

Turbidity meter
HU-200TB-W SS-120-W

Instruction Manual

CODE:GZ0000361148F

Preface

This manual describes the operation of the Turbidity meter, HU-200TB-W SS-120-W.

Be sure to read this manual before using the product to ensure proper and safe operation of the product. Also safely store the manual so it is readily available whenever necessary.

Product specifications and appearance, as well as the contents of this manual are subject to change without notice.

Warranty and responsibility

HORIBA Advanced Techno, Co., Ltd. warrants that the Product shall be free from defects in material and workmanship and agrees to repair or replace free of charge, at option of HORIBA Advanced Techno, Co., Ltd., any malfunctioned or damaged Product attributable to responsibility of HORIBA Advanced Techno, Co., Ltd. for a period of one (1) year from the delivery unless otherwise agreed with a written agreement. In any one of the following cases, none of the warranties set forth herein shall be extended;

- Any malfunction or damage attributable to improper operation
- Any malfunction attributable to repair or modification by any person not authorized by HORIBA Advanced Techno, Co., Ltd.
- Any malfunction or damage attributable to the use in an environment not specified in this manual
- Any malfunction or damage attributable to violation of the instructions in this manual or operations in the manner not specified in this manual
- Any malfunction or damage attributable to any cause or causes beyond the reasonable control of HORIBA Advanced Techno, Co., Ltd. such as natural disasters
- Any deterioration in appearance attributable to corrosion, rust, and so on
- Replacement of consumables

HORIBA Advanced Techno, Co., Ltd. SHALL NOT BE LIABLE FOR ANY DAMAGES RESULTING FROM ANY MALFUNCTIONS OF THE PRODUCT, ANY ERASURE OF DATA, OR ANY OTHER USES OF THE PRODUCT.

Trademarks

Company names and brand names are either registered trademarks or trademarks of the respective companies. (R), (TM) symbols may be omitted in this manual.

Regulations

Conformable Directive

This equipment conforms to the following directives and standards:



EMC:	EN61326-1 Class A, Industrial electromagnetic environment
Safety:	EN61010-1
RoHS:	EN50581 9. Industrial monitoring and control instruments

Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Note

When the sensor cable, the transmission cable, or the contact input cable is extended to 30 m or longer, the surge test specified in the EMC directive for CE marking is not applied.

■ Installation environment

This product is designed for the following environment.

- Overvoltage Category II
- Pollution degree 2

■ Information on disposal of electrical and electronic equipment and disposal of batteries and accumulators

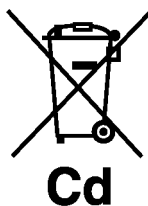
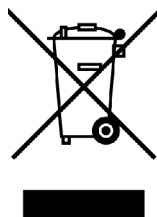
The crossed out wheeled bin symbol with underbar shown on the product or accompanying documents indicates the product requires appropriate treatment, collection and recycle for waste electrical and electronic equipment (WEEE) under the Directive 2012/19/EU, and/or waste batteries and accumulators under the Directive 2006/66/EC in the European Union.

The symbol might be put with one of the chemical symbols below. In this case, it satisfies the requirements of the Directive 2006/66/EC for the object chemical.

This product should not be disposed of as unsorted household waste.

Your correct disposal of WEEE, waste batteries and accumulators will contribute to reducing wasteful consumption of natural resources, and protecting human health and the environment from potential negative effects caused by hazardous substance in products.

Contact your supplier for information on applicable disposal methods.



FCC rules

Any changes or modifications not expressly approved by the party responsible for compliance shall void the user's authority to operate the equipment.

■ **Warning**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

For Your Safety

Hazard classification and warning symbols

Warning messages are described in the following manner. Read the messages and follow the instructions carefully.

● Hazard classification



This indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This is to be limited to the most extreme situations.



This indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



This indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

● Warning symbols









Description of what should be done, or what should be followed



Description of what should never be done, or what is prohibited

Safety precautions

This section provides precautions for using the product safely and correctly and to prevent injury and damage. The terms of DANGER, WARNING, and CAUTION indicate the degree of imminency and hazardous situation. Read the precautions carefully as it contains important safety messages.

 WARNING	
	If there is a possibility of a lightning strike, install an arrester on the output side and receiving instrument side of the converter.
	Electric shock hazard Be sure to check that no electric power is supplied before starting the procedure.
	Electric shock hazard Be sure to ground the grounding terminal (The ground resistance should be 100 Ω or less).
	To connect any load exceeding the contact capacity or any induction load (e.g., motor, pump), be sure to use a power relay.
	Unexpected operation of the unit may result in damage to the unit or an injury. Be sure to turn OFF the power when replacing any parts.

Product Handling Information

Operational precautions

Use of the product in a manner not specified by the manufacturer may impair the protection provided by the product. And it may also reduce product performance.

Exercise the following precautions:

- Do not press any operation key with the tip of your nail or anything pointed.
- Do not use solutions such as organic solvents.
- Do not operate the automatic cleaner while the inside of the detector is filled with water and the valve is closed. Doing so may damage the cleaner.
- The operation of this equipment at any voltage outside the rated range may cause damage. It is recommended that the fluctuations in power supply voltage fall within a range of $\pm 10\%$.
- Take care about the load connecting to the normally closed relay contacts of the R1 and R2 which are closed when power is turned OFF.
- If a corrosive gas is present in the installation environment, supply clean instrument air from the purge air supply inlet of the equipment.
- Replace the desiccant with a new one periodically. In particular, when measuring cold water, measurement cannot be performed correctly if dew condensation occurs.

Disposal of the product

When disposing of the product, follow the related laws and/or regulations of your country.

Manual Information

Description in this manual

Note

This interprets the necessary points for correct operation and notifies the important points for handling the product.

Reference

This indicates the part where to refer for information.

Tip

This indicates reference information.

Term definition

This document uses the following terms as defined:

Term	Definition
Long press	To hold down the object until the lamp lights or the display changes.
Flash	To flicker quickly several times, and the setting is established.
Clear water	<ul style="list-style-type: none">● Water for zeroing which is clear and regarded as zero relatively.● It is called zero water in calibration process.

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Overview

Introduction

This product consists of a converter (HU-200TB-W) and a flow through type turbidity detector (SS-120-W). This instrument measures the low and high range turbidity accurately with a right angle scattering/transmission method. Any measured values are displayed to the second decimal place. Turbidity standard substances are selectable from among Formazin, Kaolin, and Polystyrene Latex (PSL).

The measuring range is 0 NTU to 2000 NTU for Formazin, 0 to 1000 for Kaolin turbidity and 0 to 100 for PSL turbidity standard. The measuring unit can be switched from turbidity to SS (suspended solid by mg/L) unit when the standard is Kaolin. In the SS measuring mode, you can adjust the measured value with a coefficient.

The SS-120-W detector for the HU-200TB-W industrial-use turbidity meter can measure turbidities with high stability, as the fluctuations in the light intensity are eliminated by using an LED light source (860 nm) and two photo detectors for the transmitted and scattered lights.

Two transmission outputs (4 mA to 20 mA DC) are provided, and the transmission range is fixed for transmission output 1. For transmission output 2, a maximum of four transmission ranges can be specified. Two contacts are output according to the range selected using the commands sent from the two external contacts or the automatic range changeover function, which automatically selects the optimum range.

For these three contact outputs, the content of the output can be assigned individually, such as an upper/lower limit alarm, error, during cleaning, hold state, and during automatic zero calibration. The delay time can also be set for the contact output.

If an automatic cleaner is installed, the soiled inner surface of the cell, which could interfere with measurements, can be automatically cleaned. In addition, an optional automatic zero calibration function has the software and control output as standard features, and these can be operated by installing an external electric ball valve and a solenoid valve. The operations of both the cleaning and automatic zero calibration are started according to the internal timer or commands from external contact.

The operations such as the turbidity measurement data transfer or cleaning commands are carried out through communications among the converter, detector, and the automatic cleaner. The sensor cables include 5 wires for the 12 V DC power supply, two-line communications, and grounding.

When an automatic cleaner is installed, the length of the sensor cable leading to the converter is 5 m. If it is not installed, the cable can be extended up to 50 m.

Optional products are: span solution that can be used as a substitute for the standard solution, span bottle (liquid, solid), an automatic cleaner with electric motor, piping kit for a standard piping assembly, filter unit for preparing zero water, automatic zero calibration assembly stand.

■ The NTU turbidity unit

The measuring structure of the turbidity detector (SS-120-W) does not comply strictly with the requirement of US EPA180.1. The measuring range of the EPA180.1 is limited within 0 NTU to 40 NTU and the sample over 40 NTU should be diluted to be within 40 NTU.

The SS-120-W outputs the turbidity value by a method of right angle scattering/transmission with a near-infrared LED light source, the low turbidity of SS-120-W is relational to the turbidity by EPA180.1 method.

If the NTU turbidity unit is chosen, Formazin should be used.

■ Features

● Converter

- Aluminum die cast
- Wide wiring space and a terminal block provided with a screw drop-off prevention function
- Outdoor installation type (equivalent to IP65; splash-proof construction)
- Easy to view display (150% zoom as compared with our conventional type)
- Front-face keys for all key operations
- Enhanced self-diagnosis function
- Programmable transmission output range
- Automatic range changeover and external range changeover functions for the transmission range
- Embedded sequence software for automatic calibration
- Calibration log memory
- Can be measured without any difference between each machine by calling up detector-specific data
- Key seat with superior operability

● Detector

- Near-infrared LED light source and two detectors that can eliminate fluctuations in the light source
- Long-life near-infrared LED light source
- 90-degree transmission-scattering method with reduced stray lights
- Blinking light sources that can eliminate ambient light
- Low-drift electric circuits
- CPU and memory for storage of calibration data

● Automatic cleaner (option)

- Electric reciprocating operation drive
- Silicon rubber wiper with highly effective cleaning
- Operable under internal pressure
- CPU-based intelligent movement

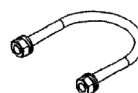
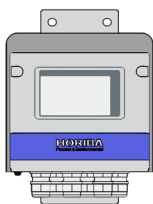
Unpacking

Upon delivery of this product, unpack it immediately and check the contents for completeness. In addition, check this product for any damage at the same time.

■ Breakdown of complete set

● Converter

- Main body.....1
(With a bracket and a cover)
- U bolt..... 2
(U bolt: 2, M8 nut: 4, Spring washer: 4, Flat washer: 4)



- Instruction manual (this book)..... 1

● Detector

The detector is separately packed.

- Detecting part and bracket
- Option
 - Automatic cleaner
 - Liquid span bottle
 - Solid span bottle
 - Kaolin standard solution: 10000 mg/L, 500 mL
 - Kaolin standard solution: 5 degrees, 500 mL
 - Formazin standard solution: 4000 NTU, 500 mL
 - PSL: 100 degrees, 100 mL

● Option

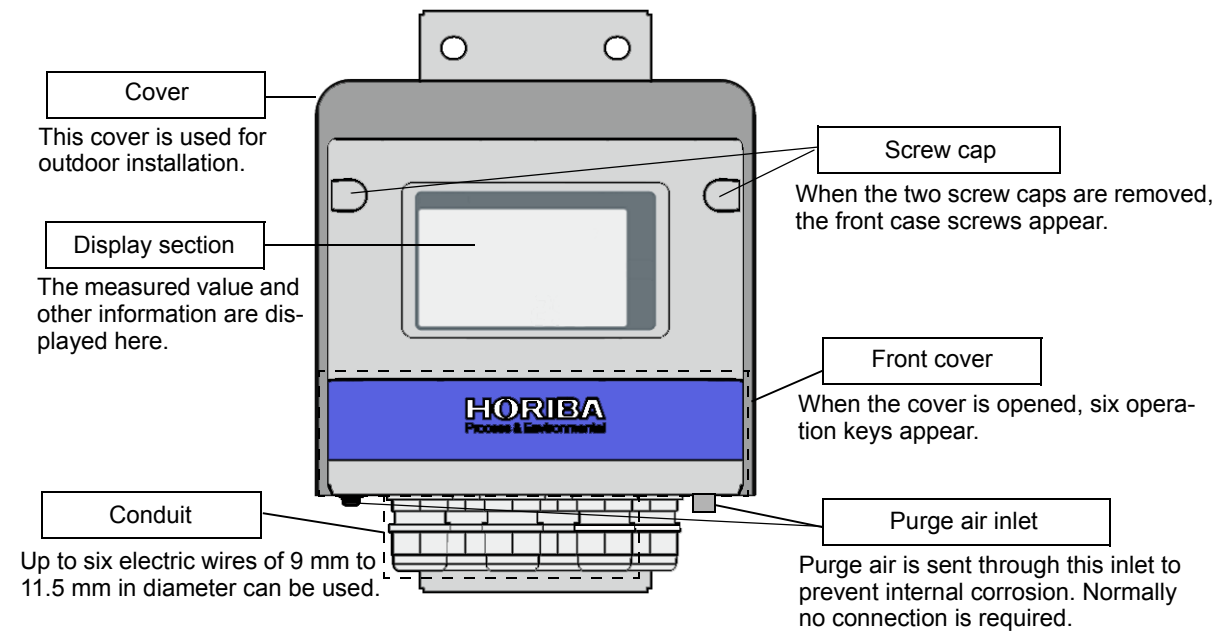
Optional parts for installation:

- Overflow tank
- Filter (for zero calibration)
- Piping kit
- 50 A pole stand
- Built-in standard stand for the manual valve type sampling piping
- Standard stand with an automatic zero calibration function

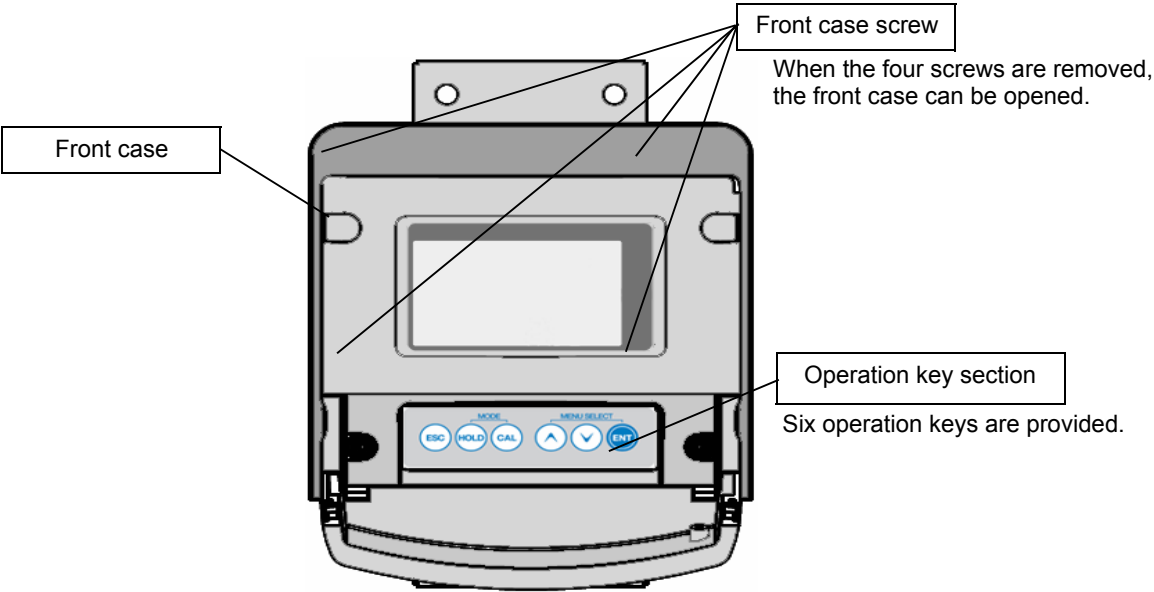
Names and functions of each part

■ Converter

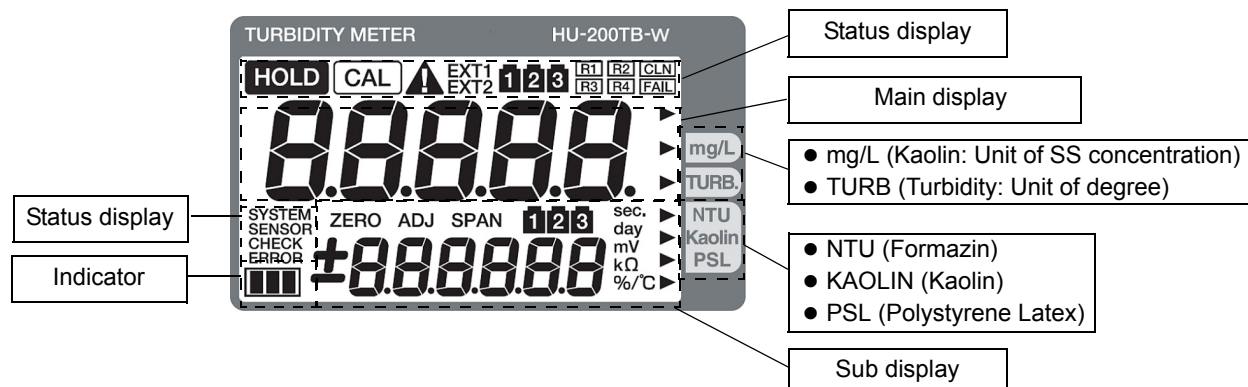
● Front panel



● With front cover opened



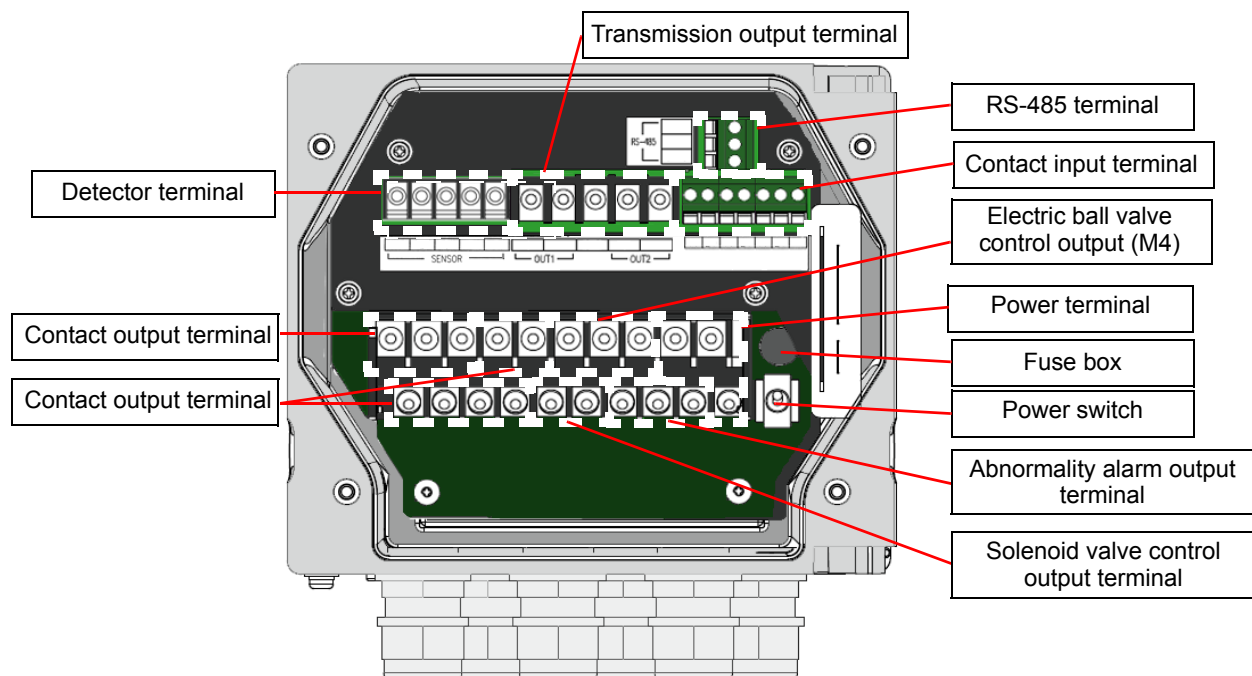
● Display section



● Operation key section

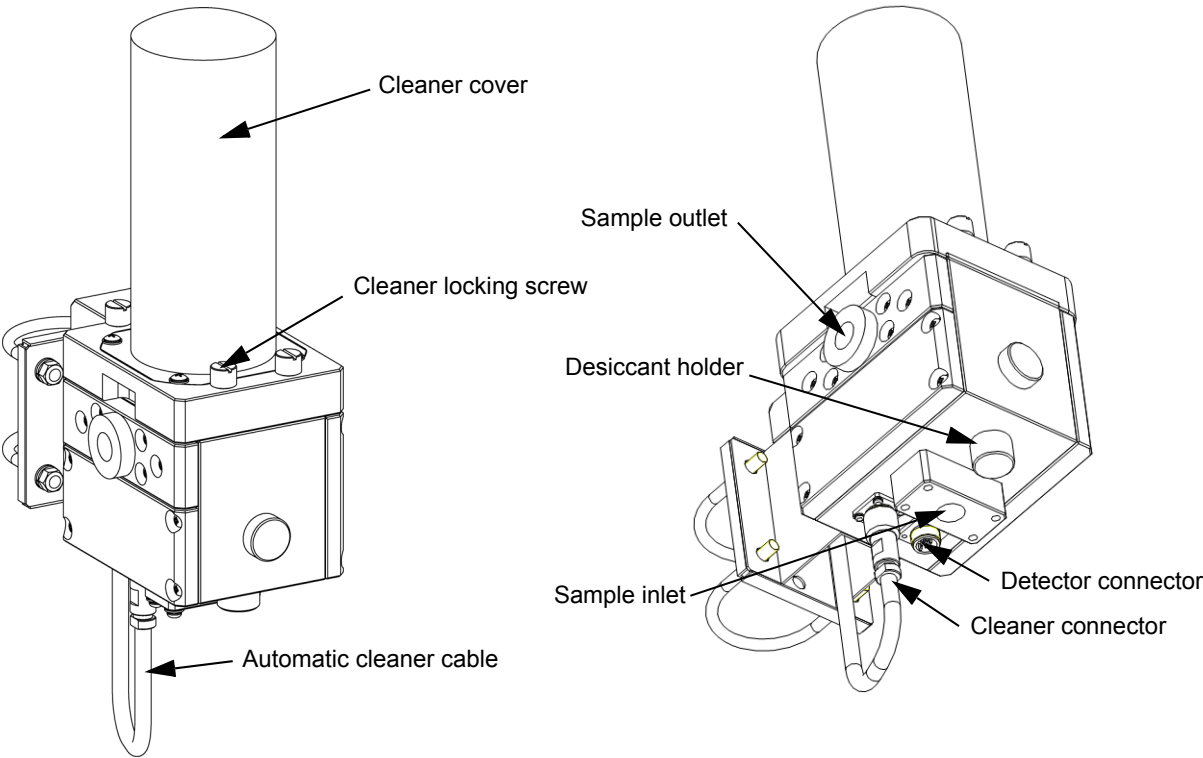


● Terminal block

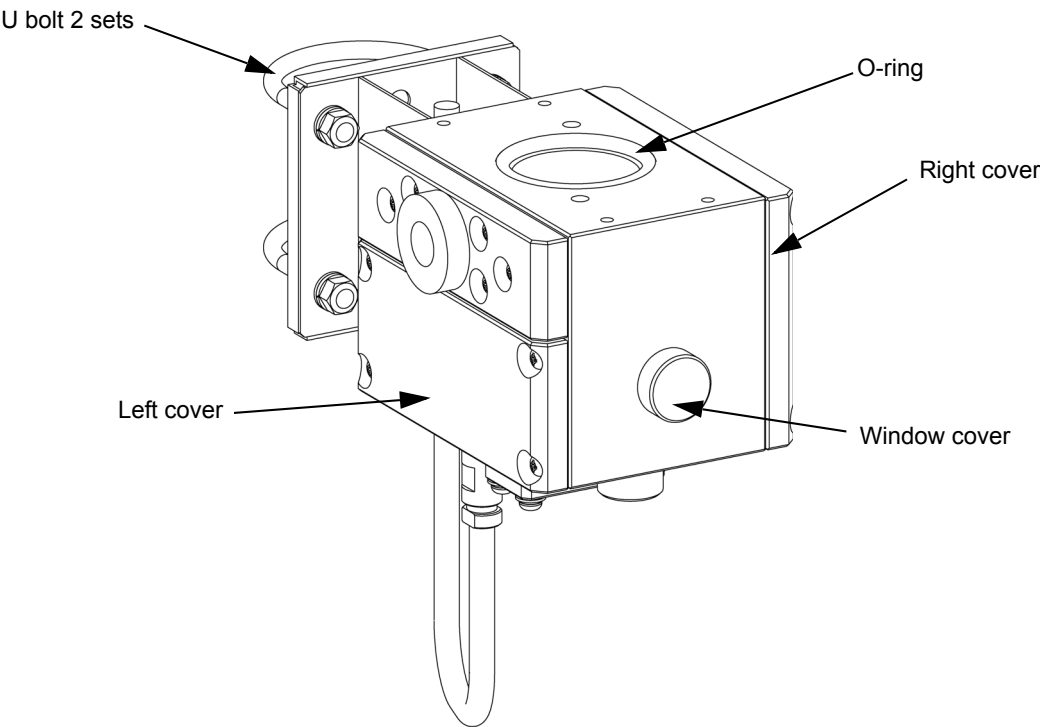


■ **Detector**

● **Diagram showing the automatic cleaner attached**

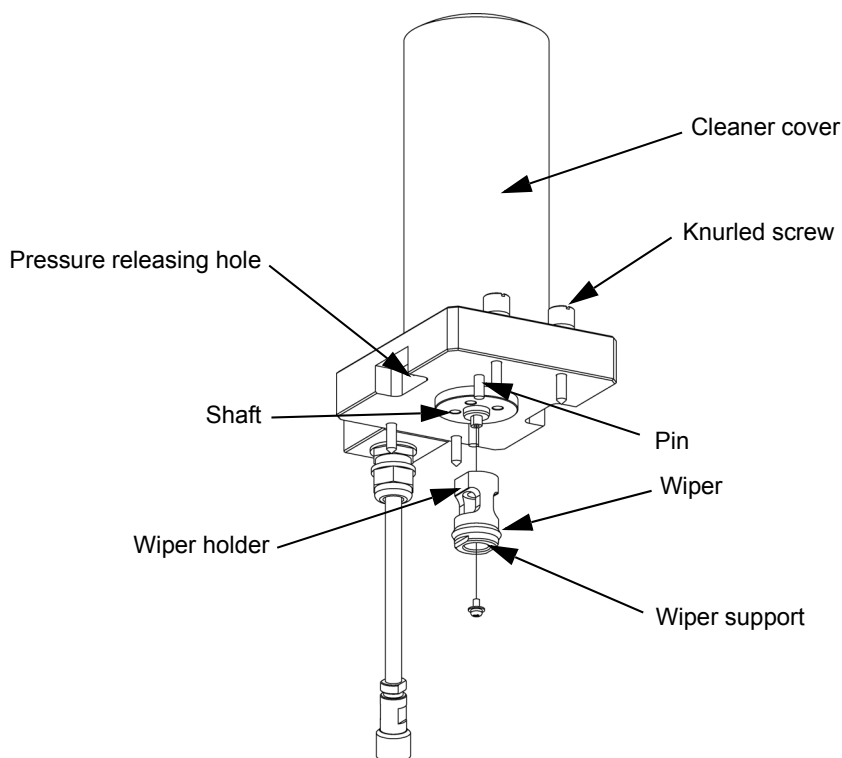


● **Diagram showing the automatic cleaner detached**

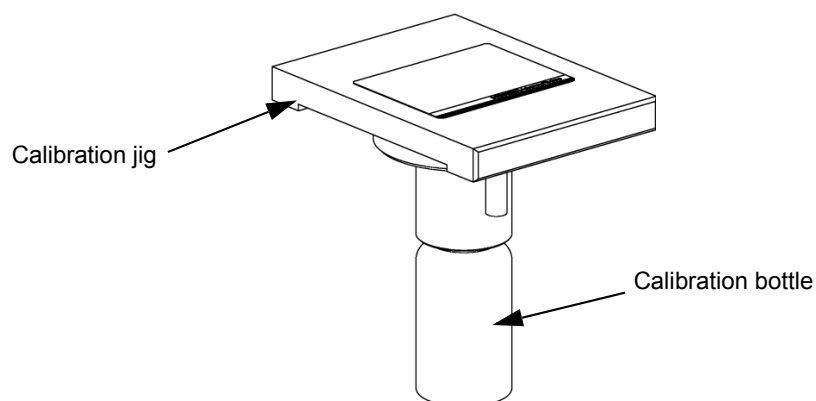


● Option

● Automatic cleaner



● Liquid span bottle



Seal the calibration bottle with a liquid solution of Kaolin that has been properly adjusted according to the measurement range.

Fill the calibration bottle with zero water, and attach the calibration jig to the turbidity meter already calibrated with the span solution. Then, write down the measured value. For the subsequent span calibrations, measure the span by inserting the calibration jig in zero water, instead of the span solution. Before insertion, shake and mix the calibration bottle well.

Note






If Kaolin solution with a low turbidity is sealed, the turbidity is more likely to vary due to Kaolin adhering to the wall surfaces of the bottle. In order to avoid this, use a solution with a turbidity of 5 degrees or more.

