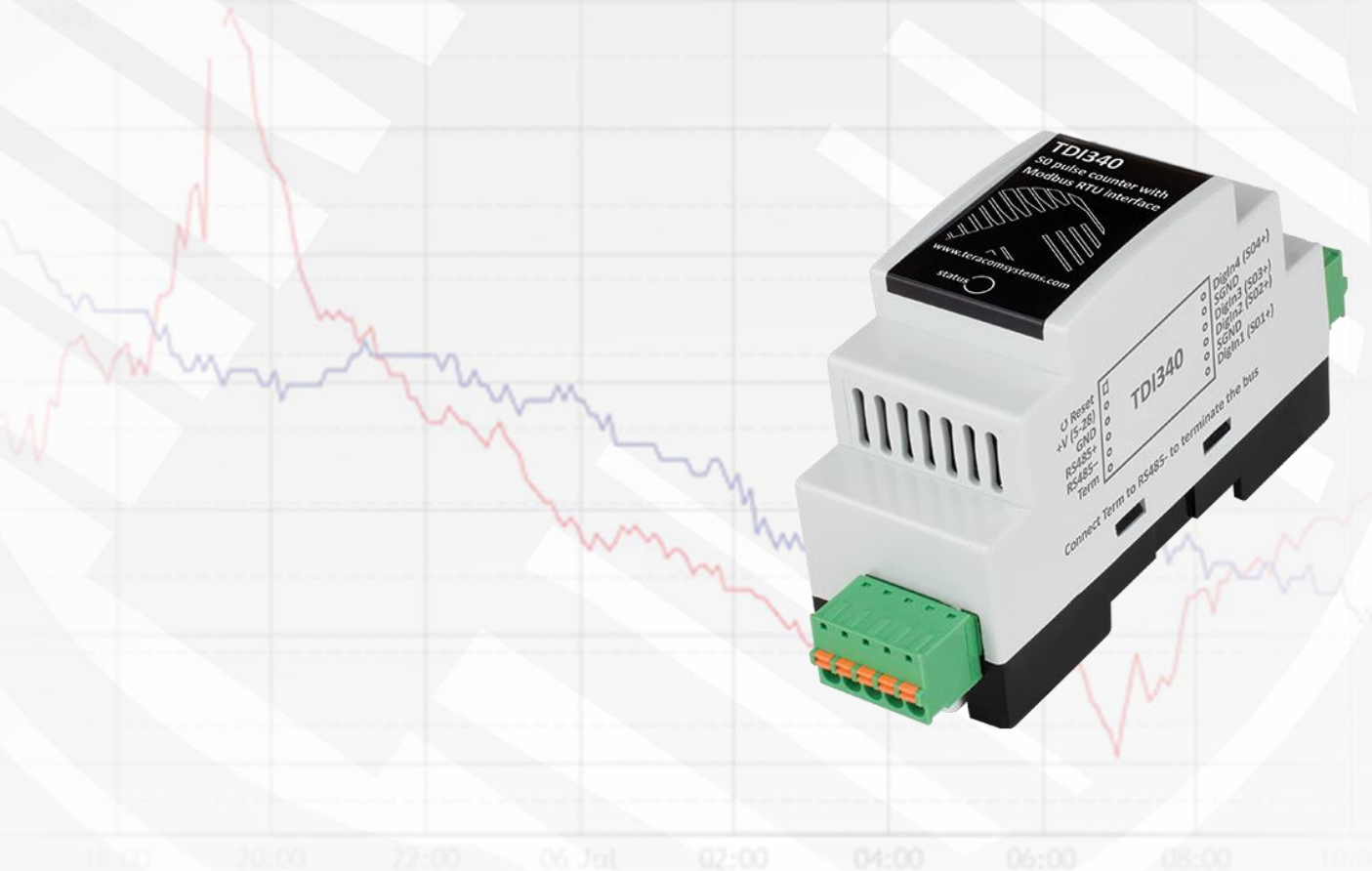
control solutions
TERACOM



TDI340

S0 pulse counter with MODBUS RTU interface

USER MANUAL

1. Short description

TDI340 is a S0 pulse counter with the MODBUS RTU interface. It has 4 isolated digital inputs, complying with the S0 standard 62053-31. The S0 pulse counter works in polling or edge modes. In edge mode, it can be set up to count on rising, falling, and both edges.
The device is dedicated to the S0 pulse counter but it also provides simultaneous readings for the state of the digital inputs - OPEN/CLOSE. Independent delays for Low-To-High and High-To-Low transitions can be applied. The delays are from 0 to 656 seconds in a 10mS step and work if the counter for the corresponding digital input is in polling mode.

2. Features

- RS-485 interface carrying up to 63 nods
- Non-volatile memory for the counters
- LED indicator for the status of communication
- Isolated digital inputs
- 32-bit counters
- Built-in 120ohms termination resistor
- DIN rail mounting
- Firmware update via the interface

3. Applications

- Remote monitoring of device with an S0 output
- Remote data acquisition
- Industrial process control
- Energy management

4. Specifications

- Physical characteristics
  Dimensions: 35x86x59mm (2 module enclosure)
  Weight: 60g
  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: 50mA@5V
- Digital inputs
