

# EC&TDS

## RS 485 Transmitter Manual

### I. Overview

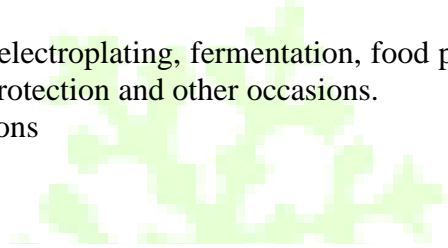
EC-TDS transmitter has online one-button calibration, automatic temperature compensation, electrode quality alarm during calibration, power failure protection (to prevent calibration results and preset data from being lost due to shut down or power failure), overcurrent protection, overvoltage Protection, high measurement accuracy, fast response, long service life, etc.

The product is small in size, light in weight, easy to install and maintain, and standard industrial signal output (0-5V, 0-10V, 4-20MA, ModbusRTU485) can maximize the connection of various real-time monitoring equipment on site. The product is convenient to connect with various control equipment and display instruments, and realize online monitoring of EC and TDS status.

#### Application

This product is suitable for: electroplating, fermentation, food processing, sewage treatment, metallurgy, environmental protection and other occasions.

Product appearance dimensions



### Automatic Temperature Compensation

### One-Button Calibration



## Technical parameters

technical parameter	Parameter value
EC Range	Optional: 0-440uS/cm、0-4400uS/cm、0-44000uS/cm
EC Accuracy	$\leq \pm 2\%$ F. S
TDS Range	可选: 0-200PPM、0-2000PPM、0-20000PPM
TDS Accuracy	$\leq \pm 2\%$ F. S
Power supply	DC: 12V~24V
Signal output	ModbusRTU485
Load Resistance (for 4-20mA output)	Voltage output: R Load $\geq 5K \Omega$ Current output: R Load $\leq (U_{vcc}-3)/0.02 \text{ ohm}$
Power consumption	<1W
Storage conditions	10-50°C (-20~+80°C peak) 20-60%RH
Use environment	0°C~100°C
Dimensions	65×46×28.5mm <sup>3</sup>

Pin	Use	Description
1	+	DC 12-24V Power positive
2	A	RS485 A+
3	-	DC 12-24V Power negative
4	B	RS485 B-



Data format is 10-bit asynchronous communication mode, including 1 start bit, 8 data bits and 1 stop bit, no parity

Check. MODBUS uses RTU mode, the transmitter only open 03H, 10H function code. The format is as follows: Function code 03H: Read register

Host request:

address code	function code	Register start address	Number of registers	CRC check
1 byte	1 byte	2 byte	2 byte	2 byte
0 ~ 247	03H	0000H ~ 0002H	1 ~ 3	

Transmitter response:

address code	function code	Register start address	data 1	...	data N	CRC check
1 byte	1 byte	1 byte	2 byte	...	2 byte	2 byte
0 ~ 247	03H	N×2				

function code 10H: Write register

Host request:

address code	function code	Register start address	Number of registers	Number of bytes	data 1	...	Data N	CRC check
1 byte	1 byte	2 byte	2 byte	1 byte	2 byte	...	2 byte	2 byte
0 ~ 247	10H			N×2				

Transmitter response:

address code	function code	Register start address	Number of registers	CRC check
1 byte	1 byte	2 byte	2 byte	2 byte
0 ~ 247	10H			

The calculation method of the CRC check code is as follows:

- (1) Preset a 16-bit register as hexadecimal FFFF (that is, all ones), and call this register the CRC register;
- (2) XOR the first 8-bit binary data (the first byte of the communication information frame) with the lower 8 bits of the 16-bit CRC register, and put the result in the CRC register;
- (3) Shift the contents of the CRC register to the right by one bit (towards the lower bit) and fill the highest bit with 0, and check the shifted out bits after the right shift;
- (4) If the shift-out bit is 0, repeat step 3 (shift the bit to the right again);

If the shift-out bit is 1, the CRC register is XORed with the polynomial A001 (1010 0000 0000 0001);

- (5) Repeat steps 3 and 4 until 8 times to the right, so that the entire 8-bit data has been processed;

- (6) Repeat steps 2 to 5 to process the next byte of the communication information frame;
- (7) After calculating all the bytes of the communication information frame according to the above steps, the CRC register content obtained is: 16-bit CRC check code.

**Error response**

When the function code, register address, number of registers, and data sent by the host computer are wrong, the error code will be returned. When replying to the error code, the highest position of the function code is 1. The reply format is:

address code	function code &0x80	error code	CRC check
1 byte	1 byte	1 byte	2 byte
0 ~ 247			

error code	
01H	Function code error
02H	Data address error
03H	Data error
06H	Data frame length error
0CH	CRC Check error

Serial number	address	name	type of data	R/W
1	00H	Calibration fluid ECvalue	int	R
2	01H	current EC/TDSvalue	int	R
3	02H	Transmitter address	int	R/W

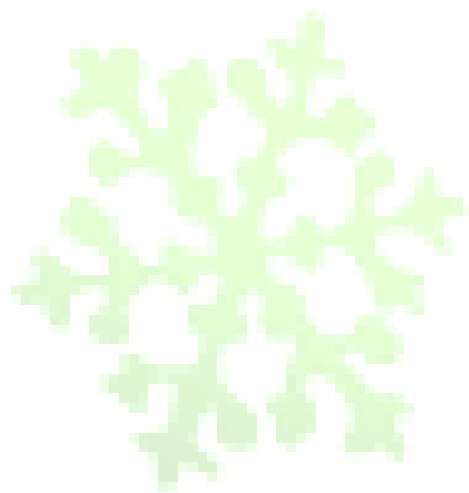
**(1) Transmitter address setting**

The address of the transmitter is set by a write command and can be set between 00 and F7 (0-247), see the figure below for details;

Set the address and send the following command:

address code	function code	Register start address	Number of registers	Number	data 1	CRC check
1 byte	1 byte	2 byte	2 byte	1 byte	2 byte	2 byte
0 ~ 247	10H	0002H	0001H	02H	0001H ~ 00F7H	

(2) Baud rate setting (9600 Setting is temporarily not supported)



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### (3) Data representation

The data type is a signed integer, which is expressed in hexadecimal. The query data is converted to decimal and then simply converted.