For span calibration with a lower turbidity, use a stable Solid span bottle.

Operation section

■ Operation keys

Operation keys are used to switch displays, enter settings, and perform calibration, etc. You can change the value or item while the display is blinking. Select a value or item with ▲/▼, and press ENT. The display will flash, and the setting will be finished. To disable the key operations, use the security menu.

Key	Notations in the text	Description/operation	
	ESC		Used to go back to the previous menu from any other menu. While specifying various settings in the hold mode, pressing this key once will return to the previous item. Any change that was previously made to any setting is canceled.
		Hold down	Holding down this key in the hold mode will select the meas mode.
	HOLD	Hold down	Holding down this key in the meas mode will select the hold mode. Holding down this key in the hold mode will select the meas mode.
	CAL	Hold down	Hold down this key until the CAL indicator turns ON. This activates the calibration mode.
	▲▼		Used to change the displayed item or value. Pressing ▲/▼ will increase/decrease the value by an increase/decrease of 1. Holding down the key will continuously increase/decrease the value. ▲ and ▼ are used to scroll up and down, respectively. If you scroll too far up or down with either key, press the other key to return.
	ENT		Used to confirm each setting or calibrated value. <div>Note No change is reflected if you have returned to the previous menu by pressing ESC.</div>

Note
Do not press any operation key with the tip of your nail or anything pointed.

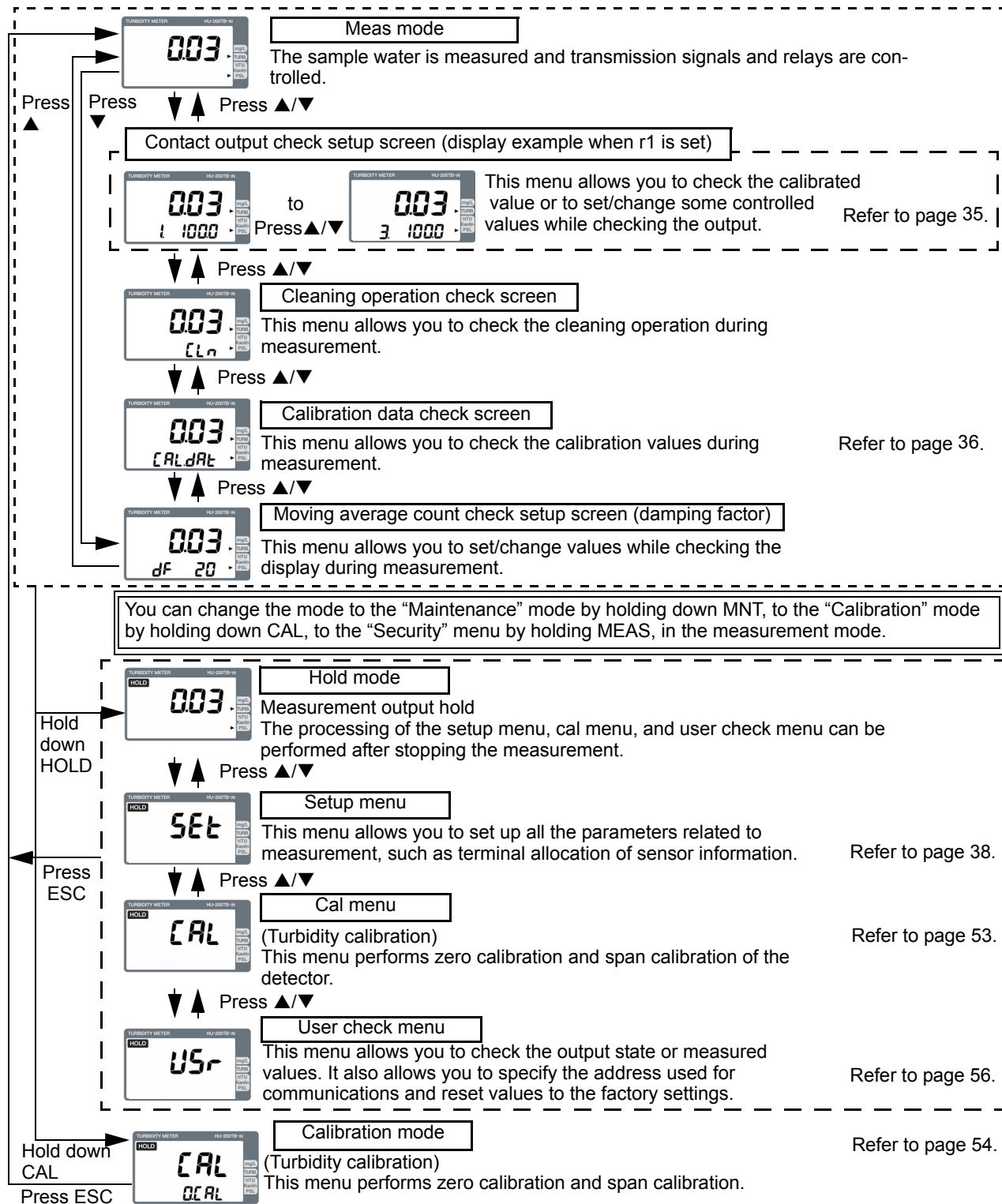
■ Status display

● Description of display lamps

HOLD	HOLD indicator	<ul style="list-style-type: none"> • This indicator is illuminated while the hold mode is active. • Starts blinking when contact input is received or when the hold mode becomes active due to an error.
CAL	CAL indicator	Turns ON when the Cal mode becomes active.
EXT1	EXT1 indicator	Turns ON while a contact signal (calibration command) is being input externally.
EXT2	EXT2 indicator	Turns ON when contact input such as the cleaning signal is received.
CLN	CLN indicator	Turns ON when the cleaning output contact signal is output.
FAIL	FAIL indicator	Turns ON when the FAIL contact signal is output. When the FAIL is output, the power for the relay coil is cut.
SYSTEM ERROR	SYSTEM ERROR indicator	Turns ON when system error E-90, E-91, or E-92 occurs.
SENSOR ERROR	SENSOR ERROR indicator	Turns ON when any of errors E-41, or E-80 to E-85 occurs.
SENSOR CHECK	SENSOR CHECK	Illuminated while checking connection of the detector.

Description of operation modes and menu items

■ Modes and menus from the meas mode



Tip
Press **ESC** to return to the last menu.

Installation

Installation environment

To keep the HU-200TB-W stable and reliable for use, install it in a place where the following conditions are satisfied.

■ Converter

- Well-ventilated location.
- Ambient temperature in the range of -20°C to 55°C .
- Not exposed to direct sunlight.
- Not exposed to direct radiant heat.
- Ambient relative humidity in the range of 90% without dew condensation.
- The converter is not splashed with water or chemicals.
- Mechanical vibration is rare.
- There is sufficient space for maintenance and wiring.
- Dust and corrosive gases are not present.
- The influence of electromagnetic fields is rare.
- The altitude is 2000 m at maximum.
- The range of power supply voltage fluctuation is within 10% of the rated voltage.

■ Detector

- Sensors can be checked and maintained.
- Spilled water does not adversely affect the location.
- Utilities are available for zero water.
- Measured liquids should be those that will not damage the portion of the detector that comes into contact with the liquid.
- Samples do not freeze.
- For an automatic cleaner, a 5 m cable can be connected between the automatic cleaner and the converter.

Note

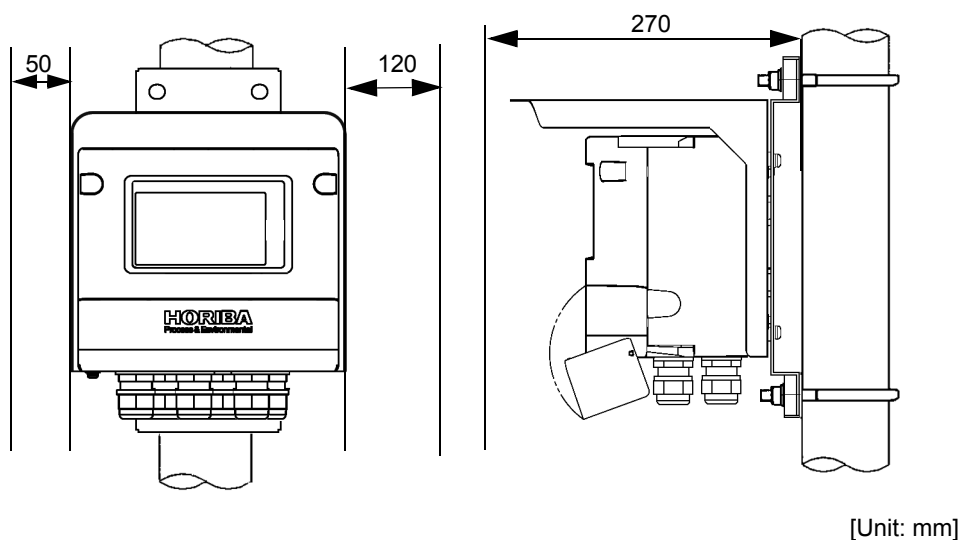
If measurements are made without depressurizing a pressurized sample, water may leak from the pressure releasing hole. This is not an abnormality.

Installation method

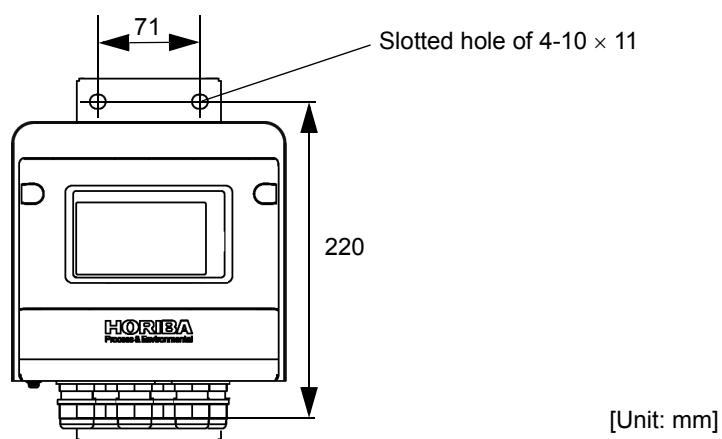
■ Installing the converter

The HU-200TB-W can be installed on a pole (50 A) or a wall. Spaces for opening the front case are required.

● Installation on a pole

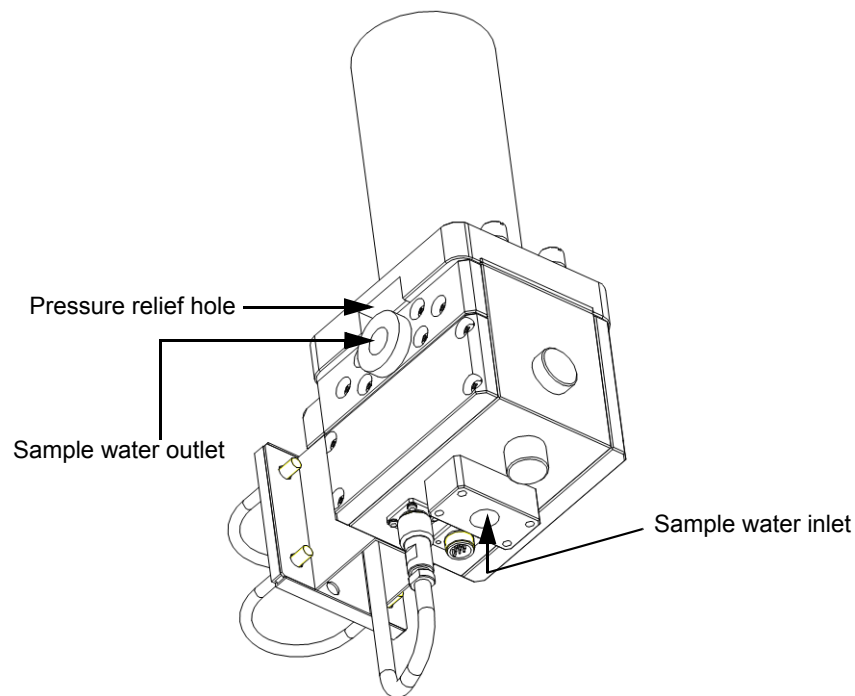


● Installation on a wall



■ Installing the detector

- Use the supplied U-bolt to attach the detector to the pole (50 A).
This work can be performed easily when the detector is installed at a height of 1 m.
- Attach a stand (option) to the upper section of the same piping used for holding the removed the automatic cleaner (option) temporarily.
- A trace amount of water droplets will spill from the pressure relief hole of the automatic cleaner. Use a tube to lead these water droplets to an appropriate place.
 - An M5 female screw for mounting a joint is provided.
- Connect the commercial quick connector joint (M5 × ϕ 4 mm/M5 × ϕ 6 mm) to the tube. If no internal pressure is applied, this step is not necessary.



Piping

Flow

Piping from 15 A to 20 A is suitable for the detector. If the turbidity and flow rate are low, $\phi 8$ mm/ $\phi 6$ mm black nylon tube can be used. For the detector, be sure to run sample water upward from the bottom. The flow rate of the sample water flowing to the measurement cell should be within a range from 0.5 L/min to 10 L/min.

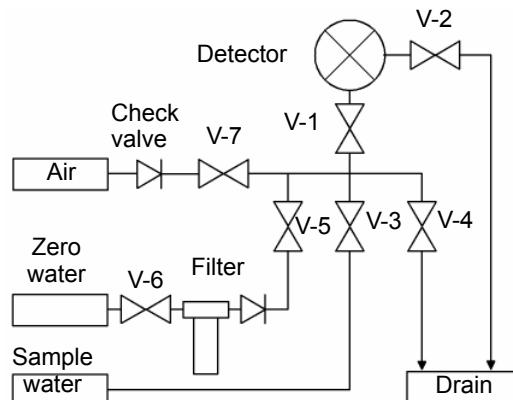
Install valve V-2 for flow rate adjustment at the outlet of the detector. When the sample water is supplied in-line, closing this valve allows measurement to be performed while maintaining the pressure. This makes it possible to suppress the formation of air bubbles inside the detector.

Install manual ball valve V-1 at the shortest distance possible from the inlet of the detector. Collect the calibration solution by operating this valve.

Install three valves, which are V-3 for sample water, V-5 for zero water, and V-4 for drain, in the forward direction of valve V-1.

Moreover, for sample water that may easily contaminate piping, it is recommended that you provide air piping so that the sampling piping can be cleaned from the opposite direction. Install a check valve for the air pipeline to prevent reverse flow.

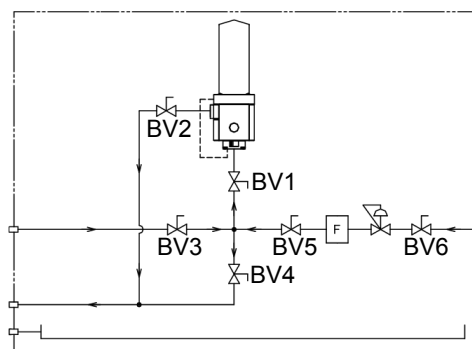
If tap water is used for zero water and cleaning water, collect the water using a water receiving tank and send the water using a pump to prevent contamination by reverse flow. It is recommended that you provide a check valve for this pipeline as well.



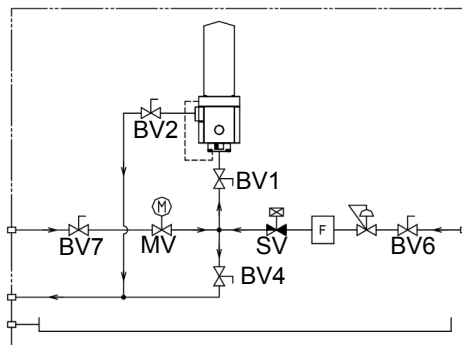
For low-turbidity sample water (e.g., tap water, swimming pool water), use the sample water filtered with an ultra filter as zero water. Perform zero calibration while running zero water without accumulating it.

Schematic flow of optional rack

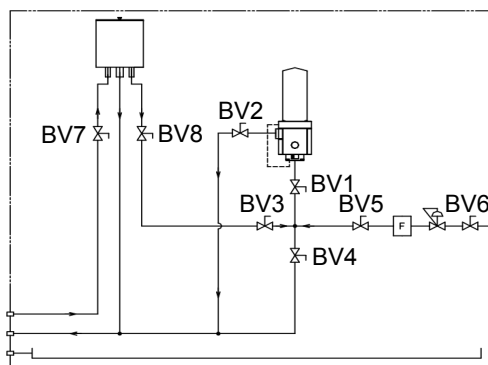
In-line (manual zero calibration)



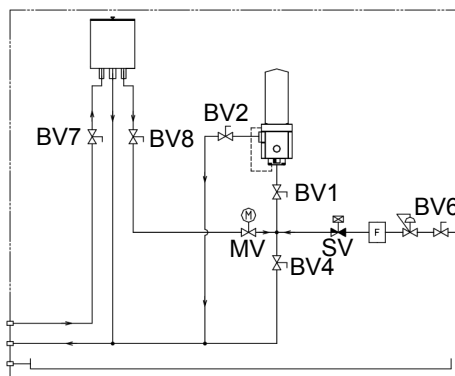
● In-line (automatic zero calibration)



● Overflow tank (manual zero calibration)



● Overflow tank (automatic zero calibration)



Sampling

■ sampling pump

● Types of sampling pump

For a sampling pump, select a submerged centrifugal pump that is free from rusting.

— Tip —

Some types of pump, such as cascade-type pumps, diaphragm-type pumps, piston pumps, tube pumps, and gear pumps, are not suitable for use because the discharge pressure rises rapidly when the pump outlet is closed. If any of these pumps is used, be sure to provide a pressure relief valve.

● Selection of submerged pumps

- If you like to use submerged pump, be sure to select a pump with a power that the discharge pressure is enough for the delivery to the height of the detector and the flow rate is enough for the sampling flow rate.
- If sample includes solids which deposit as a sediment increase flow rate to prevent adhesion of soil to the inner wall of piping.

— Tip —

- It might be an effective way that a large flow rate of sample is carried to a position near the detector and the sample to the detector is branched at the position.
 - It might be another way that a large flow rate of sample is carried to an overflow tank and the falling sample from the overflow tank is provided to the detector.
-

- When the pump is stopped, the sampling piping becomes empty due to reverse flow. To prevent this, provide a check valve.

● Flow rate of sample water

- The flow rate of the sample water of tap water, etc., can be reduced by switching to the in-line measurement. In this case, throttle the flow rate on the outlet side of the detector and perform measurements while the detector is pressurized. This makes it possible to mitigate the influence of air bubbles. The flow rate can be decreased to a range from 0.5 L/min to 1 L/min.
- When easily precipitating sample water is measured, set the flow rate to approximately 20 L/min.

— Tip —

If anything that tangles easily, such as hair, is contained in the sample water, install a rough filter in the sampling line.

● Uniformity in turbidities of sample water

The turbidities of sample waters must be uniform to some degree. If the SS does not disperse but clumps together and forms a fluke, throttle the outlet of the pump to increase the pump passage time, so that the sample water can be agitated by the blade of the sampling pump.

● Influence of soiled piping

If a low flow rate is set, solids may flake off from the soiled sampling piping due to the fluctuations in the flow rate or vibration of the piping. This may eventually influence the turbidity. In order to avoid this, minimize the influence by sampling at as constant a flow rate as possible, or by increasing the flow rate.

Note

If the automatic cleaner is operated while the inlet/outlet valve for the detector filled with water is closed, the automatic cleaner will be damaged. If the automatic cleaner is provided, do not seal the detector.

Tip

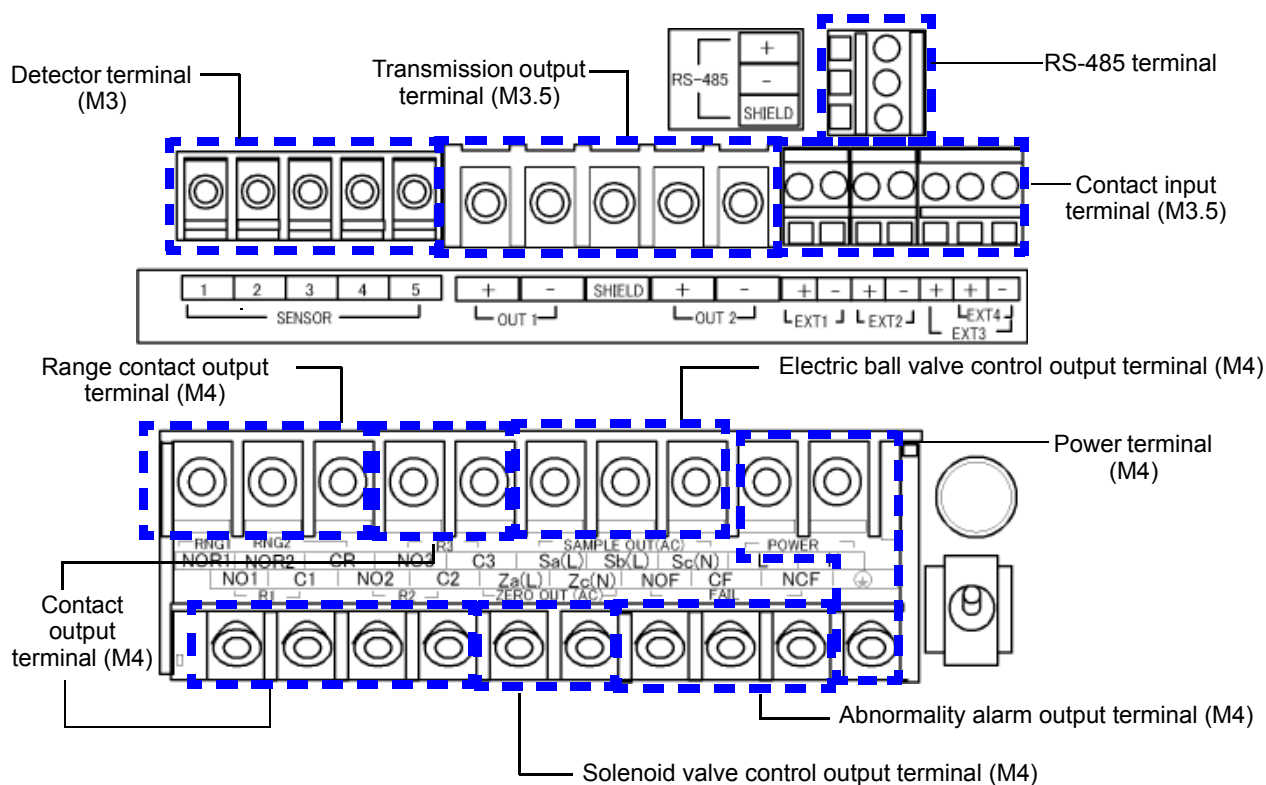
It is recommended that pressurized air can be used for sampling pipe cleaning.

Wire connection

● Opening the cover for the converter

1. Remove the two screw caps located on the top on the front of the converter.
Carefully store the removed caps.
2. Open the front cover.
3. Loosen the four screws located on the front of the converter.
Check that these screws are pushed forward by the spring force without falling off.
4. Open the front case for the converter.

● Connection terminal diagram






Note

- These screws for the front case and terminal blocks will not drop off by mechanical stopper.
- Turn the screws until they are pushed up by spring force for connecting round terminal.
- If water droplets are on the case wipe them before opening the case.

Tip

Raise up or remove the black plastic terminal cover hinged on the terminal block for wiring.

Power supply

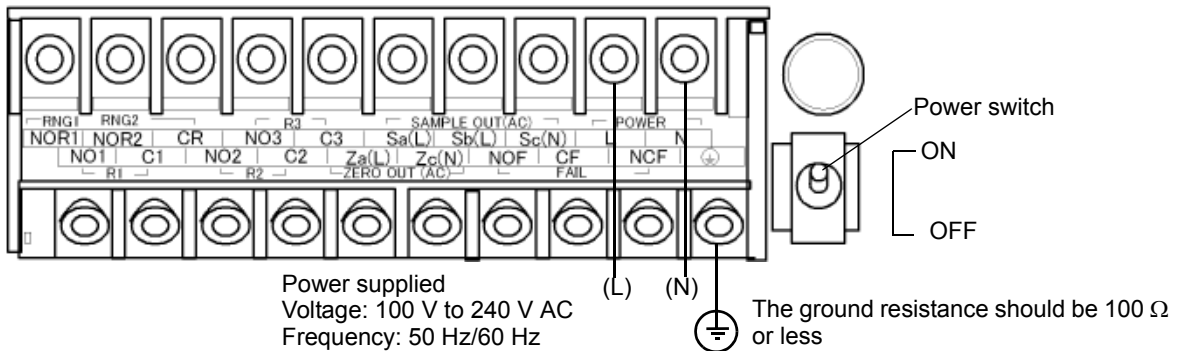
 WARNING	
	If there is a possibility of a lightning strike, install an arrester on the output side and receiving instrument side of the converter.
	Electric shock hazard Be sure to check that no electric power is supplied before starting the procedure.

- A power switch is equipped beside the terminal block.
- The voltage of AC power source is free between 100 V and 240 V AC.
- The terminal screws of the contact output are M4 type.
- The applicable electric wire is of 0.75 mm² to 5.5 mm² (AWG18 to AWG10).
- Provide a power switch near the HU-200TB-W so that the power can be turned ON/OFF.



Note

- The operation of this equipment at any voltage outside the rated range may cause damage.
- It is recommended that the fluctuations in power supply voltage fall within a range of $\pm 10\%$.

As illustrated below, connect the power cable and the grounding cable.



Instructions for grounding

 WARNING	
	Electric shock hazard Be sure to ground the grounding terminal (The ground resistance should be 100 Ω or less).

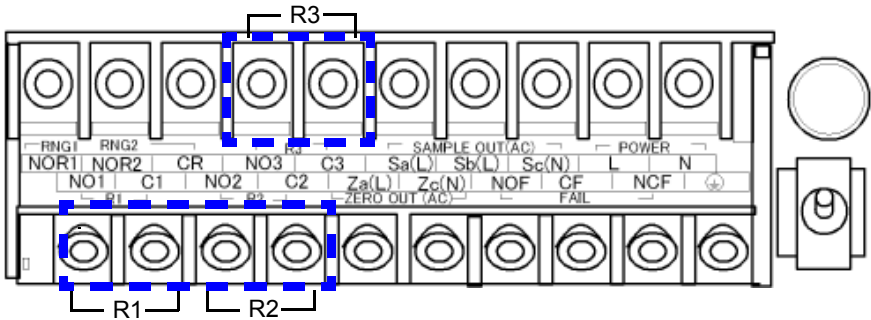
Separate this grounding from any other grounding for electric equipment such as the motor.

■ **Contact output R1 to R3**

- The terminal screw for the contact output are M4 type.
- The applicable electric wire is of 0.75 mm² to 5.5 mm² (AWG18 to AWG10).
- For wire connection, remove the black resin terminal cover for the power terminal by pulling it forward and raising it, or by detaching the hinge.

● **Contact capacity**

	Resistance load
R1, R2	Within 250 V AC 3 A or 30 V DC 3 A
R3	Within 30 V DC 3 A



Tip

Set an assignment of the contact in the hold mode.
For each contact, a function can be assigned from among the upper/lower limit, during cleaning, during calibration, hold state, at the completion of cleaning, and at the completion of calibration.

Failure output



WARNING

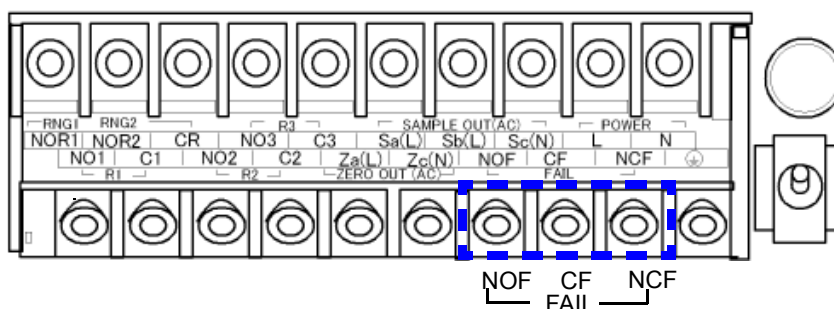


To connect any load exceeding the contact capacity or any induction load (e.g., motor, pump), be sure to use a power relay.

If you want a break signal for power OFF or abnormality, use the contact with CF and NCF. When this equipment is normal (not malfunctioning), the CF-NOF contact is opened, and the CF-NCF contact is short-circuited.

When the power supply is disconnected, the CF-NOF contact is short-circuited.

