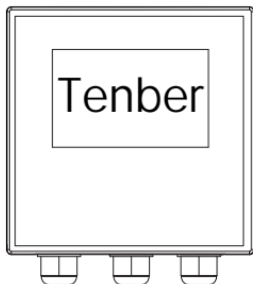


EC-702 Conductivity / Resistivity / TDS Manual



96 Series



Directory

Safety Instructions	2
Instrument Use	2
Product Contents and Warranty	2
Specifications	3
Instrument Installation	4
Wiring Label	5
Electrode Wiring Diagram	5
Relay Contact Protection Diagram	6
Display Description	7
Button Description	8
Hold Mode	8
Analog Current 1 Setting	9
Relay 1 Setting	10
Relay 2 Setting	10
Analysis Setting	11
Temperature Setting	11
Communication Setting	11
Output Test	12
Date Setting	12
Backlight Setting	12
Factory Reset	13
Calibration	13
Factory Values	14
Error Codes	15
RS485 Communication	16



Safety Instructions

Please read the following safety instructions carefully before use:

1. Before use, check whether the instrument housing was damaged during transport;
2. The instrument must be operated by trained professional personnel;
3. Read the operation manual carefully to avoid safety problems or instrument damage caused by incorrect wiring;
4. After all wiring is complete, check it carefully before powering on and confirm that the connected equipment is correct;
5. Install away from high temperature, high humidity and corrosive environments, and avoid direct sunlight;
6. Avoid power supplies that generate surge interference. If surge interference occurs, separate the instrument power from other interfering equipment power supplies.

Instrument Use

The instrument is used for industrial measurement of conductivity, resistivity, total dissolved solids and temperature, such as wastewater, purified water, high-purity water, environmental monitoring and food production processes;

proportional or frequency control of chemical dosing pumps, etc.;

The instrument supports panel, wall and pipeline installation;

The instrument provides one current output with a maximum load of 500 Ω ;

Product Contents and Warranty

96 Series: The package includes one instrument and two sets of brackets (screws, fixing blocks and fixing rods)



Specifications

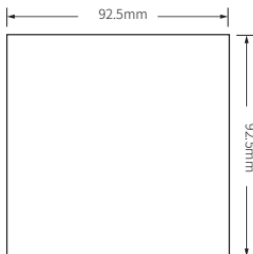
Function	Conductivity	Resistivity	TDS
Measuring range	0.00 μS–2000 mS	0.00–20.00 MΩ·cm	0–133000 ppm
Resolution	0.01 / 0.1 / 1	0.01	1
Accuracy	±1% F.S.	±1% F.S.	±1% F.S.
Temperature compensation	Pt-1000 / NTC30K		
Temperature measurement range	NTC30K (0–100.0 °C)	PT1000 (–10.0 to +130.0 °C)	
Temperature compensation range	NTC30K (0–100.0 °C)	PT1000 (–10.0 to +130.0 °C)	
Temperature resolution	0.1 °C		
Temperature accuracy	±0.2 °C		
Electrode constant	0.001 to 20.000		
Operating ambient temperature	0 to +70 °C		
Storage ambient temperature	–20 to +70 °C		
Display	Backlit color LCD		
Current output 1	Isolated 4–20 mA output, max. load 500 Ω		
Current output accuracy	±0.05 mA		
RS485	Modbus RTU standard protocol		
Relay contact rating	5 A / 250 VAC; 5 A / 30 VDC		
Protection rating	IP65		
Power	90–260 VAC; power consumption <7 W		
Installation	Panel / wall / pipeline installation		
Instrument weight	96 Series: 0.70 kg		



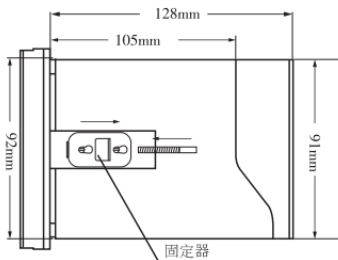
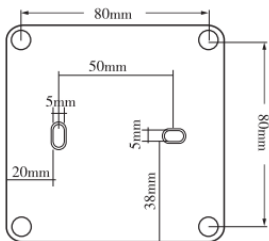
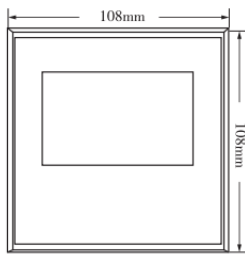
Instrument Installation

96 Series: The instrument can be installed on a panel, in a pipe or on a wall.

Panel installation: Cut a 92.5 mm × 92.5 mm square hole in the control cabinet panel, insert the instrument from the front of the cabinet panel, and install the retainers on both sides of the instrument.



