

SIGNUX TUR01

Water quality — RS485



SX-TUR01



DESCRIPTION

Digital turbidity transmitter for water quality monitoring. It measures by 90-degree scattered light, with an infrared source and a fibre-optic light path; internal filtering against ambient light and automatic temperature compensation, for continuous submerged measurement. Plastic or stainless steel housing.

FEATURES

- 90° scattered light: The standard method for turbidity. With internal filtering and a fibre-optic light path, ambient light does not affect the reading.
- Four ranges: From 50 to 4000 NTU. Chosen when ordering: a 50 NTU unit cannot measure a thousand, and it is not reconfigured afterwards.
- Temperature compensated: A built-in temperature sensor corrects the reading automatically, so the probe can stay in the water measuring continuously.
- Waterproof, IP68: Corrosion-resistant plastic or stainless steel housing, and five metres of cable.

AT A GLANCE

Measures	Turbidity · Temperature
Output	RS485
Protection	IP68
Operating	0 to +40 °C

CONTENTS

01	Introduction	3
02	Wiring	5
03	Dimensions and ordering information	6
3.1	Dimensions	6
3.2	Ordering information	7
04	Safety, care and installation	8
4.1	Installation	8
4.2	Care and maintenance	8
05	Calibration	9
06	Modbus RS485 protocol	10
6.1	Communication parameters	10
6.2	Frame format	10
6.3	Modbus registers	11
6.4	Communication examples	12
6.4.1	Example 1: read turbidity and temperature	12
6.4.2	Example 2: set the turbidity offset	12
6.4.3	Example 3: calibrate the full scale point	12

1 Introduction

The SX-TUR01 is a digital turbidity transmitter for water quality monitoring. It uses the 90° scattered light method, with an infrared LED source and a fibre-optic light path, and an internal filtering algorithm that makes it highly resistant to ambient light.

A built-in temperature sensor provides automatic temperature compensation, so the probe is suited to long-term online monitoring....

- Turbidity measuring ranges: 0-50, 0-200, 0-1000 and 0-4000 NTU
- IP68 protection rating
- 90° scattered light principle, highly resistant to ambient light, with automatic temperature compensation
- RS485 interface with Modbus RTU protocol, easy to connect to a PLC, datalogger or computer
- Configurable Modbus address and baud rate
- Wide supply voltage range: 10-30 V DC

SPECIFICATIONS

Measuring range	0-50.00 NTU; 0-200.0 NTU; 0-1000.0 NTU; 0-4000 NTU
Accuracy	±5 % FS (at 25 °C); temperature ±0.5 °C
Resolution	0-50 NTU range: 0.01 NTU 0-200 and 0-1000 NTU ranges: 0.1 NTU 0-4000 NTU range: 1 NTU Temperature: 0.1 °C
Response time	≤30 s
Operating conditions	0-40 °C
Power supply	10-30 V DC
Power consumption	0.2 W
Communication interface	RS485, Modbus RTU 4800 baud by default (1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 selectable)
Measuring principle	90° scattered light
Service life	2 years under normal use
Protection rating	IP68
Cable length	5 m by default
Housing material	Corrosion-resistant plastic or stainless steel



2 Wiring

The probe is supplied with a four-core cable with bare ends.

FUNCTION	WIRE COLOUR	DESCRIPTION
Power supply	Brown	Power supply positive (10-30 V DC)
Power supply	Black	Power supply negative (GND)
Communication	Yellow	RS485 A
Communication	Blue	RS485 B

3 Dimensions and ordering information

3.1 Dimensions

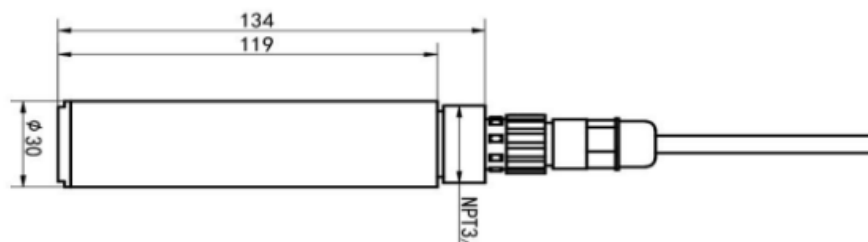


Fig. 3.1.1 · Plastic housing (-P)

