# H-1 Series Industrial Turbidity and Suspended Solids Analyzer (4-Wire System)
# HU-200TB-IM


## Overview

This product comprises a converter (HU-200TB-IM) and an immersion type detector (SS-150).
The SS-150 measures turbidity and suspended solids by detecting scattered light, transmitted light and reference light and calculating the signals of these.

Turbidity is measured using the transmission scattering method, in which calculations are made using transmitted light and scattered light. Either kaolin solution or formazin solution can be selected for sensitivity calibrations. When calibrating with formazin, NTU is selected as the turbidity unit.

Suspended solids can be measured using either the transmission scattering method or the transmission method (in which calculations are made using transmitted light and reference light). mg/L is selected as the suspended solids unit.

Absorbance correlates strongly with the concentration of suspended solids, meaning that turbidity can be calculated from the absorbance. Absorbance can also be used for control, straight line conversion and recording. If the correlation between absorbance and the concentration of suspended solids in wastewater (determined by manual analysis) is known, the absorbance can be converted to a concentration value using a three-dimensional function.

This device is equipped with two transfer outputs (DC 4 - 20 mA).
Up to four transfer ranges can be set for these transfer outputs, and the optimum range can either be set by a command created by two external contact points or be set automatically by this device's automatic range switching function.

This device is equipped with three contact point outputs.
Output content such as upper and lower limit alarms, "Error", "Cleaning" or "Hold" can be allocated to each contact point, and a delay time can be set for each contact point output.

The detector is equipped with an automatic cleaning device.
The interior surface of the sensor head is cleaned automatically by wipers at set intervals or by external command.

An optional chain unit for hanging, wire and spindle immersion guide and jet cleaning pipe unit are also available.

## Measurement target

Turbidity and suspended solids in solution

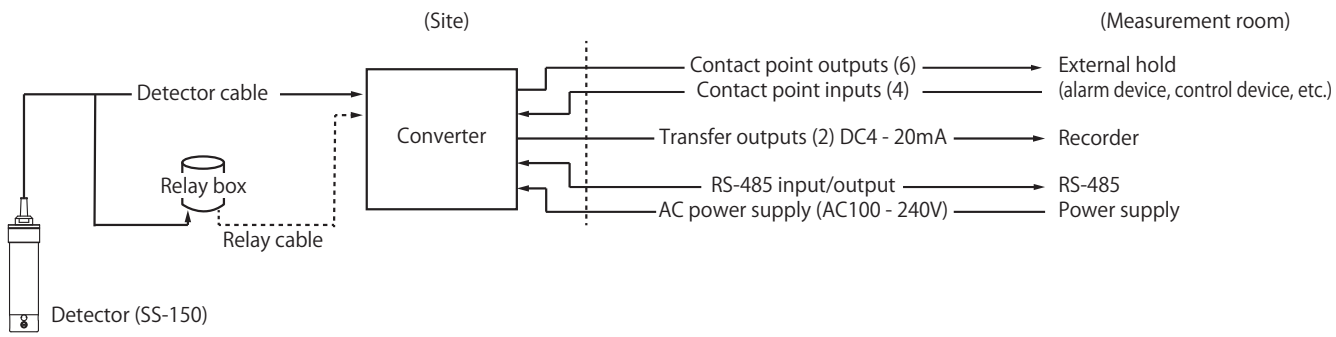
## Measuring principle

90-degree transmission scattering method, transmission method

## Uses

Control and monitoring of drain water processing and production processes.

## System Configuration



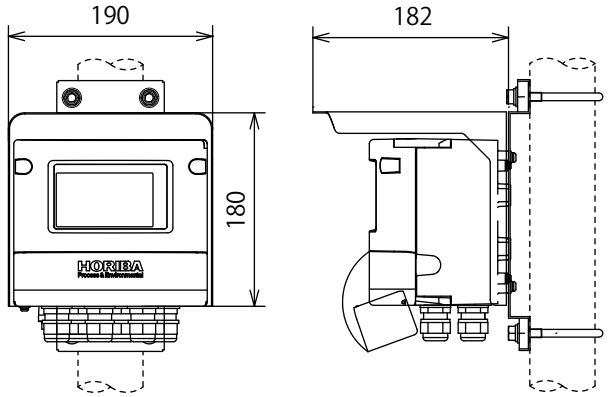
# HU-200TB-IM Turbidity and Suspended Solids Analyzer (Overview 1)

## Merits

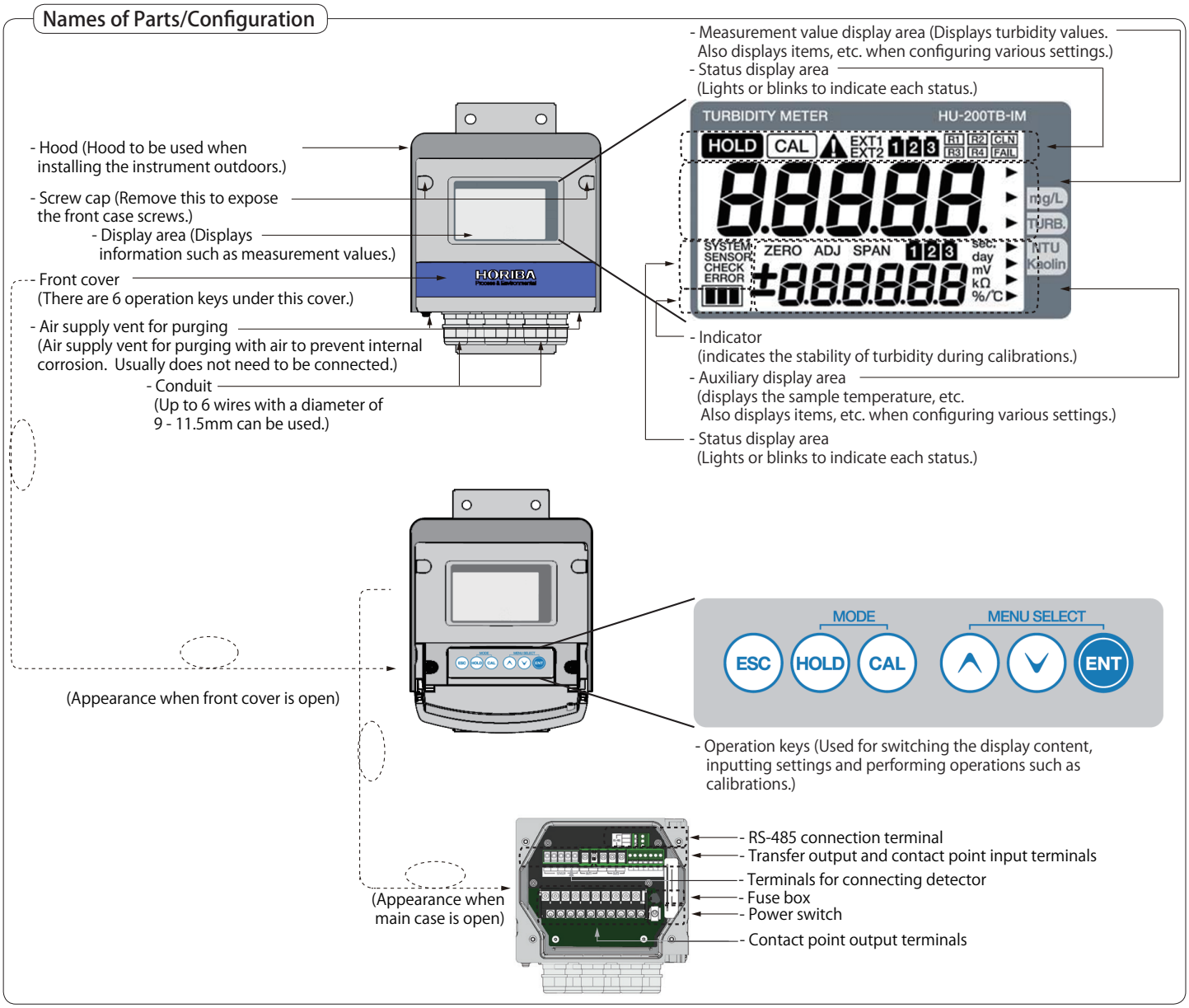
**Characteristics of Converter**
- Aluminum die cast
- Ample wiring space and terminal block that prevents screw loss
- Can be installed outdoors (drip-proof structure equivalent to IP65)
- Easy-to-read display (150% larger than Horiba's conventional displays)
- All operations can be performed using the keys on the front
- Ample self-diagnosis functions
- Free transfer output ranges can be set
- Automatic switching and external switching of transfer range
- Embedded sequence software for automatic calibration
- Calibration history memory
- Fixed data can be called from the detector, enabling measurements with no instrumental error
- Easy-to-use key sheet

**Characteristics of Detector**
- Sensor heads made from PFA, which does not easily get dirty
- Long-life near-infrared LED light source
- Transmission scattering method or transmission method can be selected as a measurement method
- Automatic cleaning by wipers (optional jet cleaning pipe unit can be installed)
- Turbidity can be measured to two decimal places
- Turbidity can be measured up to 4000 NTU
- Easy turbidity calibration by span checker
- Surrounding light is canceled by blinking light sources
- Low-drift electronic circuits
- Equipped with CPU and memory for saving calibration data

## External dimensions




## Names of Parts/Configuration



# HU-200TB-IM Turbidity and Suspended Solids Analyzer (Overview 2)

## Power Source

- The instrument power source is a free power source with a rated voltage of AC100-240 V, 50/60Hz.
  The maximum output is 35VA.

## Contact output

- Equipped with 6 contact point outputs. The contact capacity is less than AC 250 V and 3A or DC 30V and 3 A.

## Transmission output

- Equipped with 2 transfer outputs.
  A DC 4 - 20 mA signal compatible with the measurement range is output.
- Receiving resistance on the receiving instrument side is a maximum of 900 Ω.

## Turbidity and suspended solids detector

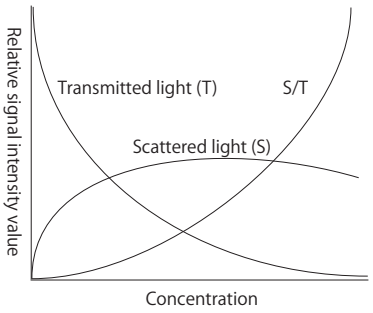
- Turbidity and suspended solids can be analyzed by the same detector.
- Optional cleaning unit can be installed.

## Range output

- External or automatic switching between up to 4 measurement ranges.

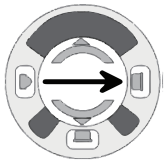
## Measuring principle

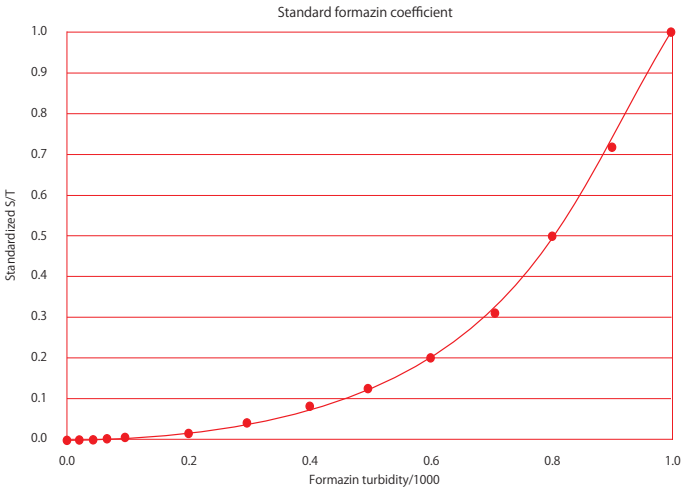
The detector is equipped with functions for detecting transmitted light, scattered light and light source intensity, and measurements by the transmission scattering method and measurements by the transmission method can be conducted selectively.
Influence from surrounding light is canceled by a near infrared LED light source that blinks at around 2 Hz.
In the following explanation, the transmitted light signal is referred to as "T", the scattered light signal is referred to as "S" and the light source intensity signal is referred to as "R". The transmission scattering method calculates turbidity from the ratio of S to T. In the transmission method, the transmission ratio and absorbance are calculated from the ratio of T to R and then converted to the concentration of suspended solids.
The instrument is equipped with a function for displaying and outputting absorbance within a range of 0 to 3.
While absorbance is proportionate to low concentrations of suspended solids, the proportionate relationship peaks and then lessens with high concentrations of suspended solids. A straight-line signal suitable for high concentrations can be obtained by inputting a three-dimensional function for converting absorbance to the concentration of suspended solids. % is used as the unit for suspended solid concentration so that the converted values can be displayed within a range of 0 to 3. Absorbance can be converted to a concentration of up to 3%.