The corresponding calibration standards and EC / TDS values are available. Such as:  
(if the transmitter address is 01H)

Host computer sends: 01 03 00 00 00 02 c4 0b

Transmitter reply: 01 03 04 37 32 a8 57 6b b6

Then the calibration value =  $3732H / 10 = 14130/10 = 1413.0$  EC / TDS value =  $a857H / 10 = 43095/10 = 4309.5$

Note: 0-44000uS / cm range does not need to be divided by 10.

Remarks: The factory default local address is 01H, the lower 8 bits of the CRC check code come first, and the higher 8 bits come last.

### Transmitter calibration and electrode quality detection

Calibrate the transmitter (As long as the calibration process has not been performed to step 9, you can terminate the current calibration process in advance by long pressing the calibration button, and the sensor will still work with the parameters of the last successful calibration after termination.)

1. Clean the electrode with CO<sub>2</sub>-free distilled water and wipe dry with a soft paper towel.
2. Connect the transmitter power supply and electrode correctly.
3. Press and hold the calibration button until the calibration indicator lights up in yellow, then release the button.
4. Quickly press the calibration button twice until the calibration indicator flashes red. At this time, the transmitter enters the zero calibration process.

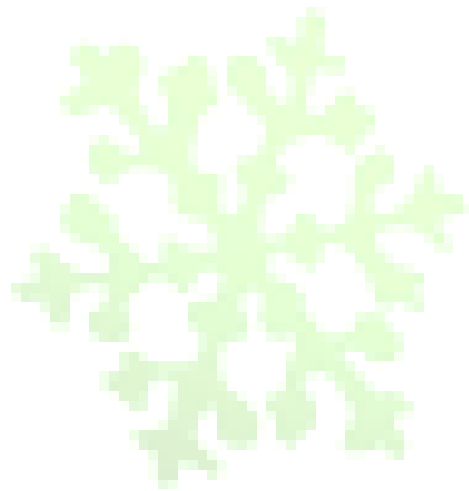
(The duration of this process is 30 seconds.) After the calibration, the calibration indicator is always red.

5. After the calibration indicator light is always red, immerse the electrode in the prepared standard solution. The different ranges and corresponding standard solutions are as follows:

0-440uS range corresponding standard solution: 146.5uS / cm

0-4400uS and 0-2000ppm range corresponding standard solution: 1413uS / cm

0-44000uS range corresponding standard solution: 12.88mS / cm



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6. Quickly press the calibration button once. At this time, the calibration indicator flashes green, and the transmitter enters the calibration standard point process.

(The duration of this process is 30 seconds.) After the calibration is completed, the calibration indicator lights up green for 20 seconds, and then flashes yellow for 20 seconds.

Calibration data will be saved.

7. Detection of electrode quality (automatic judgment) and data storage: If the electrode is damaged or the electrodes do not match during the calibration process, the calibration indicator will flash red and green to flash the alarm.

After blinking for 20 seconds, the indicator goes out, and the current round of calibration is over. The data of this round of calibration is not saved.

During the calibration process, if there is no fault in the electrode detection, the transmitter will automatically store the data of the current round of calibration, the calibration indicator light will always be yellow for 20 seconds, and the current round of calibration will end.

#### **Repair and maintenance**

1. The electrode is cleaned every two weeks, depending on the condition of the water sample.
2. Calibrate the transmitter periodically with a calibration solution, once a month. Depending on the condition of the water sample.
3. If the transmitter cannot be calibrated, if it is not replaced with a new electrode, please contact our company.

**Wiring instructions** (when the current signal is output, the load or instrument is directly connected in series between the signal output terminal and the ground)

(When the voltage signal is output, the load or meter is directly connected in parallel between the signal output terminal and the ground)

Attention: The voltage or current output mode has been configured according to the requirements of the customer when ordering;

When wiring, it is necessary to carefully check the match between the output signal and the collector or instrument port. If the signal mode is changed, the power supply of the transmitter must be powered off to avoid damage (especially the voltage output cannot be connected to the current sampling terminal, which may cause IC is damaged);

Before connecting the transmitter to the power supply, you must carefully check whether the wiring is correct and avoid human damage. (If you connect the wrong power, it may cause the internal components of the transmitter to burn out and affect normal use.);

#### **Installation methods:**

1. Fix the transmitter with M5 screws through the two holes on the left and right sides of the housing or the holes on the top of the red pin.
2. Guide rail installation;

#### **Matters needing attention**

1. Turn off the power when installing and replacing. Check whether the leads are correct before connecting the power.
2. Please store in a dry environment when not used for a long time.
3. Some functional indicators of the product may be modified, and the indicators on the product identification shall prevail.
4. The warranty period is 12 months. During the warranty period, non-man-made products are normally used. The manufacturer is responsible for free maintenance.