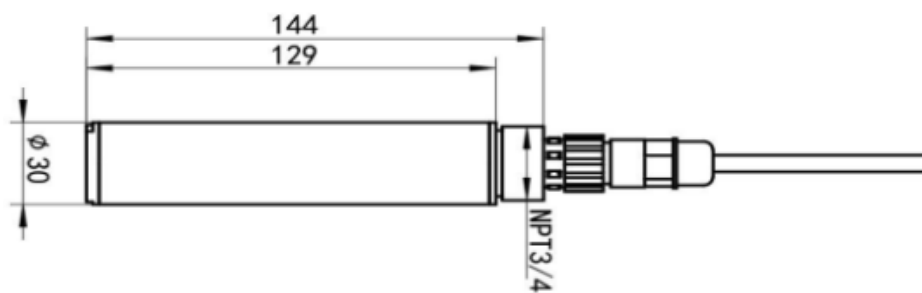


Fig. 3.1.2 · Stainless steel housing (-S)

3.2 Ordering information

PARAMETER	CODE	DESCRIPTION
Code 1: Product series	SX-TUR01	Turbidity transmitter, RS485 Modbus RTU
Code 2: Housing	P S	Corrosion-resistant plastic Stainless steel
Code 3: Measuring range	50 200 1000 4000	0-50 NTU 0-200 NTU 0-1000 NTU 0-4000 NTU

Order code example: SX-TUR01-P-200

Product series: SX-TUR01 turbidity transmitter;

Housing: corrosion-resistant plastic;

Measuring range: 0-200 NTU;

The package contains:

- Turbidity transmitter, 1 pc
- 5 m cable
- Certificate and warranty card

4 Safety, care and installation

4.1 Installation

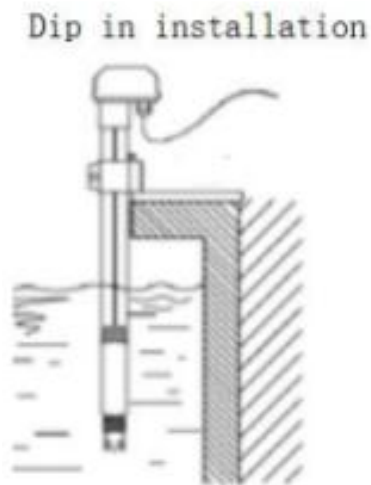


Fig. 4.1.1

- The probe has an NPT 3/4 thread for use with a waterproof pipe: route the cable through the pipe and screw the probe onto the pipe thread.
- Install the probe where the water flows slowly and there are no bubbles.
- Keep at least 5 cm between the probe and the surrounding walls, and no obstacles within 7 cm below the sensor.

4.2 Care and maintenance

- If the device shows an obvious fault, do not open or repair it: contact SIGNUX for a solution.
- Remove the black rubber cap before measuring.
- Clean the measuring probe regularly, according to the working environment: deposits cause measurement deviation. Avoid scratching the light-guide window when cleaning. Recommended cleaning interval: every 30 days.
- Rinse the outer surface with running water. If dirt remains, wipe it with a soft, damp cloth.
- Calibrate the probe before each use, and every 3 months in long-term use. Adjust the calibration interval to the application: how dirty the water is, chemical deposits, and so on.

5 Calibration

Turbidity is calibrated at two points: zero and full scale. Both are Modbus commands on registers 0x1010 and 0x1011 (see Modbus registers).

- Zero point: place the probe in a 0 NTU standard solution (deionized water; if high accuracy is not required, dark, clean air can be used). When the reading is stable, write 0x0001 to register 0x1010 and 0x0000 to register 0x1011.
- Full scale: place the probe in a standard turbidity solution at the upper limit of its range. When the reading is stable, write 0x0002 to register 0x1010 and 0x0001 to register 0x1011.
- During calibration no bubbles may cling to the optical window, and the probe must be more than 7 cm from the bottom of the container.

6 Modbus RS485 protocol

6.1 Communication parameters

Encoding	8-bit binary
Data bits	8
Parity	None
Stop bits	1
Error check	CRC (cyclic redundancy check)
Baud rate	4800 bit/s by default (1200 to 115200 configurable)
Device address	1 (0x01) by default

6.2 Frame format

Communication uses the Modbus RTU protocol. Each frame is made up of:

- Start: silence of at least 4 byte times
- Address code: 1 byte
- Function code: 1 byte
- Data area: N bytes
- Error check: 16-bit CRC
- End: silence of at least 4 byte times

Address code: the address of the transmitter, unique on the bus (factory default 0x01).