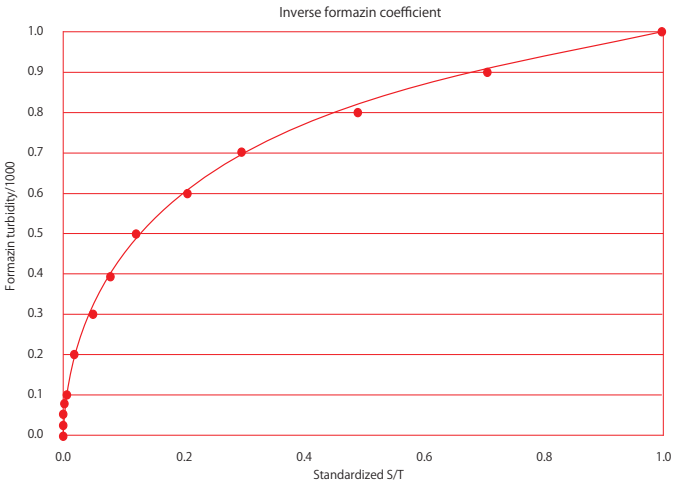



Measuring turbidity by the transmission scattering method
S/T cancels fluctuations in the light source and detector and light attenuation caused by localized dirt.
The S/T value of zero water measurements is remembered as S0/T0. As (S/T - S0/T0) is a relative value, multiply by factor α to find a standard function value corresponding to the turbidity value when performing span calibration.


Transmission scattering method


Transmission method



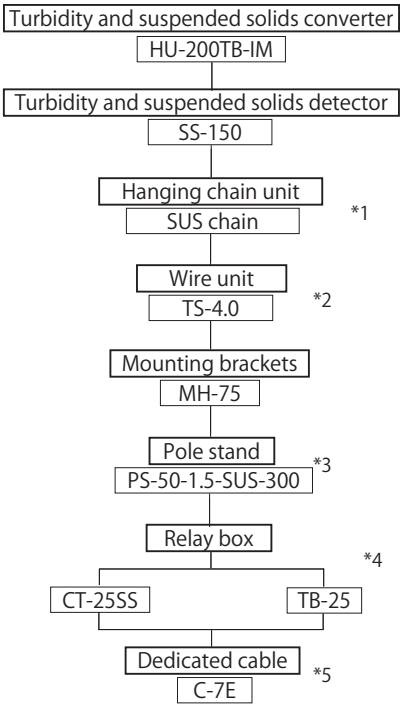




Next, turbidity is calculated in an equation (inverse function) that converts
α x (S/T − S0/T0) to a turbidity value.

# HU-200TB-IM Turbidity and Suspended Solids Analyzer (Combination 1)

Below are combinations suitable for the specifications of products such as the converter and detector.
Refer to the section on each product for detailed specifications.

## Combination

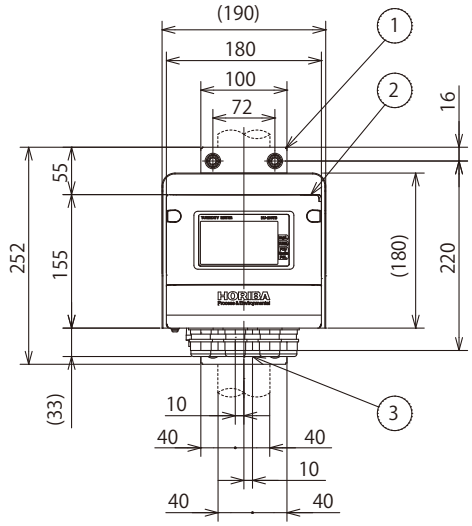


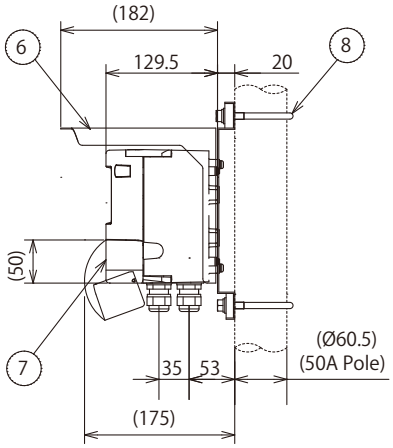

*1: The hanging chain unit consists of a chain for hanging the detector (4m), shackles, chain fasteners and a bracket for hanging the detector.
*2: The wire unit consists of a wire (4m), a weight (3.6kg), shackles, wire clips and connecting brackets.
*3: Pole stand for installing the converter, mounting bracket (MH-75) or relay box.
*4: The CT-25SS has a rainproof structure and the TB-25 has a moisture-proof structure.
*5: Can be extended to up to 10m.

# HU-200TB-IM Turbidity and Suspended Solids Analyzer (External Dimensions 1)

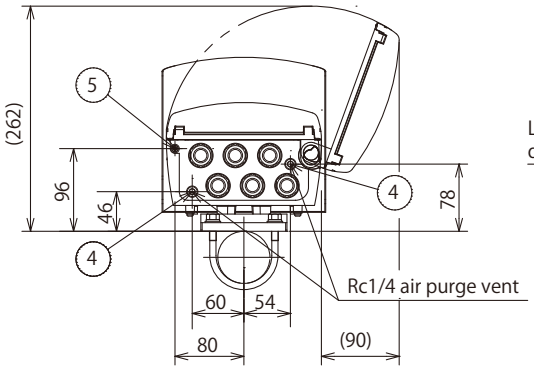
## Converter

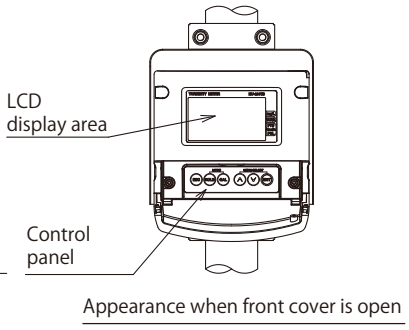
-Pole Installation-



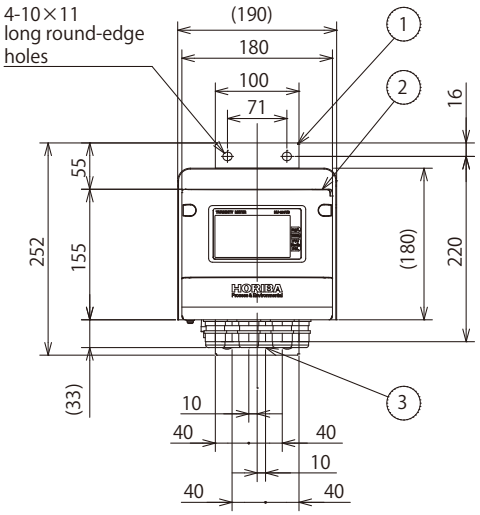

| NO. | PARTS NAME | NOTES |
|---|---|---|
| 1 | Bracket | SUS304 |
| 2 | Case | ADC12 |
| 3 | Conduit (cable gland) | Screw size G1/2<br>O.D Ø7～Ø12Cable |
| 4 | Plug | SUS304 |
| 5 | Earth terminal | SUS304 M4 |
| 6 | Cover | SUS304 |
| 7 | Front cover | ADC12 |
| 8 | U-Bolt | SUS304 50A M8 |

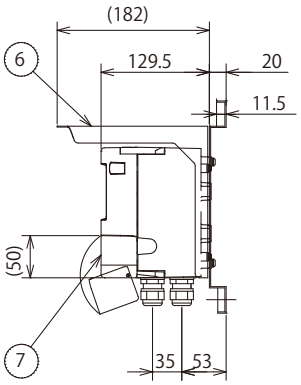


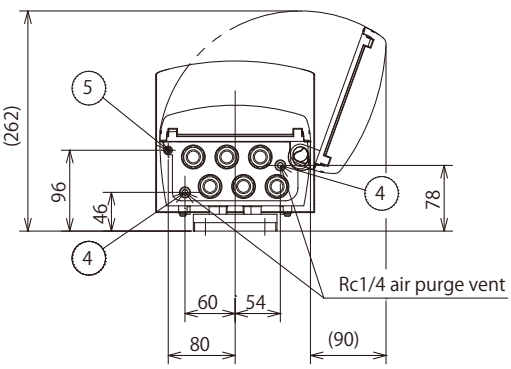




Appearance when front cover is open

- Wall Installation (part names and the appearance when the front cover is open are common) -

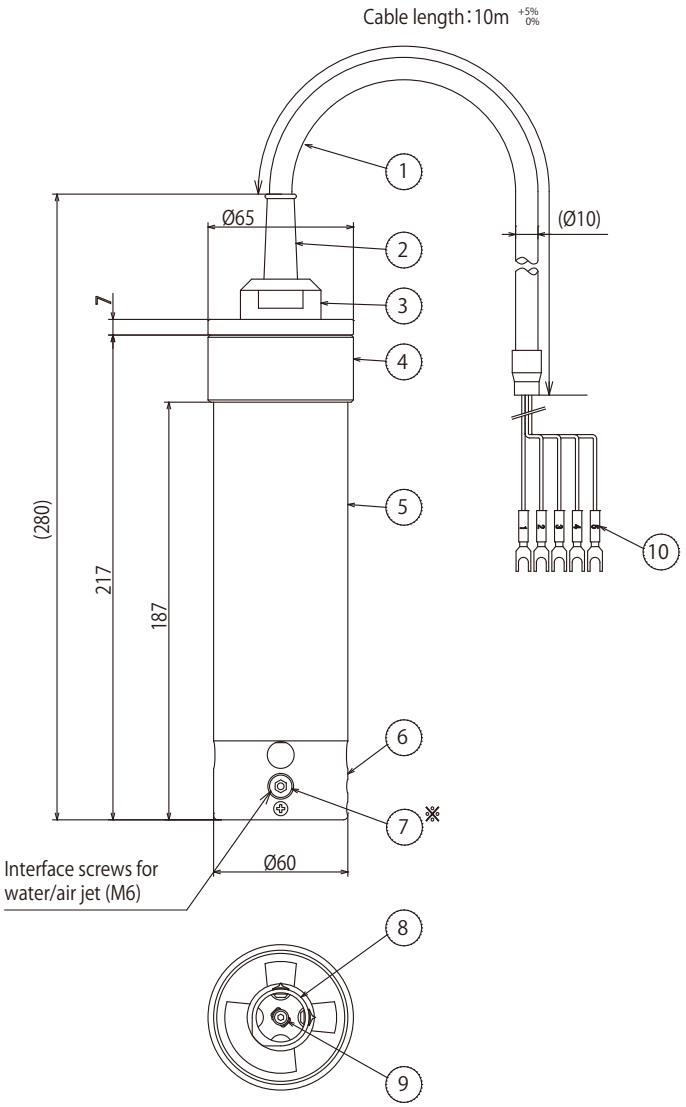


# HU-200TB-IM Turbidity and Suspended Solids Analyzer (External Dimensions 2)

## Turbidity detector (SS-150)

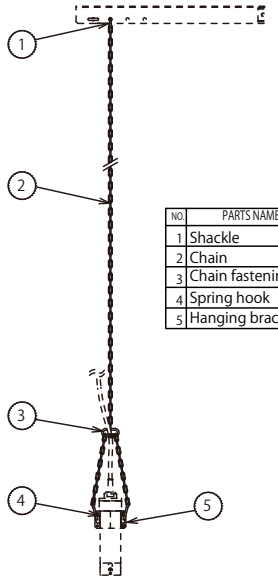



| NO. | PARTS NAME | NOTES |
|---|---|---|
| 1 | Cable | PVC |
| 2 | Cable cover | EPDM |
| 3 | Cable nut | PPO |
| 4 | Adaptor | PVC |
| 5 | Sensor body | SUS316 |
| 6 | Sensor head | PFA, POM |
| 7 | Plug | M6, SUS316 |
| 8 | Cleaner | POM, EPDM |
| 9 | Hexagon socket head bolt | M3, SUS316 |
| 10 | Y Terminal | M4 |

Specifications
Conditions of measured liquid:
Temperature range: 0 - 45℃ (no freezing)
Pressure range: 0 - 0.1MPa
Materials of wetted part:
PFA, PVC, PPO, POM, EPDM, FKM, SUS316
Weight: Approx. 1.0kg (excluding cable)
Tolerance of dimensions:
According to JIS B 0405 Tolerance Class v

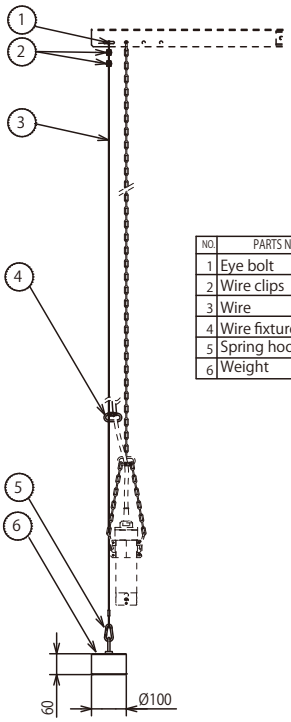
* Remove the plug (7) when using the cleaner.