  Isolation: Functional, 1kV DC
  Independent modes: OPEN/CLOSED (“Dry contact”) and COUNTER (S0 compatible)
  Maximum count value: $2^{32} - 1$
  Maximum input voltage: +5.5VDC
  Maximum source impedance for “0” reading: 800Ohm
  Minimum source impedance for “1” reading: 1MOhm
  Current max. (With 0-ohm source impedance): 3mA
  Maximum frequency for edge counter mode: 100Hz
  Polling period: 10ms
  L-H/H-L transition delay interval: 0 to 65535 x (polling period); not available for edge counter mode
- 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
Type: 3.81mm pitch screwless pluggable for 28 to 16 (AWG) / 0.081 to 1.31 (mm²) wires

5. Status indicator

The status of the device is shown by a single LED, located behind the semitransparent front panel:

- 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.

6. Pinout

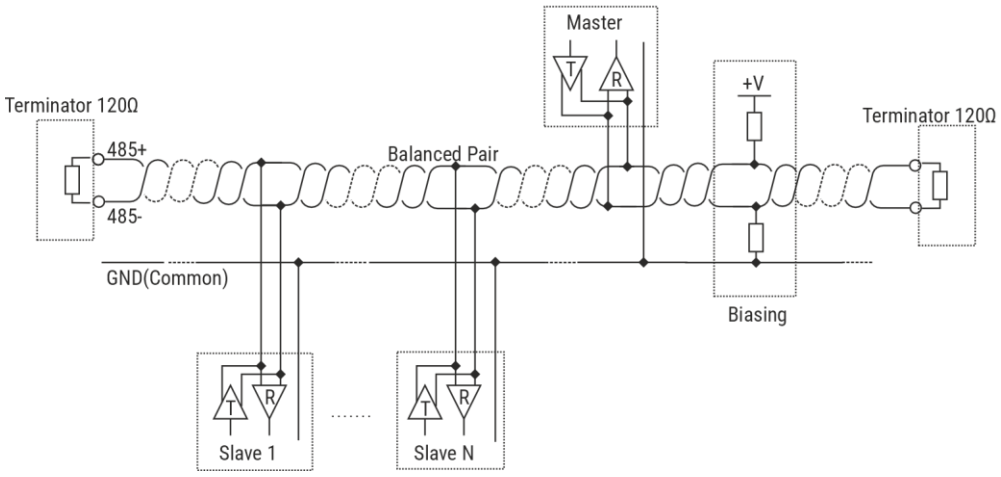
- 5-pins connector
  1 – +VDD (5-28)
  2 – GND
  3 – RS485+
  4 – RS485-
  5 – Terminator
- 6-pins connector
  1 – Digital input 1 (S01+)
  2 – SGND
  3 – Digital input 2 (S02+)
  4 – Digital input 3 (S03+)
  5 – SGND
  6 – Digital input 4 (S04+)



Inside the device, a 120 Ω resistor is connected with one end to RS485+ and the other end to Term.
To enable 120 Ω bus termination, connect Term to RS485– externally with a wire.
The input-side ground (SGND) is galvanically isolated from the system ground (GND).