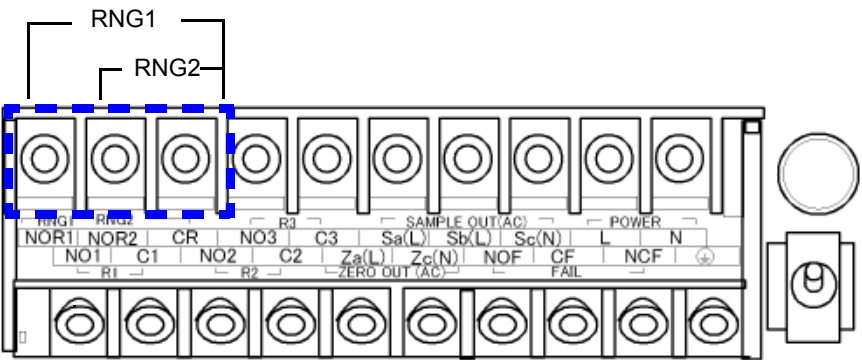
	When normal	Abnormal condition (FAIL occurrence)	Power-OFF
CF-NOF	Opened	Closed	Closed
CF-NCF	Closed	Opened	Opened



Range output

For transmission output 2, a maximum of four measurement ranges can be switched externally or automatically. The range currently output for transmission output 2 can be recognized at the range output contact.

Tip
An arbitrary range, from range 1 to range 4, can be set for transmission output 2 (zero and span values). However, it is recommended that you set the lowest value for range 1 and a larger span value for the rest of the ranges sequentially.



Although a maximum of four transmission ranges can be set, if only two ranges are set (switched from one to the other), only RNG1 is monitored.

If a contact is to be switched using the external contact, input signals from EXT3 and EXT4.

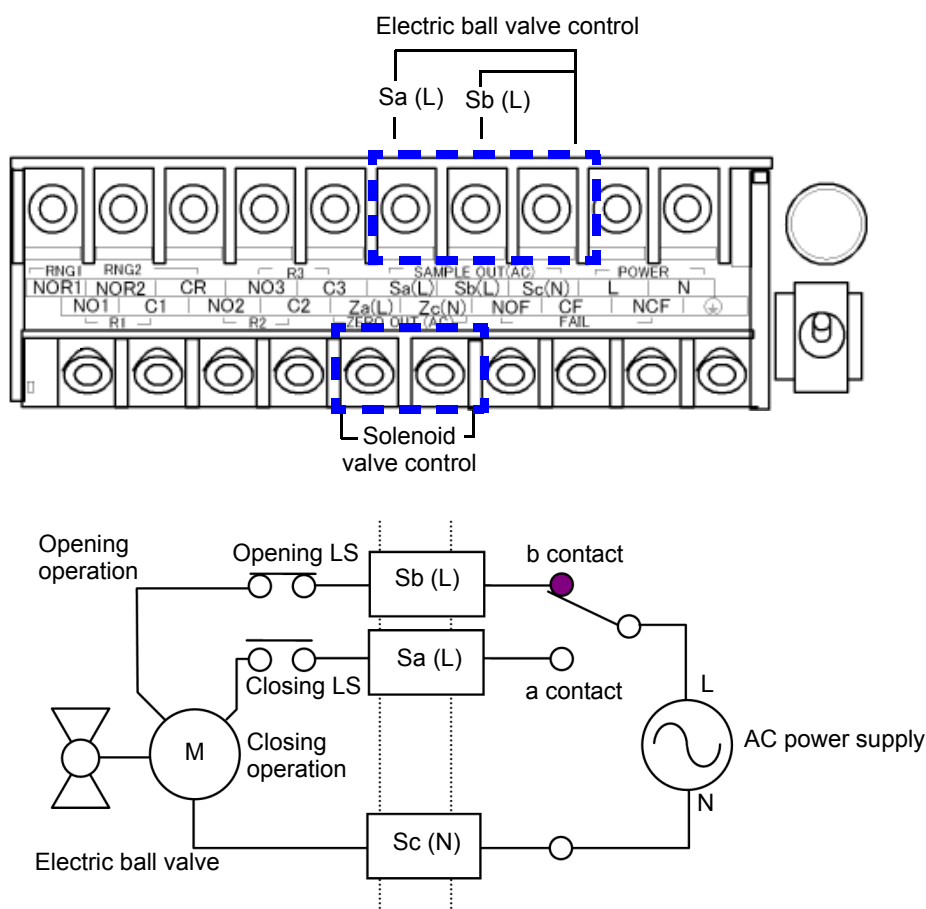
Transmission output 2.A range	RNG1	RNG2
Cur2.A	0	0
Cur2.b	1	0
Cur2.c	0	1
Cur2.d	1	1

1: closed 0: opened

Control output for automatic zero calibration (AC power-supply voltage output)

This is a voltage control output that controls the electric ball valve for the sample water line and solenoid valve for zero water. For the sample water line, in order to control the electric ball valve applicable to a large bore size, power is supplied to either the open or close operation. Make connections so that the electric ball valve is normally open. When the open/close operation of the electric ball valve is completed, the power is cut off by the internal limit switches.

Connect the solenoid valve for zero water so that it is normally closed (power is OFF) and is opened when it is energized. The solenoid valve is opened in the automatic zero calibration and manual zero calibration modes.



Equipment status	Solenoid valve		Electric ball valve	
During measurement	Closed	Power OFF	Opened	AC power output between Sb (L) - Sc (N)
During zero calibration	Opened	Power ON	Closed	AC power output between Sa (L) - Sc (N)

Note

The voltage for AC power output is the same as that to be supplied to the converter. Check that the power supply specification for the solenoid valve and electric ball valve is the same as the voltage to be supplied to the converter.

■ Connecting the transmission output terminals

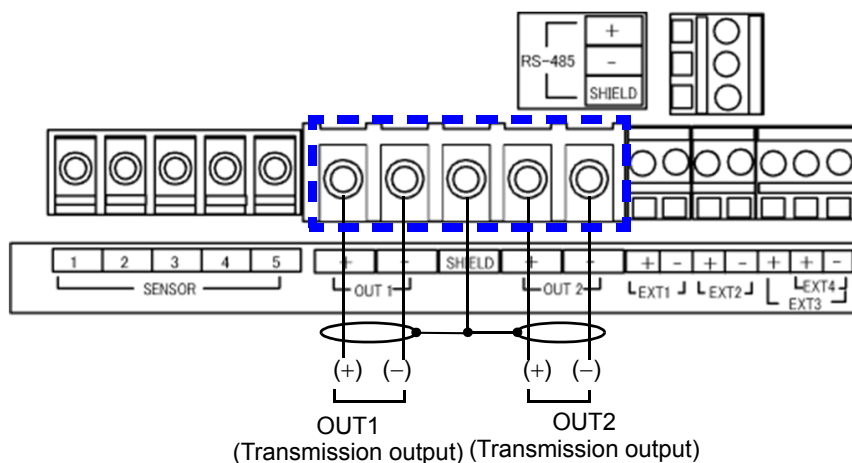


WARNING



If there is a possibility of a lightning strike, install an arrester on the output side and receiving instrument side of the converter.

- The terminal screws for transmission output are of the M3.5 type.
- The applicable electric wire is 2 mm² (AWG14) max.
- For the transmission output cable, use a shielded cable.

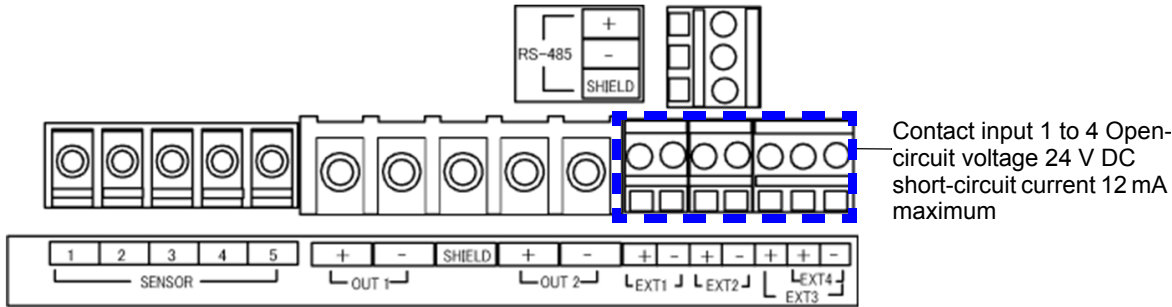


Note

The maximum load resistance of the transmission output is 900 Ω.

■ Connecting the contact input terminal

- The applicable electric wire is of 0.14 mm² to 2.5 mm² (AWG26 to AWG14).
- For the cable for contact input, use a twist pair shielded wire.
- If lightning might strike, install an arrester along the signal line.



Tip

- EXT1: External command input for automatic zero calibration (refer to “ Setting of automatic zero calibration start method ” (page 41)).
- EXT2: External command input for the automatic cleaner (refer to “ Cleaning operation type setting ” (page 46)).
- EXT3, EXT4: Range switchover command input for transmission output 2 from a maximum of four ranges. Cancels the automatic range changeover for transmission output 2 and activates manual switching (Specifically, refer to “ Transmission output 2 range (fixed/automatic changeover) setting ” (page 44)).

EXT3	EXT4	Range changeover for transmission output 2
0	0	Cur2.A
1	0	Cur2.b
0	1	Cur2.c
1	1	Cur2.d

1: closed 0: opened

Note

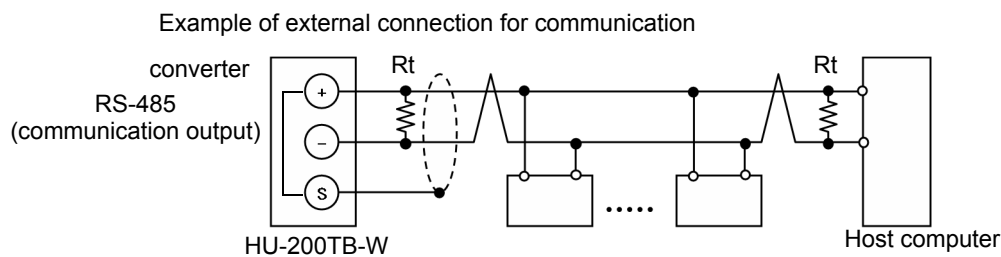
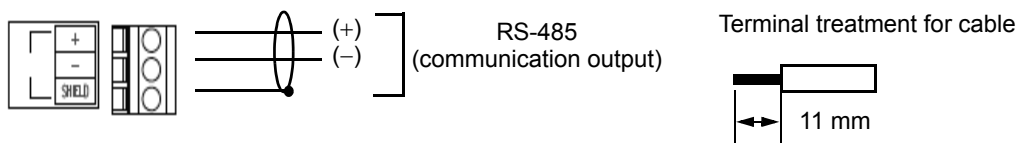
- The contact input impedance should be within 100 Ω.
- When contact input 1 is short-circuited, the EXT1 indicator in the display area lights up.

■ RS-485

● Connecting the RS-485 terminal

Two wire communication RS-485 is ready to use for sending data to host computer.

- The applicable electric wire is of 0.14 mm² to 2.5 mm² (AWG26 to AWG14).
- For the communication output cable, use a twisted shielded pair.
- Up to 32 connections can be made including one for the host computer. For the address settings, refer to “RS-485 address setting” (page 47).
- The communication cable length is 500 m at maximum.
- To terminate the cable, strip 11 mm of the coating from the tip of the cable and connect it to the terminal.
- Connect a terminating resistor (Rt: 120 Ω) to the terminal device of the RS-485 communication line.



● RS-485 communication conditions

The RS-485 communication conditions are shown below:

Item	Condition
Baud rate	19200 bps
Character length	8 bit
Parity	None
Stop bit	1 bit

Reference

For details on communications, refer to the separately bound instruction manual for communication specifications.

■ Sensor cable connection

● Cautions for the sensor cable connection

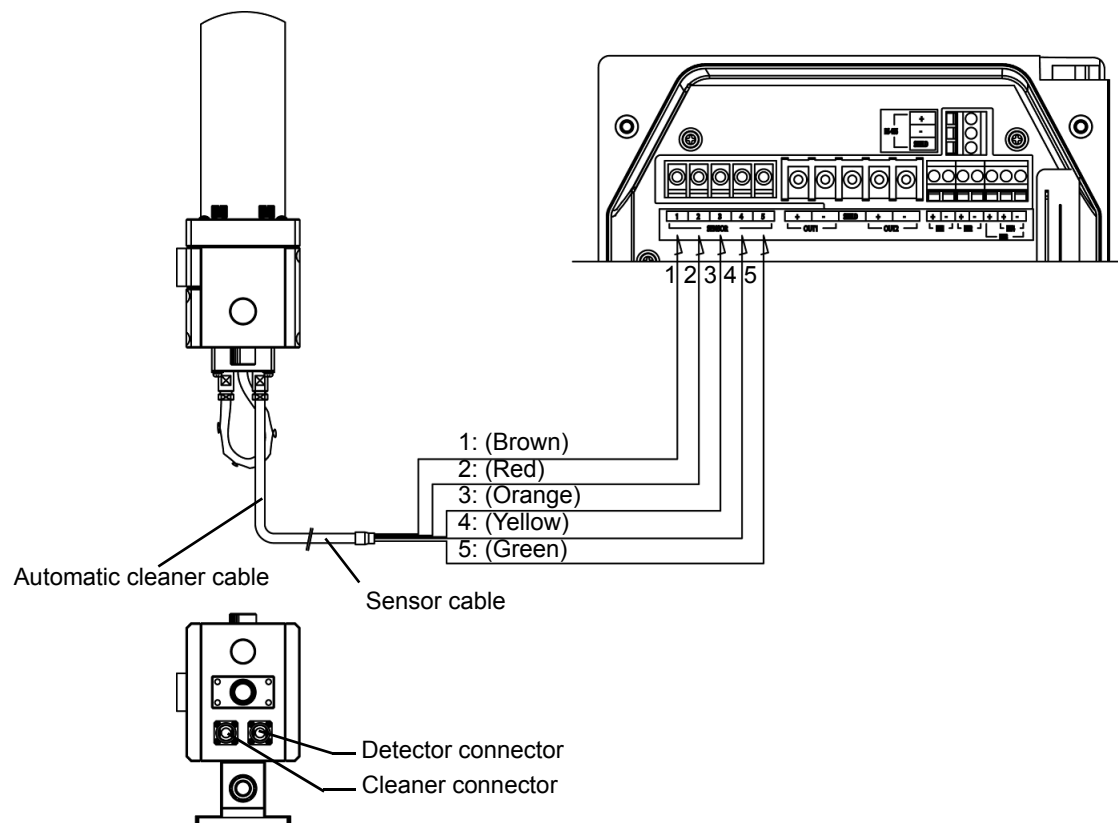
Turn OFF the power during the connection work.

● Connections

Connect the sensor cables correctly to the corresponding terminals on the terminal block, according to the illustration below.

The sensor cable has the following terminals:

1: Power supply	+12 V
2: Power supply	0 V
3: Communication	+
4: Communication	-
5: Grounding	



■ Connecting the automatic cleaner cable

The automatic cleaner is connected to the detector using an exclusive-use connector.

If the automatic cleaner is not used, place the cover on the connector on the detector side to prevent the connector from becoming wet.

Operation

Preparation for operation

When you start using the converter for the first time after factory shipment or resetting it to factory settings, be sure to complete the following preparation procedures.

- Check of converter and detector installation condition (refer to “ Installation method ” (page 12)).
- Check if the wirings are correct (refer to “ Wire connection ” (page 18)).
- Check if the terminal block screws are firmly tightened.
- Check if the piping for mistake (refer to “ Piping ” (page 14)).
- Initial setup (selection of turbidity standard substance, transmission signal setting, operation condition settings for relay contacts, etc.)
- Calibration (zero and span) (refer to “ Calibration ” (page 59))

At the time of shipping from the factory, span calibration has already been performed using Polystyrene Latex. As the calibration information stored on the sensor is called up when the power is turned ON, calibration using Polystyrene Latex is not necessary. However, span calibration is necessary if Formazin or Kaolin is used as a span solution.

Initial setup

The converter is shipped with initial settings from the factory.

If necessary, change the initial settings according to “ Entering the setup menu ” (page 38).

Note

- Before starting operation, be sure to set the items grayed out in the following table.
- When Kaolin is selected, set the item of “Selection of turbidity unit or SS unit (mg/L) for Kaolin”.
- When an automatic zero calibration function (option) is provided, set the item of “ Automatic zero calibration setting ” (page 41).
- When a cleaner (option) is provided, set the item of “ Cleaning operation setting ” (page 45).

For the initial values, refer to the table below.

Display	Item	Description	Setting range	Initial value	Refer to page
PArA	Parameter setting				39
dF	Moving average count (damping factor) setting	Increase dF to reduce variations in the measured data: Decrease dF to speed up the response.	1 to 120 (times)	10	39
A.rEt	Auto return setting	This setting returns the system from the hold mode to the meas mode automatically.	yES, no	yES	39
rEt.t	Auto return time setting	The hold mode will be back to the meas mode automatically when the set time is passed from the last key touch. Note: This is displayed when “A.rEt” is set to “yES”.	1 to 24 (h)	2	39
rEt.S	Transmission hold cancellation time setting	This setting allows you to maintain the transmission hold state until the measured value is stabilized after the hold mode has been switched to the meas mode. Set the time (in seconds) until the maintained transmission hold state is cancelled.	2 to 30 (s)	5	39

Display	Item	Description	Setting range	Initial value	Refer to page
SEnSor	Sensor setting				39
tyPE	Turbidity standard substance (type) selection	Select the turbidity standard substance from among Kaolin (SiO), Formazin (For), and Polystyrene Latex (PSL).	SiO, For, PSL	PSL	39
Unit	Selection of turbidity unit or SS unit (mg/L) for Kaolin	For Kaolin, turbidity or mg/L can be further selected for the unit of measurement. Note: This is displayed when “tyPE” is set to “SiO”.	PtnA, Ptnb	PtnA	39
C.CoEF	Coefficient input	You can adjust the measure value to the analyzed value with this coefficient with Kaolin standard.	0.01 to 300.00	1.00	39
diSP	Display setting				40
d.rng	Selection of automatic decimal point shift or fixed decimal point	Select either the fixed decimal point or automatic decimal point shift.	Auto, 10.00, 100.0, 1000	Auto	40
S.diSP	Sub display area display setting	Specify what is to be displayed on the sub display area when the measurement mode starts after the end of the hold mode.	r1, r2, r3, non	non	40
rng.C	Setting of a hidden area outside of measurement range (range cut)	Specify whether or not to display the area outside the measurement range when a value exceeds the display range.	yES, no	yES	40
CAL	Automatic zero calibration setting				41
CAL	Automatic zero calibration setting	Select “yES” when an external electric ball valve and a solenoid valve for automatic zero calibration are installed. Set to “no” when the automatic zero calibration function is not available or to stop the function.	yES, no	no	41
tyPE	Setting of automatic zero calibration start method	Select the combined operation of the internal timer and the external command for automatic zero calibration.	nor, or, And, trg	or	41
CyCLE	Automatic zero calibration cycle setting	Specify the calibration cycle (in hours) when the automatic zero calibration function is available.	1 to 999 (h)	168	41
HoLd.t	Transmission hold time setting after completion of automatic zero calibration	A transmission signal is held until the valve is returned to its original position and the indication is stabilized after the completion of the automatic zero calibration.	60 to 600 (s)	60	41
StAb.L	Stability level setting during automatic calibration	This value is used to compare the instantaneous and average values of turbidity. Zero calibration is performed if the difference is constantly below the zero stability level for the zero stability time.	0.01 to 0.05	0.01	41
Stab.t	Stability duration setting during automatic calibration	Zero calibration is performed if the difference between the instantaneous and average values of turbidity is constantly below the zero stability level for the zero stability time.	1 to 60 (s)	30	41
CAL.E	Display setting of automatic calibration attempt error E-43	Specify whether or not to display an automatic calibration attempt error (E-43).	yES, no	no	41

Display	Item	Description	Setting range	Initial value	Refer to page
r1 to r3	Contact output setting: R1 to R3 <hr/> Tip The other relays can be set in the same manner. <hr/> <div>Reference</div> <hr/> Refer to “ Control targets and their available options ” (page 48) for the options available for the selected control target.				42
1.tyPE	Contact output type setting	Specify the contact output type (Control target).	non, AL, HoLd, CLn, CAL	non	42
1.HoRL	Control direction setting	Specify whether to perform control using the upper limit operation or lower limit operation. Note: This is displayed when “1.tyPE” is set to “AL”.	Hi, Lo	Hi	42
1.rng	Selection of decimal point position (range) for alarm setting value	Select the optimal position of the decimal point (range) for the alarm settings. Note: This is displayed when “1.tyPE” is set to “AL”.	10.00, 100.0, 1000	100.0	42
1.SET	Alarm value setting	Specify the alarm value. Note: This is displayed when “1.tyPE” is set to “AL”. The item of sub display depends on which ever “10.00” ^{*1} or “100.0” ^{*2} or “1000” ^{*3} in “1.rng” is selected.	<div>*1 0.00 to 10.00</div> <div>*2 0.0 to 100.0</div> <div>*3 0 to 2000</div>	<div>10.00</div> <div>2.000</div> <div>2000</div>	42
1.dt	Contact output delay time setting	Specify the delay time in seconds from when an alarm or hold state occurs until a contact is output. Note: This is displayed when “1.tyPE” is set to “AL” or “HoLd”.	0 to 600 (s)	0	42
1.CLn.t	Output type setting for cleaning	Specify the cleaning output type. Note: This is displayed when “1.tyPE” is set to “CLn”.	CLn, trg	CLn	42
1.CAL.t	Output type setting for calibration	Specify the calibration contact type. Note: This is displayed when “1.tyPE” is set to “CAL”.	CAL, trg, CAL.E	CAL	43
FAiL	Error alarm (FAiL) output setting: RF				43
F.SC	Setting of FAiL output when abnormality is detected during self-check	Specify whether or not to output a FAiL when an abnormality is detected during self-check.	yES, no	yES	43
F.oF	Setting of FAiL output when measured value exceeds full-scale range	Specify whether or not to output a FAiL when the measured value exceeds the full-scale range.	yES, no	no	43
F.CAL.E	Setting of FAiL output when a calibration error occurs (Calibration error is regarded as “FAiL”)	Specify “yES” when a FAiL is to be output if a calibration error occurs. In this case, a transmission output is held in the meas mode until the FAiL is cancelled.	yES, no	no	43

Display	Item	Description	Setting range	Initial value	Refer to page	
F.dt	FAiL output delay time setting	Specify the time in seconds from when a FAiL occurs until a contact is output.	0 to 600 (s)	0	43	
Curr	General transmission output setting				43	
C.HoLd	Transmission hold plan in general	Specify the transmission holding status in general in the output hold mode.	HoLd, PrES	HoLd	43	
b.out	Burnout hold setting for general transmission output	Specify the burnout current of the transmission output when an error occurs during measurement. Note: A burnout current is output in the meas mode only.	non, out.4, out.20	non	44	
Cur2.t	Transmission output 2 range (fixed/automatic changeover) setting	For transmission output 2, a maximum of four ranges can be switched using the external contact. In addition, the converter selects the optimal range according to the automatic range changeover function.	rng, Auto	rng	44	
Cur1	Transmission output 1 setting				44	
C.rng	Transmission output 1 full-scale range (fixed range) setting	Select the transmission output range. The alarm value can be specified based on the selected decimal point.	10.00, 100.0, 1000	100.0	44	
rng.0	Zero point value setting for transmission output 1	Specify the value at the zero point (4 mA) of transmission output 1. Note: The item of sub display depends on which ever "10.00"*1, "100.0"*2 or "1000"*3 in "C.tgt" of Cur1 is selected.	*1	0.00 to 11.00	0.00	44
			*2	0.0 to 110.0	0.0	
			*3	0 to 2200	0	
rng.S	Span point value setting for transmission output 1	Specify the value at the span point (20 mA) of transmission output 1. Note: The item of sub display depends on which ever "10.00"*1, "100.0"*2 or "1000"*3 in "C.tgt" of Cur1 is selected.	*1	0.00 to 11.00	10.00	44
			*2	0.0 to 110.0	100.0	
			*3	0 to 2200	1000	
PrES	Preset value setting for transmission output 1	Input the preset value for current holding. Note: This is displayed when "C.HoLd" is set to "PrES" and the item of sub display depends on which ever "10.00"*1, "100.0"*2 or "1000"*3 in "C.rng" of Cur1 is selected.	*1	0.00 to 11.00	10.00	44
			*2	0.0 to 110.0	100.0	
			*3	0 to 2200	1000	
Cur2.A to Cur2.d	Transmission output 2.A to 2.d setting Tip <ul style="list-style-type: none">The other transmission output 2.b, 2.c, 2.d can be set in the same manner.The transmission output 2 provides maximum four output ranges which are selected by external inputs or automatic range selection function. The zero and span point of the transmission range can be set any within the measuring range.				44	
C.rng	Transmission output 2.A value (full-scale range) setting	Select the transmission output range. The alarm value can be specified based on the selected decimal point.	Cur2.A Cur2.b/2.c Cur2.d	10.00, 100.0, 1000 100.0 10.00	44	

Display	Item	Description		Setting range	Initial value	Refer to page
rng.0	Zero point value setting for transmission output 2.A	Specify the value at the zero point (4 mA) of transmission output 2.A.	Cur2.A	0.00 to 11.00, 0.0 to 110.0, 0 to 2200	0	45
			Cur2.b/2.c		0.0	
		Note: The item of sub display depends on which ever “10.00” ^{*1} , “100.0” ^{*2} or “1000” ^{*3} in “C.rng” of Cur2.A is selected.	Cur2.d		0.00	
rng.S	Span point value setting for transmission output 2.A	Specify the value at the span point (20 mA) of transmission output 2.A.	Cur2.A	0.00 to 11.00, 0.0 to 110.0, 0 to 2200	1000	45
			Cur2.b		100.0	
		Note: The item of sub display depends on which ever “10.00” ^{*1} , “100.0” ^{*2} or “1000” ^{*3} in “C.rng” of Cur2.A is selected.	Cur2.c		50.0	
			Cur2.d		10.00	
PrES	Transmission output 2.A hold output value (preset) setting	Input the preset value for current holding.	Cur2.A	0.00 to 11.00, 0.0 to 110.0, 0 to 2200	1000	45
			Cur2.b		100.0	
		Note: This is displayed when “C.HoLd” is set to “PrES” and the item of sub display depends on which ever “10.00” ^{*1} , “100.0” ^{*2} or “1000” ^{*3} in “C.rng” of Cur2.A is selected.	Cur2.c		50.0	
			Cur2.d		10.00	
CLn	Cleaning operation setting					45
CLn	Automatic cleaner operation setting	If you do not want to activate the cleaner or there is not a cleaner, set “no”. In this case the cleaner will be operated by the test mode.		yES, no	no	45
tyPE	Cleaning operation type setting	Specify the way to start cleaning with a internal timer or a combination of external command. Note: This is displayed when “CLn” is set to “yES”.		nor, or, And, trg	or	46
CyCLE	Internal timer cleaning cycle setting	Specify the cleaning cycle in hours. Note: This is displayed when “CLn” is set to “yES”, and “tyPE” of CLn is set to “nor”, “or”, or “And”.		0.1 to 168.0 (h)	2.0	46
CLn.t	Cleaning time setting	Specify the cleaning time in seconds. Note: This is displayed when “CLn” is set to “yES”.		20 to 600 (s)	30	46
Hold.t	Setting of retention time for transmission output hold after completion of cleaning	Specify the hold retention time in seconds after the completion of the cleaning for the specified extended time. Note: When “CLn” is set to “no”, the hold retention time is effective for the test cleaning.		60 to 600 (s)	60	46

Display	Item	Description	Setting range	Initial value	Refer to page
Ein1	External input 1 (calibration/hold)				46
tyPE	Selection of command by contact (calibration/hold command)	<p>When external input 1 is a calibration command ("Setting of automatic zero calibration start method" is set to "or", "And", or "trg"), if this contact is closed, zero calibration and its associated operations will be started automatically.</p> <p>Note: The following display cannot be changed.</p> <ul style="list-style-type: none"> When "tyPE" of Automatic zero calibration setting is set to "nor" (internal timer only), "HoLd" is displayed When "tyPE" of Automatic zero calibration setting is set to "or", "And", or "trg", "CAL" is displayed 	CAL, HoLd	-	46
rE	Setting for reversing logic of hold command (calibration/hold command)	When "tyPE" of Automatic zero calibration setting is set to "nor", the logic of the calibration/hold command is reversed.	yES, no	no	46
Ein2	External input 2 (cleaning/hold)				47
tyPE	Selection of command by contact (cleaning/hold command)	<p>When external input 2 is a cleaning command ("tyPE" of Cleaning operation setting is set to "or", "And", or "trg"), if this contact is closed, automatic cleaning and its associated operations will be started.</p> <p>Note: The following display cannot be changed.</p> <ul style="list-style-type: none"> When "tyPE" of Cleaning operation setting is set to "nor" (internal timer only), "HoLd" is displayed When "tyPE" of Cleaning operation setting is set to "or", "And", or "trg", "CLn" is displayed 	CLn, HoLd	-	47
rE	Setting for reversing the logic of hold command (cleaning/hold command)	When the cleaning start is set to "nor", the logic of the cleaning/hold command is reversed.	yES, no	no	47
rS	RS-485 setting				47
Addr	RS-485 address setting	Specify the RS-485 communication address.	0 to 99	0	47

Measurement

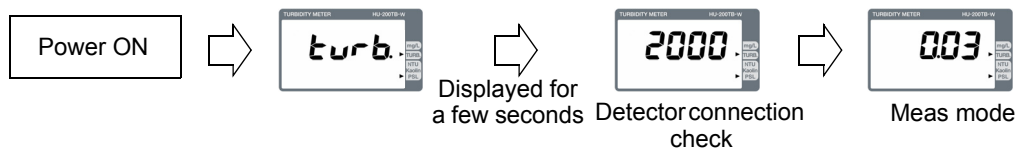
Measurement mode

1. Turn the power ON.

The measurement target appears on the main display and the measurement range is displayed.