## Hanging chain unit




| NO. | PARTS NAME | NOTES |
|---|---|---|
| 1 | Shackle | SUS304 |
| 2 | Chain | SUS304 |
| 3 | Chain fastening bracket | SUS304 |
| 4 | Spring hook | SUS304 |
| 5 | Hanging bracket | SUS316 |

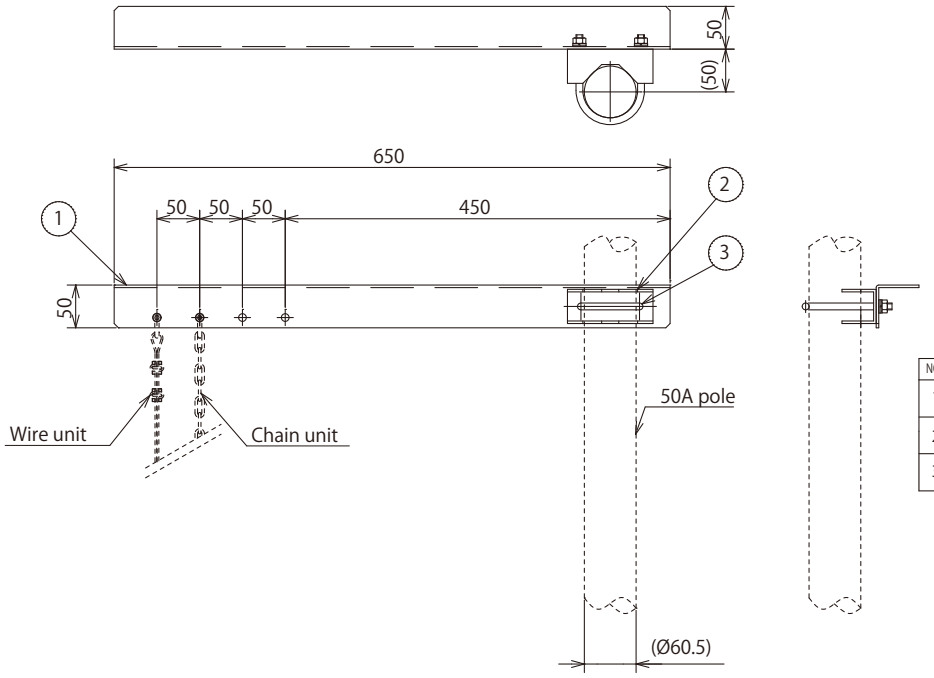
## Wire unit




| NO. | PARTS NAME | NOTES |
|---|---|---|
| 1 | Eye bolt | SUS304 |
| 2 | Wire clips | SUS304 |
| 3 | Wire | SUS304 |
| 4 | Wire fixture | SUS304 |
| 5 | Spring hook | SUS304 |
| 6 | Weight | SUS304 |

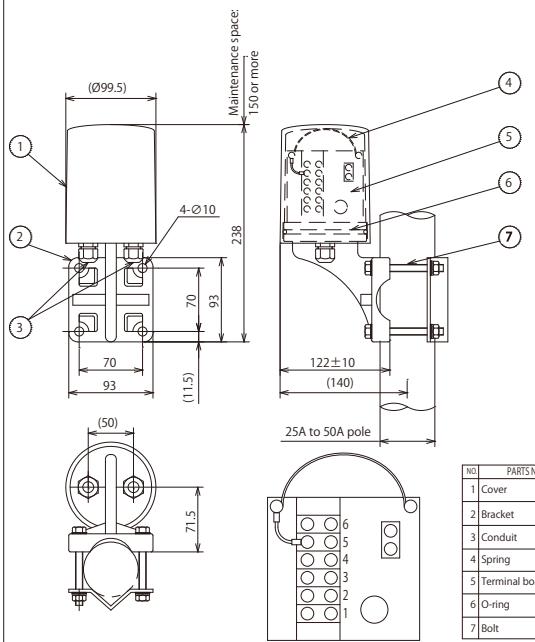
# HU-200TB-IM Turbidity and Suspended Solids Analyzer (External Dimensions 3)

## Mounting bracket (MH-75)




| NO. | PARTS NAME | NOTES |
|---|---|---|
| 1 | Installation arm | SUS304 |
| 2 | Mounting eye | SUS304 |
| 3 | U-bolt | SUS304 M8 |

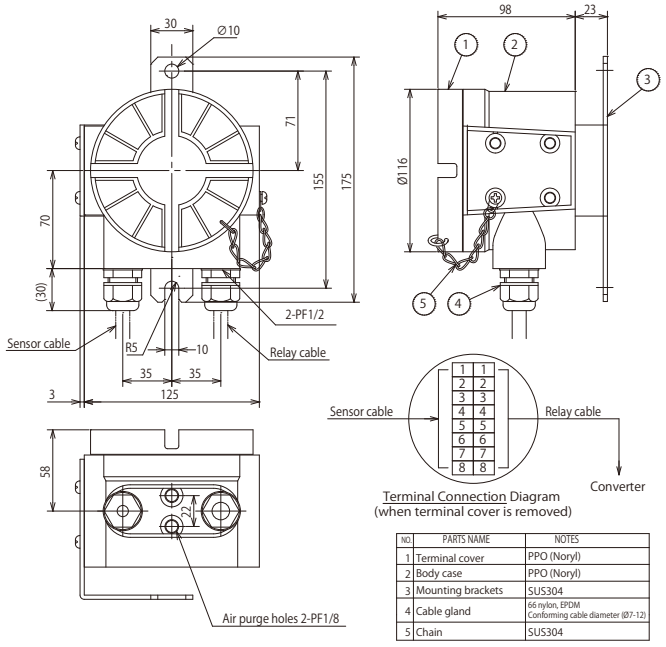
## Relay box (CT-25SS)




| NO. | PARTS NAME | NOTES |
|---|---|---|
| 1 | Cover | ABS |
| 2 | Bracket | ABS |
| 3 | Conduit | |
| 4 | Spring | SUS304 |
| 5 | Terminal board | ABS |
| 6 | O-ring | NBR |
| 7 | Bolt | SUS304 M8 (accessory) |

《CT-25SS》
Layout of Terminals on
Terminal Board for Turbidity and MLSS

## Relay box (TB-25)



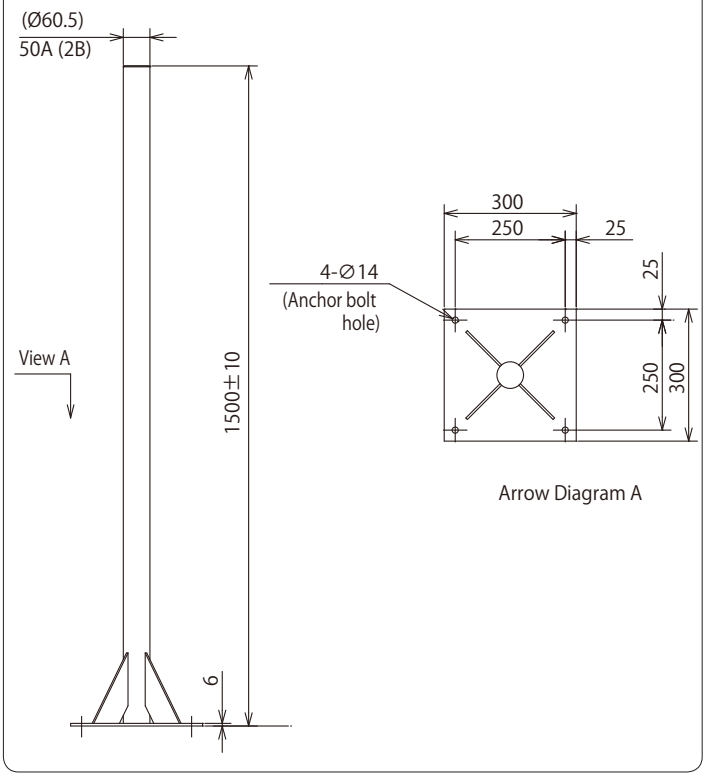

Terminal Connection Diagram
(when terminal cover is removed)

| NO. | PARTS NAME | NOTES |
|---|---|---|
| 1 | Terminal cover | PPO (Noryl) |
| 2 | Body case | PPO (Noryl) |
| 3 | Mounting brackets | SUS304 |
| 4 | Cable gland | 66 nylon, EPDM<br>Conforming cable diameter (Ø7-12) |
| 5 | Chain | SUS304 |

1. Use a C-7E relay cable to keep the case airtight.
2. Install the box perpendicularly with the conduit at the bottom.
3. Make sure that the surface of the measured liquid is at least 300mm from the bottom of the box. Make sure that the relay cable is also not immersed in the measured liquid.
4. Make sure that the pressure of the dry air emitted from the air purge holes is 0.1MPa or less and that one side functions as an inlet and the other functions as an outlet. Please note that air pipes are not included.
5. Install in an area with the following environment:
   - An area where maintenance, etc. (sensor calibrations, replacements, etc.) can be carried out easily and safely.
   - An area where the ambient temperature is -5 - 40°C and there are minimal fluctuations in temperature.
   - An area with minimal influence from electromagnetic fields.
6. A desiccant is placed inside the box to prevent condensation. Replace this regularly. It also needs to be replaced if the cover is opened for purposes such as changing the sensor.
7. Make sure that the sensor cable and relay cable are long enough that the replay box can be lifted.

# HU-200TB-IM Turbidity and Suspended Solids Analyzer (External Dimensions 4)

## Pole stand (PS-50-1.5-SUS-300)




Arrow Diagram A

## Solenoid valve (SUV-A-A1/SUN-A-A2)

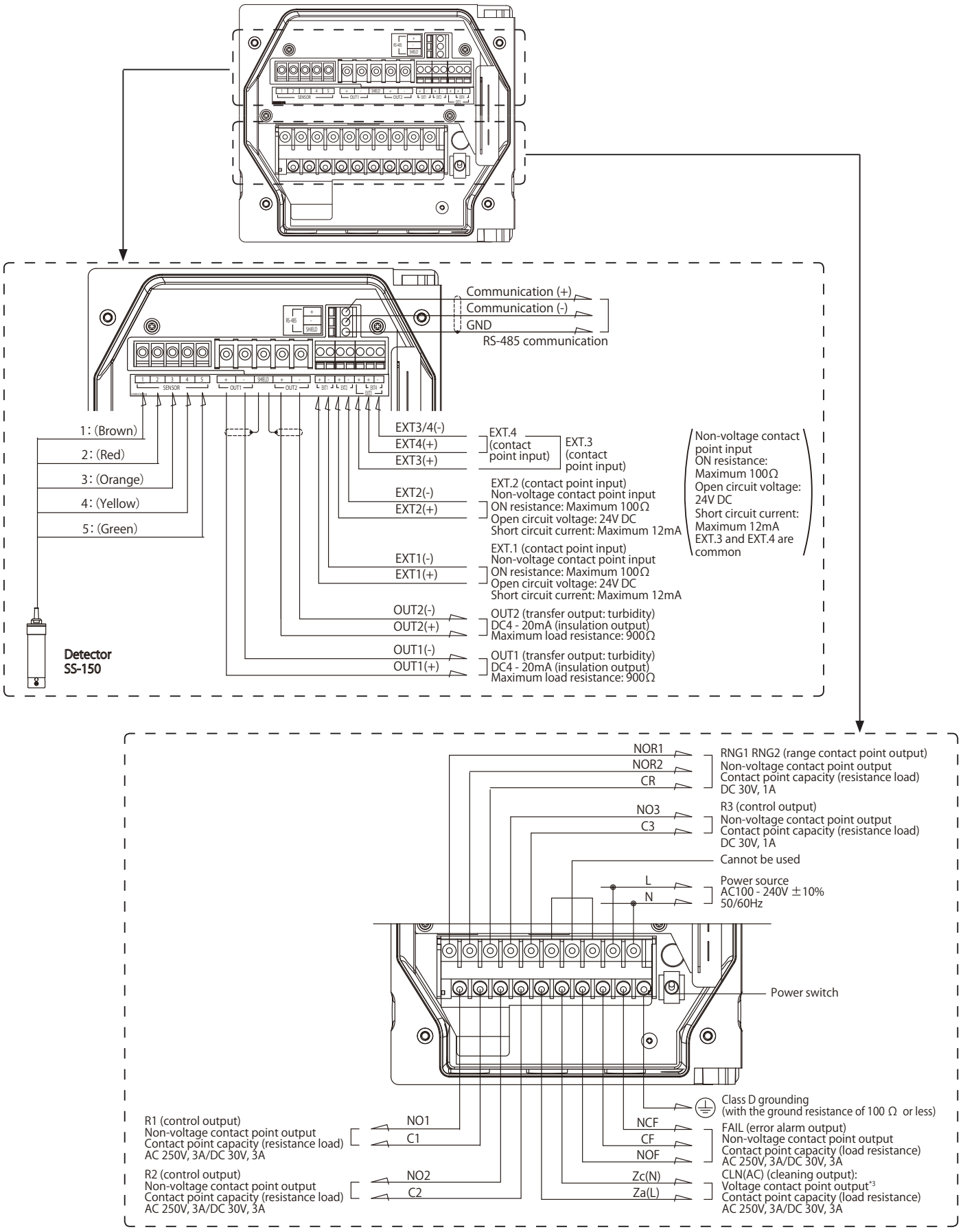
## Pump unit (WPU-10)

## Pump unit (WPU-20)

# Command Converter for HU-200TB-IM Turbidity and Suspended Solids Analyzer (External Connection Diagram)

## Converter + turbidity detector

- The wiring of the HU-200TB-IM converter and the turbidity detector (SS-150) is described below.