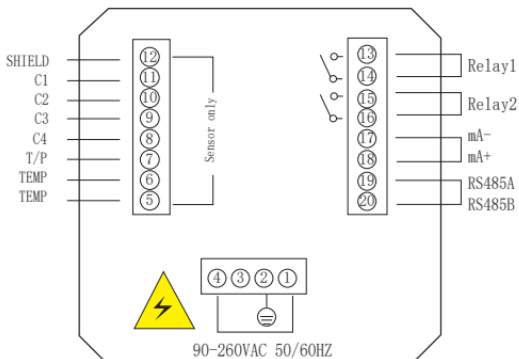
96 Series panel opening dimensions



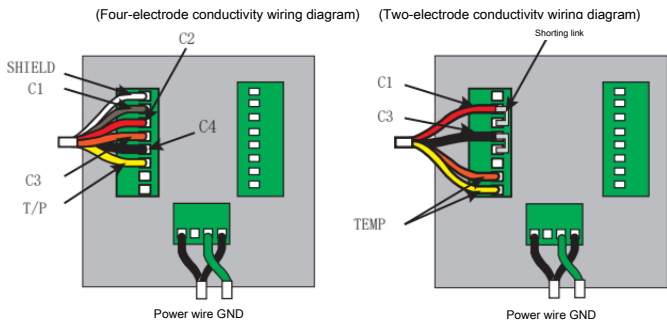
96 Series hole pattern 96 Series overall dimensions



Wiring Label



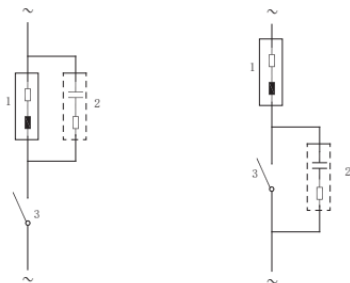
96 Series electrode wiring diagram





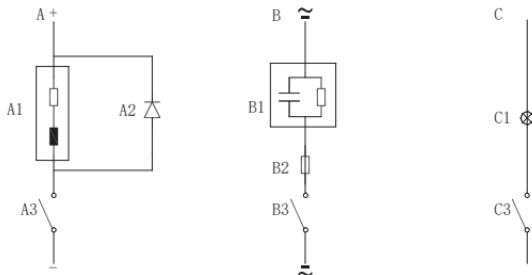
Relay Contact Protection Diagram

Relay contacts exposed to electrical sparks may have a shortened service life, especially with inductive or capacitive loads. To suppress sparks and arcing, use an RC circuit to extend relay life.



AC protection for inductive loads

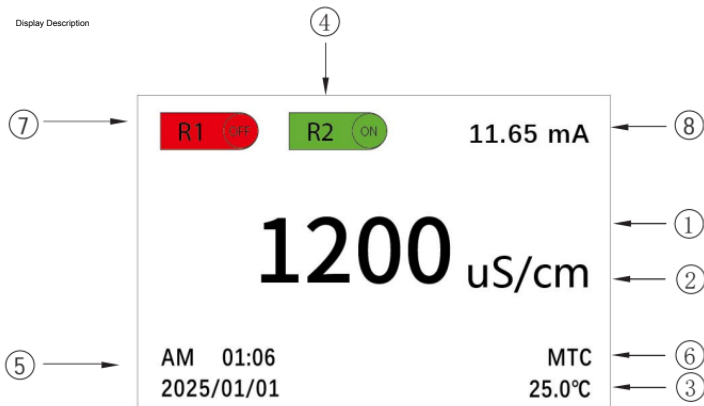
1. Load
2. RC spark suppressor for 220 VAC, $R = 10 \Omega / 1 \text{ W}$, $C = 0.1 \mu\text{F} / 630 \text{ V}$
3. Relay contact