After the measurement range is displayed, the measurement starts.

This is the normal measurement mode.



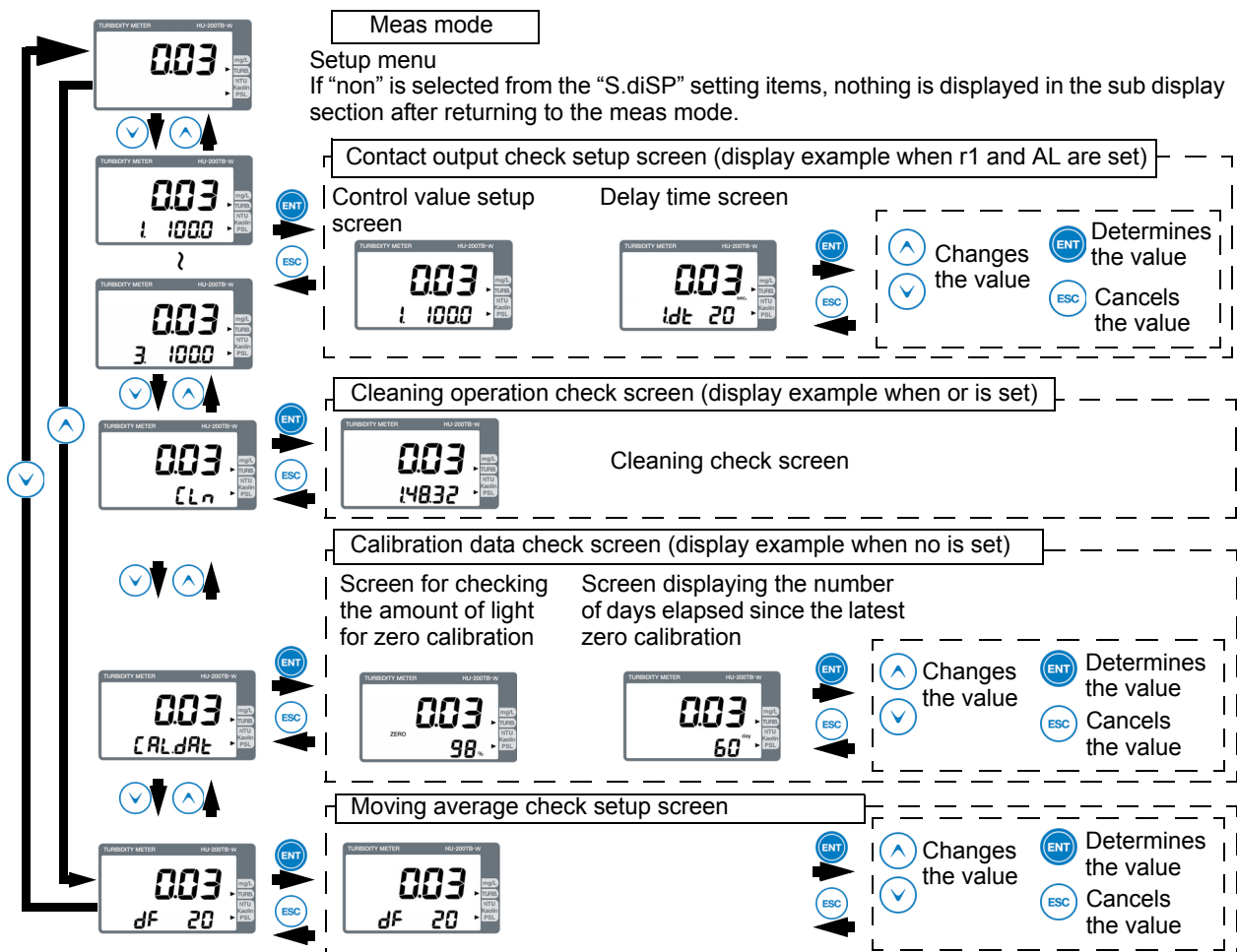
2. The screen is changed by pressing ▲/▼.

Pressing ENT allows you to check or change the set values during measurement.








To return to the meas mode from a different mode, hold down HOLD or ESC.









Note






Prior to measurement, be sure to calibrate the detector.



● List of items displayed in the meas mode

Displays	Display condition	Item	Description	Setting range
	-	Main display screen	Displays the measured values, unit of measurement, and type of turbidity standard substance.	
Contact output check setup screen (display example when r1 is set)				
<div>Tip</div> <div>The other relays can be set in the same manner.</div>				
<div>Reference</div> <div>Refer to “ Control targets and their available options ” (page 48) for the options available for the selected control target.</div>				
	When “non” is set in “1.tyPE”	Relay setting condition screen (the numeral at the lower left indicates the relay number)	Relay 1 is not used. Note: “ --- ” indicates that a relay is not used.	
	When “AL” is set	Control value setup screen	Displays the upper/lower limit setting value for turbidity. The set value can be changed. Note: The setting range changes with the position of the decimal point.	0.00 to 10.00, 0.0 to 100.0, 0 to 2000 (degrees)
		Delay time screen	Displays or is used to specify the delay time in seconds.	0 to 600 (s)
		Retention time screen	Retention time from the hold OFF is displayed or changed in seconds.	0 to 600 (s)
	When “CLn” is set in “1.CLn.t”	Screen for indicating that a contact is output in a hold state during and after cleaning	Display only	-
	When “trg” is set	Screen for indicating that a trigger is output after cleaning		-

Displays	Display condition	Item	Description	Setting range
When “CAL” is set in “1.tyPE”				
	When “CAL” is set in “1.CAL.t”	Screen for issues an output in a hold state during and after zero calibration	Display only	-
	When “trg” is set	Screen for outputs the contact for 5 seconds starting 2 seconds after the completion of calibration		-
	When “CAL.E” is set	Screen for issues an output when a calibration error occurs		-
Cleaning operation check screen				
	Cleaning operation check screen			
	When “no” is set in “CLn”	Screen for indicating that the automatic cleaner is not used	Display only Note: “----” indicates that the automatic cleaner is not used.	-
When “yES” is set in “CLn”				
	When “nor”, “or”, or “And” is set in “tyPE”	Cleaning operation wait time screen	Displays the time until the next cleaning is started in a format of hours-minutes-seconds. When the automatic cleaner is used, the countdown of the cleaning cycle timer can be checked. Note: If the time is 10 hours or longer, it is shown in a format of hours-minutes.	-
	When “trg” is set	Cleaning operation type	Indicates that “Cleaning operation type setting” is set to “trg”.	-
	-	Cleaning test motion screen	When ENT is held on, the automatic cleaner performs one stroke of the reciprocating motion and stops at the top dead point. Note: For test operation A transmission signal is maintained in a hold state for the hold time during and after cleaning.	-

Displays	Display condition	Item	Description	Setting range
Calibration data check screen				
		Calibration data check screen		
	-	Screen for checking the light intensity for zero calibration	Displays the ratio (%) of the factory-configured amount of transmitted light during zero calibration to the amount of transmitted light during the latest zero calibration. Note: This notifies you of any deterioration in the LED light source.	-
	-	Screen displaying the number of days elapsed since the latest zero calibration	Indicates the number of elapsed days after the last zero calibration. Note: The time counts up every two hours while the system is energized. The time is not measured while the power is off.	-
	When "yES" is set in "CAL"	Automatic calibration wait time screen	Displays the time until the next calibration is started in a format of hours-minutes-seconds.	-
Moving average count check setup screen (damping factor)				
	-	Moving average count check setup screen (damping factor)	The moving average count can be checked and changed. Note: Increase dF to reduce variations in the measured values; decrease dF to speed up the response.	1 to 120 (times)

■ Setup menu

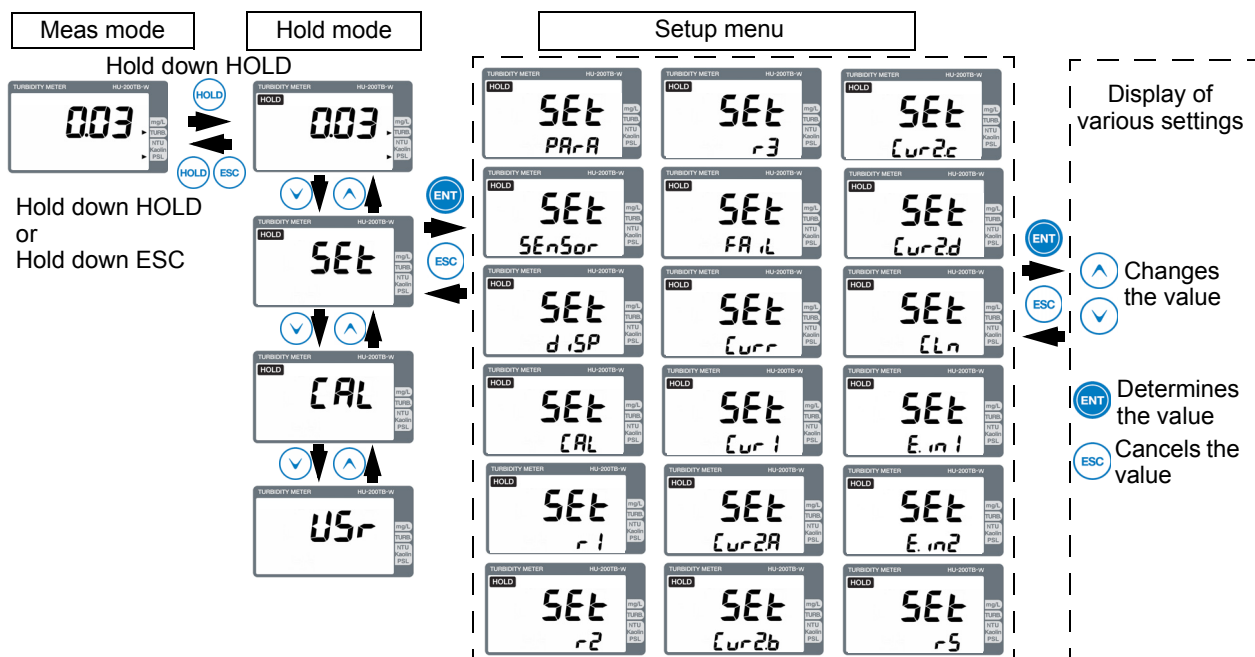
The setup menu allows you to set any parameters, select turbidity standard substances for the detector and units of measurement, and to specify any display, transmission output, relays and communication addresses.

Entering the setup menu

1. In the meas mode, hold down HOLD until the HOLD indicator turns ON.
2. Press ▲/▼ to display “SEt” on the main display.
3. Press ENT.
4. Press ▲/▼ to display a desired item on the sub display.
5. Press ENT.

Tip

- Once the system has entered the hold menu, a measured value changes while a transmission signal is maintained in a hold state according to the specified method.
- Press down the HOLD or ESC to return to the meas mode.















Note








Although the displayed value changes when the HOLD indicator is lit, the transmission output will be held at the value specified in the setup menu.









● List of items displayed for the setting menu

Display	Item	Description	Setting range
	Parameter setting		
	Moving average count (damping factor) setting	Increase dF to reduce variations in the measured data: Decrease dF to speed up the response. It is possible to change the damping factor in the meas mode.	1 to 120 (times)
	Auto return setting	This setting returns the system from the hold mode to the meas mode automatically. <ul style="list-style-type: none">• yES: Enables auto return The mode is automatically returned when the specified time has elapsed after the last key operation.• no: Disables auto return As the mode is not automatically returned, it is necessary to return to the meas mode manually.	yES, no
	Auto return time setting	The hold mode will be back to the meas mode automatically when the set time is passed from the last key touch. In the hold mode, a transmission signal is in a hold state. To cancel the hold state, it is necessary to return to the meas mode. Note: This is displayed when "A.rEt" is set to "yES".	1 to 24 (h)
	Transmission hold cancellation time setting	This setting allows you to maintain the transmission hold state until the measured value is stabilized after the hold mode has been switched to the meas mode. Set the time (in seconds) until the maintained transmission hold state is cancelled.	2 to 30 (s)
	Sensor setting		
	Turbidity standard substance (type) selection	Select the turbidity standard substance from among Kaolin (SiO), Formazin (For), and Polystyrene Latex (PSL).	SiO, For, PSL
	Selection of turbidity unit or SS unit (mg/L) for Kaolin	For Kaolin, turbidity or mg/L can be further selected for the unit of measurement. <ul style="list-style-type: none">• Pattern A: TURB (turbidity)• Pattern b: mg/L (SS) Note: This is displayed when "tyPE" is set to "SiO".	PtnA, Ptnb
	Coefficient input	You can adjust the measure value to the analyzed value with this coefficient with Kaolin standard. Note: This is displayed when "tyPE" is "SiO" and the "Unit" is "Ptnb".	0.01 to 300.00






Display	Item	Description	Setting range																									
	Display setting																											
	Selection of automatic decimal point shift or fixed decimal point	<p>Select either the fixed decimal point or automatic decimal point shift.</p> <ul style="list-style-type: none"> ● Auto: Position of the decimal point is automatically changed according to the turbidity value. ● Fixed decimal point: Select the optimal position of the decimal point according to the turbidity of the sample water. 10.00: Displays a second decimal place 100.0: Displays a first decimal place 1000 : Displays an integer 	Auto, 10.00, 100.0, 1000																									
	Sub display area display setting	<p>Specify what is to be displayed on the sub display area when the measurement mode starts after the end of the hold mode.</p> <ul style="list-style-type: none"> ● non: No display ● r1: Displays an alarm value or assignment for relay 1 ● r2: Displays an alarm value or assignment for relay 2 ● r3: Displays an alarm value or assignment for relay 3 	r1, r2, r3, non																									
	Setting of a hidden area outside of measurement range (range cut)	<p>Specify whether or not to display the area outside the measurement range when a value exceeds the display range.</p> <ul style="list-style-type: none"> ● yES: Enables the range cut <ul style="list-style-type: none"> ● For fixed decimal point: When a value exceeds the maximum value of each display range, the value is fixed at the maximum value and starts blinking. ● Fixed decimal point range: The value is fixed to 10.00, 100.0 or 1000. ● For the automatic decimal point shift: Refer to the following table. ● no: Disables the range cut <ul style="list-style-type: none"> ● For fixed decimal point: When a value exceeds the maximum value plus 10% of each display range, it is fixed to the value and starts blinking. ● Fixed decimal point range: The value is fixed to 2200, 110.0 or 11.00. ● For the automatic decimal point shift: Refer to the following table. <table border="1"> <thead> <tr> <th>Turbidity standard substance (type) selection</th><th>Selection of automatic decimal point shift or fixed decimal point</th><th>yES: Enables the range cut</th><th>no: Disables the range cut</th></tr> </thead> <tbody> <tr> <td rowspan="2">SiO</td><td>10.00, 100.0, 1000</td><td>10.00, 100.0, 1000</td><td>11.00, 110.0, 1100</td></tr> <tr> <td>Auto</td><td>0 to 1000</td><td>0 to 1100</td></tr> <tr> <td rowspan="2">For</td><td>10.00, 100.0, 1000</td><td>10.00, 100.0, 2000</td><td>11.00, 110.0, 2200</td></tr> <tr> <td>Auto</td><td>0 to 2000</td><td>0 to 2200</td></tr> <tr> <td rowspan="2">PSL</td><td>10.00, 100.0, 1000</td><td>10.00, 100.0, 100</td><td>11.00, 110.0, 110</td></tr> <tr> <td>Auto</td><td>0 to 100</td><td>0 to 110.0</td></tr> </tbody> </table>	Turbidity standard substance (type) selection	Selection of automatic decimal point shift or fixed decimal point	yES: Enables the range cut	no: Disables the range cut	SiO	10.00, 100.0, 1000	10.00, 100.0, 1000	11.00, 110.0, 1100	Auto	0 to 1000	0 to 1100	For	10.00, 100.0, 1000	10.00, 100.0, 2000	11.00, 110.0, 2200	Auto	0 to 2000	0 to 2200	PSL	10.00, 100.0, 1000	10.00, 100.0, 100	11.00, 110.0, 110	Auto	0 to 100	0 to 110.0	yES, no
Turbidity standard substance (type) selection	Selection of automatic decimal point shift or fixed decimal point	yES: Enables the range cut	no: Disables the range cut																									
SiO	10.00, 100.0, 1000	10.00, 100.0, 1000	11.00, 110.0, 1100																									
	Auto	0 to 1000	0 to 1100																									
For	10.00, 100.0, 1000	10.00, 100.0, 2000	11.00, 110.0, 2200																									
	Auto	0 to 2000	0 to 2200																									
PSL	10.00, 100.0, 1000	10.00, 100.0, 100	11.00, 110.0, 110																									
	Auto	0 to 100	0 to 110.0																									

Display	Item	Description	Setting range
	Automatic zero calibration setting		
	Automatic zero calibration setting	Select "yES" when an external electric ball valve and a solenoid valve for automatic zero calibration are installed. Set to "no" when the automatic zero calibration function is not available or to stop the function.	yES, no
	Setting of automatic zero calibration start method	Select the combined operation of the internal timer and the external command for automatic zero calibration. <ul style="list-style-type: none"> • nor: Zero calibration is only started in response to the zero calibration cycle defined by the internal timer without accepting an external command. However, a transmission signal is held by an external command. • or: Zero calibration is started in response to the internal timer or when an external command is input. • And: Zero calibration is started in response to the internal timer only while an external command is being input. • trg: Zero calibration is only started in response to an external command (trigger for two seconds or longer) while the internal timer function is disabled. 	nor, or, And, trg
	Automatic zero calibration cycle setting	Specify the calibration cycle (in hours) when the automatic zero calibration function is available.	1 to 999 (h)
	Transmission hold time setting after completion of automatic zero calibration	A transmission signal is held until the valve is returned to its original position and the indication is stabilized after the completion of the automatic zero calibration. A transmission output is also held when the mode is returned to the meas mode after the manual/automatic zero calibration, span calibration, or valve operation from the user check menu.	60 to 600 (s)
	Stability level setting during automatic calibration	This value is used to compare the instantaneous and average values of turbidity. Zero calibration is performed if the difference is constantly below the zero stability level for the zero stability time.	0.01 to 0.05
	Stability duration setting during automatic calibration	Zero calibration is performed if the difference between the instantaneous and average values of turbidity is constantly below the zero stability level for the zero stability time.	1 to 60 (s)
	Display setting of automatic calibration attempt error E-43	Specify whether or not to display an automatic calibration attempt error (E-43). <ul style="list-style-type: none"> • yES: Displays E-43 if zero calibration fails because the value is not stabilized within the automatic zero calibration time. Also specify this when outputting the contact. Note, however, that the transmission output for the next measurement is not held even when E-43 is displayed and the contact is output. If the system judges that it is an error, measurement continues under the condition of the latest zero calibration that has been performed successfully. E-43 can only be cancelled next time the zero calibration is performed successfully or zero calibration is completed manually. An error is more likely to occur when a longer zero stability time is set. If the time is too short, zero calibration is performed with a high turbidity, which results in a lower measurement value. • no: No error processing is performed and measurement continues under the condition of the previous zero calibration. 	yES, no






Display	Item	Description	Setting range
	Contact output setting: R1 to R3 Tip The other relays can be set in the same manner. Reference Refer to “Control targets and their available options” (page 48) for the options available for the selected control target.		
		Contact output type setting Specify the contact output type (Control target). <ul style="list-style-type: none"> ● non: Stops the function and no contact is output ● AL: Operates the alarm contact point ● HoLd: Issues an output in a transmission output hold state ● CLn: Outputs a trigger at the end of cleaning or outputs during cleaning ● CAL: Outputs a trigger at the end of the calibration or outputs during calibration or outputs when a calibration error occurs 	non, AL, HoLd, CLn, CAL
	Control direction setting	Specify whether to perform control using the upper limit operation or lower limit operation. <ul style="list-style-type: none"> ● Hi: Relay 1 is activated when a value is over the alarm level. ● Lo: Relay 1 is activated when a value is under the alarm level. Note: This is displayed when “1.tyPE” is set to “AL”.	Hi, Lo
	Selection of decimal point position (range) for alarm setting value	Select the optimal position of the decimal point (range) for the alarm settings. Note: This is displayed when “1.tyPE” is set to “AL”.	10.00, 100.0, 1000
	Alarm value setting	Specify the alarm value. The default value is reset to 2.000 or 10.00 according to the selected range. Note: This is displayed when “1.tyPE” is set to “AL”. The item of sub display depends on which ever “10.00” ^{*1} or “100.0” ^{*2} or “1000” ^{*3} in “1.rng” is selected.	*1 0.00 to 10.00
			*2 0.0 to 100.0
			*3 0 to 2000
	Contact output delay time setting	Specify the delay time in seconds from when an alarm or hold state occurs until a contact is output. If the alarm is cancelled, the contact will be immediately cancelled without delay. Note: This is displayed when “1.tyPE” is set to “AL” or “HoLd”.	0 to 600 (s)
	Output type setting for cleaning	Specify the cleaning output type. <ul style="list-style-type: none"> ● CLn: Issues an output in a hold state during and after cleaning ● trg: Outputs the contact for 5 seconds starting 2 seconds after the completion of cleaning Note: This is displayed when “1.tyPE” is set to “CLn”.	CLn, trg

Display	Item	Description	Setting range
	Output type setting for calibration	<p>Specify the calibration contact type.</p> <ul style="list-style-type: none"> ● CAL: Issues an output in a hold state during and after zero calibration ● trg: Outputs the contact for 5 seconds starting 2 seconds after the completion of calibration ● CAL.E: Issues an output when a calibration error occurs. However, this error does not maintain the transmission output in a hold state. <p>Note: This is displayed when “1.type” is set to “CAL”.</p>	CAL, trg, CAL.E
	Error alarm (FAiL) output setting: RF		
	Setting of FAiL output when abnormality is detected during self-check	Specify whether or not to output a FAiL when an abnormality is detected during self-check. (E-80 to 85)	yES, no
	Setting of FAiL output when measured value exceeds full-scale range	<p>Specify whether or not to output a FAiL when the measured value exceeds the full-scale range. Over full scale is regarded as “FAiL”.</p> <p>When the FAiL is set to be output, it is output if the measured value exceeds the following value:</p> <ul style="list-style-type: none"> ● When the range cut is enabled: PSL: 100.0 degree, Formazin: 2000 degree, Kaolin: 1000 degree ● When the range cut is disabled: PSL: 110.0 degree, Formazin: 2200 degree, Kaolin: 1100 degree 	yES, no
	Setting of FAiL output when a calibration error occurs (Calibration error is regarded as “FAiL”)	Specify “yES” when a FAiL is to be output if a calibration error occurs. In this case, a transmission output is held in the meas mode until the FAiL is cancelled.	yES, no
	FAiL output delay time setting	<p>Specify the time in seconds from when a FAiL occurs until a contact is output.</p> <p>Note: If a failure is restored, FAiL contact will be cancelled without delay.</p>	0 to 600 (s)
	General transmission output setting		
	Transmission hold plan in general	<p>Specify the transmission holding status in general in the output hold mode.</p> <ul style="list-style-type: none"> ● HoLd: The current will be held at the latest value ● PrES: The current will be held at the preset value 	HoLd, PrES

Display	Item	Description	Setting range
	Burnout hold setting for general transmission output	Specify the burnout current of the transmission output when an error occurs during measurement. <ul style="list-style-type: none"> out.4: Outputs 3.8 mA at the time of burnout out.20: Outputs 21 mA at the time of burnout non: No burnout setting Note: A burnout current is output in the meas mode only.	non, out.4, out.20
	Transmission output 2 range (fixed/automatic changeover) setting	For transmission output 2, a maximum of four ranges can be switched using the external contact. In addition, the converter selects the optimal range according to the automatic range changeover function. <ul style="list-style-type: none"> mg: Sets the range using the external input (sets the range using EXT3, 4) Auto: Uses the automatic range changeover function 	rng, Auto
	Transmission output 1 setting		
	Transmission output 1 full-scale range (fixed range) setting	Select the transmission output range. The alarm value can be specified based on the selected decimal point.	10.00, 100.0, 1000
	Zero point value setting for transmission output 1	Specify the value at the zero point (4 mA) of transmission output 1. Any value within the range can be set. Note: The item of sub display depends on which ever "10.00"*1, "100.0"*2 or "1000"*3 in "C.tgt" of Cur1 is selected.	*1 0.00 to 11.00 *2 0.0 to 110.0 *3 0 to 2200
	Span point value setting for transmission output 1	Specify the value at the span point (20 mA) of transmission output 1. Any value within the range can be set. Note: The item of sub display depends on which ever "10.00"*1, "100.0"*2 or "1000"*3 in "C.tgt" of Cur1 is selected.	*1 0.00 to 11.00 *2 0.0 to 110.0 *3 0 to 2200
	Preset value setting for transmission output 1	Input the preset value for current holding. Note: This is displayed when "C.HoLd" is set to "PrES" and the item of sub display depends on which ever "10.00"*1, "100.0"*2 or "1000"*3 in "C.rng" of Cur1 is selected.	*1 0.00 to 11.00 *2 0.0 to 110.0 *3 0 to 2200
	Transmission output 2.A to 2.d setting <hr/> Tip The other transmission output 2.b, 2.c, 2.d can be set in the same manner. The transmission output 2 provides maximum four output ranges which are selected by external inputs or automatic range selection function. The zero and span point of the transmission range can be set any within the measuring range. <hr/>		
	Transmission output 2.A value (full-scale range) setting	Select the transmission output range. The alarm value can be specified based on the selected decimal point.	10.00, 100.0, 1000

Display	Item	Description	Setting range	
	Zero point value setting for transmission output 2.A	Specify the value at the zero point (4 mA) of transmission output 2.A. Any value within the range can be set. Note: The item of sub display depends on which ever “10.00” ^{*1} , “100.0” ^{*2} or “1000” ^{*3} in “C.rng” of Cur2.A is selected.	*1	0.00 to 11.00
			*2	0.0 to 110.0
			*3	0 to 2200
	Span point value setting for transmission output 2.A	Specify the value at the span point (20 mA) of transmission output 2.A. Any value within 110% of the range can be set. Note: The item of sub display depends on which ever “10.00” ^{*1} , “100.0” ^{*2} or “1000” ^{*3} in “C.rng” of Cur2.A is selected.	*1	0.00 to 11.00
			*2	0.0 to 110.0
			*3	0 to 2200
	Transmission output 2.A hold output value (preset) setting	Input the preset value for current holding. Note: This is displayed when “C.HoLd” is set to “PrES” and the item of sub display depends on which ever “10.00” ^{*1} , “100.0” ^{*2} or “1000” ^{*3} in “C.rng” of Cur2.A is selected.	*1	0.00 to 11.00
			*2	0.0 to 110.0
			*3	0 to 2200
	Cleaning operation setting			
	<div>Tip</div> <p>For automatic cleaning, approximately 30 seconds are required for each cleaning time. Once cleaning has started, the automatic cleaner continues to operate until the specified cleaning time elapses, and then stops at the next top dead point. For example, if the cleaning time is set to 20 seconds, the cleaning operation ends in one stroke of the reciprocating motion. If it is set to 40 seconds, it ends in two strokes of the reciprocating motion.</p> <p>If a cleaning command is a trigger, the cleaning operation is performed for the specified cleaning time per trigger.</p> <p>(Cleaning operation continues while trigger signals are continuously input.)</p> <p>If the start time for automatic cleaning and that for automatic zero calibration are the same, automatic zero calibration is always started first. If automatic cleaning is to be started during automatic calibration or automatic zero calibration is to be started during automatic cleaning, the automatic cleaning or automatic zero calibration will only be started after the current operation is completed.</p>			
	Automatic cleaner operation setting	If you do not want to activate the cleaner or there is not a cleaner, set “no”. In this case the cleaner will be operated by the test mode. Even when a cleaner is provided, if you do not want to activate the operation using the timer, set to “no”. In this case, the automatic cleaner can still be operated in the test mode. When an automatic cleaner is provided and if you want to activate the cleaning operation automatically using the internal timer, set to “yES”. If “yES” is set, the connection with the automatic cleaner will be checked.	yES, no	



















