OPTEX
Sensing Innovation

With Compact Design Of Low Range Turbidity For Stable Measurement

Low Range Turbidity

TC-Mi

- Prevention of Dew Condensation System Inside
- Built-In Bubble Removal Design
- LED Light Source For Long Life
- IP65 Dust and Water proof Structure

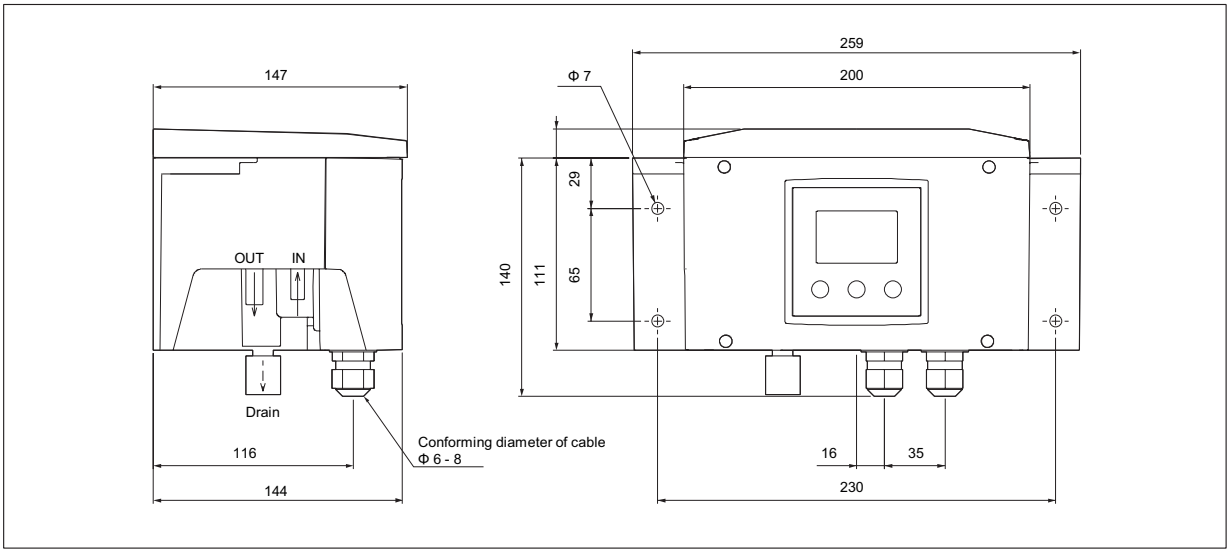
LOW - TURBIDITY CHECKER

■Specification

	Display Type	Non Display Type
Model No.	TC-Mi	TC-Mi-A
Measuring method	90 Degree Scattered Light Method	
Light source	LED	
Measuring range	0-2/0-5/0-20/0-100 (NTU/FNU)	
Display	LCD monitor	-
Display resolution	0.0001 - 9.9999NTU : 0.0001NTU 10.000 - 100.00NTU : 0.001NTU	-
Accuracy	±2% at the measuring point range	
Ripeatability	±0.5% f.s	
Source voltage	DC24V±10% / 110 - 240VAC 50/60Hz (Opt.)	
Responding time	60 sec. to reach the 90% of the value	
Digital communication	MODBUS(RS485)	
Output	1x4 to 20 mA Analog 300Ω 1xOutputSelf-Checking Output (Fault) 2xAlarm Relay Output (Hi/Lo.Opt.)	
Measuring water flow rate	100 - 200 ml / min	
Measuring water temperature	0 - 50 ℃(No freezing)	
Operating temperature	-20 ± 50 ℃ humidity 95%RH	
Main materials	PP-GF AES SUS316L	
Dimension	Approx. 157(H) x 259(W) x 147(D) mm	
Weight	Approx. 2 kg	
Protective construction	IP65	
Option	Flowmeter (TC-Mi-FL)	

Note: Specifications and design are subject to change without prior notice.