- A DC protection: A1 inductive load; A2 1N4007; A3 relay contact
B AC/DC protection: B1 capacitive load; B2 $0.8 \Omega / 1 \text{ W}$ (for 24 VDC); B3 relay contact
C Resistive load: C1 lamp; C3 relay contact



Display Description



1. Main display
2. Unit
3. Temperature and unit
4. Relay 2 status indicator
5. Time display
6. Temperature compensation mode
7. Relay 1 status indicator
8. Current 1 display

Note: If the conductivity value exceeds the positive or negative range, the display shows 99.99 / 999.9 / 9999

If the temperature exceeds the positive or negative range, the display shows ~99.9 / 999.9



Button Description



SET



CAL



UP



DOWN



ENTER

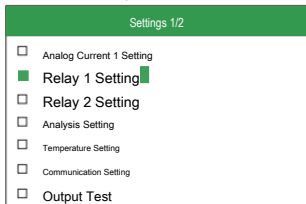
Button	Measuring state	Setting state	Calibration state	Record state
SET	Enter settings	Exit	Exit	Exit
CAL	CAL	Enter calibration	Move digit position	Move digit position
UP	UP	—	Increase value	Increase value
DOWN	DOWN	—	Decrease value	Decrease value
ENTER	ENTER	Backlight on/off	Confirm	Confirm

Hold Mode

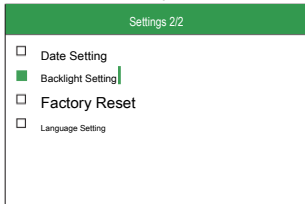
Hold mode is a safety mode mainly used during calibration and setting. In hold mode, the relays are open (inactive), the current follows the settings, and the displayed measurement value does not change.

Main Screen

Press SET to enter settings, use UP/DOWN to select a function, and press ENTER to enter the function settings:



Page 1



Page 2

Notes:

- During setting, if an entered value is outside the specified range, "Error" appears at the top of the display;
- Press ENTER after entering a value to save it;
- Press SET at any time to leave the setting mode;
- If no button is pressed for more than 10 minutes in setting mode, the instrument automatically returns to measuring mode.



Analog Current 1 Setting

Analog Current 1 Setting	
04.00 mA	= 000.0 mS
20.00 mA	= 200.0 mS
Offset	= +0.00 mA

1. Set the conductivity / resistivity / salinity / TDS value corresponding to the 4.00 mA output;

Corresponding value:

2. Set the conductivity / resistivity / salinity / TDS value corresponding to the 20.00 mA output. The conductivity value

must differ by at least 1.00 / 10.0 / 100 (μS / mS), the resistivity value by at least 1.00 M Ω , the salinity by 1.00

Minimum difference: 1.00 / 10.0 / 100 (μS / mS),
resistivity at least 1.00 M Ω ; salinity
at least 1.00 g/kg; TDS at least 100 ppm;

3. Set the current offset for conductivity / resistivity / salinity / TDS current output; range ± 1.00 mA.

Range ± 1.00 mA.

Relay 1 Setting

Relay 1 Setting	
Switch	= ☒ On ☐ Off
Activation point = 100.0 mS	
Release point = 001.0 mS	

1. Switch: press UP/DOWN to turn on or off;
If off, the relay will not operate.

2. Set point: relay conductivity / resistivity / salinity / TDS activation point;
Activation point (action)

3. Release point: relay conductivity / resistivity / salinity / TDS release point;
Release point (inactive)

Relay 2 Setting

Relay 2 Setting	
Switch =	☒ On ☐ Off
Activation point = 100.0 mS	
Release point = 001.0 mS	

