits 31 … 16);
PDU address – the actual address bytes used in a Modbus Protocol Data unit;
The formation of the specified logical addresses involved the use of offset 40001. Utilizing a different offset will result in the creation of alternative logical addresses.