■Dimensions(mm)



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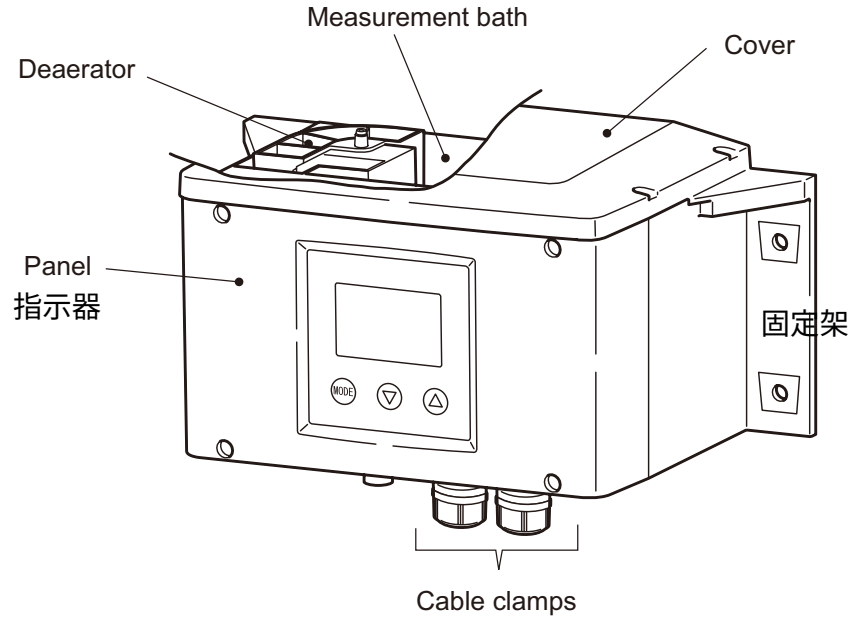
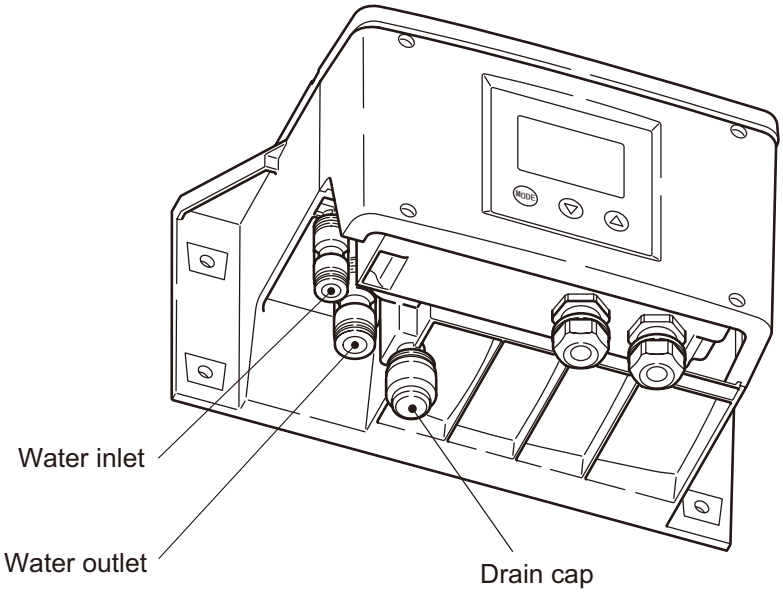
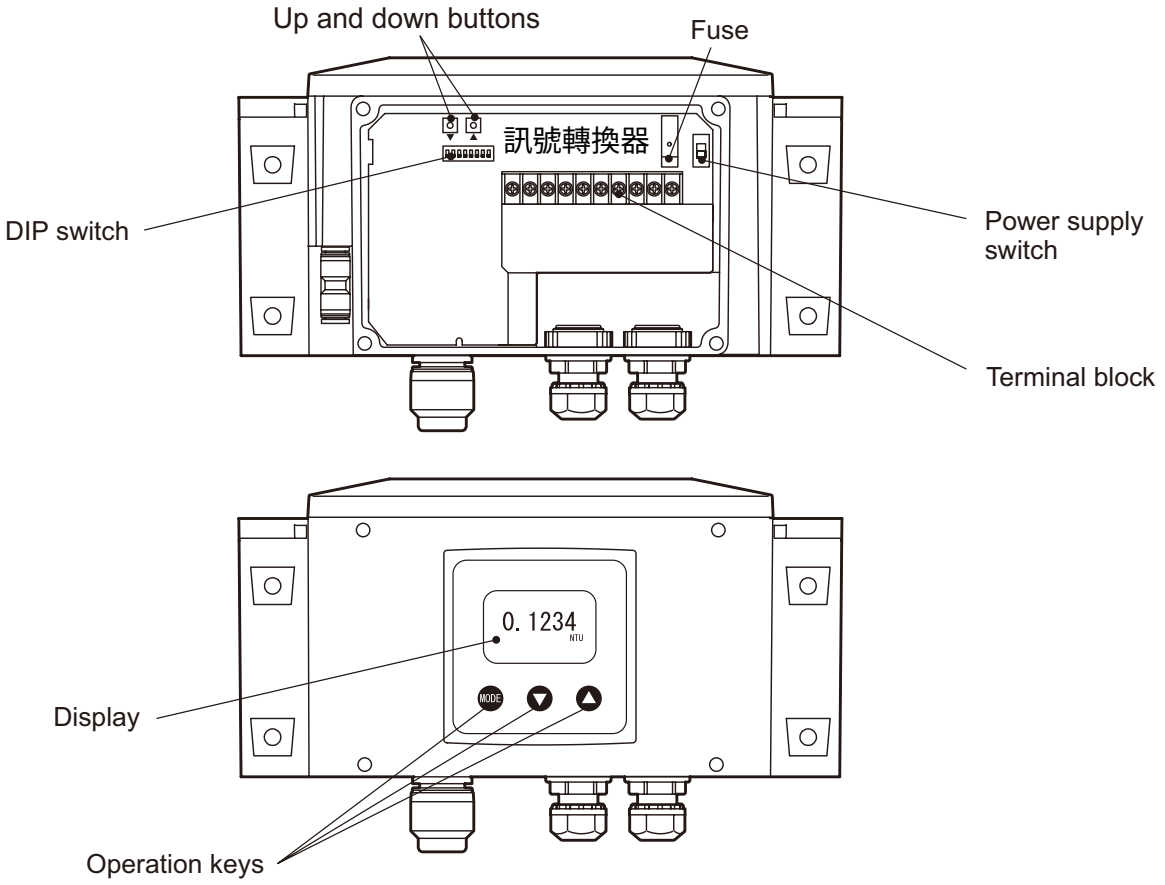
2 Names of the parts