Function code: the command issued by the master.

Data area: the data of the command. In 16-bit values the high byte comes first.

CRC: two-byte check code.

6.3 Modbus registers

REGISTER ADDRESS	FUNCTION CODES (DEC)	DESCRIPTION
0x0000	3 / 4	Turbidity (NTU). UINT16: the register holds 10 times the value (100 times in the 0-50 NTU range)
0x0001	3 / 4	Temperature (°C). INT16: the register holds 10 times the value
0x0050	3 / 4 / 6 / 16	Turbidity offset. 16-bit, 10 times the value (100 times in the 0-50 NTU range); negative values in two's complement
0x0051	3 / 4 / 6 / 16	Temperature offset. INT16, 10 times the value
0x1010 / 0x1011	16	Turbidity calibration, two points: write 0x0001 to 0x1010 and 0x0000 to 0x1011 for zero; write 0x0002 to 0x1010 and 0x0001 to 0x1011 for full scale
0x07D0	3 / 4 / 6 / 16	Device address: 1-254 (UINT16, factory default 1)
0x07D1	3 / 4 / 6 / 16	Baud rate: 0 = 2400, 1 = 4800, 2 = 9600, 3 = 19200, 4 = 38400, 5 = 57600, 6 = 115200, 7 = 1200 (factory default 1 = 4800)

UINT16: 16-bit unsigned integer

INT16: 16-bit signed integer

6.4 Communication examples

In the following examples, values starting with 0x are hexadecimal. The two CRC bytes are sent low byte first.

6.4.1 Example 1: read turbidity and temperature

MASTER REQUEST: 01 03 0000 0002 C4 0B

Slave address	1 byte	0x01
Function code	1 byte	0x03
Start register	2 byte	0x0000
Number of registers	2 byte	0x0002
CRC	2 byte	0xC4 0x0B

SLAVE RESPONSE: 01 03 04 0D2E 00DB D8 CD |||

Slave address	1 byte	0x01
Function code	1 byte	0x03
Number of data bytes	1 byte	0x04
Turbidity	2 byte	0x0D2E
Temperature	2 byte	0x00DB
CRC	2 byte	0xD8 0xCD

0x0D2E is 3374 in decimal, so the turbidity is $3374 / 10 = 337.4$ NTU.

0x00DB is 219, so the temperature is $219 / 10 = 21.9$ °C.

6.4.2 Example 2: set the turbidity offset

To apply an offset of -10 NTU, write -100 to register 0x0050. In hexadecimal, -100 is 0xFF9C.

MASTER REQUEST: 01 06 0050 FF9C C8 42

Slave address	1 byte	0x01
Function code	1 byte	0x06
Register	2 byte	0x0050
Value	2 byte	0xFF9C
CRC	2 byte	0xC8 0x42

The slave replies with the same frame, as the Modbus standard defines for this function.

MASTER REQUEST: 01 06 0050 FF9C C8 42

Slave address	1 byte	0x01
Function code	1 byte	0x06
Register	2 byte	0x0050
Value	2 byte	0xFF9C
CRC	2 byte	0xC8 0x42

6.4.3 Example 3: calibrate the full scale point

After the value is stable in the 0 turbidity environment, writes 0x0001 to the 0x1010 register, and writes 0x0000 to the 0x1011 register. When calibrating the full scale point, should select the standard turbidity liquid at the upper scale limit, write 0x0002 to 0x1010 and 0x0001 to 0x1011.

MASTER REQUEST: 01 10 1010 0002 04 0002 0001 5F 63 |||

Slave address	1 byte	0x01
Function code	1 byte	0x10
Start register	2 byte	0x1010
Number of registers	2 byte	0x0002
Number of data bytes	1 byte	0x04
Values	4 byte	0x0002, 0x0001
CRC	2 byte	0x5F 0x63

SLAVE RESPONSE: 01 10 1010 0002 44 CD |||

Slave address	1 byte	0x01
Function code	1 byte	0x10
Start register	2 byte	0x1010
Number of registers	2 byte	0x0002
CRC	2 byte	0x44 0xCD