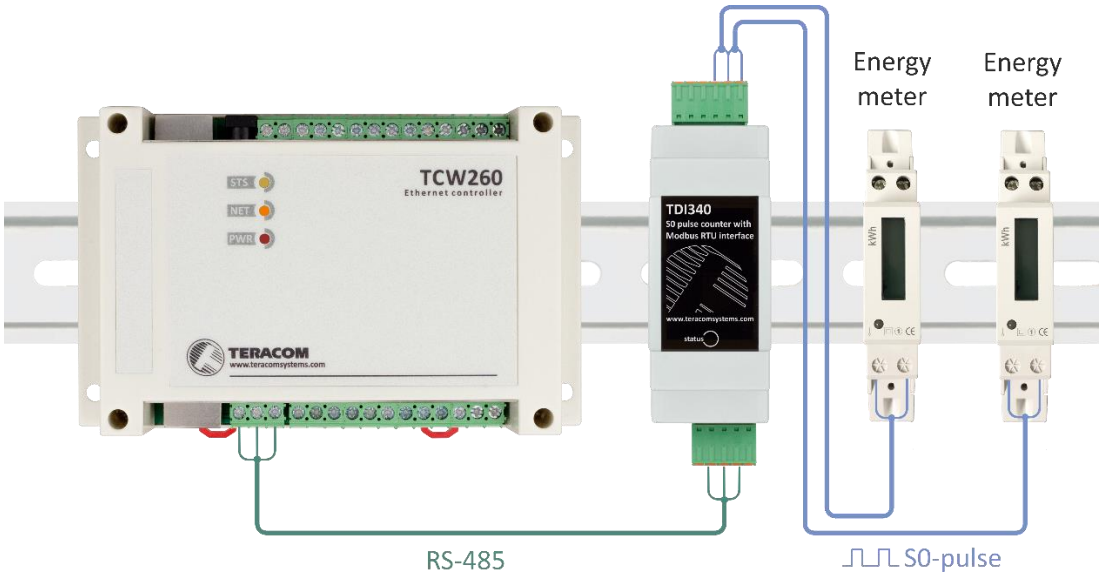
7. Installation

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 for transmitting. In fact, a third conductor must also interconnect all the devices of the bus - the common.”



A daisy-chain (linear) topology and UTP/FTP cables for multiple sensors are strongly recommended.
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 “RS485-“ and “Term” must be shortened.

8. Typical application



9. Counters

The device provides pulse counters for each digital input.

The counters accumulate incoming pulses and store the counter values in non-volatile memory. Counter values are preserved during power loss, and counting resumes from the last stored value after power is restored.

The counters are available via Modbus as 32-bit registers, allowing the full counter value to be read or written. Writing to a 32-bit counter register can be used to reset or preset the counter value.

For compatibility with systems that support only 16-bit access, the device also allows writing the counter value using 16-bit registers. When a value is written using 16-bit access, the written value is applied to the 32-bit counter and the upper 16 bits of the counter are automatically set to zero.

10. Real value calculation from pulse inputs

The device can calculate real (engineering) values directly from pulse inputs.

Pulse signals from external meters are counted internally.

A configurable pulses-per-unit parameter defines how many pulses correspond to one engineering unit (for example, pulses per kWh). Using this parameter, the device converts the pulse count into a real value that can be read directly via the Modbus interface.