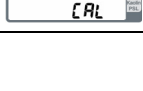
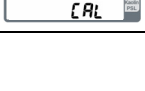
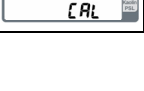
Display	Item	Description	Setting range
	Cleaning operation type setting	<p>Specify the way to start cleaning with a internal timer or a combination of external command.</p> <ul style="list-style-type: none"> ● nor: Cleaning will start in accordance with the internal timer setting. The external command can be used to hold the transmission output. ● or: Cleaning is performed in accordance with the internal timer or when an external command is input. ● And: Cleaning is performed in accordance with the internal timer while the external command is input. ● trg: Cleaning will start only by the external signal triggered at least 2 seconds. The internal timer setting is neglected. Refer to “Cleaning start condition ” (page 51). <p>Note: This is displayed when “CLn” is set to “yES”.</p>	nor, or, And, trg
	Internal timer cleaning cycle setting	<p>Specify the cleaning cycle in hours.</p> <p>Note: This is displayed when “CLn” is set to “yES”, and “tyPE” of CLn is set to “nor”, “or”, or “And”.</p>	0.1 to 168.0 (h)
	Cleaning time setting	<p>Specify the cleaning time in seconds.</p> <p>Note: This is displayed when “CLn” is set to “yES”.</p>	20 to 600 (s)
	Setting of retention time for transmission output hold after completion of cleaning	<p>Specify the hold retention time in seconds after the completion of the cleaning for the specified extended time.</p> <p>Note: When “CLn” is set to “no”, the hold retention time is effective for the test cleaning.</p>	60 to 600 (s)
	External input 1 (calibration/hold)		
	Selection of command by contact (calibration/hold command)	<p>When external input 1 is a calibration command (“Setting of automatic zero calibration start method” is set to “or”, “And”, or “trg”), if this contact is closed, zero calibration and its associated operations will be started automatically.</p> <p>Note: The following display cannot be changed.</p> <ul style="list-style-type: none"> ● When “tyPE” of Automatic zero calibration setting is set to “nor” (internal timer only), “HoLd” is displayed ● When “tyPE” of Automatic zero calibration setting is set to “or”, “And”, or “trg”, “CAL” is displayed 	CAL, HoLd
	Setting for reversing logic of hold command (calibration/hold command)	<p>When “tyPE” of Automatic zero calibration setting is set to “nor”, the logic of the calibration/hold command is reversed.</p> <ul style="list-style-type: none"> ● no: Contact is closed when a calibration command is issued ● yES: Contact is opened when a hold command is issued 	yES, no

Display	Item	Description	Setting range
	External input 2 (cleaning/hold)		
	Selection of command by contact (cleaning/hold command)	<p>When external input 2 is a cleaning command ("tyPE" of Cleaning operation setting is set to "or", "And", or "trg"), if this contact is closed, automatic cleaning and its associated operations will be started.</p> <p>Note: The following display cannot be changed.</p> <ul style="list-style-type: none"> When "tyPE" of Cleaning operation setting is set to "nor" (internal timer only), "HoLd" is displayed When "tyPE" of Cleaning operation setting is set to "or", "And", or "trg", "CLn" is displayed 	CLn, HoLd
	Setting for reversing the logic of hold command (cleaning/hold command)	<p>When the cleaning start is set to "nor", the logic of the cleaning/hold command is reversed.</p> <ul style="list-style-type: none"> no: Contact is closed when a cleaning command is issued yES: Contact is opened when a hold command is issued 	yES, no
	RS-485 setting		
	RS-485 address setting	Specify the RS-485 communication address.	0 to 99

● Contact output

● Control targets and their available options

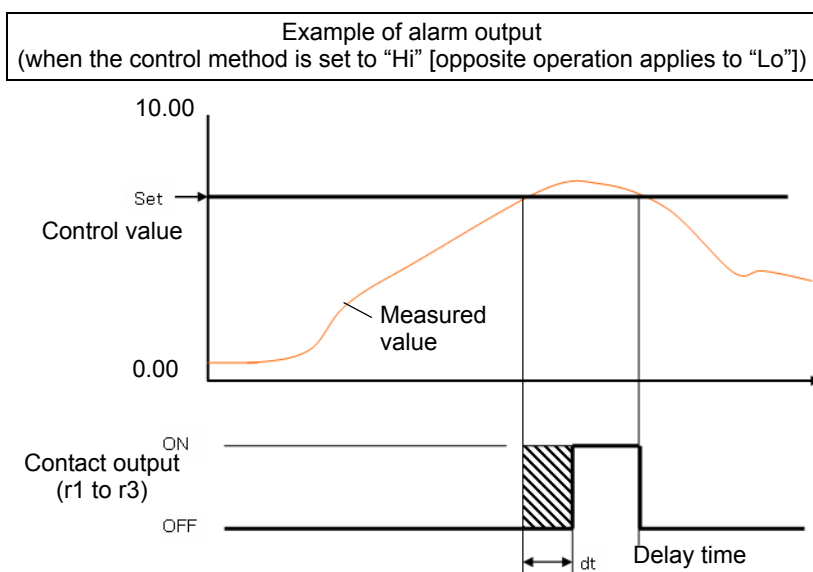
Assign the contact output type which means task of the relay R1, R2 and R3 and set the following items. The available items depend on the relay assignment are grayed. The items marked with a check are available for display as options.

R1	R2	R3	Item	Options				
			Contact output type setting	non	AL	HoLd	CLn	CAL
			Control direction setting	-	✓	-	-	-
			Selection of decimal point position (range) for alarm setting value	-	✓	-	-	-
			Alarm value setting	-	✓	-	-	-
			Contact output delay time setting	-	✓	✓	-	-
			Output type setting for cleaning	-	-	-	✓	-
			Output type setting for calibration	-	-	-	-	✓

● Contact output types

The following contact output types are available.

- non: No output
This setting disables the contact output.
- Concentration alarm output
When a measured value is continuously higher than the set value for triggering an alarm during the specified delay time, the contact is output after the delay time (turning ON a relay) and an alarm occurs.
When the measured value falls below the set value, the output is immediately stopped (turning OFF the relay) and the alarm is cancelled.
“Turning ON a relay” means that an electric current is passed to the coils of a relay. (The above explanation is applicable to the upper limit operation. The opposite operation applies to the lower limit operation.)
The settings include:
 - HorL: Control method setting:
“Hi” (the action occurs when the value exceeds the upper limit)/“Lo”
(the action occurs when the value falls below the lower limit)
 - SEt: Control value setting:
0.00 degrees to 10.00 degrees, 0.0 degrees to 100.0 degrees,
0 degrees to 2000 degrees
 - dt: Delay time setting: 0 s to 600 s



- HoLd: Output in a hold state
When the measured value is in a hold state, an alarm is output (ON) after the delay time.
When the hold state is cancelled, the output is immediately stopped (OFF).
The settings include:
dt: Delay time setting: 0 s to 600 s
- Cleaning output type setting
 - CLn: Outputs a contact in a hold state during and after cleaning.
 - trg: Outputs a contact for 5 seconds when 2 seconds have elapsed from the completion of cleaning.
- Output during calibration
Selectable from among “during calibration”, “at the completion of calibration”, and “calibration error”.

● Output conditions for each output type

The output conditions for various output types are shown below.

Status				Contact output				(Operation bet. CF-NCF)*1	Transmission output					
				non	AL	HoLd	CLn		CAL		C.HoLd			
											HoLd		PrES	
											b.out			
FAIL output setting							CLn	trg	CAL	trg	non	*2	non	
Power OFF				OFF				Opened (ON)		-				
Measurement	When normal operation			OFF	ON	Valid		Closed (OFF)		Measurement value				
	Occurrence of over-FS	F.oF	yES					Opened (ON)	Latest value	*5	Preset value			
			no									Closed (OFF)	Measurement value	
	E-80 to E-85	F.SC	yES			Opened (ON)	Latest value	*5	Preset value					
			no							Closed (OFF)	Measurement value			
	E-43	F.CALE	yES			Opened (ON)	Latest value	*5	Preset value					
no			Closed (OFF)	Measurement value										
E-90 to E-92				Valid		Opened (ON)		Latest value	*5	Preset value				
Closed (OFF)		Measurement value												
During cleaning	When normal			OFF	ON	ON	*3	OFF	Closed (OFF)		Latest value	Preset value		
	E-80 to E-85								Cleaning is completed when any of the E-80 to 85 errors occurs, and the system is switched to a hold state after cleaning					
	E-90 to E-92													
Hold after cleaning	When normal			OFF	ON	ON	*3	OFF	Opened (ON)		Latest value	Preset value		
	E-80 to E-85								Closed (OFF)					
	E-90 to E-92								Opened (ON)					
During calibration	When normal			OFF	ON	ON	ON	*4	Closed (OFF)		Latest value	Preset value		
	E-80 to E-85								Calibration is completed when any of the E-80 to 85 errors occurs, and the system is switched to the meas mode					
	E-90 to E-92													
Hold after calibration	When normal			ON	OFF	ON	OFF	Opened (ON)		Latest value	Preset value			
	E-41, E-43							Closed (OFF)						
	E-80 to E-85							A hold state after calibration is completed when any of the E-80 to 85 errors occurs, and the system is switched to the meas mode						
E-90 to E-92														
External input HOLD	When normal			OFF	ON	Valid		Opened (ON)		Latest value	Preset value			
	E-41, E-43, E-80 to E-85							Closed (OFF)						
	E-90 to E-92							Opened (ON)						
Hold mode	When normal			OFF	ON	OFF		Closed (OFF)		Latest value	Preset value			
	E-90 to E-92							Opened (ON)						

*1: The error alarm is turned ON/OFF as follows:

When it is ON, CF-NCF is open; when it is OFF, CF-NCF is closed. (ON; abnormal state, OFF; normal state)

*2: out.4 or out.20

*3: ON for 5 s after cleaning

*4: ON for 5 s after calibration

*5: 3.80 mA or 21 mA

● Cleaning start condition

The automatic cleaning is performed according to the following conditions.

Cleaning operation conditions				Cleaning and associated operations			
CLn	Cleaning start type	Internal cleaning cycle During cleaning: ✓ Waiting: -	External contact input ON: ✓ OFF: -	Cleaning operation ^{*1} ON: ⊙ OFF: -	CLn Contact output ^{*2} ON: ● OFF: -	HoLd Contact output ^{*3} ON: ● ✓ OFF: -	Transmission output
yES	nor Started only by internal timer	✓	✓	⊙	●	●	*4
		✓	-	⊙	●	●	
		-	✓	-	-	✓	
		-	-	-	-	-	Measurement value
	or Started by both internal timer and external commands	✓	✓	⊙	●	●	*4
		✓	-	⊙	●	●	
		-	✓	⊙	●	●	
		-	-	-	-	-	Measurement value
	And Started by internal timer when external command is ON	✓	✓	⊙	●	●	*4
		✓	-	-	-	-	Measurement value
		-	✓	-	-	-	
		-	-	-	-	-	
	trg Started by external trigger	No setting	ON for 2 s	⊙	●	●	*4
			-	-	-	-	Measurement value
no	No setting	No setting	✓	-	-	✓	*4
			-	-	-	-	Measurement value

*1: When the “Automatic cleaner operation setting” setup menu is set to “yES”, the cleaning operation is performed according to the specified method (⊙). Cleaning is not performed when it is to be started during zero calibration.

*2: The “CLn” contact is output for the specified hold time during and after cleaning. (●)

*3: There are two types of “HoLd” contact output: 1. “HoLd” contact is output for the specified hold time during and after cleaning (●), and 2. “HoLd” contact is output when the external contact input is ON (✓).

*4: The transmission output is issued according to the settings in the “Transmission output hold setting” setup menu.

● Calibration start condition

The automatic zero calibration is performed according to the following conditions.

Automatic zero calibration operation conditions				Calibration and associated operations			
CAL	Calibration start type	Calibration cycle During calibration: ✓ Waiting: -	External contact input ON: ✓ OFF: -	Calibration operation* ¹ ON: ⊙ OFF: -	CAL Contact output* ² ON: ● OFF: -	HoLd Contact output* ³ ON: ●✓ OFF: -	Transmission output
yES	nor Started only by internal timer	✓	✓	⊙	●	●	*4
		✓	-	⊙	●	●	
		-	✓	-	-	✓	
		-	-	-	-	-	Measurement value
	or Started by both internal timer and external	✓	✓	⊙	●	●	*4
		✓	-	⊙	●	●	
		-	✓	⊙	●	●	
		-	-	-	-	-	Measurement value
	And Started by internal timer when external	✓	✓	⊙	●	●	*4
		✓	-	-	-	-	Measurement value
		-	✓	-	-	-	
		-	-	-	-	-	
	trg Started by external trigger	No setting	ON for 2 s	⊙	●	●	*4
			-	-	-	-	Measurement value
no	No setting	No setting	✓	-	-	✓	*4
			-	-	-	-	Measurement value

*1: When the “Automatic zero calibration setting” setup menu is set to “yES”, the calibration operation is performed according to the specified method (⊙). Zero calibration is not performed when it is to be started during cleaning.

*2: The “CAL” contact is output for the specified hold time during automatic zero calibration or after calibration (●).

*3: There are two types of “HoLd” contact output: 1. “HoLd” contact is output for the specified hold time during the automatic zero calibration or after the calibration (●), and 2. “HoLd” contact is output when the external contact input is ON (✓).

*4: The transmission output is issued according to the settings in the “Transmission output hold setting” setup menu.

Cal menu

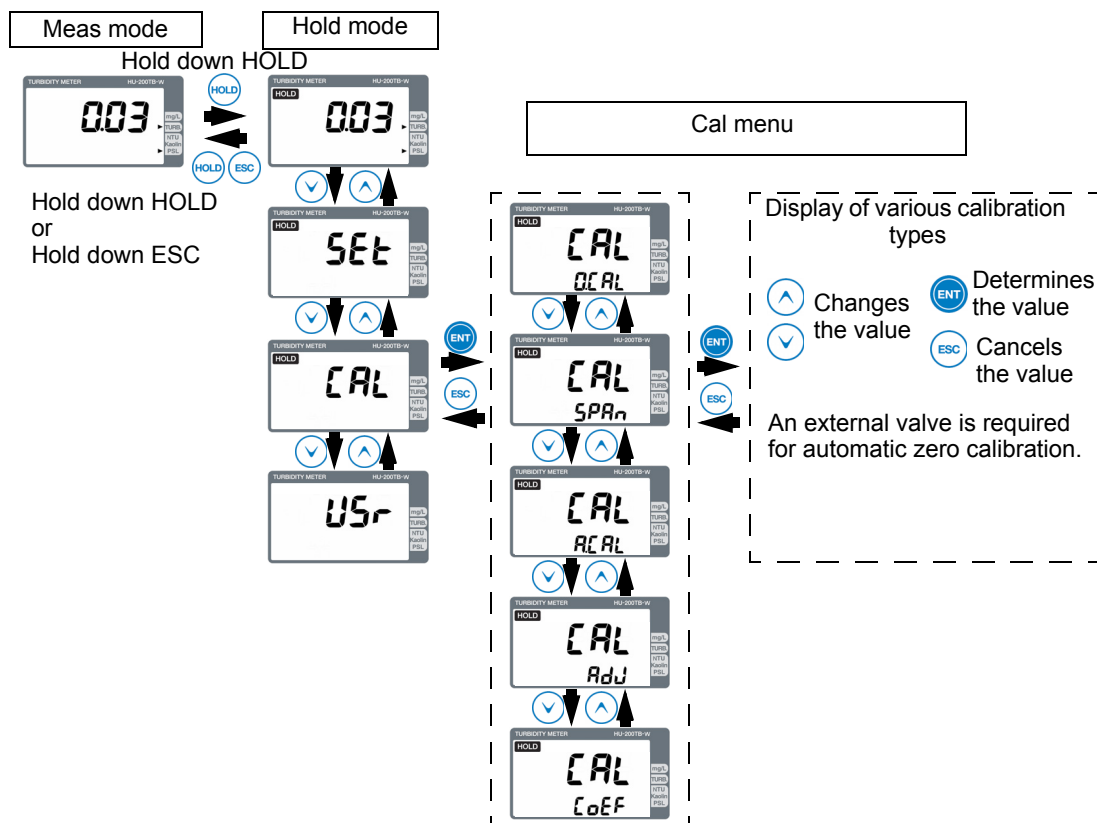
Calibration menu allows you to perform zero and span calibration of the detector.
As a rule of thumb, zero calibration and span calibration should be performed once a month.

Entering the cal menu







Calibration menu can be opened by pressing down CAL in the measurement mode or selected in the hold mode.




This section describes the method of entering the cal menu from the hold mode.

1. In the meas mode, hold down HOLD until the HOLD indicator turns ON.
2. Press ▲/▼ to display “CAL” on the main display.
3. Press ENT.
4. Press ▲/▼ to display a desired item on the sub display.
5. Press ENT.



● List of items displayed for the cal menu

Display	Calibration Type	Item	Description	Setting range	Initial value
	Manual zero calibration				
	<p>Note</p> <p>When an automatic zero calibration function (option) is provided, specify “ Automatic zero calibration setting ” (page 41).</p> <p>Reference</p> <p>Refer to “ Zero calibration ” (page 59).</p>				
	Zero	Manual zero calibration	The current measured value is blinking. The value displayed when ENT is pressed will be set to zero. Pour zero water into the detector. At this point, if contamination in the accumulated water will affect the calibration performance, keep supplying the zero water and wait until the indication is stabilized. Once the indication is stabilized, press ENT at the lowest value possible, and then complete the zero calibration.	-	-
	Span calibration				
	<p>Note</p> <p>Specify the items of “Turbidity standard substance (type) selection” in advance.</p> <p>Reference</p> <p>Refer to “ Span calibration ” (page 61).</p>				
	Span	Span calibration	Adjust the current value to the turbidity of the standard solution. The measured value of the span calibration liquid is displayed, and a coefficient is displayed in the sub display area. Press ▲/▼ to calibrate span and press ENT to finish span calibration. A measured value changes in proportion to the coefficient. Adjust the coefficient so that the turbidity is equal to that of the turbidity standard substance that was poured into the detector. Or, adjust the coefficient so that the value is equal to that of the already tested span bottle. The indication is stabilized within one minute after the span calibration liquid has been poured into the detector. Press ENT sometime between one to three minutes later.	-	1.0000
	Data shift by adjust				
	Manual shift	Adjust	You can shift the measured value. The shift value is displayed on the sub display which can be increased or decreased by ▲/▼. The data is shifted by the value you input. This function may be used for fine tuning around turbidity zero.	-10.00 to 10.00	0.00

Display	Calibration Type	Item	Description	Setting range	Initial value
	Coefficient				
	Manual input of coefficient	Coefficient	Data will be gained in proportion to the coefficient. This function may be used to correspond to the analyzed value or the value of other instrument. The coefficient on the sub display will be blinking and ready to be changed by ▲/▼.	0.001 to 5.000	1.000
Automatic zero calibration					
<div><div>Note</div><p>When an automatic zero calibration function (option) is provided, specify “ Automatic zero calibration setting ” (page 41).</p></div>					
<div><div>Reference</div><p>Refer to “ When automatic zero calibration function (option) is provided ” (page 60).</p></div>					
	Zero	Automatic zero calibration	When ENT is pressed, a sequential valve operation and automatic zero calibration will be performed, and then the valve will return to its original condition. Two external automatic valves are required for automatic zero calibration.	-	-

Tip

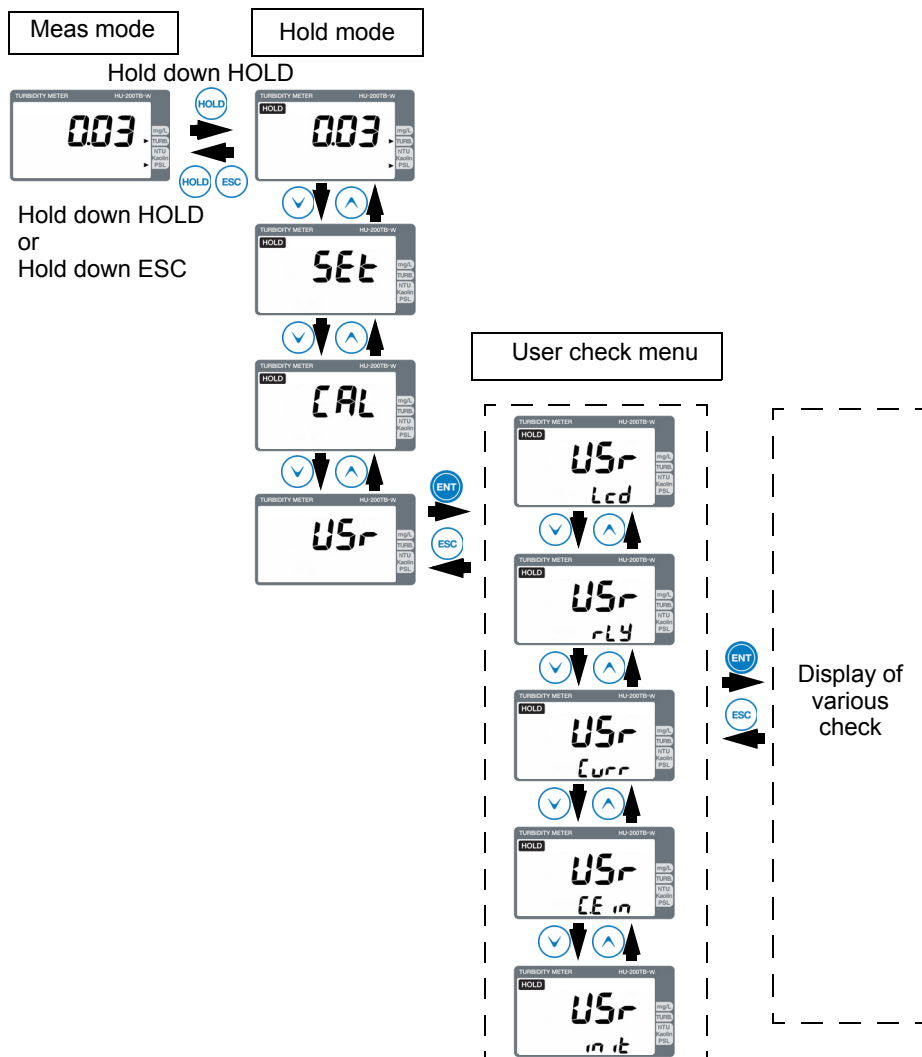
When an automatic zero calibration unit is provided, switching to the zero calibration mode with a key operation will close the electric ball valve and open the solenoid valve, so that zero water can be automatically supplied. While checking that the indication has been stabilized, press ENT at the zero calibration timing.

■ User check menu












Entering the user check menu allows you to check the display section or the transmission output or to initialize the settings.

Entering the user check menu

1. In the meas mode, hold down HOLD until the HOLD indicator turns ON.
2. Press ▲/▼ to display “USr” on the main display.
3. Press ENT.
4. Press ▲/▼ to display a desired item on the sub display.
5. Press ENT.



● List of items displayed for the user check menu

Display	Item	Description
	LCD check	
	LCD check screen	The whole LCD lights up to find defects of the display panel.
	Relay output check: R1 to R3	
	Relay output 1 check screen	The ON/OFF status for relay 1 (r1) can be checked. ENT: ON/OFF switching Note: When the system enters this mode, the contact output is set to OFF.
	Relay output 2 check screen	The ON/OFF status for relay 2 (r2) can be checked. ENT: ON/OFF switching Note: When the system enters this mode, the contact output is set to OFF.
	Relay output 3 check screen	The ON/OFF status for relay 3 (r3) can be checked. ENT: ON/OFF switching Note: When the system enters this mode, the contact output is set to OFF.
	FAIL output check screen	The ON/OFF status of FAIL can be checked. (When a FAIL occurs, the coil current of the relay is cut off. The current flows through the coil of the relay in a normal state.)
	Range contact output 1 check screen	The ON/OFF status for range contact output 1 can be checked.
	Range contact output 2 check screen	The ON/OFF status for range contact output 2 can be checked.
	Screen for checking electric ball valve output for sample water line	The electric ball valve operation can be checked. on: The valve is closed oFF: The valve is open
	Screen for checking solenoid valve output for zero water line	The solenoid valve operation can be checked. Note: When the output is "on", voltage is output and the valve is opened.

Display	Item	Description
	Transmission output check	
	Transmission output check screen (3.8 mA output check)	3.8 mA is output to the transmission output. Note: Select the current output with ▲/▼. Connect the transmission output to an external recorder or ammeter, and check for errors.
	Transmission output check screen (4 mA output check)	4 mA is output to the transmission output. Note: Select the current output with ▲/▼. Connect the transmission output to an external recorder or ammeter, and check for errors.
	Transmission output check screen (12 mA output check)	12 mA is output to the transmission output. Note: Select the current output with ▲/▼. Connect the transmission output to an external recorder or ammeter, and check for errors.
	Transmission output check screen (20 mA output check)	20 mA is output to the transmission output. Note: Select the current output with ▲/▼. Connect the transmission output to an external recorder or ammeter, and check for errors.
	Transmission output check screen (21 mA output check)	21 mA is output to the transmission output. Note: Select the current output with ▲/▼. Connect the transmission output to an external recorder or ammeter, and check for errors.
	External contact input check	
	External contact input check screen	When 1, 2, 3, and 4 are input, in this order from the left, 1 is displayed. Note: Short-circuit the input contact and check the reaction.
	Initialization setting	
	Initialization screen for setup data and span calibration data	<ul style="list-style-type: none"> Initialization screen for the setup data and calibration data Select “yES” with ▲/▼, and then press ENT to initialize. Note: Be aware that the set values will return to the default values. When the operation is completed, the initial screen will be displayed and the system will return to the meas mode.

Maintenance

This chapter provides information on maintenance aimed at ensuring accuracy, such as calibration methods.

Calibration

Zero calibration

Zero calibration is an operation that adjusts the value of clean water to zero.

The following calibration method is recommended, depending on the degree of turbidity.

When low turbidity water (such as tap water or swimming pool water) is measured, the turbidity resulting from air bubbles and matter adhering to wall surfaces may make it difficult to perform calibration by accumulating zero water. For this reason, it is recommended that you perform zero calibration while successively running zero water filtered with an ultra filter.

Run zero water successively and check that the indication has been stabilized. Then, perform zero calibration when the value of the turbidity reaches the lowest level.

Note

- If the inside of the cell is filled with air, zero calibration cannot be performed.
- When running zero water, be careful of the formation of air bubbles.
- Turbidity might increase due to contamination in the piping path.
- For sample water with a high salt content, it may be necessary to use filtered water of the same salt content as zero water.

Zero calibration procedure

Perform the following steps in the meas mode.

Zero calibration can be performed commonly for any turbidity standard substances.

1. **Remove the automatic cleaner, then clean the cell of the detector adequately with a brush.**
2. **Close the valve beneath the detector, and pour zero water from above into the cell. Or, switch the lines and run zero water successively.**
If air bubbles are formed in zero water, reattach the automatic cleaner or the lid, then pressurize the detector by adjusting the outlet valve.
3. **Wait until the indication is stabilized.**
If the turbidity fluctuates, the cleaning was insufficient.
4. **Hold down CAL until the HOLD lamp lights up to enter the zero calibration mode.**

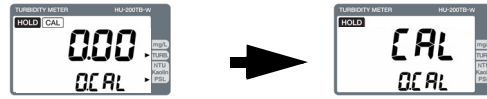


Once the measured value is stabilized, perform zero calibration.

5. **Press ENT. The numerical value starts blinking. Press ENT again at the lowest value to complete the zero calibration.**



6. Display is automatically returned to the zero calibration mode.



7. Hold down ESC to return to the meas mode.



● When automatic zero calibration function (option) is provided

● Manual zero calibration

When zero calibration is specified manually, the electric ball valve for the sample water line will be closed in a few seconds and the solenoid valve for zero water will be opened. When you press ENT after the indication has been stabilized, the zero calibration will be completed. Once the zero calibration is completed, the valve will return to its original condition.

● Automatic zero calibration (option)

Call up “A.CAL” in the cal mode and press ENT. While zero water is being run automatically, the system will perform zero calibration when it judges that the measured value has been stabilized.

Even if the turbidity of zero water is high, zero calibration may be performed as long as the automatic zero calibration conditions are met. In order to avoid this, it is necessary to set stricter criteria. To make the criteria stricter, decrease the stability level or lengthen the stability time in the setup menu. However, if the criteria are too strict, zero calibration may not be completed within the specified time, and an error may also occur. Adjust the stability level and time so that the system can make the optimum judgment for zero calibration.

By setting the cycle for the automatic zero calibration, zero calibration can automatically be performed at the specified interval.

— Tip —
In the zero calibration mode, a negative measured value is also displayed.

● Checking the zero calibration data

On the calibration data check screen, checks can be made of the amount of transmitted light during zero calibration and the number of days elapsed since the last zero calibration. A check of the amount of transmitted light makes a comparison with the initial amount of transmitted light. It is assumed that fluctuations in the amount of light are attributable to the deterioration of light sources, the influence of temperature, or contamination on the cell. The default value is the factory-configured amount of transmitted light. The default value is updated each time zero calibration is performed.

Procedure for checking the calibration data

1. Display the calibration data check screen on the converter.

Press ▲/▼ in the meas mode to display “CAL.dAt”.



2. Check the amount of light for zero calibration.



3. Check the number of days elapsed from the last zero calibration.



Note

- The fluctuations in the amount of light from a light source over time are about 5% to 10% per year.
- If the amount of transmitted light has decreased to a level of 40% or less of the initial amount of light, an error announcement will be issued to indicate the decrease in the amount of light. It is presumed that the amount of light from a light source may decrease to a level of 40% or less over a period of at least 10 years because the deterioration of a light source is not linear. If an error occurs after only a few years, it can be judged that other causes may exist.