# HU-200TB-IM Turbidity and Suspended Solids Analyzer (Specifications 1)

## Converter Specifications 1

- Below are the specifications of the HU-200TB-IM converter.
- The specifications of accessories such as the turbidity detector (SS-150) are indicated in each external dimension diagram. Please refer to these for details.

| | | | | | |
|---|---|---|---|---|---|
| Product name | Industrial Turbidity and Suspended Solids Analyzer | | | | |
| Model | HU-200TB-IM | | | | |
| Turbidity and suspended solids detection method | SS-150 | | | | |
| Measurement method | 90-degree transmission scattering method | | | Measurement method suitable for turbidity or 200 mg/L or less of suspended solids (Kaolin) | |
| | Transmission method | | | Measurement method suitable for 50 mg/L or more of suspended solids (Kaolin) | |
| Measurable range | Turbidity | 90-degree transmission scattering method | Formazin | 0 - 4000 degrees | |
| | | | Kaolin | 0 - 2000 degrees (reference can be displayed for 2001 - 4000 degrees) | |
| | Suspended solids | 90-degree transmission scattering method | Kaolin | 0 - 2000 mg/L (reference can be displayed for 2001 - 4000 mg/L) | |
| | | Transmission method | | | |
| Repeatability (using Horiba's standard fluid) | Turbidity | 90-degree transmission scattering method | Formazin | 0 - 2000 degrees / The larger of ± 2% or ± 0.5 degrees of the read value | |
| | | | | 2001 to 4000 degrees / The higher of within ± 3% | |
| | | | Kaolin | 0 - 1000 degrees / The larger of ± 2% or ± 0.5 degrees of the read value | |
| | | | | 1001 - 2000 degrees / The higher of within ± 3% | |
| | Suspended solids | 90-degree transmission scattering method | Kaolin | 0 - 1000mg/L / The larger of ± 2% or ± 0.5 mg/L of the read value | |
| | | | | 1001 - 2000 mg/L / The higher of within ± 5% | |
| | | Transmission method | | 0 - 2000mg/L / The larger of ± 5% or ± 5 mg/L of the read value | |
| Linearity (using Horiba's standard fluid) | Turbidity | 90-degree transmission scattering method | Formazin | 0 - 2000 degrees / The deviation from the intermediate point of span calibration values is the larger of ± 3% or ± 3 degrees of the calibration value | |
| | | | | 2001 - 4000 degrees / The deviation from the intermediate point of span calibration values is ± 5% of the calibration value | |
| | | | Kaolin | 0 - 1000 degrees / The deviation from the intermediate point of span calibration values is the larger of ± 3% or ± 3 degrees of the calibration value | |
| | | | | 1001 - 2000 degrees / The deviation from the intermediate point of span calibration values is ± 5% of the calibration value | |
| | Suspended solids | 90-degree transmission scattering method | Kaolin | 0 - 1000mg/L / The deviation from the intermediate point of span calibration values is the larger of ± 3% or ± 3 mg/L of the calibration value | |
| | | | | 1001 - 2000 mg/L / The deviation from the intermediate point of span calibration values is ± 5% of the calibration value | |
| | | Transmission method | | 0 - 1000mg/L / The deviation from the intermediate point of span calibration values is the larger of ± 3% or ± 3 mg/L of the calibration value | |
| | | | | 1001 - 2000 mg/L / The deviation from the intermediate point of span calibration values is ± 10% of the calibration value | |
| Display resolution | Turbidity | | | 0.01 (range of 0 - 10) | Select a fixed range (decimal point) or automatic range switching |
| | | | | 0.1 (range of 10 - 100) | |
| | | | | 1 (range of 100 - 1000) | |
| | Suspended solids | | | 1 | Fixed range (decimal point) |
| | Absorbance | | | 0.001 | 0.000 - 3.000<br>Input a three-dimensional function so that the value is within the abovementioned range of values that can be converted to a concentration value. |
| Transmission output | Number of output points | | | 2 | |
| | Output type | | | DC4-20mA input/output insulation type | |
| | Load resistance | | | Maximum 900 Ω | |
| | Repeatability | | | Within ± 0.02mA (output only) | |
| | Linearity | | | Within ± 0.08mA (output only) | |
| | Error output | | | Burnout capability included (3.8mA or 21mA) | |
| | Hold capability | | | Select from holding at the previous value or holding at an arbitrary value | |
| Contact output | Number of output points | | | 6 | |
| | Output type | | | No-voltage contact output | |
| | R1, R2 | Contact type | | Relay contact, SPST (1a) | |
| | | Contact capacity | | AC250V 3A, DC30V 3A (resistance load) | |
| | | Contact capability | | Select from upper limit alarm, lower limit alarm, transmission output hold and cleaning output (opened at alarm operation, closed usually, closed at power-off) | |
| | | Description of alarm | | ・Setting range: Turbidity: within measurable range<br>・Delay time: 0-600 seconds | |
| | R3 | Contact type | | Relay contact, SPST (1a) | |
| | | Contact capacity | | DC30V 3A (resistance load) | |
| | | Contact capability | | Select from upper limit alarm, lower limit alarm, transmission output hold and cleaning output (closed at alarm operation, opened usually, opened at power-off) | |
| | | Description of alarm | | ・Setting range: Turbidity: within measurable range<br>・Delay time: 0-600 seconds | |

# HU-200TB-IM Turbidity and Suspended Solids Analyzer (Specifications 2)

## Converter Specifications 2

| | | | |
|---|---|---|---|
| Transmission output | FAIL | Contact type | Relay contact point, SPST (1c) |
| | | Contact capacity | AC250V 3A, DC30V 3A (resistance load) |
| | | Contact capability | - Error alarms can be set for values outside the measurement range and for self-diagnosis output<br>- Delay time: 0 - 600 seconds |
| | RANG1, RANG2 | Contact type | Relay contact, SPST (1a) |
| | | Contact capacity | DC30V 3A (resistance load) |
| | | Contact capability | Status output of transmission output range |
| Contact input | Number of input points | | 4 |
| | Contact type | | No-voltage a contact for open collector |
| | Conditions | | ON resistance: Maximum 100 Ω<br>Open-circuit voltage: DC24V<br>Short-circuit current: Maximum DC 12mA |
| | Contact capability | EXT1 | Hold command |
| | | EXT2 | Cleaning command |
| | | EXT3, EXT4 | Switching command for up to 4 transfer output ranges |
| Communication capability | Method | | RS-485 |
| | Signal type | | 2 wire type, input/output insulation type (transmission output not insulated) |
| Calibration | Calibration method | | Zero calibration: by filtered clean water |
| | | | Span calibration: A method in which turbidity is adjusted by inputting a turbidity coefficient |
| | Compatible standard substances | | Kaolin, formazin |
| Correction | Correction method | | Shift correction: Shift calculation for a particular water sample<br>Coefficient correction: Coefficient calculation for a particular water sample |
| Cleaning output (for auxiliary wiper cleaning) | Number of output points | | 1 point (water and air jet cleaning pipe units can be used together) |
| | Output type | | Voltage contact output (voltage output of connected power source) |
| | Contact type | | Relay contact, SPST (1a) |
| | Contact capacity | | AC250V 3A, DC30V 3A (resistance load) |
| | Settings | Cleaning frequency | 0.2-168.0 hours |
| | | Cleaning time | 30-600 seconds |
| | | Hold time | 30-600 seconds |
| | Timer accuracy | | Monthly error margin less than 2 minutes |
| | Description of cleaning operation | | - Operation by internal timer<br>- Operation by internal timer and external connection input<br>- The internal timer is only enabled during input from an external contact point<br>- Select one cleaning trigger operation (the internal cleaning sequence starts after two or more seconds of input from an external contact point) |
| Self-check | Sensor diagnosis error | | Sensor error |
| | Sensor check error | | CPU error, memory error |
| Operating temperature range | -20 - 55℃ (no freezing) | | |
| Operating humidity range | Relative humidity of 5-90% (no condensation) | | |
| Storage temperature | -25 - 65℃ | | |
| Power source | Power supply voltage range | | AC100-240V 50/60Hz |
| | Power consumption | | 36VA (max, when operating at AC 100V) |
| | Other | | Contains power switch for maintenance |
| Applicable standards | CE marking | | EMC Directive (2004/108/EC) EN61326-1: 2006*1<br>Emissions: Class A<br>Immunity: Industrial locations<br>Low Voltage Directive (2006/95/EC) EN61010-1: 2010 (Ed. 3.0) |
| | FCC rules | | Part 15 CLASS A |
| Structure | Installation | | Outdoor installation type |
| | Installation method | | 50A pole or wall mounting |
| | Protection class | | IP65 |
| | Material of case | | Aluminum alloy (epoxy glue degeneration melamine resin painting) |
| | Material of mounting brackets | | SUS304 |
| | Material of cover | | SUS304 (epoxy glue degeneration melamine resin painting) |
| | Material of display window | | Polycarbonate |
| | Display element | | Reflective monochrome LCD |
| External dimensions | 180 (W) x 155 (H) x 115 (D) (not including mounting brackets) | | |
| Mass | Main unit: approx. 3.5kg, cover and mounting brackets: approx. 1kg | | |

*1: The surge testing for the EMC directive of the CE mark does not apply to detector cables, transfer cables or contact point input cables that are 30m or longer.

*2: This instrument is equipped with an arrestor for transfer output, contact point input and communication (firing potential 400 V). However, please install the most suitable surge absorption element in the connection line according to the surrounding environment, installation conditions and external devices that are connected.

# HU-200TB-IM Turbidity and Suspended Solids Analyzer (Specifications 3)

## Detector Specifications

| | |
|---|---|
| Product name | Industrial Turbidity and Suspended Solids Detector |
| Model | SS-150 |
| Measuring principle | 90-degree transmission scattering method or transmission method |
| Light source | Near infrared LED 860 nm |
| Detector | Silicon photo diode |
| Detector window material | PFA |
| Cell length | 30 mm |
| Data transfer | RS-485 (communication with converter) |
| Cleaning function | Wiper method (standard device)<br>Stepping motor operation<br>Power supply: DC 24 V 6 W supply from HU-200TB-IM converter<br>During cleaning, rotation occurs repeatedly according to a command from the converter.<br>Stands by in the prescribed position after the cleaning time has elapsed. |
| Sample water temperature | 0 - 45° C (no freezing) |
| Storage temperature | -25 - 65° C |
| Sample water pressure | 0 - 0.1 MPa |
| Material of wetted part | PFA, POM, SUS316, FKM, EPDM, PVC, PPO, SUS304 |
| Cable length | 10 m (standard), maximum extension 50 m (total length 60 m) |
| Power source | DC 24 V supply from HU-200TB-IM converter |
| External dimensions | Φ 60 x L250 mm (not including cable) |
| Mass | Approx. 1.0 kg (not including cable) |

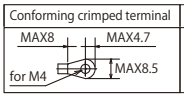
# HU-200TB-IM Turbidity and Suspended Solids Analyzer (Specifications 4)

## Power Source

- The power supply of this instrument is a free power source with a rated voltage of AC100 to 240 V.
- Check the voltage of the power source, as operating at a voltage outside the rated range causes malfunction. Also, check that the range of fluctuations in supply voltage does not exceed ± 10%.
- This instrument has a power switch.

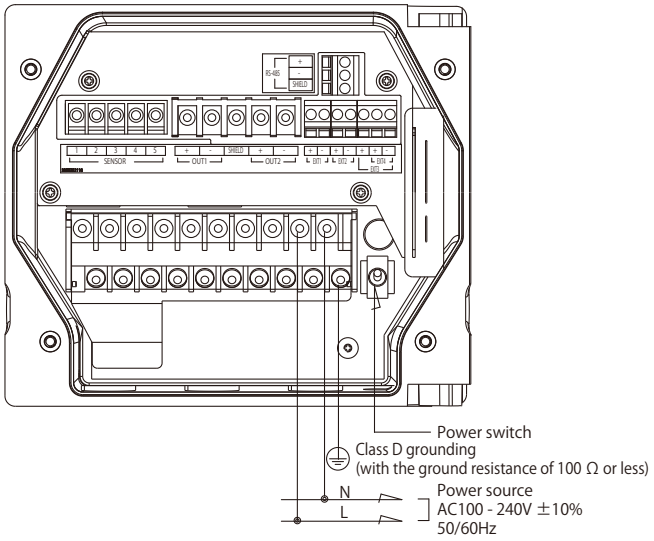
Main Specifications
- M4 terminal screws are used for the power supply.
- 0.75 - 5.5 mm$^2$ (AWG10 - 18) electric wires can be used.