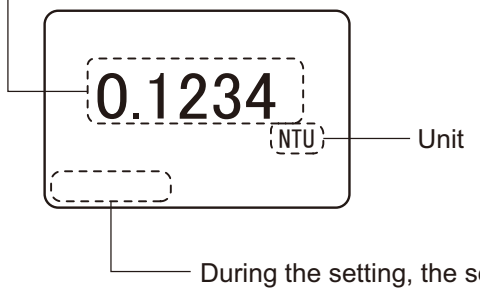






Display

Measurement value (During the setting, the setting value is displayed.)



Operation keys

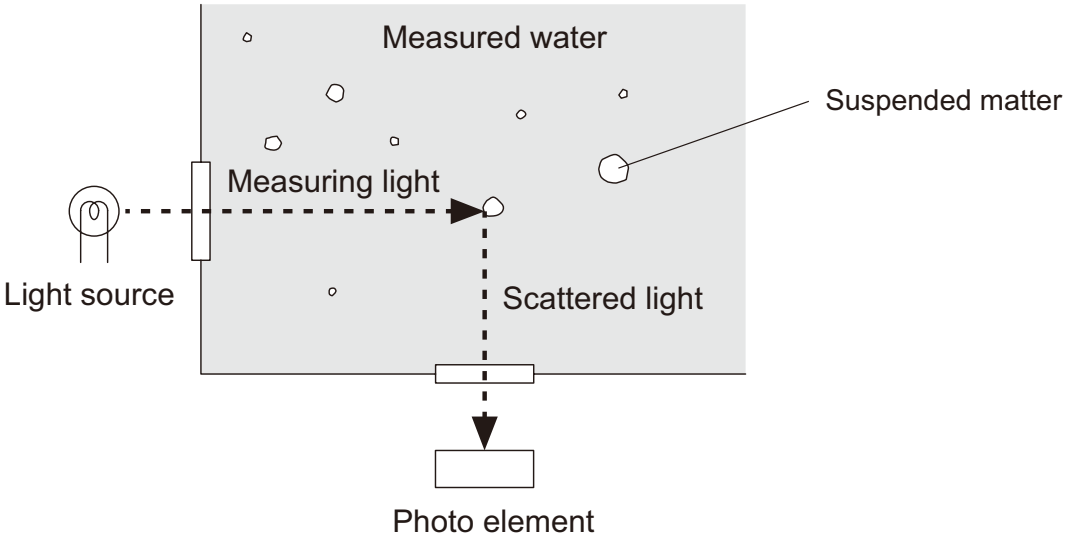
MODE button: enables to confirm the setting items and to determine the setting values.