Span calibration

Prior to span calibration, it is necessary to select a turbidity standard substance. Conventionally, refined powders of Kaolin and Formazin have been used. For tap water, Polystyrene Latex (PSL) is used.

For these turbidity standard substances, use commercial products or HORIBA Advanced Techno's consumables.

Moreover, an optional span solution is also available as a substitute for the span calibration liquid. If span solution is used, pour the span solution into the Liquid span bottle and shake and mix it strongly before putting it in place. By doing this, signals indicating that the span solution is used as a substitute for the standard solution can be obtained. However, even if an already-known turbidity liquid is poured into the Liquid span bottle, span calibration cannot be performed according to that value.

To use a Liquid span bottle, attach it to a turbidity meter already calibrated with a turbidity standard substance beforehand. Then, test the measured value that is indicated at this point. From the next time, perform span calibration with reference to this value.

The span solution components are refined Kaolin, a trace amount of dispersant (sodium pyrophosphate), and sterilizing agent (hydrogen peroxide).

Put the Liquid span bottle in zero water. As the value of the Liquid span bottle changes, retest it once a year.

Pour a Kaolin solution of 5 degrees or higher into the Liquid span bottle. If a solution with a low turbidity is poured, particles will adhere to the wall surfaces and the turbidity will change over time. For span calibration of turbidity, use a standard solution of 2 degrees or higher. It is possible that errors may become larger in a standard solution that is closer to the zero point.

Note

- Put the Liquid span bottle in zero water. If it remains in the air, calibration cannot be performed.
- A solution of 0.3 times to 0.9 times the measurement range is suitable for the turbidity of a span calibration liquid.
- Prior to span calibration, clean the inside of the cell adequately and rinse it with clean water.

Perform calibration using the span calibration liquid of an already-known turbidity.

At the time of shipment from the factory, it is calibrated with Formazin. Other turbidity standard substances may be calibrated and shipped upon request. In this case, they need to be calibrated by the user.

Adjust the span coefficient for the measured value so that it is equal to the turbidity of the standard solution.

● Recipes of the span solution from a concentrated solution

● How to determine the suitable span solution for the turbidity meter

- Confirm the turbidity standard substance beforehand.
- The turbidity standard substance might be selected from Kaolin, Formazin and PSL.
- The average turbidity should be in consideration.
- The deviation of the turbidity should be in consideration.

In the case of low turbidity measurement; for example city water, swimming pool water

For the low turbidity measurement less than 1 degree, the optimum turbidity for span calibration is made by dilution of the concentrated solution between 2 degrees and 10 degrees.

In the case of unstable turbidity measurement; for example treatment water, river water

Set the recording range which covers the maximum turbidity if the data fluctuate.

Determine the span solution between 0.3 and 0.9 of the recording full scale range and make it by dilution.

● How to dilute concentrated solution with water for any span solution

Any span solution from Kaolin 10000 degrees

Span solution A degree: Take $A/10$ mL of Kaolin 10000 degrees solution and fill up to 1 L by water.

For the example $A = 50$: Take 5 mL ($50/10$) of Kaolin 10000 degrees solution and fill up to 1 L by water.

Reference

For the calibration liquid preparation procedure, refer to “ Kaolin standard solution ” (page 80).

Any span solution from Formazin 4000 degrees

Span solution B degree: Take $B/4$ mL of Formazin 4000 degrees solution and fill up to 1 L by water.

For the example $B = 40$: Take 10 mL ($40/4$) of Formazin 4000 degrees solution and fill up to 1 L by water.

Reference

For the calibration liquid preparation procedure, refer to “ Preparation method of calibration solution ” (page 79).

Any span solution from PSL 100 degrees

Span solution C degree: Take $C \times 10$ mL of PSL 100 degrees solution and fill up to 1 L by water.

For the example $C = 2$: Take 20 mL (2×10) of PSL 100 degrees solution and fill up to 1 L by water.

● Span calibration procedure

Pouring a standard solution

1. Close the sample water valve and open the drain valve to drain the sample water from the detector.
2. Detach the automatic cleaner and clean the cell.
3. Clean the inside of the cell of the detector thoroughly.
4. Prepare 200 mL of a span calibration liquid.
5. Pour the span calibration liquid into the cell from the top to clean it.
6. Pour the span calibration liquid into the cell from the top again and wait until any air bubbles disappear.
7. Switch the converter to the span calibration mode.
8. In the meas mode, hold down CAL, then press ▼ to display the span calibration screen.



9. Press ENT to display the span coefficient input screen.



10. Adjust the coefficient so that the turbidity measured matches the turbidity of span solution. Then, press ENT to set it.

During span coefficient input, the numerical value continues blinking.
After the coefficient is set, return to the span calibration mode.



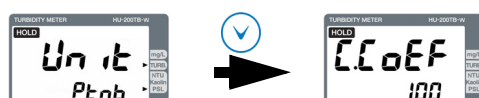
11. Hold down ESC to return to the meas mode.

● SS adjustment (Coefficient setting menu)

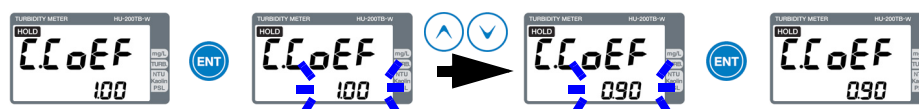
When the unit is set to SS mg/L with Kaolin (Ptnb), you can change the measured value with multiplying by a coefficient. This function allows you to adjust the output to the analyzed value (refer to "Coefficient input" (page 39)).

Operation procedure

1. Open SEnSor in the setting menu.
2. Select SiO (Kaolin) for standard material in tyPE (Calibration type).
3. Press ▼ to let it display coefficient.



4. Press ENT to start adjustment with ▲▼ and press ENT to finish setting.



Maintenance

■ Cleaning the detector

Remove the automatic cleaner or the lid, then clean the cell of the detector with a soft brush or paper. If the detector is soiled, errors caused by flaking dirt become larger during zero calibration. It is necessary to clean not only the optical path section but also the entire liquid contact section of the detector.

If the inside of the piping is soiled with iron rust, the cell will also be soiled with rust. In this case, clean the cell by filling it with the hydrochloric acid detergent.

■ Cleaning the sampling piping

Dirt is gradually deposited in the sampling piping. If deposited dirt flakes off due to vibration of a pipe or the start and stop of a pump, etc., turbidity will increase.

Inject air into a pipe periodically to remove any dirt.

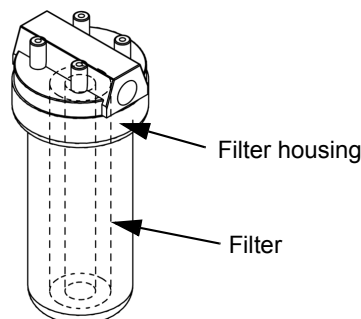
■ Replacing the zero calibration filter (if installed)

Provide a valve to prevent the outlet of a filter for zero turbidity from coming in contact with the sample water. Keep the valve closed during measurement.

If the amount of filtration decreases, replace the filter with a new one.

Note

Before replacing the filter, be sure to decompress the filter housing completely.



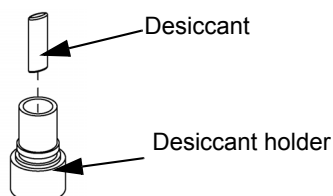
■ Replacing the desiccant

The inside of the detector must be dry at all times. If the inside of the detector is in the same condition as the external air, cold sample water cannot be measured due to condensation.

The desiccant used for the detector can be replaced with a new one. The yearly periodic replacement of desiccants is recommended. In addition, when the case is opened, replace the old desiccant with a new one.

The desiccant is a magnesium chloride and magnesium oxide compound. You can tell by squeezing the desiccant bag from the outside if it is still powdered or not. If a desiccant has absorbed moisture, it will become hard and expanded.

Turn the knob for replacing desiccant, and replace the old desiccant with a new one.



■ Replacing the wiper of the automatic cleaner



WARNING

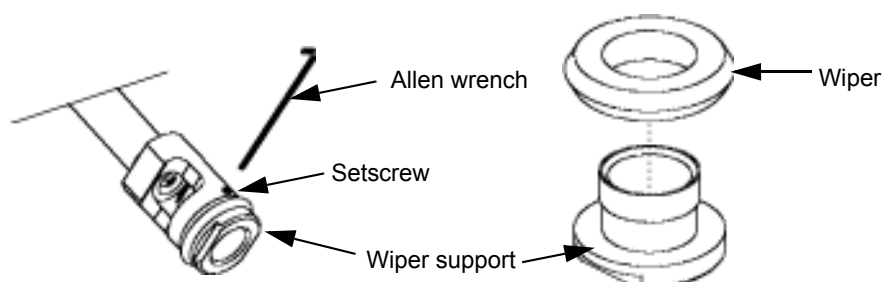


Unexpected operation of the unit may result in damage to the unit or an injury. Be sure to turn OFF the power when replacing any parts.

The wiper of the automatic cleaner is made of silicone rubber. As the wiper will gradually change its size if the number of cleaning times increases, replace it as necessary. Replace it about once a year for the automatic cleaner.

Replacing procedure

1. Stop the sample water and remove the automatic cleaner.
2. Loosen the setscrew securing the wiper support.
3. Turn the wiper support counterclockwise and replace the wiper.
4. Attach a new wiper, then turn the wiper support until it stops.
5. Lightly tighten the setscrew to prevent the wiper support from coming loose.



Note

- The deterioration of a wiper varies depending on the sampling water. Replace it as necessary.
- Do not tighten the setscrew too tightly.

■ Replacing the motor of the automatic cleaner



WARNING

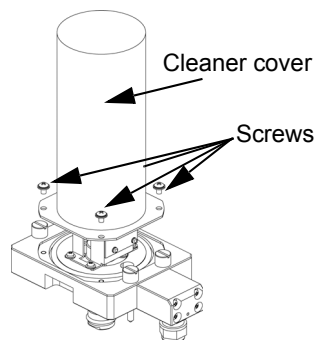


Unexpected operation of the unit may result in damage to the unit or an injury. Be sure to turn OFF the power when replacing any parts.

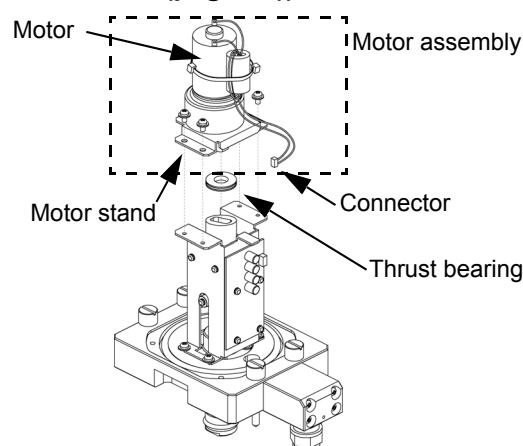
Replace the drive motor of the automatic cleaner about once every 3 years.

Replacing procedure

1. Loosen the 4 screws, and remove the cleaner cover.



2. Check the O-ring for deterioration (elasticity and cracking).
3. Remove the connector of the wiring of the motor. Do not strain the connector.
4. Loosen the 4 screws securing the motor platform, and remove the motor assembly.
5. Take out the set of thrust bearings (retain it for reuse).
6. Attach a new motor assembly in the reverse order.
7. Attach the connector of the motor.
8. Perform a test operation of the automatic cleaner to check the movement (refer to “Cleaning test motion screen ” (page 36)).



9. Check all the screws in each section for looseness.
10. Wipe off any dirt on the O-ring, place the cover on the O-ring, then tighten the screws.

Note

When screwing a stainless steel bolt into a resin female screw, turn the bolt with your fingers without using a tool. Screwing in the bolt using excessive torque will damage the screw.

Troubleshooting

Problems with measurement

Symptom	Possible cause	Remedial action
Fluctuation in measured value	Non-uniformity of sample water	<ul style="list-style-type: none"> ● Run zero water and check for variations. ● Pour in the turbidity standard solution, and check its difference from the sample water. ● Increase the numerical value of the damping factor, and check for variations.
	The sample water's particle size is large and it subsides easily	Stir the sample water.
	The average movement count is low	Change dF (moving average count) to a larger value.
Measured value is high	The sensor is clogged with debris	Remove any solids.
	The automatic cleaner wiper remains in the optical path	Contact HORIBA Advanced Techno.
	Condensation forms on the cell	Replace the desiccant.
Measured value is negative (during zero calibration)	Drift of instruments	Zero calibration can be performed with no problem with values around -0.05.
	The previous calibration was not performed properly	Perform zero calibration with clean water.
Measured value does not vary	Commands are in a hold state	Cancel the hold mode to set operation to the meas mode.
	The cell is empty	Supply the sample water.
Value of zero water is high during calibration	The detector is soiled	Remove any dirt from the detector.
	The detector is faulty	Contact us.
Abnormal operation	Substrate operation error	The blinking LED can be checked through the peephole.
	The light source is not lit	Contact us.
Measured value decreases after automatic zero calibration (option)	Zero calibration is performed with a high turbidity	<ul style="list-style-type: none"> ● Decrease the stability level or lengthen the stability time. ● Correct the value by manually performing zero calibration.
Automatic calibration error occurs	Zero water measurement cannot be stabilized due to contaminated piping, etc.	Specify a shorter stability time.
Power is not turned ON	The power supply voltage is outside the rated voltage range	Check the power supply voltage.
	Wiring error	Check the power distribution line.
	Internal error of the converter	Contact HORIBA Advanced Techno.

Measurements exceeding the measurement range

If the measured value of turbidity is higher than the maximum value of the display, which is determined by the position of the decimal point, the measured value will start blinking.

Take remedial action as instructed below.

Symptom	Possible cause	Remedial action
Blinking display (outside the measurement range)	Concentration of the sample water is high	If the measured value of zero water is normal, the measurement is outside the range. No remedial action is possible.
	Concentration of the sample water is low	<ul style="list-style-type: none"> ● For a measurement of water that is close to transparent, it is possible that a negative value is obtained. Perform zero calibration again. ● If you immerse it in the sample water of a high concentration and issue a negative value command, contact us.

Error codes

The converter has a function for displaying various error codes.

A blinking error code is displayed on the sub display area.

No more than two types of errors can be displayed. If multiple errors occur, the errors are displayed in the order of frequency.

■ Description of error codes

Error code	Description of error code	Remedial action
E-41	(Zero calibration error) Decrease in the amount of transmitted light	Clean the measuring cell and try zero calibration with clean water. If E-41 still occurs during normal zero calibration, contact us.
E-43	Automatic zero calibration error	This error remains activated until the next time zero calibration is performed properly or zero calibration is performed manually. The measured turbidity value is output by the previous calibration information and the transmission output is not held. If the criteria for stability of zero calibration are too strict, calibration may not be performed. Adjust to the optimum stability level and time.
E-80	(Sensor connection error) Detector and converter are disconnected	Check the wire connection between the detector and converter. The connection of the detector is always monitored. If connection is made under normal conditions, this error goes off "Sensor cable connection" (page 27).
E-81	(Sensor memory error) Loss of the contents of the detector's internal memory	Turn OFF the power supply and turn it ON again. If the sensor memory error does not go off even when the system is restarted, contact us.
E-82	(Sensor ADC error) Malfunction of the A/D converter inside the detector	Contact us.
E-85	(Cleaner connection error) Cleaner is disconnected	Check the wire connection between the sensor and cleaner, and correct it to a normal condition.
E-90	(System error) Converter internal communication error	Turn OFF the power supply and turn it ON again. If the system error does not go off even when the system is restarted, contact us.
E-91	(System error) Malfunction of the A/D converter	
E-92	(System error) Loss of the contents of the memory, such as setting values and calibration values	

Tip

If an error code is displayed, the HOLD display blinks and the transmission output will be held at the value specified in the setup menu.

Data

Specifications

■ Converter

Product name	Turbidity meter		
Model	HU-200TB-W Industrial-use turbidity converter		
Turbidity sensor type	SS-120-W Industrial-use turbidity detector		
Measurement range	Kaolin	0 to 1000 (degrees) (Display range: 0 to 1100 (degrees)) or 0 to 1000 (mg/L)	
	Formazin (NTU)	0 to 2000 (NTU) (Display range: 0 to 2200 (NTU))	
	PSL	0 to 100 (degrees) (Display range: 0 to 110 (degrees))	
Transmission output setting range	Kaolin	Arbitrary setting within the range from 0.00 to 10.00 (degrees), 0.0 to 100.0 (degrees), 0 to 2200 (degrees)	
	Formazin (NTU)		
	PSL		
Display resolution	<div>● 0.01 degrees (Degree range: 0 to 10 (degrees))</div> <div>● 0.1 degrees (Degree range: 0 to 100 (degrees))</div> <div>● 1 degrees (Degree range: 100 to 2200 (degrees))</div> Selectable between fixed range (decimal point) and automatic range changeover		
Performance	Repeatability	Within ±2% of the reading or ±0.2 degrees, whichever is larger (checked using the solid span bottle)	
	Linearity	The deviation at the mid-range point of the span calibration value is within ±2% of the span calibration value or ±0.04 degrees, whichever is larger	
	Accuracy	Within ±2% of reading	
Transmission output	Number of current outputs: 2		
	Output type	4 mA to 20 mA DC, input/output isolation type	
	Load resistance	900 Ω (max.)	
	Linearity	Within ±0.08 mA (limited to the current linearity)	
	Repeatability	Within ±0.02 mA (limited to the current repeatability)	
	Error output	Provided with burnout function (3.8 mA or 21 mA)	
	Hold function	Selectable between the latest value hold and the preset value hold	
Contact output	Number of output points: 6		
	Output type		No-voltage contact output
	R1, R2	Contact type	Relay contact, SPST (1a)
		Contact capacity	250 V AC 3 A, 30 V DC 3 A (resistance load)
		Contact function	Selectable from among the upper limit alarm, lower limit alarm, during transmission output hold, cleaning output and automatic calibration (closed at alarm operation, open under normal conditions and in a power-off state)
		Description of alarm	<div>● Setting range: Within turbidity measurement range</div> <div>● Delay time: 0 to 600 (s)</div>
	R3	Contact type	Relay contact, SPST (1a)
		Contact capacity	30 V DC 1 A (resistance load)

Contact output	R3	Contact function	Selectable from among the upper limit alarm, lower limit alarm, during transmission output hold, cleaning output and automatic calibration (closed at alarm operation, open under normal conditions and in a power-off state)	
		Description of alarm	<ul style="list-style-type: none">● Setting range: Within turbidity measurement range● Delay time: 0 to 600 (s)	
	FAIL	Contact type	Relay contact, SPDT (1c)	
		Contact capacity	250 V AC 3 A, 30 V DC 3 A (resistance load)	
		Contact function	Error alarm (closed under normal condition, open in an error or power-off state)	
		Description of alarm	<ul style="list-style-type: none">● Error alarms for values outside the measurement range, self-checks, and calibration errors can be set● Delay time: 0 to 600 (s)	
	RANG1, RANG2	Contact type	Relay contact, SPST (1a)	
		Contact capacity	30 V DC 1 A (resistance load)	
		Contact function	Status output of the transmission output range	
Control output for automatic zero calibration (ZERO OUT, SAMPLE OUT)	Number of output points		2	
	Output type		Voltage contact output (connection power supply voltage output)	
	Contact capacity		250 V AC 3 A/30 V DC 3 A (Resistance load)	
	Contact function		SAMPLE OUT: Electric ball valve control output ZERO OUT: Solenoid valve control output	
Contact input	Number of input points		4	
	Contact type		Open collector no-voltage “a” contact	
	Condition		ON resistance: 100 Ω max. Open-circuit voltage: 24 V DC Short-circuit current: 12 mA DC max.	
	Contact function	EXT1	Switchable between automatic zero calibration command and transmission hold	
		EXT2	Switchable between cleaning command and transmission hold	
		EXT3, EXT4	Selection command from four ranges using 2-bit contacts	
Communication function	Type	RS-485		
	Signal form	Two wire type, the power source of the communication is isolated from the power of measurement circuit (the power source of transmission and communication are not isolated).		
Calibration	Calibration method	Zero calibration	By filtered clean water	
		Automatic zero calibration	Zero calibration is performed automatically by switching to the filtered clean water (option)	
		Span calibration	Turbidity adjustment method by coefficient input	
	Compatible standard substances		Kaolin, Formazin (NTU), PSL	
Automatic zero calibration (option)	Zero calibration method	The electric valve of a sample line is closed, the electromagnetic valve of a zero line is opened, measured value is automatically judged to be zero within a time, and zero calibration is carried out.		
	Setting	Calibration cycle	1 to 999 (h)	
		Stability time	1 to 60 (s)	
		Stability level	0.01 degrees/NTU to 0.05 degrees/NTU	
		Hold time	60 s to 600 s	
Cleaning function (option)	Cleaning method		Electric wiper type (executes cleaning operation by communicating with the converter)	

Cleaning function (option)	Setting	Cleaning cycle	0.1 to 168.0 (h)		
		Cleaning time	30 to 600 (s)		
		Hold time	60 to 600 (s)		
	Timer accuracy		Difference within 2 min per month		
Self-check	Sensor check error		Sensor error		
	Converter error		CPU abnormality, ADC abnormality, memory abnormality		
Operating temperature range			−20°C to 55°C (no freezing)		
Operating humidity range			Relative humidity: 5% to 90% (no condensation)		
Storage temperature	−25°C to 65°C				
Power supply	Power-supply voltage range		90 V to 264 V AC, 50 Hz/60 Hz		
	Power consumption		35 VA (max.) when an automatic cleaner is connected.		
	Others		With built-in power switch for maintenance		
Applicable standard	CE Marking	EMC Directive: EN61326-1 Low Voltage Directive: EN61010-1 RoHS Directive: EN50581			
		EMC	Immunity: Industrial electromagnetic environment	Electrostatic discharge	IEC61000-4-2
				Electromagnetic radiation radio frequency field	IEC61000-4-3
				Electric fast transient/burst	IEC61000-4-4
				Surge	IEC61000-4-5*
				Conduction obstruction induced by radio frequency	IEC61000-4-6
				Voltage dip, short time blackout, voltage variation	IEC61000-4-11
			Emission: Class A	Radiation obstruction	CISPR 11 Class A
		Noise terminal voltage	CISPR 11 Class A		
	Low voltage		Pollution degree2		
	FCC rules		Part 15 Class A		
Structure	Installation		Outdoor installation type		
	Installation method		50 A pole-mounted or wall-mounted		
	Protection class		IP65		
	Material of case		Aluminum alloy (coated with epoxy-modified melamine resin)		
	Material of mounting brackets		SUS304		
	Material of hood		SUS304 (coated with epoxy-modified melamine resin)		
	Material of display window		Polycarbonate		
	Display element		Reflective monochrome LCD		
External dimensions	180 mm (W) × 155 mm (H) × 115 mm (D) (excluding brackets)				
Mass	Mainframe: approx. 3.5 kg (excluding brackets), hood, bracket: approx. 1 kg				

*: The surge test specified in the EMC Directive for CE Marking shall not apply to the case when a sensor cable, transmission cable, or contact input cable is extended for 30 m or longer.

Note

Although an arrestor (400 V discharge starting voltage) is mounted for the output signal, contact input, and communication, install an optimum surge absorber element on the connection line, depending on the surrounding environment, device installation conditions, and external connection devices.

Detector

Product name	Turbidity detector
Model	SS-120-W
Measurement principle	90-degree transmission-scattering method
Light source	Near-infrared LED, 860 nm
Detector	Silicon photo diode
Detection window	Inside diameter: $\phi 30$ mm, hard glass tube
Data transfer	RS-485 (communication with converter)
Sample water temperature	0 °C to 45 °C (no freezing)
Sample water pressure	0 MPa to 0.3 MPa
Material of liquid contact section	PVC, SUS316, FKM, silicon, hard glass, EPDM
Cable length	Standard accessory cable: 5 m
Installation	Screwing bore size: Rc3/4
Power supply	12 V DC supplied from HU-200TB-W converter
External dimensions	131 mm (W) \times 450 mm (H) \times 224 mm (D) (excluding cable)
Mass	Approx. 3.5 kg (excluding cable)

■ Option

● Cleaner

Product name	Automatic cleaner
Model	SS-AW
Cleaning method	Electric wiper
Power supply	12 V DC, 4 W supplied from HU-200TB-W converter
Cleaning operation	Piston operation is repeated during the cleaning time. The automatic cleaner waits at the uppermost point when the cleaning time has elapsed.
Cleaning command	Cleaning is performed according to the commands sent from the converter via communication.
Mass	Approx. 2.5 kg

Note

Each cleaning time varies depending on the pressure of the sample water. The cleaning time is approximately 30 seconds under open-air conditions on the outlet side while no pressure is applied to the sample water.

● Built-in stand for automatic zero calibration

Product name	Built-in stand for automatic zero calibration		
Sample water condition	Temperature	0 °C to 45 °C (no freezing)	
	Pressure	0.02 MPa to 0.3 MPa	
Zero water condition	Temperature	0 °C to 45 °C (no freezing)	
	Pressure	Zero filter	Provided: 0.1 MPa to 0.75 MPa
			Not provided: 0.02 MPa to 0.75 MPa
Overflow tank	Provided	Overflow tank is provided for the sample water line for removing air bubbles	
		Material of liquid contact section	PVC
	Not provided	In-line measurement is performed for the sample water without removing air bubbles	
Zero calibration unit	Automatic	Sample water, zero water	Automatically switch sample water and zero water and supply it to a detector
		Material of liquid contact section	SCS14, SUS316, FKM, PTFE, SUS303, SUS304, NBR, SCS13, AS, PP, NBR
		Power supply*	100 V AC $\pm 0^{\circ}\text{C}$ 50/60 Hz
	Manual	Sample water, zero water	Manually switch sample water and zero water and supply it to a detector
		Material of liquid contact section	PVC, EPDM, PPF, AS, PP, NBR
	Not attached	Save zero water in a detector cell and calibration.	

*: The actuator power supply of the zero calibration unit for 100 V AC specifications, power supply source to this product is only 100 V AC.

Parts list

■ Consumables

Product name	Part name	Specification	Part number
Span solution	SS-KA5	Kaolin 5 degrees 500 mL	3200317293
	SS-KA50	Kaolin 50 degrees 500 mL	3200317292
	SS-KA200	Kaolin 200 degrees 500 mL	3200317291
Span stock solution	SS-NTU	Formazin 4000 NTU 500 mL	3200315315
	SS-MG	Kaolin 10000 mg/L 500 mL	3200302555
	SS-D	PSL 100 degrees 100 mL	3200317715
Span bottle	SS-SP	Liquid span bottle	3200311442
Replacement part	Zero filter	Sterapore-K, for replacement	3200317006
	Wiper	Wipers for cleaner and automatic cleaner	3200317007
	Motor assembly	Motors for cleaner and automatic cleaner	3200316992
	Desiccant	Desiccant for detector, for replacement	3200317008

Note

Use up span solution and span stock solution after opening a letter early.

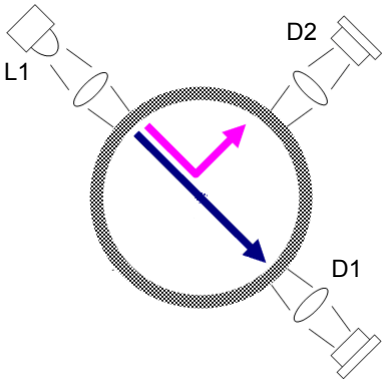
There is possibility of the solidification in turbidity solution diluted by pure water, adjust it at the time of use.

Measurement principle

Two detectors are used to detect the transmitted light and scattered light by using the blinking LED light source. While light source L1 is blinking, detector D1 detects the transmitted light and D2 detects the scattered light. The influence of the ambient light is eliminated by causing the light sources to blink and by obtaining the difference between a turn-on signal and turn-off signal.