Terminal Block Specifications

| Conforming crimped terminal | Wire size | Screw tightening torque |
|---|---|---|
|  | 5.5mm$^2$/MAX (AWG10) | 1.2 - 1.8 N·m |

*Note: The screws on the terminal block have a fall prevention structure.
When installing the terminal block, turn the screws until they lift (upward screw structure).

- Install the power switch near the instrument and ensure that the power source can be turned on and off.
- Install lightning arresters if there is a risk that the instrument will be struck by lightning.
- For safety reasons, be sure to ground the earth terminal (class D grounding: with the ground resistance of 100 Ω or less).
- Ground separately from electrical equipment such as the motor.




Main Specifications

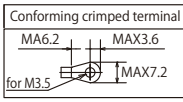
| | |
|---|---|
| Rated Voltage | AC100 - 240V 50/60Hz |
| Power consumption | Maximum 36VA (when operating at AC100V) |
| Terminal screw | M4 |
| Applicable wiring | 0.75 - 5.5mm$^2$(AWG10 - 18) |

## Transmission output

- Equipped with 2 transfer outputs.
  A DC 4 - 20 mA signal compatible with the measurement range is output.
- Four types of transfer output range can be set for Transfer Output 2 (OUT 2), and it is possible to switch between these using an external input signal (contact point input).
- Receiving resistance on the receiving instrument side is a maximum of 900 Ω .
  Select a receiving instrument whose input suits that of this instrument (recorder, meter relay).
- An arbitrary full-scale range can be set for the transfer output within the full-scale setting range for measurement values. Also, set a burnout (transmission output: 3.8mA or 21mA). It is possible to set whether to temporarily hold the output value at the last value or a preset value when holding the transmission output during an external signal.

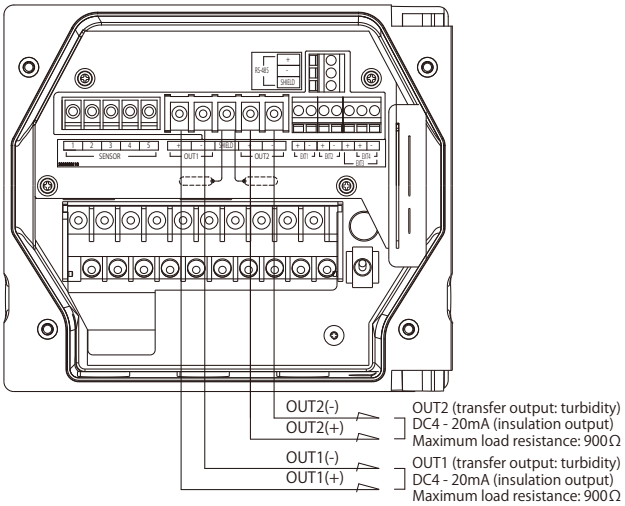
Main Specifications
- M3.5 terminal screws are used for the transfer outputs.
- The wire size is 2mm2 (AWG14) max.

Terminal Block Specifications

| Conforming crimped terminal | Wire size | Screw tightening torque |
|---|---|---|
|  | 2mm$^2$/MAX (AWG14) | 0.8 - 1.2 N·m |

*Note: The screws on the terminal block have a fall prevention structure.
When installing the terminal block, turn the screws until they lift (upward screw structure).

- Use shield wires for the transfer output cables.
- Install arresters on the output side and receiving instrument side of the instrument if there is a risk that it will be struck by lightning.




Main Specifications

| | |
|---|---|
| Transmission output | 4 - 20mA DC |
| Maximum load resistance | 900Ω |
| Terminal screw | M3.5 |
| Applicable wiring | 2mm$^2$(AWG14) |

# HU-200TB-IM Turbidity and Suspended Solids Analyzer (Specifications 5)

## Contact input

- Equipped with 4 contact point inputs.
  It is possible to put output on hold, operate the cleaner or switch the transfer output range using an external signal.
- It is possible to switch between four preset types of transfer output ranges using the EXT.3 and EXT.4 contact point inputs.

Main Specifications
- 0.14 - 2.5 mm2 (AWG 14 - 26) electric wires can be used.

Terminal Block Specifications

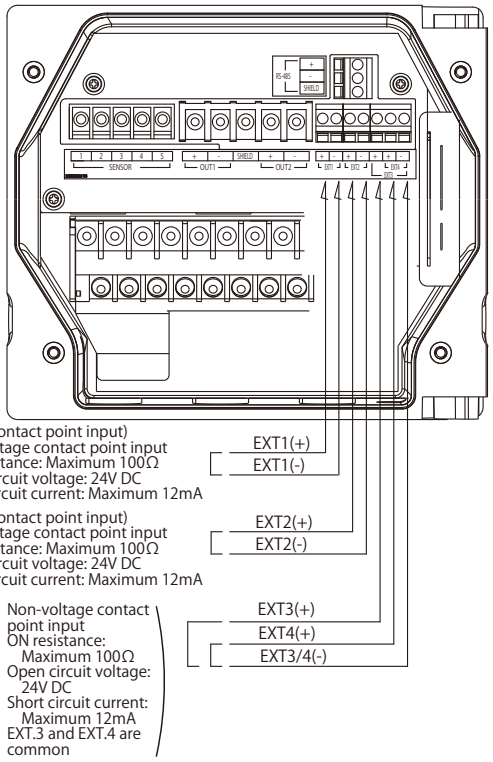
| Conforming crimped terminal | Wire size | Screw tightening torque |
|---|---|---|
|  | 0.14 - 2.5mm² (AWG14 - 26) Single wire or strand wires | 0.5 - 0.6 N·m |

*Note: The screws on the terminal block have a fall prevention structure.
When installing the terminal block, turn the screws until they lift (upward screw structure).

- Use a twist pair shielded cable.
  Install arresters on the output side and receiving instrument side of the instrument if there is a risk that it will be struck by lightning.
- The maximum resistance of contact point inputs must be 100 Ω or lower.

- It is possible to switch between four preset types of transfer output ranges using the EXT.3 and EXT.4 contact point inputs.
  The combinations of contact point inputs and the corresponding transfer output ranges are indicated below.

| Contact point input terminal | | Transfer output range (*1) |
|---|---|---|
| EXT.3 | EXT.4 | |
| Open input | Open input | A (*2) |
| Close | Open input | B (*2) |
| Open input | Close | C (*2) |
| Close | Close | D (*2) |




| Main Specifications | |
|---|---|
| Input resistance | Max 100Ω or lower |
| Applicable wiring | 0.14 - 2.5mm²(AWG14 - 26) |

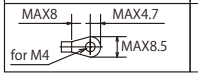
*1: The transfer output range can only be switched for Transfer Output 2 (OUT2).
*2: The four types of transfer output ranges (A - D) need to be set beforehand.

## Range output

- Transfer Output 2 (OUT2) allows external or automatic switching between up to 4 measurement ranges. Some range output contact points can recognize the range being output at Transfer Output 2.

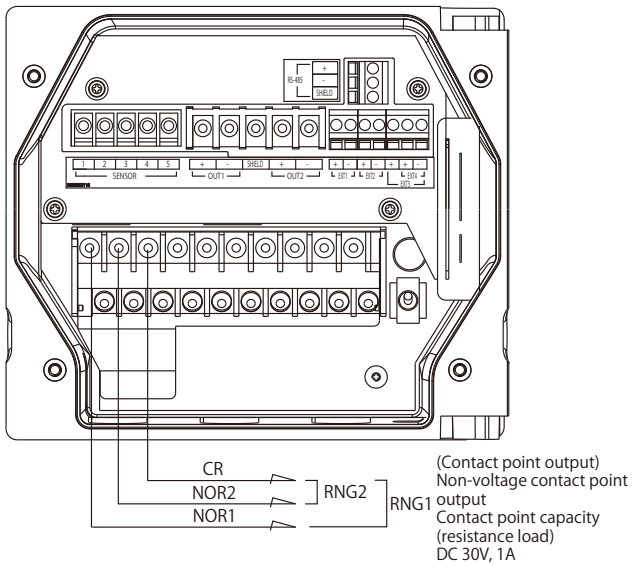
Main Specifications
- M4 terminal screws are used for the power supply.
- 0.75 - 5.5 mm² (AWG10 - 18) electric wires can be used.

Terminal Block Specifications

| Conforming crimped terminal | Wire size | Screw tightening torque |
|---|---|---|
|  | 5.5mm²/MAX (AWG10) | 1.2 - 1.8 N·m |

*Note: The screws on the terminal block have a fall prevention structure.
When installing the terminal block, turn the screws until they lift (upward screw structure).

- Install lightning arresters if there is a risk that the instrument will be struck by lightning.
- For safety reasons, be sure to ground the earth terminal (class D grounding: with the ground resistance of 100 Ω or less).
- Ground separately from electrical equipment such as the motor.




| Contact point output | | Transfer output range (*1) |
|---|---|---|
| RNG.1 | RNG.2 | |
| No output | No output | A (*2) |
| Output | No output | B (*2) |
| No output | Output | C (*2) |
| Output | Output | D (*2) |

Main Specifications

| | |
|---|---|
| Contact capacity | less than 30V DC, 3A |
| Type of Contact Output | Range type output |
| Terminal screw | M4 |
| Applicable wiring | 0.75 - 5.5mm²(AWG10 - 18) |

*1: The transfer output range can only be switched for Transfer Output 2 (OUT2).
*2: The four types of transfer output ranges (A - D) need to be set beforehand.

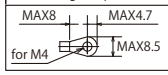
# HU-200TB-IM Turbidity and Suspended Solids Analyzer (Specifications 6)

## Contact output

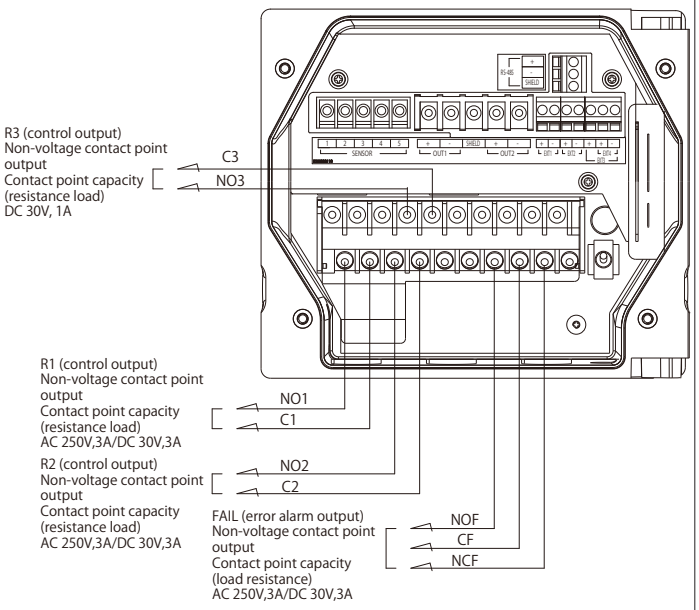
- Equipped with 4 contact point outputs (one for FAIL (error alarms)).
- Select from 5 types: "Alarm Output (AL)", "Absorbance Alarm Output (Abs)", "Hold (HOLD)", "Cleaning (CLn)" or "None (non)".

Main Specifications
- The contact capacity is less than AC 250 V and 3A or DC 30V and 3 A.
- M4 terminal screws are used.
- Electric wires up to 0.75 - 5.5mm$^2$ (AWG10 - 18) can be used.

Terminal Block Specifications

| Conforming crimped terminal | Wire size | Screw tightening torque |
|---|---|---|
|  | 5.5mm$^2$/MAX (AWG10) | 1.2 - 1.8 N·m |

*Note: The screws on the terminal block have a fall prevention structure.
When installing the terminal block, turn the screws until they lift (upward screw structure).




- Use a varistor or noise killer if noise occurs in the load.
- The NO and NC arrangement is reversed only in the case of fail output. For normal (non-fail) output, the CF-NOF contact is open and the CF-NCF contact is shorted. The C-NOF contact is shorted when the power is off.

! If connecting a load higher than the contact capacity or an inductive load (such as a motor or pump), be sure to connect the load through a power relay with a rating higher than that of the load.