1. Switch: press UP/DOWN to turn on or off;
If off, the relay will not operate.

2. Set point: relay conductivity / resistivity / salinity / TDS activation point;
Activation point (action)

3. Release point: relay conductivity / resistivity / salinity / TDS release point;
Release point (inactive)



Analysis Setting

Analysis Setting	
☒	Conductivity
☐	Resistivity
☐	TDS

Analysis Setting	
------------------	--

Analysis Setting	
☐	Conductivity
☒	Resistivity
☐	TDS

Analysis Setting	
------------------	--

Analysis Setting	
☐	Conductivity
☐	Resistivity
☒	TDS

Analysis Setting	
------------------	--

1. Select the measuring mode with UP/DOWN, then press ENTER to go to the next page.
2. Select the measuring range; only conductivity has range selection.
3. Enter the offset. Conductivity range: $\pm 1.000 \mu\text{S}$ / $\pm 10.0 \mu\text{S}$ / $\pm 100 \mu\text{S}$ / $\pm 1.00 \text{ mS}$ / $\pm 10.00 \text{ mS}$ / $\pm 100.0 \text{ mS}$ / $\pm 100 \text{ mS}$; resistivity range: $\pm 1.00 \text{ M}\Omega$; TDS range: $\pm 100 \text{ ppm}$.
4. Filter setting: range 0–10



Temperature Setting

Temperature Setting	
Temperature compensation	= ☒ Manual
	☐ Automatic
Probe type	= ☐ Pt 1000
	☐ NTC 30K
Offset	= +0.0 °C
Manual measuring temperature=+025.0°C	

1. Select automatic or manual temperature compensation with UP/DOWN; selection.
2. Select the temperature probe type with UP/DOWN;
3. Temperature offset range ± 5.00 °C (automatic mode only);
4. Enter the manual temperature measurement.

Communication Setting

Communication Setting	
Communication address	= 0 0 1

1. Select the communication address: 1–255.

Output Test

Output Test	
Current 1	= 0 4 . 0 0 mA
Relay 1 release	☐ Closed
	= ☐ Released
Relay 2	☐ Closed

1. Current 1 output test: 4.00–20.00 mA;
2. Current 2 output test: 4.00–20.00 mA;
3. Relay 1 test; select with UP/DOWN;
4. Relay 2 test; select with UP/DOWN.

Note: This function tests whether the current outputs and relays operate normally. operating normally.

Date Setting

Date Setting
Year=2099 Month=02 Day=09 Hour=19 Minute=14

Use UP/DOWN to set the date and time. After power is removed, the time is retained for about two days.

Hour。

Backlight Setting

Backlight Setting
Backlight = ☒ Automatic ☐ Manual

1. Backlight time: press UP/DOWN to select automatic backlight off after 60 seconds or manual backlight turn off the backlight or use manual backlight

Language Setting

Language Setting
Language Setting = Simplified Chinese

1. Press UP/DOWN to select Simplified Chinese or English.

Factory Reset

Factory Reset	
Factory reset	= ☒ No ☐ Yes

Press UP/DOWN to select reset all or no. The following values are not affected: backlight setting and measuring mo

: Backlight Setting, Mode.

Note: This reset does not affect the conductivity calibration value.

Calibration

Calibration	
☒ Parameter Setting	
☐ Conductivity Calibration	
☐ Factory Reset	

Press CAL to enter calibration, use UP/DOWN to select a function, and press ENTER to confirm:

Press ENTER to confirm:

1. Parameter setting: enter the solution temperature coefficient and reference temperature;
2. Conductivity calibration: calibrate the conductivity value;
3. Factory reset: restore the factory calibration value;

Note: If the electrode constant calculated by the instrument differs from the conductivity electrode constant by more than 30%, replace the electrode.

Parameter Setting

Parameter Setting	
TemperatureCoefficient	= 02.00 %/°C
Temperature	= 25.0 °C
Confirm	

1. Solution temperature coefficient: enter the solution temperature coefficient;

Range: 0.01% to 40.00%;

2. Enter the reference temperature: range 15 °C to 35 °C.

Normally, conductivity is compensated to 25.0 °C. If another compensation temperature is required, change the reference temperature.

If another compensation temperature is required, change the reference temperature.

Conductivity Calibration

Conductivity Calibration

Previous constant = 01.0000

Conductivity measurement = 00.03 uS

Temperature = + 000.0 °C

= 01.0000

Confirm

1. Place the electrode in a known standard solution.
2. The current conductivity measurement value is displayed.
3. After the value is stable, enter the electrode constant with UP/DOWN so the display equals the standard value, then press ENTER to save.
4. If the measurement exceeds the selected range or temperature is outside 0.0–60.0 °C, "Error" appears at the top.