The real value is calculated using the following formula:

Counter InputX real value = Counter InputX / Pulses per unit InputX

Example:

If an energy meter generates 2000 pulses per kWh and the pulse counter value is 10 000, the calculated real value is:

10 000 / 2000 = 5 kWh

11. Factory default settings

Disconnect the power supply.

Press and hold the “RESET” button. Connect the power supply not releasing the button.

The status LED will be ON for 3 seconds and after this will flash for 7 seconds. After that, the LED will be ON again. Release the button. The device will restart with factory default settings.

12. Firmware update

The firmware of the device can be updated by Teracom controller with MODBUS RTU supports or MBRTU-Update software.

To put the sensor in update mode, do the following:

- Disconnect the sensor from the bus. Disconnect the power supply.
- Press and hold the “RESET” button. Connect the power supply not releasing the button.
- The status LED will be ON for 3 seconds. If in these 3 seconds, the button is released and pressed 3 times the device goes into update mode.

In the update mode status LED will be ON permanently.

Important: The sensor can be updated only if it is alone on the bus.

13.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	uint16	1	1 to 247
Baud rate *	R/W	3,6,16	11	40012	uint16	19200	2400, 4800, 9600, 19200, 38400, 57600
Parity, data, stop bits *	R/W	3,6,16	12	40013	uint16	1	1=E81, 2=O81, 3=N81
Data order	R/W	3,6,16	13	40014	uint16	1	1=MSWF (MSW, LSW) 2=LSWF (LSW, MSW)
Device code	R	3	14	40015	uint16		0x00DF
FW version	R	3	15	40016	uint16		
Vendor URL	R	3	18	40019	UTF-8 64 bytes		teracomsystems.com
Float test value (MSW)	R	3	82	40083	float32		-9.9(0xC11E6666)
Float test value (LSW)	R	3	84	40085	float32		-9.9(0xC11E6666)
Signed integer test value	R	3	86	40087	int16		-999(0xFC19)
Signed integer test value (MSW)	R	3	87	40088	int32		-99999(0xFFFE7961)
Signed integer test value (LSW)	R	3	89	40090	int32		-99999(0xFFFE7961)
Unsigned integer test value	R	3	91	40092	uint16		999(0x03E7)
Unsigned integer test value (MSW)	R	3	92	40093	uint32		99999(0x0001869F)
Unsigned integer test value (LSW)	R	3	94	40095	uint32		99999(0x0001869F)
Counter mode Input1	R/W	3,6,16	110	40111	uint16	2	1=Polling 2=Edge
Counter edge Input1	R/W	3,6,16	111	40112	uint16	1	1=Rising 2=Falling 3=Both
Pulses per real unit Input1	R/W	3,6,16	112	40113	uint16	2000	0 to 65535
Delay Low-to-High Input1 (x10 ms)	R/W	3,6,16	113	40114	uint16	0	0 to 65535