! Be careful when connecting loads, as the R1-R2 C-NC contact points are shorted when the power of the analyzer is turned off.

| Main Specifications | |
|---|---|
| Contact capacity | Less than 250V AC, 3A or less than 30V DC, 3A (Direct current less than 30V DC, 3A only for R3) |
| Type of Contact Output | Upper/lower limit operation, error alarm (Error or FAIL), during maintenance, none |
| Terminal screw | M4 |
| Applicable wiring | 0.75 - 5.5mm$^2$(AWG10 - 18) |

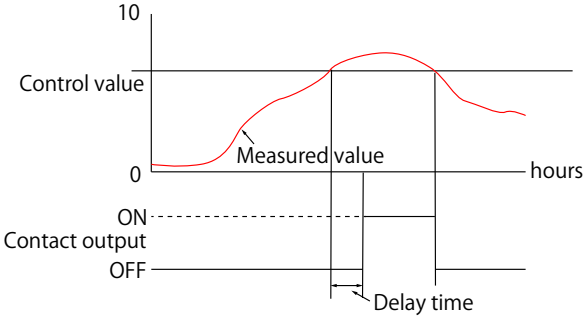
| Types of contact (alarm) output | | |
|---|---|---|
| non | | No contact (alarm) output settings. |
| AL<br>Abs | Upper limit operation | Turns upper limit on/off. |
| | Lower limit operation | Turns lower limit on/off. |
| HOLD | | Output occurs from this contact point during hold mode (when entering the settings menu, calibration menu or user check menu). |
| | | - Settings menu: The menu used when setting or changing parameters related to measurement<br>- Calibration menu: The menu used when performing zero calibration or span calibration<br>- User check menu: The menu used when checking the output status, measurement values, etc. or when restoring the default settings |
| CLn | | Output occurs from this contact point during cleaning of the detector and for a few seconds after the cleaning operation is completed. |

| | |
|---|---|
| FAIL | Output occurs from this contact point when an error code (E-80/81/82/83/84/85/90/91/92) is reported. |

- Upper limit operation, lower limit operation

These operations are performed by setting a control method, control value and delay time.

Control method: Select whether to control upper-limit or lower-limit operations.
Control value: The baseline value that triggers contact point (alarm) output. Enter this value.
Delay time: Contact point (alarm) output can be delayed until a prescribed time has elapsed. These operations are not performed if the control value is only exceeded during this time.




For example, if the control method is upper limit operation, the control value is 8.00 and a delay time is set, the contact point (alarm) activates when 8.00 is exceeded and deactivates when the value falls below 8.00.

# HU-200TB-IM Turbidity and Suspended Solids Analyzer (Specifications 7)

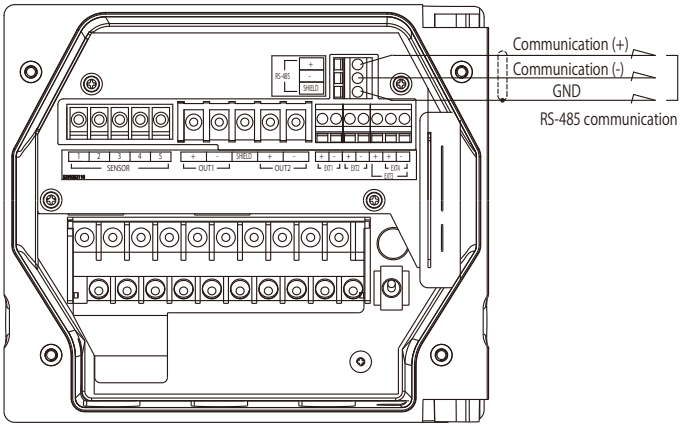
## RS-485

- This instrument is equipped with the RS-485 communication terminal. Connect the wiring before using.
- 0.14 - 2.5 mm2 (AWG 14 - 26) electric wires can be used.
- Use a twist pair shielded cable for the communication output cable.
- Up to 32 terminals can be connected including the host computer. Set an address.
- The maximum cable length of the communication cable is 500 m.
- Provide termination resistance (Rt: 120 Ω ) for the instrument that is the terminus of the RS-485 communication line.

Terminal Block Specifications

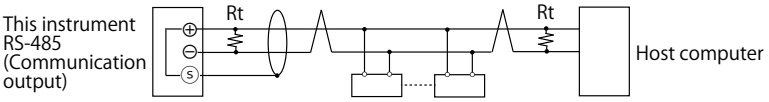
| Conforming crimped terminal | Wire size | Screw tightening torque |
|---|---|---|
|  | 0.14 - 2.5mm² (AWG14 - 26) Single wire or strand wires | 0.5 - 0.6 N·m |

*Note: The screws on the terminal block have a fall prevention structure. When installing the terminal block, turn the screws until they lift (upward screw structure).



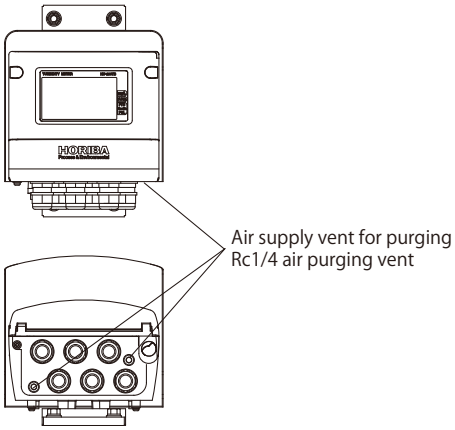

| | | |
|---|---|---|
| RS-485 communication conditions | Baud rate | 19200bps |
| | Character length | 8 bits |
| | Parity | non |
| | Stop bit | 1 bit |

Example of external communication connection




## Air purge

- This instrument is equipped with an air supply vent for purging with air to prevent internal corrosion. If using in an environment with corrosive gas, instrumentation air is constantly passed through the instrument, preventing the corrosive gas from entering the instrument.



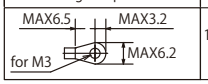
# HU-200TB-IM Turbidity and Suspended Solids Analyzer (Specifications 8)

## Detector

- A single turbidity detector can be used.
  The cleaner (optional) can be operated by an external signal.

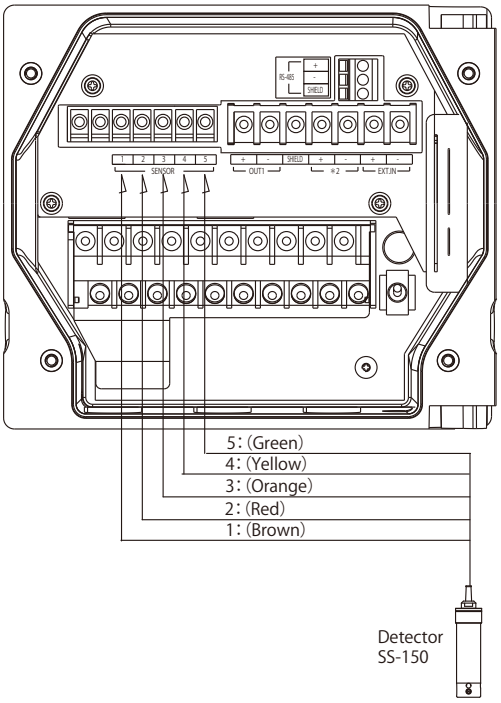
Main Specifications
- M3 terminal screws are used.
- Electric wires up to 1.25mm$^2$ (AWG16) can be used. (The cable of the detector is a dedicated cable. To extend the cable, use a relay box and dedicated relay cable.)

Terminal Block Specifications

| Conforming crimped terminal | Wire size | Screw tightening torque |
|---|---|---|
|  | 1.25mm$^2$/MAX (AWG16) | 0.8N・m |

*Note: The screws on the terminal block have a fall prevention structure. When installing the terminal block, turn the screws until they lift (upward screw structure).

- Do not allow the detector cable terminal and terminal block to come into contact with liquids such as water or soil them with finger marks or oil from hands. This decreases insulation. A decrease in insulation causes commands to become unstable. Be sure to keep dry and clean. If soiled, wipe with alcohol etc. and dry well.
- Do not wire the detector cable or relay cable near equipment that supplies induction to parts such as the motor or the power cable of this equipment.




### Detector Specifications

| | |
|---|---|
| Product name | Industrial Turbidity and Suspended Solids Detector |
| Model | SS-150 |
| Measuring principle | 90-degree transmission scattering method or transmission method |
| Light source | Near infrared LED 860 nm |
| Detector | Silicon photo diode |
| Detector window material | PFA |
| Cell length | 30 mm |
| Data transfer | RS-485 (communication with converter) |
| Cleaning function | Wiper method (standard device)<br>Stepping motor operation<br>Power supply: DC 24 V 6 W supply from HU-200TB-IM converter<br>During cleaning, rotation occurs repeatedly according to a command from the converter.<br>Stands by in the prescribed position after the cleaning time has elapsed. |
| Sample water temperature | 0 - 45° C (no freezing) |
| Storage temperature | -25 - 65° C |
| Sample water pressure | 0 - 0.1 MPa |
| Material of wetted part | PFA, POM, SUS316, FKM, EPDM, PVC, PPO, SUS304 |
| Cable length | 10 m (standard), maximum extension 50 m (total length 60 m) |
| Power source | DC 24 V supply from HU-200TB-IM converter |
| External dimensions | Φ 60 x L250 mm (not including cable) |
| Mass | Approx. 1.0 kg (not including cable) |

# HU-200TB-IM Turbidity and Suspended Solids Analyzer (How To Install 1)

## Installation environment

- Install following the conditions below to ensure the instrument is installed in stable conditions.

**Converter**

- A well-ventilated area where there is no moisture
- Ambient temperature is above -20° C and below 55° C
- An area with no direct sunlight
- An area where there is no direct high radiation heat
- An area where the relative humidity is 90% or lower
- An area where the instrument will not be splashed with water or chemicals
- An area where there is little mechanical vibration
- An area where maintenance and wiring work can be done
- An area where there is no dust or corrosive gas
- An area where there is little effect from electromagnetic fields
- At an elevation less than 2000m
- A power supply with a voltage fluctuation range of AC 100 - 240 V ± 10%

**Detector**

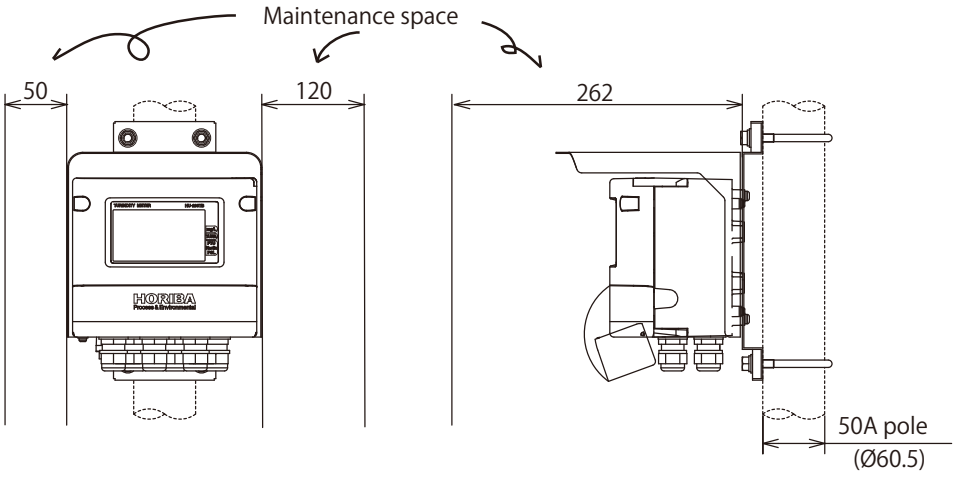
- An area where inspections and maintenance can be carried out easily
- The detector must remain stable when water is running
- At least 5 cm away from the base
- An area where tap water can be obtained for cleaning
- Water samples must not erode the wetted part of the detector
- Water samples must not be frozen
- No more than 10m deep

## Installing the Converter

This instrument can be installed either on a pole (50 A) or on the wall.

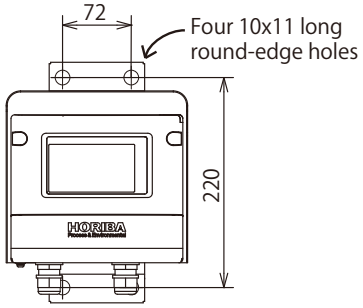
### -Pole Installation-

Allow space for maintenance of the unit.




### -Wall Installation-

Allow space for maintenance of the unit. (The same maintenance space as for pole installation is required.)