Factory Reset

Factory Reset

Factory reset = ☒ No

☐ Yes

This function restores the calibration value to the factory state.

Note: This reset restores calibration to the factory state and does not affect parameters changed in settings.
affect parameters changed in settings.

Factory Values

EC 20.00 mA set value	2000	μS	Range: 100 – 2000
EC 4.00 mA set value	0	μS	Range: 0 – 1900
			Minimum difference: 100
Resistivity 20.00 mA set value	20.00	MΩ	Range: 1.00 – 20.00
Resistivity 4.00 mA set value	19.00	MΩ	Range: 0.00 – 19.00
			Minimum difference: 1.00
TDS 20.00 mA set value	2000	ppm	Range: 100 – 133000
TDS 4.00 mA set value	0	ppm	Range: 0 – 132900
			Minimum difference: 100
Current 1 output offset	0.00	mA	Range: ±1.00
Relay 1 EC activation point	1000	μS	Range: 0 – 2000
Relay 1 EC release point	10	μS	Range: 0 – 2000
			Minimum difference: 1
Relay 1 resistivity activation point	10.00	MΩ	Range: 0.00 – 20.00
Relay 1 resistivity release point	0.1	MΩ	Range: 0.00 – 20.00
			Minimum difference: 0.01
Relay 1 TDS activation point	1000	ppm	Range: 0 – 133000



Relay 1 TDS release point	10	ppm	Range: 0 – 133000 Minimum difference: 1
Relay 1 delay time	0	s	Range: 0–120
Relay 2 EC activation point	1000	μS	Range: 0 – 2000
Relay 2 EC release point	10	μS	Range: 0 – 2000 Minimum difference: 1
Relay 2 resistivity activation point	10.00	$\text{M}\Omega$	Range: 0.00 – 20.00
Relay 2 resistivity release point	0.1	$\text{M}\Omega$	Range: 0.00 – 20.00 Minimum difference: 0.01
Relay 2 TDS activation point	1000	ppm	Range: 0 – 133000
Relay 2 TDS release point	10	ppm	Range: 0 – 133000 Minimum difference: 1
Relay 2 delay time	0	s	Range: 0–120
Logging interval	60	s	Range: 5–120
Communication address	1		Range: 1–255
EC offset	0.00	μS	Range: ± 100
Resistivity offset	0.00	$\text{M}\Omega$	Range: ± 1.00
TDS offset	0.00	ppm	Range: ± 1.00
Temperature offset	0	$^{\circ}\text{C}$	Range: ± 5.0
Manual measuring temperature	25	$^{\circ}\text{C}$	Range: $-10.0 - 130.0$
Filter	2		Range: 0 to 20
Temperature compensation	Manual		Range: Automatic / Manual
Probe type	NTC30K		Range: Pt1000, NTC10K



The instrument uses the standard Modbus-RTU protocol. Measurement values are floating-point numbers; other data are two-byte parameters (-32767 to 32767), represented in hexadecimal; the highest bit is the sign bit.

Host computer command format:

	Instrument ID	Function	Data start address	Data quantity	CRC16
Length	1 byte	1 byte	2 byte	2 byte	2 byte
Example	0x01	0x03	0x0001	0x0001	0xD5CA

This reads the first data item; see the table below.

Slave response format:

	Instrument ID	Function	Data quantity	Data	CRC16
Length	1 byte	1 byte	1 byte	N byte	2 byte
Example	0x01	0x03	0x02	0x02 0xBC	0xB895

When the instrument replies 01, the function code cannot be identified

When the instrument replies 02, the address is incorrect

When the instrument replies 03, the data quantity is incorrect

Baud rate: 9600 (fixed)

Data bits: 8

Parity: none

Stop bits: 1

Function 03: read setting values

Function 04: read measurement values

04: Definition

Address

(00) 0x00 EC measurement value Read value: floating point

(01) 0x02 EC current value Read value: $\times 0.01$

(02) 0x03 Temperature value Read value: $\times 0.1$