Delay High-to-Low Input1 (x10 ms)	R/W	3,6,16	114	40115	uint16	0	0 to 65535
Counter mode Input2	R/W	3,6,16	120	40121	uint16	2	1=Polling 2=Edge
Counter edge Input2	R/W	3,6,16	121	40122	uint16	1	1=Rising 2=Falling 3=Both
Pulses per real unit Input2	R/W	3,6,16	122	40123	uint16	2000	0 to 65535
Delay Low-to-High Input2 (x10mS)	R/W	3,6,16	123	40124	uint16	0	0 to 65535
Delay High-to-Low Input2 (x10mS)	R/W	3,6,16	124	40125	uint16	0	0 to 65535
Counter mode Input3	R/W	3,6,16	130	40131	uint16	2	1=Polling 2=Edge
Counter edge Input3	R/W	3,6,16	131	40132	uint16	1	1=Rising 2=Falling 3=Both
Pulses per real unit Input3	R/W	3,6,16	132	40133	uint16	2000	0 to 65535
Delay Low-to-High Input3 (x10 mS)	R/W	3,6,16	133	40134	uint16	0	0 to 65535
Delay High-to-Low Input3 (x10 mS)	R/W	3,6,16	134	40135	uint16	0	0 to 65535
Counter mode Input4	R/W	3,6,16	140	40141	uint16	2	1=Polling 2=Edge
Counter edge Input4	R/W	3,6,16	141	40142	uint16	1	1=Rising 2=Falling 3=Both
Pulses per real unit Input4	R/W	3,6,16	142	40143	uint16	2000	0 to 65535
Delay Low-to-High Input4 (x10 mS)	R/W	3,6,16	143	40144	uint16	0	0 to 65535
Delay High-to-Low Input4 (x10 mS)	R/W	3,6,16	144	40145	uint16	0	0 to 65535
All digital inputs (bitmask)	R	3	200	40201	uint16		Value range: 0x0000 to 0x000F Bit 0 = Digital Input1 Bit 1 = Digital Input2 Bit 2 = Digital Input3 Bit 3 = Digital Input4
Digital Input1 state	R	3	201	40202	uint16		0 = Input CLOSE 1 = Input OPEN
Digital Input2 state	R	3	202	40203	uint16		0 = Input CLOSE 1 = Input OPEN
Digital Input3 state	R	3	203	40204	uint16		0 = Input CLOSE 1 = Input OPEN
Digital Input4 state	R	3	204	40205	uint16		0 = Input CLOSE 1 = Input OPEN
Counter Input1 (32-bit)	R/W	3,6,16	210	40211	uint32		
Counter Input2 (32-bit)	R/W	3,6,16	212	40213	uint32		
Counter Input3 (32-bit)	R/W	3,6,16	214	40215	uint32		
Counter Input4 (32-bit)	R/W	3,6,16	216	40217	uint32		
Counter Input1 LOW (16-bit)	R/W	3,6,16	220	40221	uint16		Upper 16 bits of the 32-bit counter are set to zero after write

Counter Input2 LOW (16-bit)	R/W	3,6,16	221	40222	uint16		Upper 16 bits of the 32-bit counter are set to zero after write
Counter Input3 LOW (16-bit)	R/W	3,6,16	222	40223	uint16		Upper 16 bits of the 32-bit counter are set to zero after write
Counter Input4 LOW (16-bit)	R/W	3,6,16	223	40224	uint16		Upper 16 bits of the 32-bit counter are set to zero after write
Counter Input1 real value	R	3	230	40231	float32		Calculated from Counter Input1 using Pulses per unit Input1
Counter Input2 real value	R	3	232	40233	float32		Calculated from Counter Input2 using Pulses per unit Input2
Counter Input3 real value	R	3	234	40235	float32		Calculated from Counter Input3 using Pulses per unit Input3
Counter Input4 real value	R	3	236	40237	float32		Calculated from Counter Input4 using Pulses per unit Input4
Discrete inputs							
Input1	R	2	1	10002	bit		0 or 1
Input2	R	2	2	10003	bit		0 or 1
Input3	R	2	3	10004	bit		0 or 1
Input4	R	2	4	10005	bit		0 or 1

* The settings will take effect after restarting the device by power-off, power-on.
PDU address: Actual address bytes used in a Modbus Protocol Data unit
The shown logic decimal addresses are calculated with offsets 40001 (holding registers) and 10001 (discrete inputs).
MSWF: Most significant word first - (bits 31 … 16), (bits 15 … 0).
LSWF: Least significant word first - (bits 15 … 0), (bits 31 … 16).
When a floating-point value is not available, the returned value is “NaN” (e.g. in case of measurement error).
When a 32-bit signed integer value is not available, the returned value is “-2147483648” (e.g. in case of measurement error).

14. Recycling

Please recycle all applicable materials in accordance with local regulations.



Do not dispose of the device as regular household waste.
Electronic components should be properly recycled to minimize environmental impact.