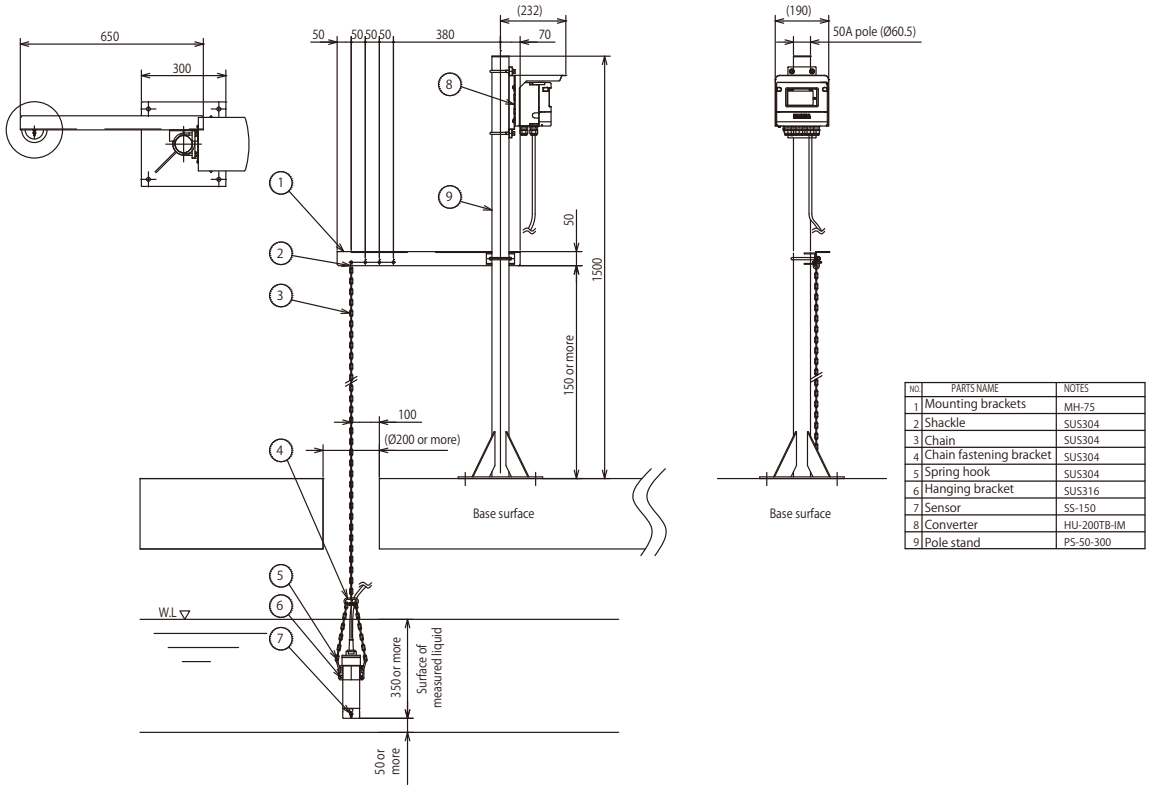
# HU-200TB-IM Turbidity and Suspended Solids Analyzer (How To Install 2)

## Installing the Detector

- The detector must always be suspended below the surface of the water.
- Measurement results are not affected as long as the detector is 2cm from the base.
  Please install it at least 5cm away from the base to enable replacement and at least 50cm from the base to prevent mud from being lifted.
- The detector can be hung by the optional chain to alleviate tension in the cable.
- Take care to ensure that the force of the water does not cause the detector to move.
- Avoid areas with air bubbles.

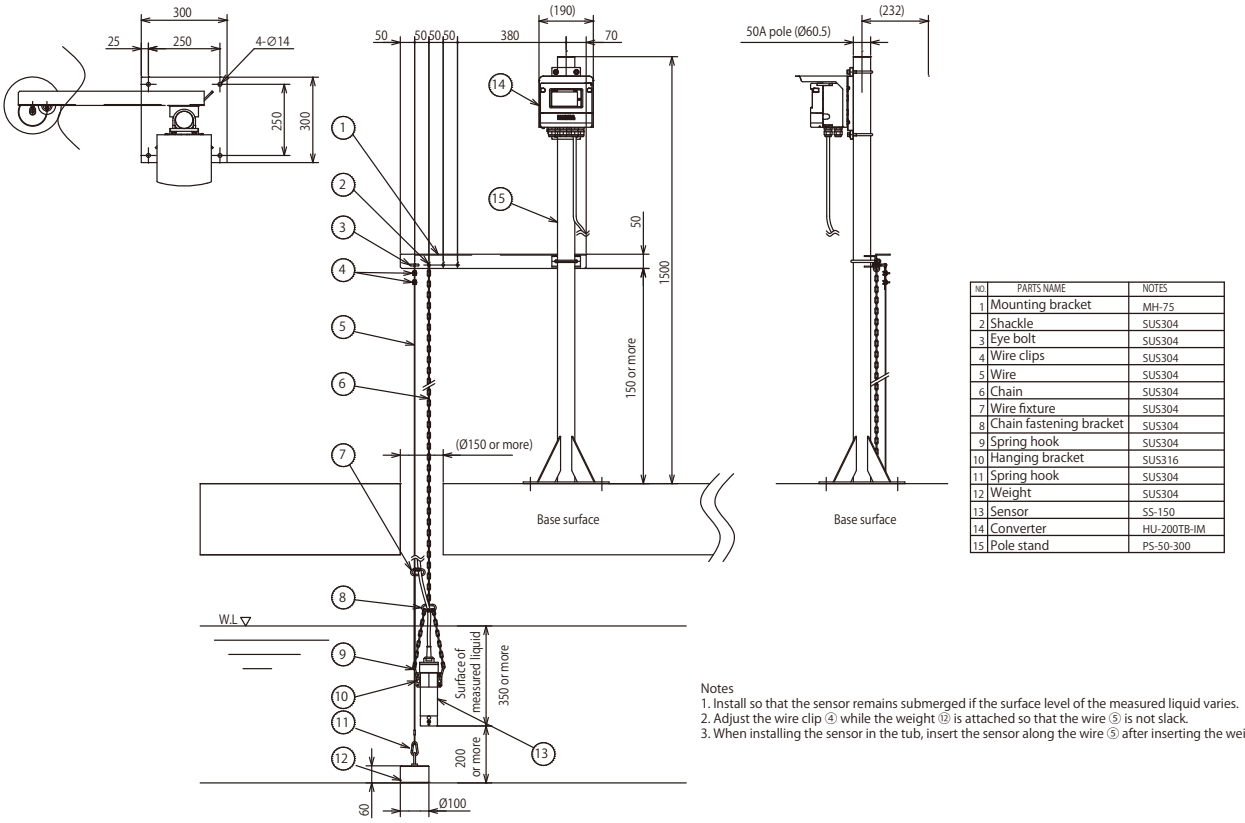
If using the hanging chain unit or wire unit, install these according to the diagrams below.

## If using the hanging chain unit




| NO. | PARTS NAME | NOTES |
|---|---|---|
| 1 | Mounting brackets | MH-75 |
| 2 | Shackle | SUS304 |
| 3 | Chain | SUS304 |
| 4 | Chain fastening bracket | SUS304 |
| 5 | Spring hook | SUS304 |
| 6 | Hanging bracket | SUS316 |
| 7 | Sensor | SS-150 |
| 8 | Converter | HU-200TB-IM |
| 9 | Pole stand | PS-50-300 |

## If using the hanging chain unit or wire unit




| NO. | PARTS NAME | NOTES |
|---|---|---|
| 1 | Mounting bracket | MH-75 |
| 2 | Shackle | SUS304 |
| 3 | Eye bolt | SUS304 |
| 4 | Wire clips | SUS304 |
| 5 | Wire | SUS304 |
| 6 | Chain | SUS304 |
| 7 | Wire fixture | SUS304 |
| 8 | Chain fastening bracket | SUS304 |
| 9 | Spring hook | SUS304 |
| 10 | Hanging bracket | SUS316 |
| 11 | Spring hook | SUS304 |
| 12 | Weight | SUS304 |
| 13 | Sensor | SS-150 |
| 14 | Converter | HU-200TB-IM |
| 15 | Pole stand | PS-50-300 |

Notes
1. Install so that the sensor remains submerged if the surface level of the measured liquid varies.
2. Adjust the wire clip ④ while the weight ⑫ is attached so that the wire ⑤ is not slack.
3. When installing the sensor in the tub, insert the sensor along the wire ⑤ after inserting the weight (12).

# HU-200TB-IM Turbidity and Suspended Solids Analyzer (Wiring 1)

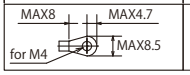
## Power Source

- The power supply of this instrument is a free power source with a rated voltage of AC100 to 240 V.
- Check the voltage of the power source, as operating at a voltage outside the rated range causes malfunction. Also, check that the range of fluctuations in supply voltage does not exceed ± 10%.
- This instrument has a power switch.

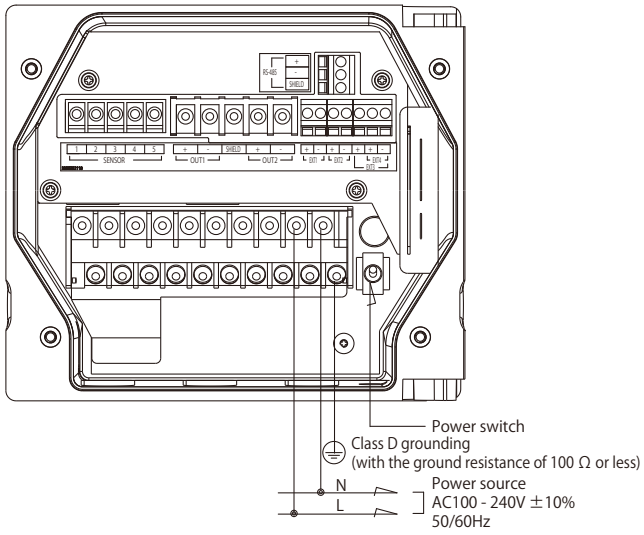
Main Specifications
- M4 terminal screws are used for the power supply.
- 0.75 - 5.5 $mm^2$ (AWG10 - 18) electric wires can be used.

- Install the power switch near the instrument and ensure that the power source can be turned on and off.
- Install lightning arresters if there is a risk that the instrument will be struck by lightning.
- For safety reasons, be sure to ground the earth terminal (class D grounding: with the ground resistance of 100 Ω or less).
- Ground separately from electrical equipment such as the motor.

Terminal Block Specifications

| Conforming crimped terminal | Wire size | Screw tightening torque |
|---|---|---|
|  | 5.5$mm^2$/MAX (AWG10) | 1.2 - 1.8 N·m |

*Note: The screws on the terminal block have a fall prevention structure.
When installing the terminal block, turn the screws until they lift (upward screw structure).



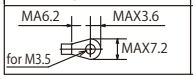

## Transmission output

- Equipped with 2 transfer outputs.
  A DC 4 - 20 mA signal compatible with the measurement range is output.
- Four types of transfer output range can be set for Transfer Output 2 (OUT 2), and it is possible to switch between these using an external input signal (contact point input).
- Receiving resistance on the receiving instrument side is a maximum of 900 Ω .
  Select a receiving instrument whose input suits that of this instrument (recorder, meter relay).
- An arbitrary full-scale range can be set for the transfer output within the full-scale setting range for measurement values. Also, set a burnout (transmission output: 3.8mA or 21mA). It is possible to set whether to temporarily hold the output value at the last value or a preset value when holding the transmission output during an external signal.

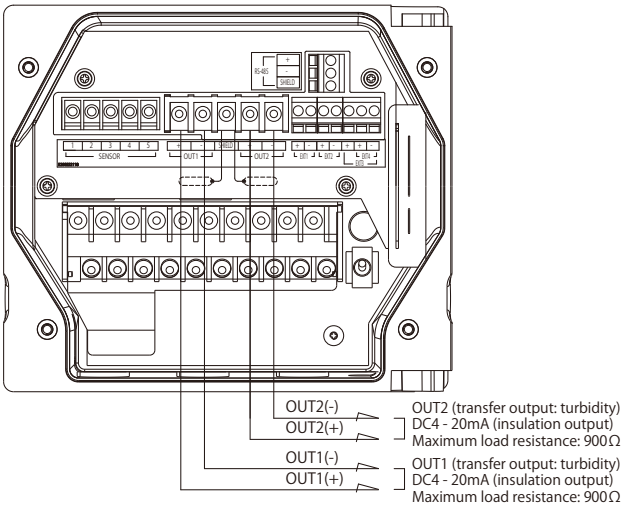
Main Specifications
- M3.5 terminal screws are used for the transfer outputs.
- The wire size is 2mm2 (AWG14) max.

- Use shield wires for the transfer output cables.
- Install arresters on the output side and receiving instrument side of the instrument if there is a risk that it will be struck by lightning.

Terminal Block Specifications

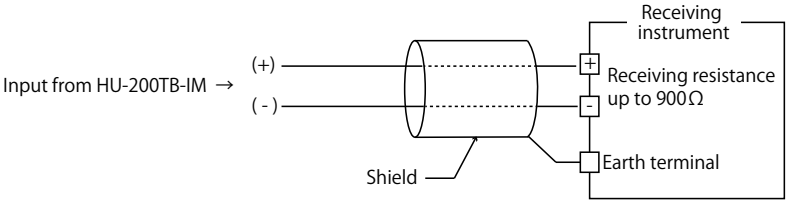
| Conforming crimped terminal | Wire size | Screw tightening torque |
|---|---|---|
|  | 2$mm^2$/MAX (AWG14) | 0.8 - 1.2 N·m |

*Note: The screws on the terminal block have a fall prevention structure.
When installing the terminal block, turn the screws until they lift
(upward screw structure).