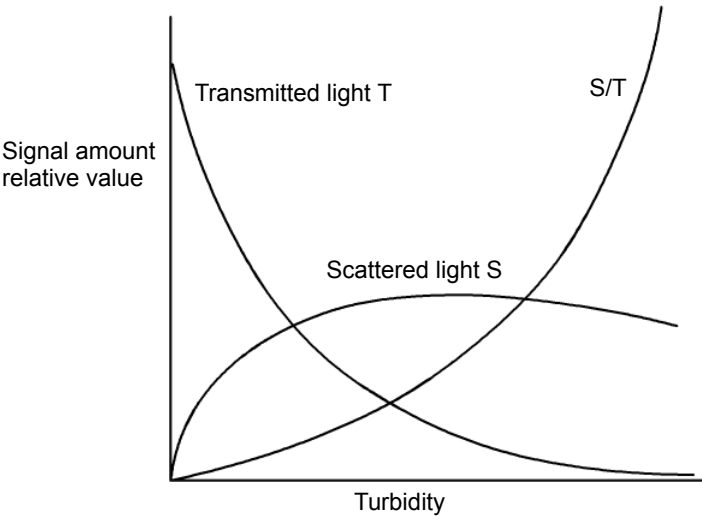
Obtained signals are defined as follows:

Signal	Type	Light source	Detector
T	Transmitted light	L1	D1
S	Scattered light	L1	D2



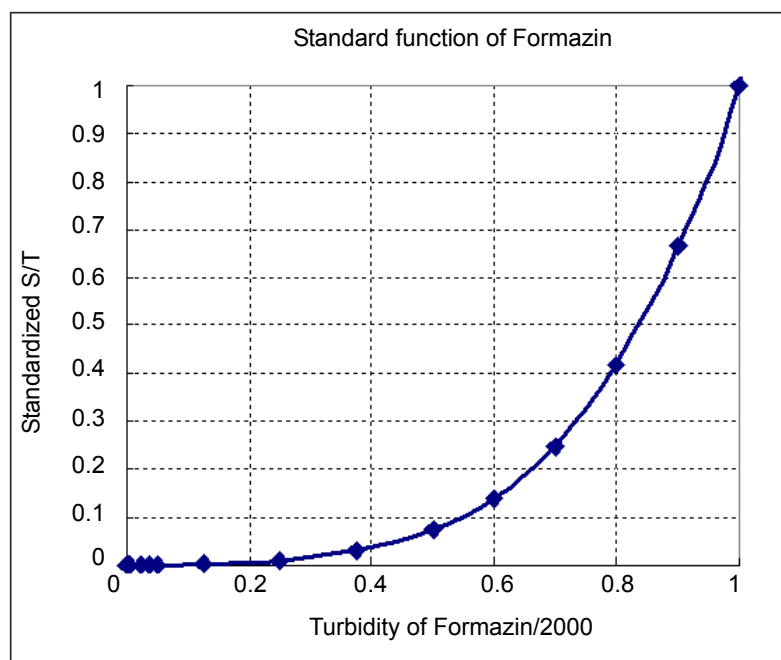
S/T is calculated according to the obtained signal.

This S/T has the effect of eliminating the damping of light caused by variations in the light sources, variations in the detectors, and local contamination.

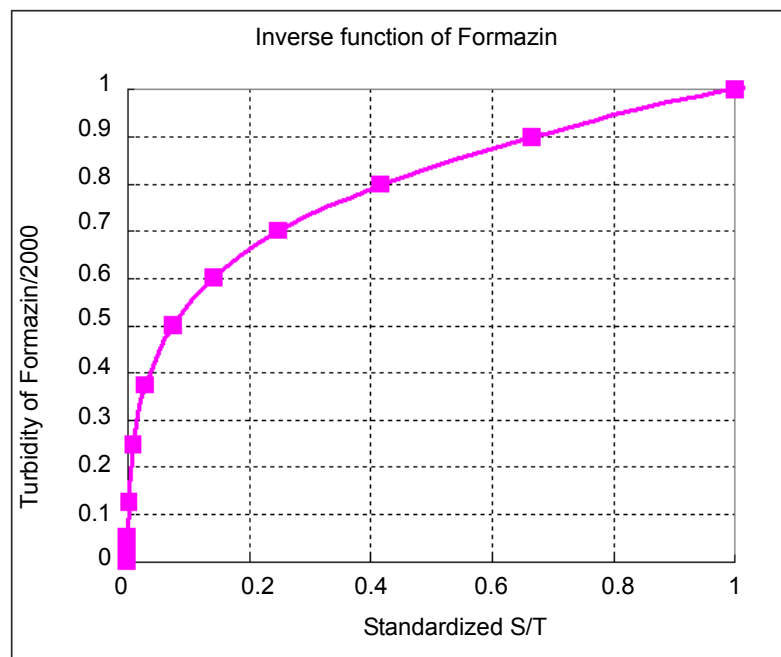


The S/T obtained during zero water measurement is stored as S_0/T_0 .

“ $S/T - S_0/T_0$ ” is a relative value. It is multiplied by the coefficient α and is span-calibrated to obtain a standard function value corresponding to the value of the turbidity.



Next, turbidity is obtained by using an expression (inverse function) that converts the value from α^* ($S/T - S_0/T_0$) to a turbidity.



Stability time and level for automatic zero calibration

When calibrating the zero point of turbidity, it is necessary to determine the zero point at the lowest value of turbidity, while supplying water for which fine particles have been removed to the extreme through the sensor. Even when the inside of the cell is adequately cleaned and zero water is replaced frequently, there is still the influence of contamination and bubbles when the sensor is filled with zero water. As the best way to perform calibration, first clean the cell and piping adequately, then check that the measured value has decreased by gently supplying water, which has been filtered through an ultra filter, to the cell. Then, perform zero calibration when the measured value has reached the lowest value. At this point, in order to prevent air bubbles from forming, adjust the flow rate by closing the valve on the outlet side, instead of adjusting it on the inlet side of the sample water.

Although it is not difficult for us to determine the zero point, it is not possible for computers to make the same judgment as we do. The following describes the judgment method for zero calibration programmed in this equipment. Read through the description and specify the optimum parameters in accordance with the on-site conditions.

■ Parameters for judgment of zero calibration

- Stability level: A value used for comparison with the difference between the instantaneous value of turbidity and average value (resolution: 0.01)
- Stability time: Stability level duration time for which the zero calibration conditions are met

■ Software concept for automatic zero calibration

When the system enters the automatic zero calibration mode, the valve is switched and zero water is supplied through the sensor. When the time allowed for the water line switching has elapsed, the instantaneous value of turbidity and moving average value are calculated, and the difference between these values is obtained. If the difference is continuously below the value specified for the stability level during the stability time, zero calibration is performed at this point. If the difference between the instantaneous value and average value exceeds the stability level, the stability time will be reset.

If the zero calibration conditions are not met within 20 minutes, which is the maximum time for automatic calibration, an E-43 error will be output. Even when this error occurs, the measurement continues from the latest calibration operation.

Parameter	Tendency
Increasing the stability level	Less strict criteria are set and zero calibration is performed with a high turbidity.
Shortening the stability time	
Decreasing the stability level	Stricter criteria are set and zero calibration may not be performed within the time.
Lengthening the stability time	

Preparation method of calibration solution

■ Formazin 4000 NTU

● Items to be prepared

- Reagent: Sulfuric acid hydrazine CAS 10034-93-2, Molecular formula $\text{H}_6\text{N}_2\text{O}_4\text{S}$ (N_2H_4 H_2SO_4)
- Reagent: Hexamethylenetetramine, CAS100-97-0 Molecular formula: $\text{C}_6\text{H}_{12}\text{N}_4$
- Balance: One that can measure 100 g with an accuracy of 0.01 g
- 500 mL beaker
- 1000 mL measuring flask
- Magnetic stirrer
- Deionized water: Highly filtered ion-exchanged water

● Preparation procedure

1. Put 5.00 g of sulfuric acid hydrazine in the 500 mL beaker, then add 400 mL of deionized water and dissolve them.
This will be solution A.
2. Put 50.00 g of hexamethylenetetramine in the 500 mL beaker, then add 400 mL of deionized water and dissolve them.
This will be solution B.
3. Pour solutions A and B into the 1000 mL measuring flask, and add deionized water until the total quantity reaches 1000 mL.
4. After stirring the solution using the stirrer for about 15 minutes, stop stirring and leave the solution at $25\pm 3^\circ\text{C}$ for 24 hours. The solution may be transferred and left in another glass vessel.
5. After 24 hours, if the settling of Formazin fills about 80 percent of the vessel, the solution is prepared.

The turbidity obtained when this solution is stirred is Formazin 4000 degrees (NTU).

The stock solution of Formazin remains stable at 4000 degrees. It can be used at room temperature for 6 months. However, if it is diluted with deionized water once, the ingredients of the solution change. As a result, the Formazin clumps together and the value of the turbidity meter is not stabilized. Therefore, when Formazin is diluted for span calibration, dilute it each time you perform calibration.

— Tip —

When Formazin is diluted with the liquid filtered from the supernatant of Formazin of 4000 degrees, the turbidity of the diluted Formazin can be stabilized.

However, as 4% to 5% of hexamethylenetetramine remains in the Formazin solution, the refractive index is different in the deionized water and supernatant liquid. Precisely, the value of the turbidity varies because there are differences in the direction of the transmitted light and amount of scattered light. Use deionized water to dilute a low-turbidity span solution of Formazin of 5 degrees or lower.

■ Kaolin standard solution

— Tip —

Immediately after Kaolin is dissolved with water, the Kaolin particles contain air and the dispersion status is imperfect, and therefore, turbidity is not stable. For this reason, prepare a highly concentrated solution in advance, and leave it in water to help assimilation.

● Items to be prepared

- Reagent: Kaolin
- Balance: One that can measure 100 g with an accuracy of 0.01 g
- 500 mL beaker
- 1000 mL measuring flask
- Magnetic stirrer
- Deionized water: Highly filtered ion-exchanged water

● Preparation procedure

1. Add deionized water to 10 g of Kaolin to make 1 L in total and prepare 10000 mg/L of Kaolin solution (Kaolin of 10000 degrees)

This will be solution A.

2. Leave solution A for at least a day.

— Tip —

It is recommended that you add 1 g of dispersant, sodium pyrophosphate, to solution A. Due to the effect of the dispersant, the Kaolin powder is dispersed to form a solution that is less likely to settle.

● Span solution

After collecting 10 mL of well-mixed solution A, add deionized water to make 1 L in total to prepare 100 mg/L (100 degrees) of span solution.

Or, after collecting 1 mL of solution A, add deionized water to make 1 L in total to prepare 10 mg/L (10 degrees) of span solution.

According to this procedure, adjust the span solution to an arbitrary turbidity (concentration) by diluting solution A.

● About dispersant

When 0.1% of dispersant is added to a highly concentrated Kaolin standard solution (10000 mg/L or more), it becomes easier to handle Kaolin standard solutions. However, the turbidity properties may change due to the effect of the dispersant. When dispersant is added to Kaolin, the Kaolin particles are finely dispersed. Due to this, the particles increase from the Mie scattering region to the Rayleigh scattering region, and the scattered light decreases. As a result, the turbidity might change to a slightly lower level. However, when a highly concentrated Kaolin solution is handled without adding dispersant, it settles quickly, and therefore it is difficult to perform the fixed quantity procedure. In this respect, the addition of dispersant is effective.

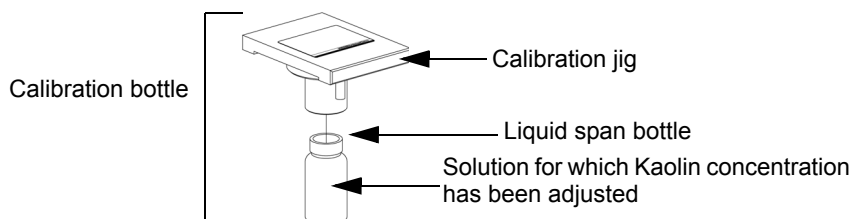
Option

■ Liquid span bottle

Use the Liquid span bottle as a secondary reference for span measurement. The span can be measured by inserting a Liquid span bottle into a cell that is filled with zero water, without preparing a span solution. Although the turbidity of the span solution is already known, the turbidity of a Liquid span bottle is not known. Use the value obtained by measuring the Liquid span bottle using the turbidity meter calibrated with the span solution as the reference value during calibration from the next time. Write down the reference value on a label. Tested values may be included with the equipment at the time of shipment from the manufacturer. When the turbidity meter is calibrated with the standard solution used by the customer, it becomes necessary to update the value for the Liquid span bottle.

The contents of the Liquid span bottle are water solutions of refined Kaolin, which contain a trace amount of dispersant. Immediately before inserting the Liquid span bottle into the detector, shake it adequately until all deposits disappear. While the Kaolin is flowing, turbidity varies. Once it stops flowing, a constant turbidity is indicated for several minutes. Wait for 1 minute until turbidity is stabilized after insertion. After that, calibrate the detector for span sensitivity to the reference value within about 6 minutes.

The Liquid span bottle cannot be used in air. Be sure to insert it into the cell filled with zero water.



● Turbidity of calibration bottle

Dilute 10000 mg/L of Kaolin standard solution with deionized water, then put the solution into the calibration bottle. Adjust the concentration of Kaolin to a turbidity of about 50% to 80% of the range, according to the relevant range. Leave about 5% air space at the top of the bottle so that it can be agitated. When Kaolin of the same turbidity is put in a bottle, the turbidity value slightly decreases as compared with the value when it is poured into the cell. At this point, be sure to adjust the turbidity to over 5 degrees. If the turbidity is lower than this level, the turbidity value will not be stabilized due to Kaolin adhering to the vessel. In this case, use a bottle filled with a solid turbidity, instead of water solution.

If Formazin and Polystyrene Latex are used as reference substances for turbidity, span calibration can be performed by putting Kaolin into a bottle. In this case, describe the measured value obtained from the Formazin or Polyethylene Latex calibration curves. Do not put diluted Formazin in a bottle because turbidity changes.

● Liquid span bottle insertion procedure

1. Before inserting a Liquid span bottle into the cell, remove any dirt from the Liquid span bottle.
2. Insert the Liquid span bottle into the cell, which has already been filled with zero calibration water beforehand.
Turbidity is unstable in air and the value changes.
3. Insert and remove the bottle several times so that air bubbles do not adhere to the bottle. Push the bottle into the cell in the direction determined by the pin, until the calibration jig hits the top surface of the detector.

■ Turbidity sampling system

Sampling system assembled with all the pipes necessary for turbidity measurement is available as an option.

The following units can be installed for the piping assembly in addition to the manual valve for use in operation.

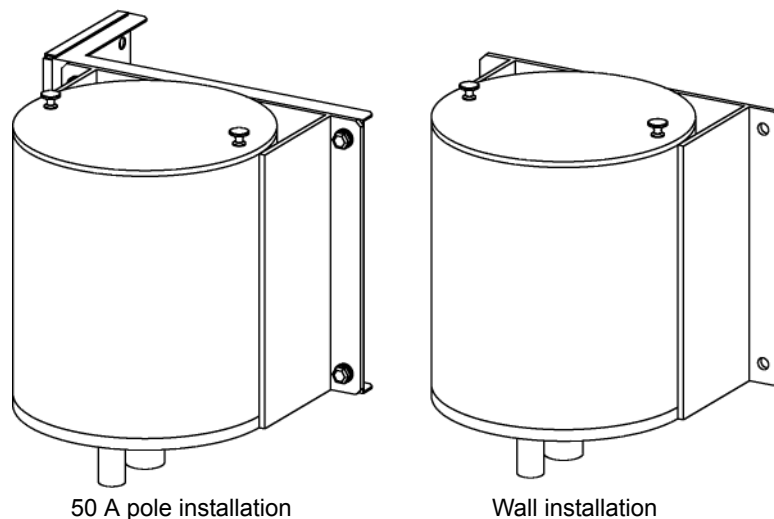
- Overflow tank
- Filter (for zero calibration)
- Piping kit

● Overflow tank

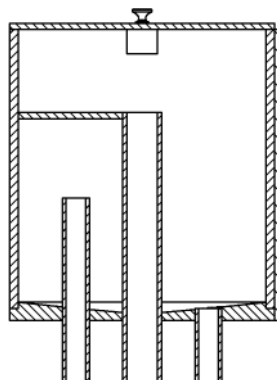
The utilization of an overflow tank will produce the effect described below.

- The flow rate in a sampling pump can be increased to cut down on the amount of dirt in the piping.
- For a sample containing air bubbles, decreasing the flow rate will help to eliminate air bubbles.
- Pressure will not be applied to the detector.

● Diagram of installation



● Cross Section of overflow tank

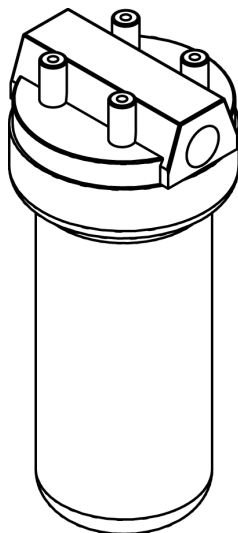


● Filter (for zero calibration)

Precise zero calibration is necessary for the measurement of a low turbidity water, such as tap water or swimming pool water.

The best way to keep errors to a minimum is to perform zero calibration while passing filtered clean water through the unit.

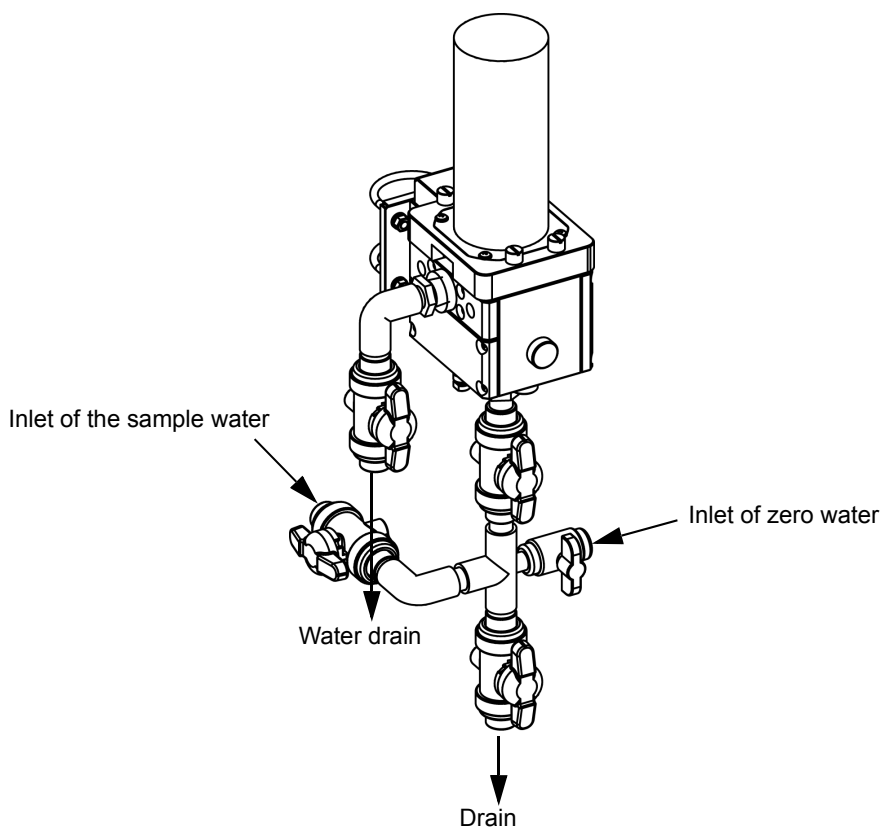
As for the type of filters, a precise filter or an ultra filter is suitable for use.



● Piping kit

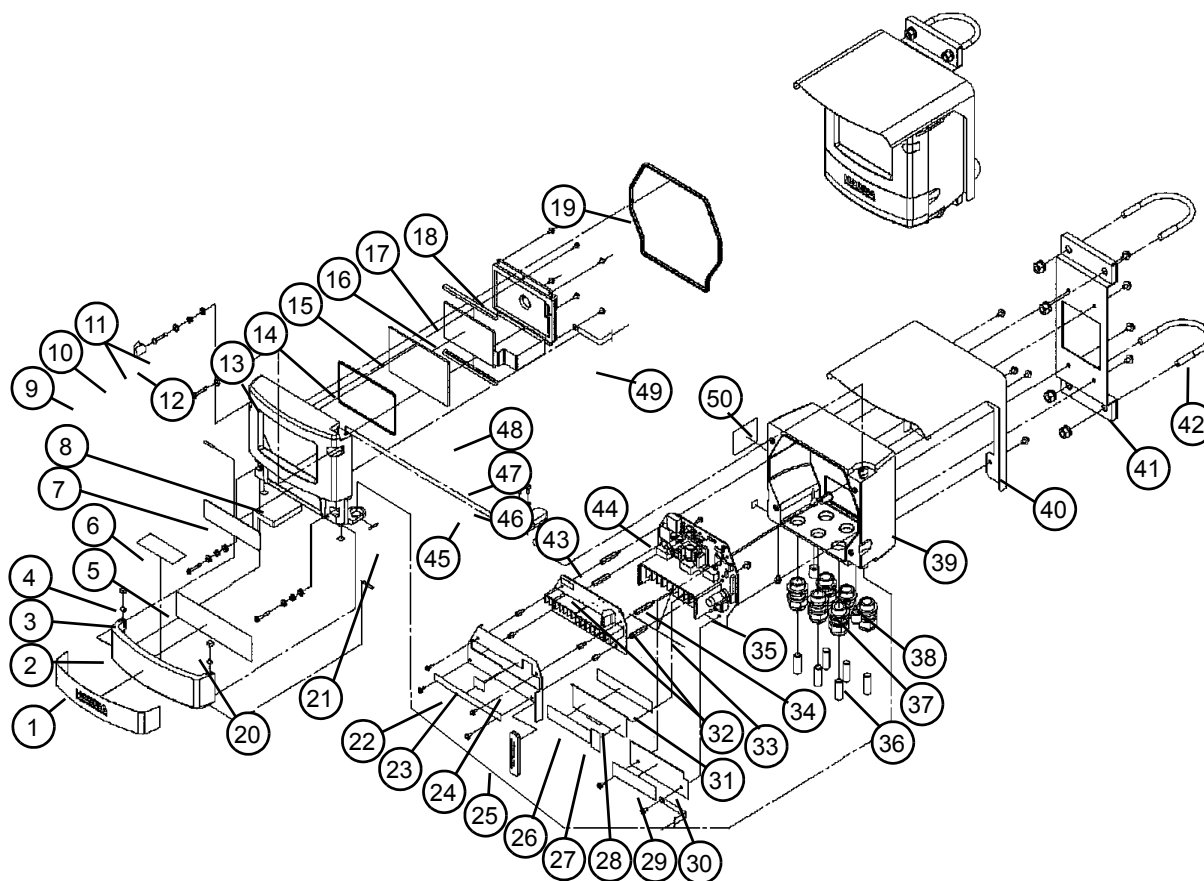
The following is a finished drawing of the piping kit used as a reference. Assemble the piping on site.

Adjust the direction of the piping according to the on-site conditions.



Disposing of the instrument



Dispose of this product in accordance with local laws, ordinances and regulations.
Parts of this product are made of the following materials.



No.	Name	Material	No.	Name	Material
1	Nameplate	PVC	26	Warning plate	PET
2	Front cover	ADC12	27	Switch ID plate	PET
3	Press-fit plunger	POM, SUS631	28	Terminal cover L	PC
4	Plunger packing L	Q	29	Warning plate	PE
5	Operation information plate	PET	30	Circuit board cover 4	PC
6	Warning plate	PET	31	Lower terminal ID plate	PET
7	Key sheet	PET	32	Spacer	C3604BD
8	Protective sheet	PVC	33	Terminal ID plate TT	PET
9	Screw cap	Q	34	Spacer	C3604BD
10	Screw	SUS304	35	Printed circuit board (H4W-MTH-0x)	Printed circuit board
11	Spring cap	SUS304	36	Sealing pin	PVC
12	Compression spring	SUS304WPB	37	Cable gland	66 nylon, EPDM
13	Top case	ADC12	38	Plug	SUS304
14	Window plate packing	Q	39	Bottom case	ADC12
15	Transparent panel	PET	40	Roof	SUS304
16	LCD	Glass	41	Ball bracket	SUS304
17	LCD packing	Q	42	U-bolt	SUS304

No.	Name	Material	No.	Name	Material
18	LCD holder	ADC12	43	Spacer	C3604BD
19	Case packing	Q	44	Printed circuit board (H4W-ANL-0x)	Printed circuit board
20	Plunger packing R	Q	45	PTFE plate	PTFE
21	Parallel pin	SUS304	46	Protective sheet U	PVC
22	Terminal nameplate	PET	47	Upper hinge	ADC12
23	Terminal block information plate	PET	48	Screw cap 2	Q
24	Terminal cover 4U	PC	49	FG mesh	Copper wire
25	Cable clamp	Q	50	Rating plate	PET

● Disposing of the printed boards after classifying their parts

 WARNING	
	Electric shock hazard Be sure to check that no electric power is supplied before starting the procedure.

When it is required to classify the parts of the printed boards before disposing of them, disassemble them referring to the figure shown below.

● Tool

Phillips screwdriver

How to disassemble

1. Check that the power is OFF.
2. Remove all the wires on the terminal block that are connected to printed circuit boards 35 and 44.
3. Remove the four screws used to secure terminal cover 24.
4. Remove spacer 43 in four places.
Printed circuit board 44 is exposed in the assembled state.
5. Remove the one flat cable connected to the connector on printed circuit board 44.
6. Remove spacer 32 in four places.
7. Remove the two screws used to secure terminal cover 4.
Printed circuit board 35 is exposed in the assembled state.
8. Remove the two flat cables connected to the connectors.

Display of turbidity meter

Display	Description	Display	Description
A.CAL	Auto zero calibration by manual zero entry	HoLd	Hold
Addr	Address	HoLd.t	Holding time
AL	Alarm	init	Initialize
And	And	Lcd	Liquid crystal display
Auto	Auto range	Lo	Low
A.rEt	Auto return	no	No
b.out	Burn out	non	Non
CAL.dAt	Calibration data	nor	Normal
CAL	Calibration menu	off	Off
CAL.E	Calibration error	on	On
1.CAL.t	Relay 1 calibration output type	OPt	Option
1.CLn.t	Relay 1 cleaning output type	or	Or
CLn	Clean	out.20	Output 20
CLn.t	Cleaning type	out.4	Output 4
CLr	Clear	PArA	Parameter
Cur1	Current 1	PtnA	Pattern A
Cur2	Current 2	Ptnb	Pattern B
Cur2.A	Current 2 A range	PSL	Polystyrene
Cur2.b	Current 2 b range	PrES	Preset
Cur2.c	Current 2 c range	rng.C	Range cut
Cur2.d	Current 2 d range	1.rng	Range of relay 1
Cur2.t	Current 2 type (Fixed or variable range)	2.rng	Range of relay 2
C.HoLd	Current hold	rng.S	Range span
C.rng	Current range	rng.0	Range zero
CyCLE	Cycle of cleaning	rLy	Relay
1.dt	Delay time of relay 1	r1	Relay 1
2.dt	Delay time of relay 2	r2	Relay 2
3.dt	Delay time of relay 3	rE	Reverse logic
dt	Delay time	rEt.t	Return time
diSP	Display	rEt.S	Hold cancellation time
d.rng	Display range	rS	RS485
dF	Damping factor	SenSor	Sensor
E.in1	External in 1	1.SET	Set value of relay 1
E.in2	External in 2	2.SET	Set value of relay 2
FAiL	Failure	SEt	Setting menu
F.CAL.E	Calibration error involved in failure	SiO	Silica
F.SC	Fail by self-check	SPAn	Span calibration
F.dt	Fail delay time	S.diSP	Sub-display
F.oF	Fail over full scale	StAb.L	Stability level
For	Formazin	StAb.t	Stability time
Hi	High	trg	Trigger to next
HorL	High or low	tyPE	Type

Display	Description	Display	Description
Unit	Unit	yES	Yes
USr	User check menu	0.CAL	Zero calibration

Quick reference (appendix)

Quick reference is a digest of the instruction manual.

Turbidity meter HU-200TB-W SS-120-W Operation procedure 1 (Daily operation)

Names of display panel

Indicator lamps

CAL Cal mode (CAL)

HOLD Hold mode (HOLD)

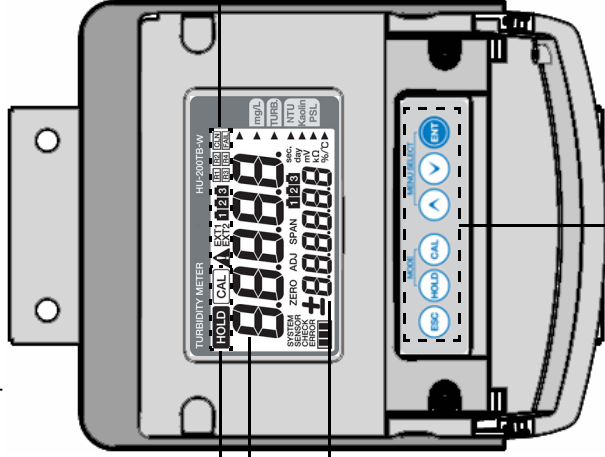
Status display lamps

EXT1 Turns ON while a contact signal (calibration command) is being input externally.

EXT2 Turns ON when contact input such as the cleaning signal is received.

CLN Turns ON when the cleaning output contact signal is output.

FAIL Turns ON when the FAIL contact signal is output.



Main display
Displays a measured value

Sub display
Displays a set value or error code.

Manual Zero Calibration

Hold down CAL in the measurement mode until the **HOLD** lamp lights up.



Zero Calibration mode is displayed. And then press ENT to start the Zero calibration.



The numerical value starts blinking. Press ENT again at the lowest value to complete the zero calibration.



Zero calibration is finished when "0.00" is displayed on the main display. Display is automatically returned to the zero calibration mode.



Hold down ESC to return to the measurement mode.

Hold down



Span Calibration

Note

Set the "Turbidity standard substance (type) selection" (page 39) before calibration.



Span calibration mode is displayed. Press ENT to start to the Span calibration.



Sub-display starts blinking. Adjust the coefficient so that the turbidity measured matches the turbidity of span solution.



Press ENT after setting the span coefficient.



Span calibration mode is displayed. Hold down ESC to return to the measurement mode.

Hold down



Used to go back to the previous menu from any other menu.
When various settings are made in the hold mode, pressing this key once will return you to the previous item.
The change that has been previously made to any setting is canceled.