Upper and lower arrow buttons: Upper and lower arrow buttons are used to change the setting values.

▲ button increases a numeric value and ▼ button decreases the value.

3 Measuring principle

Turbidity Checker TC-Mi uses a method of 90 degree scattered light. In this method, a light source illuminates the surfaces of matter suspended in the water, and the light is scattered by these surfaces is detected by a photo element installed at an angle of 90 degrees from the light axis of the measured light. The turbidity is determined by the amount of the scattered light.



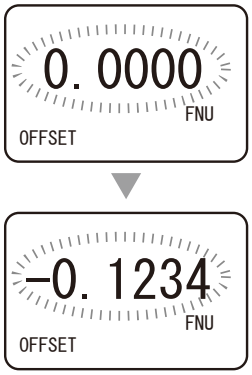
5 Offset adjustment

The output of measuring clean water (zero turbidity) is adjusted.
•Adjustable range is -1.0000 to +1.0000.
•The default value is 0.0000.

(Example) Adjust in offset so that the measured value 0.1234 FNU becomes 0.0000 FNU.

10 Use the ▼ ▲ button to input "-0.1234".

Pressing and holding the ▼ ▲ button continuously changes the indicated value.

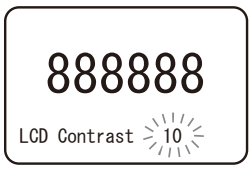


11 Press the MODE button to confirm Offset adjustment and shift to LCD contrast adjustment.

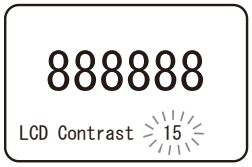
6 LCD contrast adjustment

Contrast in the LCD display can be adjusted.
•Adjustable range is 1 to 20.
•The default value is 10.

(Example) Change the liquid crystal contrast adjustment from 10 to 15.



12 Use the ▼ ▲ button to input "15".



13 Press the MODE button to confirm LCD contrast adjustment and shift to Digital communication setting display.

7 Troubleshooting

Problem	Cause		Inspection and corrective action
The Self-checking relay output is produced "Error 3" (Self-diagnostics) is indicated on the Display	Internal signal error	The converter detection error	Check Lamp or Mount the cover correctly
		The equipment is out of order	Calibration failu. Contact your dealer
"Error 4" is indicated on the Display	Out of the ambient temperature		Use the equipment in the measured water temperature (0 to 50°C) and the ambient temperature (-20°C to 50°C)
"Error 6" (AD Failt) is indicated on the Display	Internal data error		Turn OFF the power switch and turn it ON again. If the error is displayed again, the product must be repaired. Contact your dealer
The display is not turn on. The 4-20 mA signal is not output.	A power cable is not wired		Wire the power cable correctly
	The power supply voltage is out of specification		Use the product within the power supply voltage (DC24V±10%)
	The fuse is in the "ON" position		Get rid of a possible cause why the fuse has been in "ON" position, and switch it to the normal (OFF) position Normal position "ON" position 
	The power switch is not ON		Turn ON the power switch
	TC-Mi is out of order		TC-Mi needs repair. Contact your dealer
Water leaks out of the inflow port or drain port	The tube is damaged		If the tube have length to spare, cut off the tip. Replace the tube
	The joint is damaged		The joint must be replaced Contact your dealer
	The inflow port or drain port is damaged		TC-Mi needs repair. Contact your dealer
Water leaks out of the drain	The drain cap is damaged		The drain cap must be replaced Contact your dealer
	The drain is damaged		TC-Mi needs repair. Contact your dealer
Water leaks out of the measurement bath.	Dirt has been collected in the measurement bath		Clean the measurement bath
	The measurement water's flow rate is much		Use the product with a measurement water's flow rate of 100-200 ml/min
The 4-20 mA signal output does not work.	The 4-20 mA analog signal output is being fixed		Turn OFF DIP SW1-3
	The equipment is out of order		TC-Mi needs repair. Contact your dealer