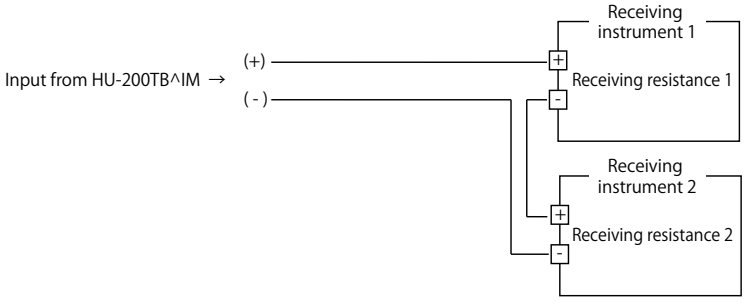



### Receiver side

- Ground the shielded cable on the receiving instrument side.




- When making multiple connections to the receiving instrument
  Connect to the series as shown in the figure on the right.
  The total resistance for the connected receiving instrument is 900 Ω .



# HU-200TB-IM Turbidity and Suspended Solids Analyzer (Wiring 2)

## Contact input

- Equipped with 4 contact point inputs.
  It is possible to put output on hold, operate the cleaner or switch the transfer output range using an external signal.
- It is possible to switch between four preset types of transfer output ranges using the EXT.3 and EXT.4 contact point inputs.

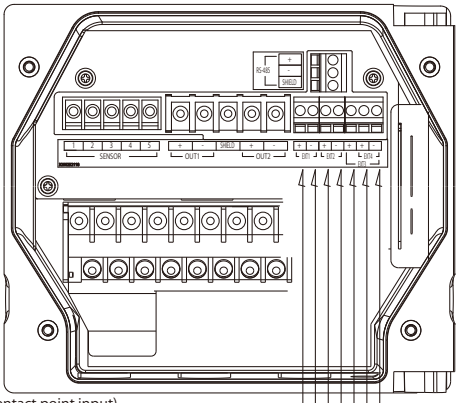
Main Specifications
- 0.14 - 2.5 mm2 (AWG 14 - 26) electric wires can be used.

- Use a twist pair shielded cable.
  Install arresters on the output side and receiving instrument side of the instrument if there is a risk that it will be struck by lightning.
- The maximum resistance of contact point inputs must be 100 Ω or lower.

Terminal Block Specifications

| Conforming crimped terminal | Wire size | Screw tightening torque |
|---|---|---|
|  | 0.14 - 2.5mm² (AWG14 - 26) Single wire or strand wires | 0.5 - 0.6 N·m |

*Note: The screws on the terminal block have a fall prevention structure.
When installing the terminal block, turn the screws until they lift (upward screw structure).




EXT.1 (contact point input)
Non-voltage contact point input
ON resistance: Maximum 100Ω
Open circuit voltage: 24V DC
Short circuit current: Maximum 12mA
EXT1(+)
EXT1(-)

EXT.2 (contact point input)
Non-voltage contact point input
ON resistance: Maximum 100Ω
Open circuit voltage: 24V DC
Short circuit current: Maximum 12mA
EXT2(+)
EXT2(-)

EXT.3 (contact point input)
EXT.4 (contact point input)
Non-voltage contact point input
ON resistance: Maximum 100Ω
Open circuit voltage: 24V DC
Short circuit current: Maximum 12mA
EXT.3 and EXT.4 are common
EXT3(+)
EXT4(+)
EXT3/4(-)

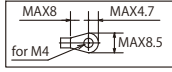
## Range output

- Transfer Output 2 (OUT2) allows external or automatic switching between up to 4 measurement ranges. Some range output contact points can recognize the range being output at Transfer Output 2.

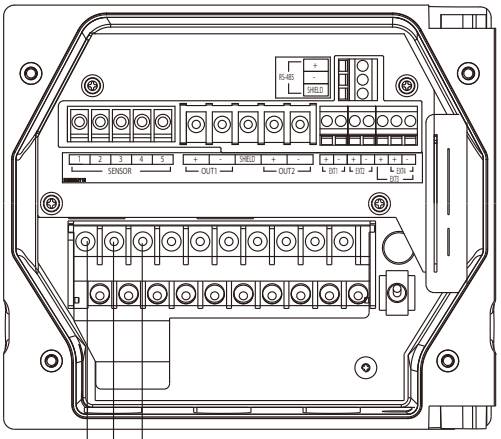
Main Specifications
- M4 terminal screws are used for the power supply.
- 0.75 - 5.5 mm² (AWG10 - 18) electric wires can be used.

- Install lightning arresters if there is a risk that the instrument will be struck by lightning.
- For safety reasons, be sure to ground the earth terminal (class D grounding: with the ground resistance of 100 Ω or less ).
- Ground separately from electrical equipment such as the motor.

Terminal Block Specifications

| Conforming crimped terminal | Wire size | Screw tightening torque |
|---|---|---|
|  | 5.5mm²/MAX (AWG10) | 1.2 - 1.8 N·m |

*Note: The screws on the terminal block have a fall prevention structure.
When installing the terminal block, turn the screws until they lift (upward screw structure).




CR
NOR2
NOR1
RNG2
RNG1

(Contact point output)
Non-voltage contact point output
Contact point capacity (resistance load)
DC 30V, 1A

# HU-200TB-IM Turbidity and Suspended Solids Analyzer (Wiring 3)

## Contact output

- Equipped with 4 contact point outputs (one for FAIL (error alarms)).
- Select from 5 types: "Alarm Output (AL)", "Absorbance Alarm Output (Abs)", "Hold (HOLD)", "Cleaning (CLn)" or "None (non)".

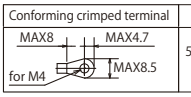
Main Specifications
- The contact capacity is less than AC 250 V and 3A or DC 30V and 3 A.
- M4 terminal screws are used.
- Electric wires up to 0.75 - 5.5mm$^2$ (AWG10 - 18) can be used.

- Use a varistor or noise killer if noise occurs in the load.
- The NO and NC arrangement is reversed only in the case of fail output. For normal (non-fail) output, the CF-NOF contact is open and the CF-NCF contact is shorted. The C-NOF contact is shorted when the power is off.

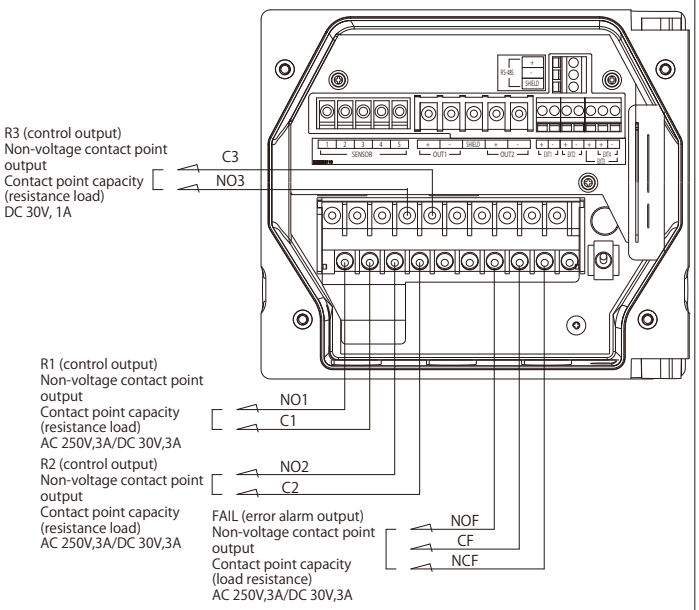
! If connecting a load higher than the contact capacity or an inductive load (such as a motor or pump), be sure to connect the load through a power relay with a rating higher than that of the load.

! Be careful when connecting loads, as the R1-R2 C-NC contact points are shorted when the power of the analyzer is turned off.

Terminal Block Specifications

| Conforming crimped terminal | Wire size | Screw tightening torque |
|---|---|---|
|  | 5.5mm$^2$/MAX (AWG10) | 1.2 - 1.8 N·m |

*Note: The screws on the terminal block have a fall prevention structure.
When installing the terminal block, turn the screws until they lift (upward screw structure).



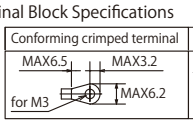

## Detector

- A single turbidity detector can be used.
  The cleaner (optional) can be operated by an external signal.

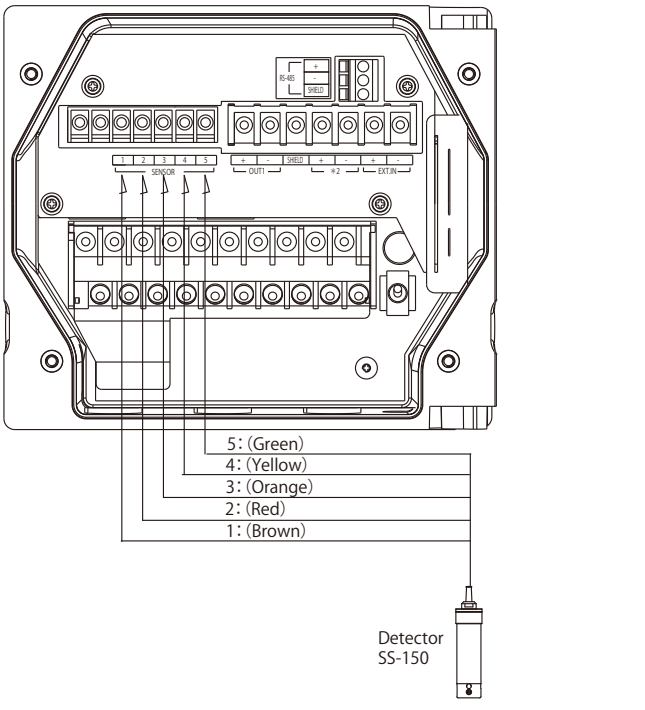
Main Specifications
- M3 terminal screws are used.
- Electric wires up to 1.25mm$^2$ (AWG16) can be used. (The cable of the detector is a dedicated cable. To extend the cable, use a relay box and dedicated cable (relay cable).)

- Do not allow the detector cable terminal and terminal block to come into contact with liquids such as water or soil them with finger marks or oil from hands. This decreases insulation. A decrease in insulation causes commands to become unstable. Be sure to keep dry and clean. If soiled, wipe with alcohol etc. and dry well.
- Do not wire the detector cable or relay cable near equipment that supplies induction to parts such as the motor or the power cable of this equipment.

Terminal Block Specifications

| Conforming crimped terminal | Wire size | Screw tightening torque |
|---|---|---|
|  | 1.25mm$^2$/MAX (AWG16) | 0.8N·m |

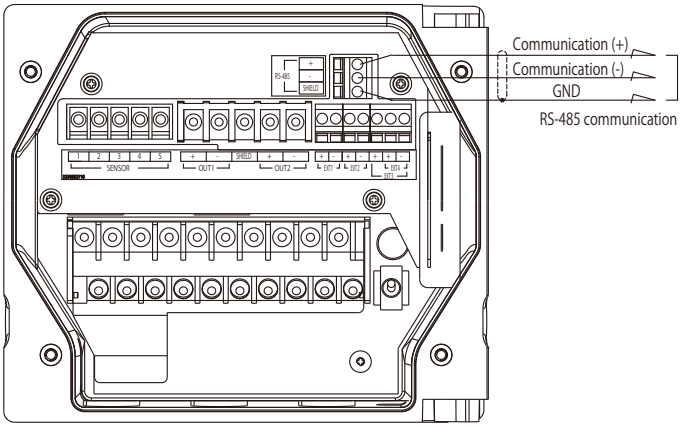
*Note: The screws on the terminal block have a fall prevention structure.
When installing the terminal block, turn the screws until they lift
(upward screw structure).



# HU-200TB-IM Turbidity and Suspended Solids Analyzer (Wiring 4)

## RS-485

- This instrument is equipped with the RS-485 communication terminal. Connect the wiring before using.
- 0.14 - 2.5 mm2 (AWG 14 - 26) electric wires can be used.
- Use a twist pair shielded cable for the communication output cable.
- Up to 32 terminals can be connected including the host computer. Set an address.
- The maximum cable length of the communication cable is 500 m.
- Provide termination resistance (Rt: 120 Ω ) for the instrument that is the terminus of the RS-485 communication line.




Terminal Block Specifications

| Conforming crimped terminal | Wire size | Screw tightening torque |
|---|---|---|
| 11 | 0.14 - 2.5mm² (AWG14 - 26) Single wire or strand wires | 0.5 - 0.6 N·m |

*Note: The screws on the terminal block have a fall prevention structure. When installing the terminal block, turn the screws until they lift (upward screw structure).

Example of external communication connection