Used to change the displayed item or value.
Pressing the key will increase/decrease the value by an increment/decrement of 1. Holding down the key will continuously increase/decrease the value.
The [▲] and [▼] keys are used to scroll up and down, respectively. If the screen is scrolled up or down excessively with either key, press the other key.



Used to establish each setting or calibrated value.

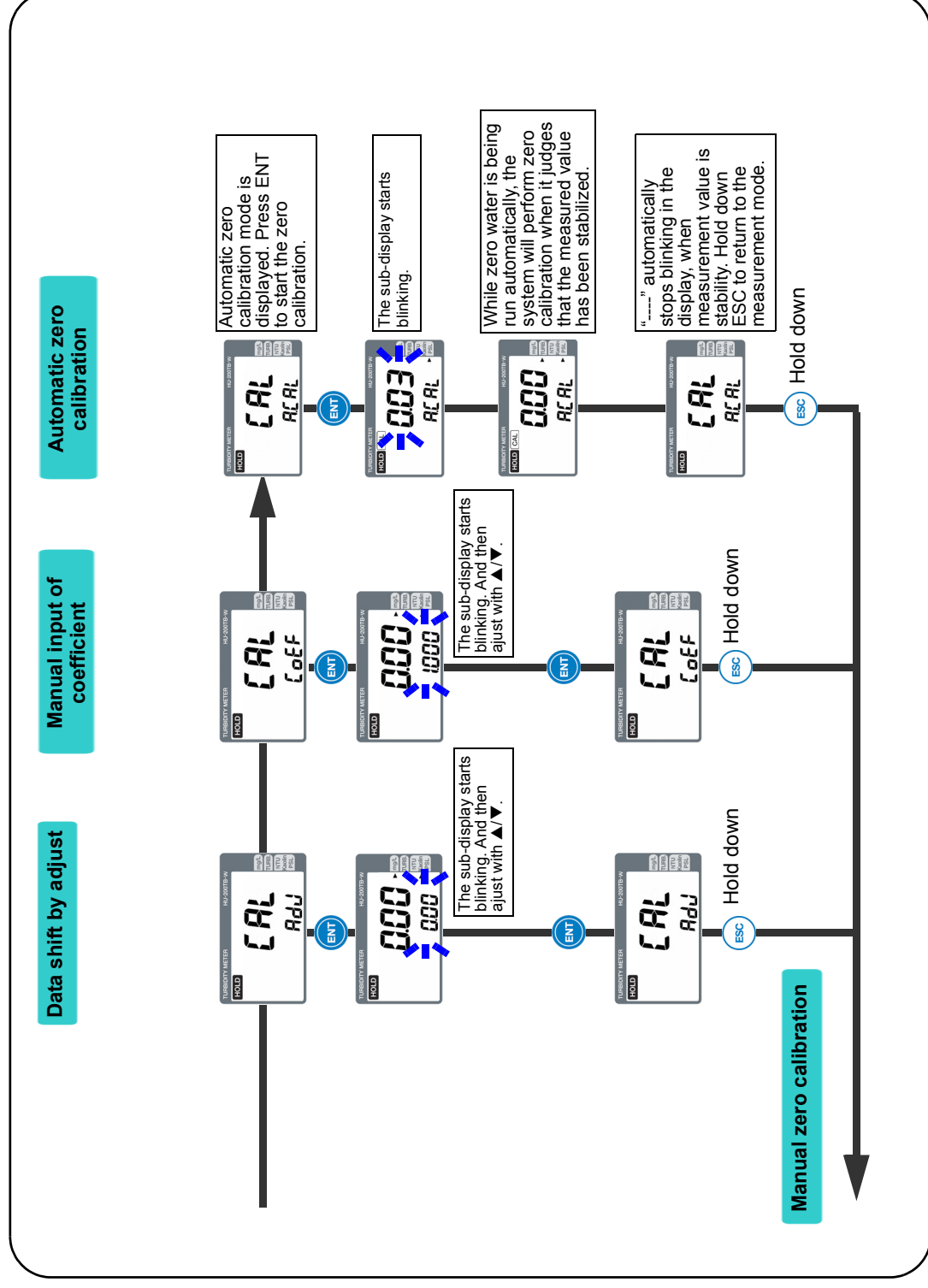


Holding down this key in the measurement mode will enter the hold mode.
Holding down this key in the hold mode will enter the measurement mode.



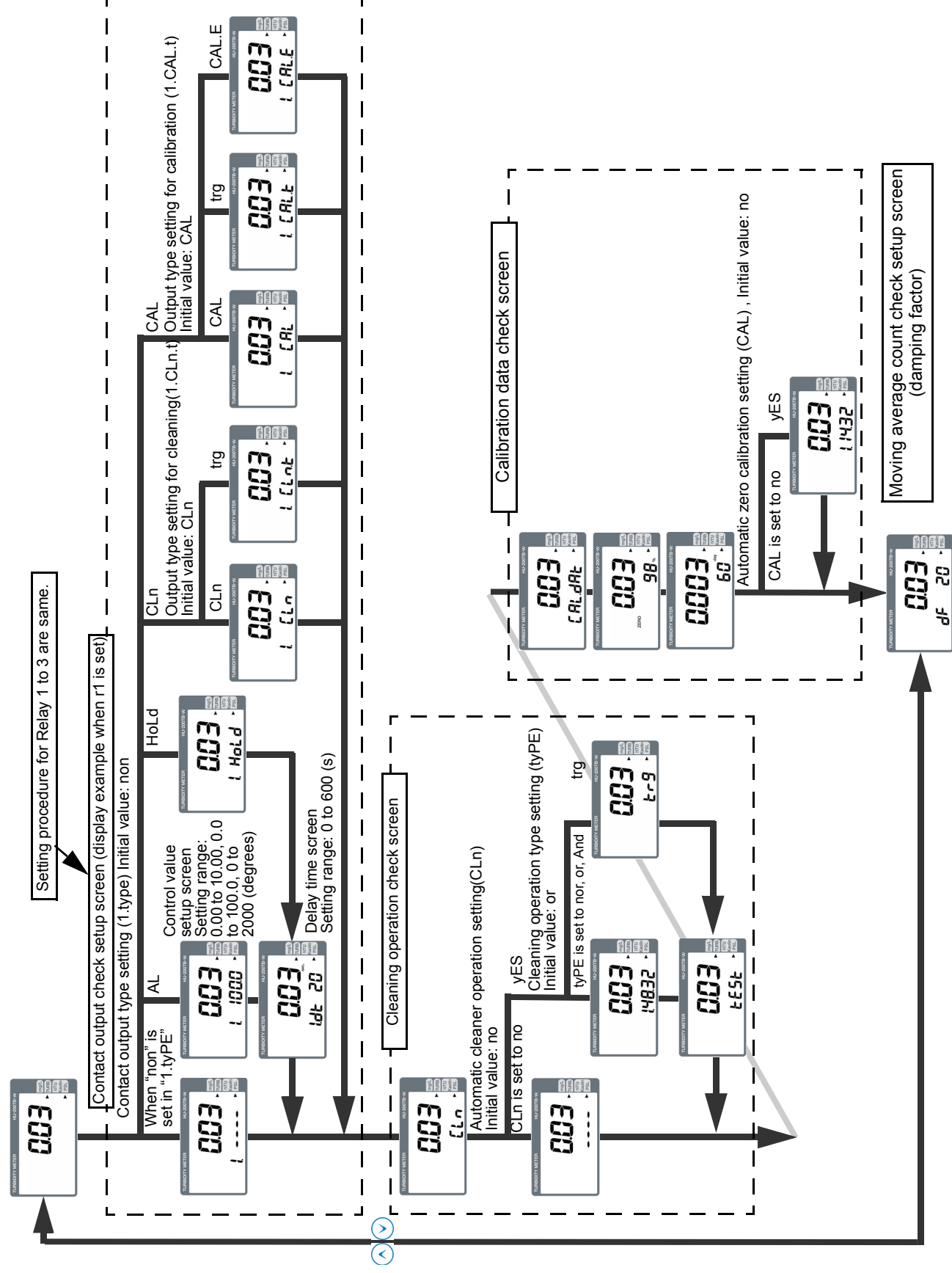
When this key is held down until the CAL indicator lights up, the span calibration mode becomes active.

Turbidity meter HU-200TB-W SS-120-W Operation procedure 2 (Daily operation)



Turbidity meter HU-200TB-W SS-120-W Operation procedure 3 (Daily operation)

Control value setup



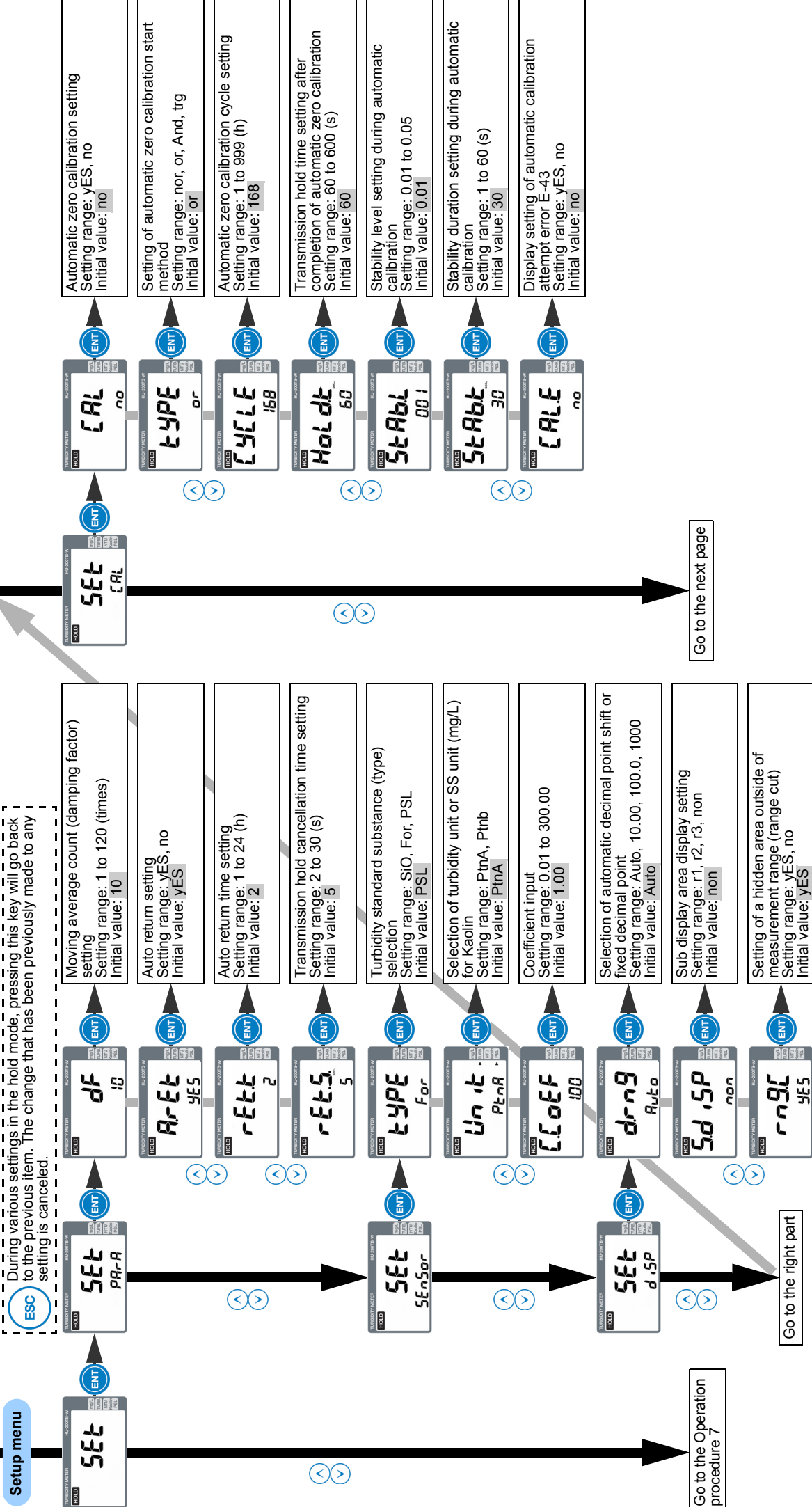
Turbidity meter HU-200TB-W SS-120-W Operation procedure 4^(Change the mode and settings)

How to operate the hold mode from the maintenance mode.

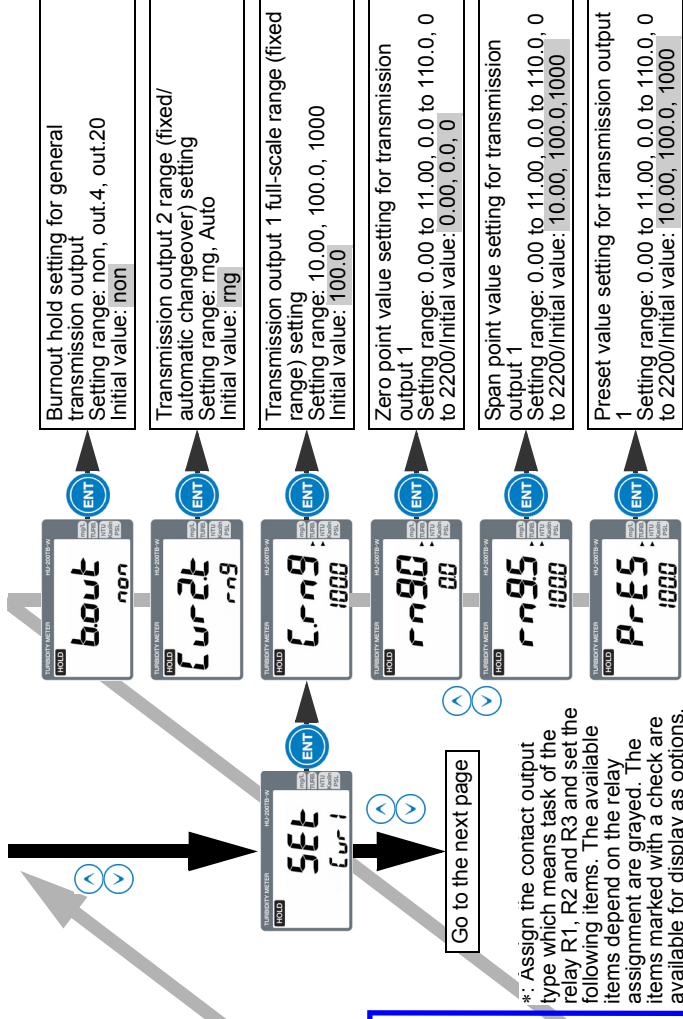
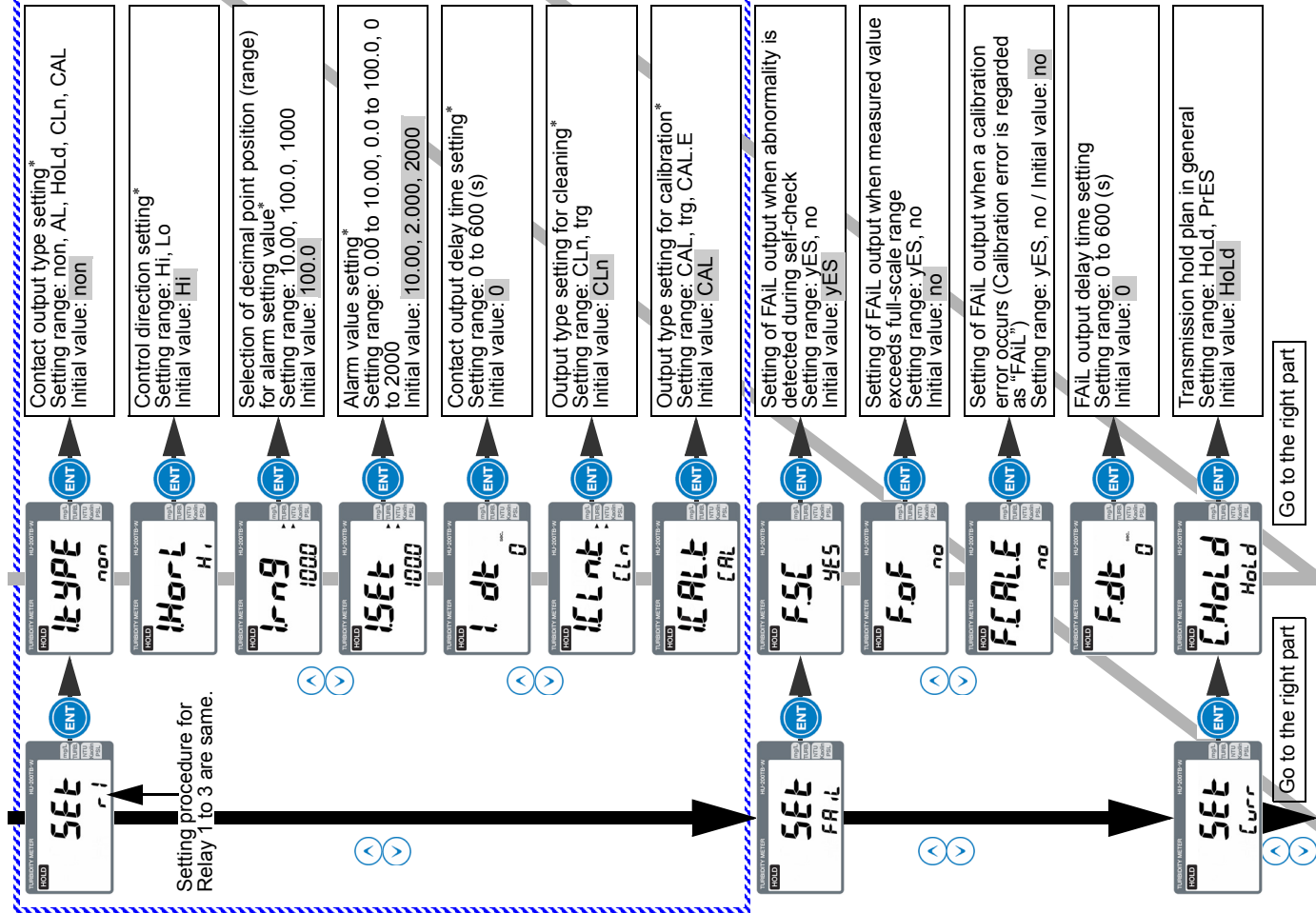
[HOLD] Hold down [HOLD] until the HOLD lamp lights up.
"SEt" will be displayed on the main display and measured stops.

[▲/▼] Use the arrow keys [▲/▼] to select the desired item

[ESC] During various settings in the hold mode, pressing this key will go back to the previous item. The change that has been previously made to any setting is canceled.



Turbidity meter HU-200TB-W SS-120-W Operation procedure 5^{Change the mode and settings}

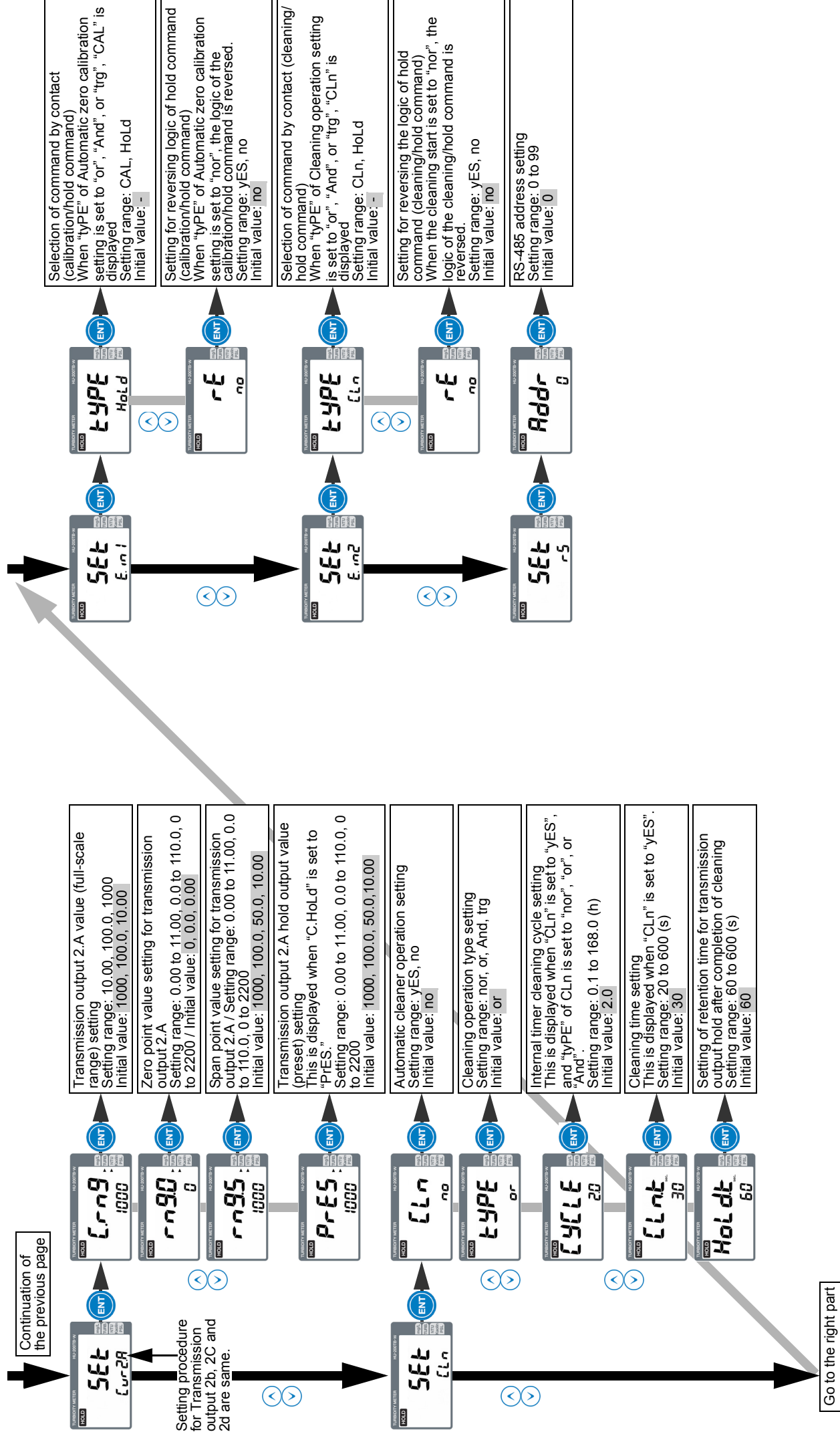


*: Assign the contact output type which means task of the relay R1, R2 and R3 and set the following items. The available items depend on the relay assignment are grayed. The items marked with a check are available for display as options.

This is displayed when "C.HoLd" is set to "PrES."

Options		Item		R3		R2		R1	
AL	HoLd	CLn	CAL	Contact output type setting	non	2tYPE	2HoL	itYPE	iHoL
✓	-	-	-	Control direction setting	-	2HoL H.i	2HoL H.i	itYPE non	iHoL H.i
✓	-	-	-	Selection of decimal point position (range) for alarm setting value	-	2-rng 1000	2-rng 1000	i-rng 1000	i-rng 1000
✓	-	-	-	Alarm value setting	-	2SEt 1000	2SEt 1000	iSEt 1000	iSEt 1000
✓	✓	-	-	Contact output delay time setting	-	2 dt 0	2 dt 0	i dt 0	i dt 0
-	-	✓	-	Output type setting for cleaning	-	2CLnL CLn	2CLnL CLn	iCLnL CLn	iCLnL CLn
-	-	-	✓	Output type setting for calibration	-	2CALt CAL	2CALt CAL	iCALt CAL	iCALt CAL

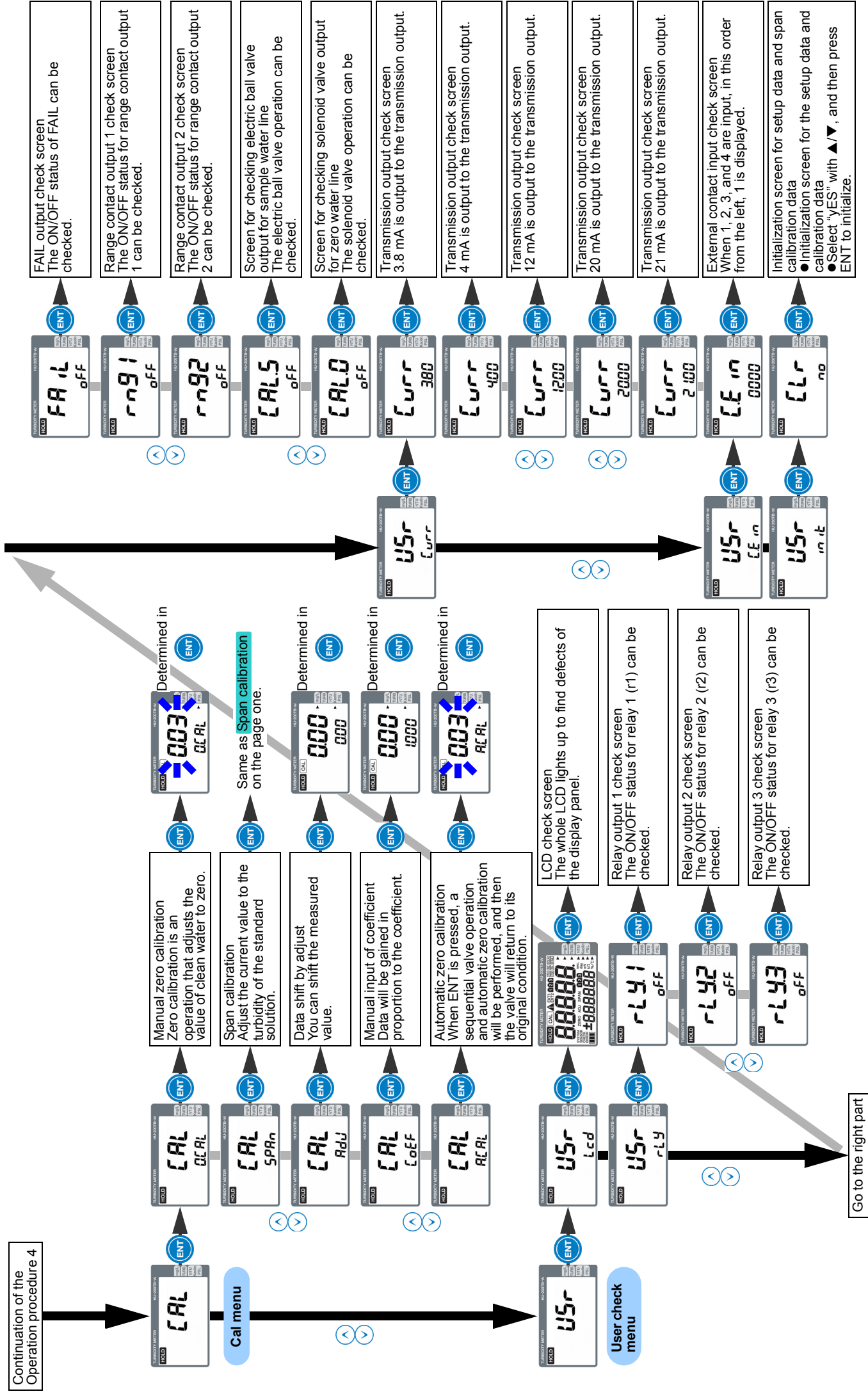
Turbidity meter HU-200TB-W SS-120-W Operation procedure 6^{Change the mode and settings}



Turbidity meter HU-200TB-W SS-120-W Operation procedure 7

Change the mode and settings)

Continuation of the
Operation procedure 4



Turbidity meter HU-200TB-W SS-120-W Operation procedure 8 (Error codes)

Error codes

● Description of error codes

Error code	Description of error code	Remedial action
E-41	(Zero calibration error) Decrease in the amount of transmitted light	Clean the measuring cell and try zero calibration with clean water. If E-41 still occurs during normal zero calibration, contact us.
E-43	Automatic zero calibration error	This error remains activated until the next time zero calibration is performed properly or zero calibration is performed manually. The measured turbidity value is output by the previous calibration information and the transmission output is not held. If the criteria for stability of zero calibration are too strict, calibration may not be performed. Adjust to the optimum stability level and time.
E-80	(Sensor connection error) Detector and converter are disconnected	Check the wire connection between the detector and converter. The connection of the detector is always monitored. If connection is made under normal conditions, this error goes off " Sensor cable connection " (page 27).
E-81	(Sensor memory error) Loss of the contents of the detector's internal memory	Turn OFF the power supply and turn it ON again. If the sensor memory error does not go off even when the system is restarted, contact us.
E-82	(Sensor ADC error) Malfunction of the A/D converter inside the detector	Contact us.
E-85	(Cleaner connection error) Cleaner is disconnected	Check the wire connection between the sensor and cleaner, and correct it to a normal condition.
E-90	(System error) Converter internal communication error	Turn OFF the power supply and turn it ON again. If the system error does not go off even when the system is restarted, contact us.
E-91	(System error) Malfunction of the A/D converter	
E-92	(System error) Loss of the contents of the memory, such as setting values and calibration values	

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