* When Err3 is displayed, the self-diagnosis output is out, 3 mA is output as the signal output

11 Digital communications

◆Communication Method

Item	Specification
Compliant Standard	Based on EIA RS-485
Transmission Method	2-wire, semi-duplicate
Protocol	MODBUS RTU (default) MODBUS ASCII TC-Mi protocol
Baud rate	9600 (default) / 14400 / 19200 / 38400 bps
Data bits	8bit
Start bits	1bit
Stop bits	1bit
Parity bit	None
Slave address MODBUS only	1 (default) to 247

1 MODBUS protocol

◆Frame Configuration

Mode	Start	Slave address	Function code	Data	Error check	End
RTU		1 byte	1 byte	n byte	2 byte	
ASCII	:	2 chars	2 chars	n chars	2 chars	CR, LF

Item	Mode	Description
Start	RTU	3.5 chare silence
	ASCII	" : "character
End	RTU	3.5 chare silence
	ASCII	"CR","LF"character
Slave address	Common	1 byte field with a value ranging from 1 to 247. Broadcast address is 0.
Function code	Common	4, 6
Data	RTU	0-N bytes with response data from the device.
	ASCII	0-N bytes with response data from the device in hex characters.
Error check	RTU	CRC
	ASCII	LRC

Function Codes	Description
4	Read input registers
6	Write single resisters

◆Error Codes

・The returned value is the sum of the function code of the request message and 0x80 (one is set on the MSB).

Ex.) This is 0x04 if the error is caused by read-out operation 0x84.

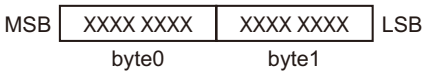
This is 0x06 if the error is caused by write-in operation 0x86.

・Exception codes (codes indicating the error details)

Exception codes	Name	Description
1	Illegal function	The function code received in the query is not an allowable action for the slave. If a Poll Program Complete command was issued, this code indicates that no program function preceded it.
2	Illegal data address	The data address received in the query is not an allowable address for the slave.
3	Illegal data value	A value contained in the query data field is not an allowable value for the slave.
4	Slave device failure	An unrecoverable error occurred while the slave was attempting to perform the requested action.
5	Acknowledge	The slave has accepted the request and is processing it, but a long duration of time will be required to do so. This response is returned to prevent a timeout error from occurring in the master. The master can next issue a Poll Program Complete message to determine if processing is completed.
6	Slave device busy	The slave is engaged in processing a long–duration program command. The master should retransmit the message later when the slave is free.

◆Data Type

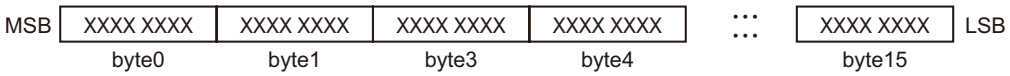
・ushort (unsigned short)



・float (IEEE 754 format, single byte)

where 'S' = sign bit, 'X' = exponent bits and 'M' = mantissa bits.

・string



◆Register Map

Register(Dec)	Size (registers)	R(Read)/W(Write)		Data type	Description
0002	1	R	W	ushort	Read: Confirm measurement state (Not in measurement = 0x0000, In measurement = 0xFFFF)
					Write: Start measurement (write in 0xFFFF)
0003	1	-	W	ushort	Stop measurement (write in 0xFFFF)
0047-0054	8	R	-	string	Store serial number
0070	1	R	-	ushort	Store error number
0084	1	R	W	ushort	Store communication protocol
0085	1	R	W	ushort	Store transmission speed
0087	1	R	W	ushort	Store slave address (default = 1)
0100-0101	2	R	-	float	Store measured value
0110	1	R	W	ushort	Store unit indication
0111-0112	2	R	W	float	Store offset (Zero) adjustment value
0115-0116	2	R	W	float	Store span adjustment value
0123	1	R	W	ushort	Store signal output response time
0124-0126	2	R	W	float	Store measurement range
0196	1	R	W	ushort	Store the noise reduction setting

Caution

Reset the power supply after changing protocol, baud rate or slave address.
The settings do not change until power reset.