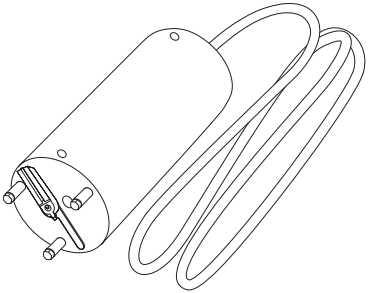
SS Checker

WATER it

TS-Mx-D

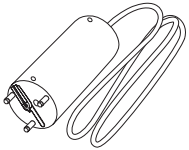
Instruction Manual

Thank you very much for purchasing SS Checker TS-Mx-D.
All of this instruction manual must be read before operation of this SS Checker for safe and proper operation.
This instruction manual should be kept for future reference such as maintenance.

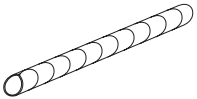


The instruction manual is also available on the following website.
https://navi.optex.net/manual/05338/?lang=en

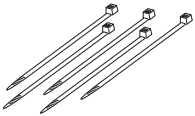
The Contents of Packaging



Sensor: 1



Cable protective cover: 1



Cable tying band: 5

Cleaning brush: 1

Detection window
cleaning paper: 1

Instruction manual
(this document)

If there are any missing or faulty items, please contact our sales representative.

Reference	Can be connected to SC-U1. 

Table of Contents

1 For Safe Use

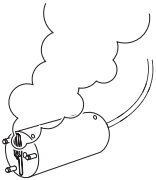
Be sure to read this instruction manual in order to use this SS Checker properly.

- Please thoroughly read "For Safe Use" before using this SS Checker properly.
- Because these precautions are related to failure or malfunction, observe the precautions for use without fail.

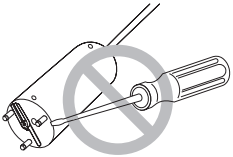
⚠ **Do not use TS-Mx-D except for measurement of water quality.**

"⃠" denotes "Prohibited action", and "❗" denotes "Required action" .

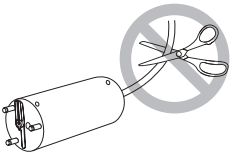
❗ **In the unlikely event of occurrence of abnormalities such as smoke or abnormal noise, immediately turn off the power.**



⃠ **Do not disassemble or modify the sensor.**



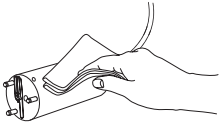
⃠ **Handle with care not to damage.**



❗ **Use the sensor with 24 VDC.**

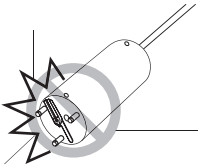
24 VDC

To clean the sensor, first wipe away lightly with a clean soft cloth damped by diluted mild detergent solution and then wipe off moisture with a dry clean soft cloth.

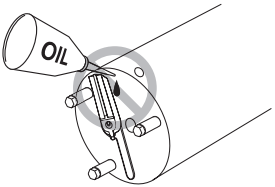


Do not wipe the sensor with solvent such as Thinner. It may cause failure.

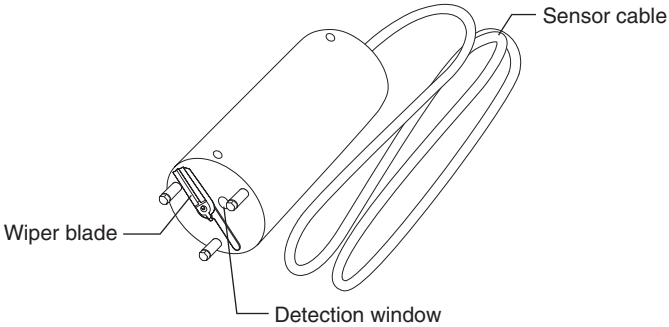
Avoid strong physical shock to the sensor or do not drop it.



Do not apply oil such as grease to the sensor.



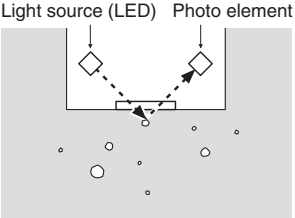
2 Component Name



Caution	• Do not carry the sensor with the sensor cable. • Do not touch the detection window. Clean the detection window if your hand touches it.

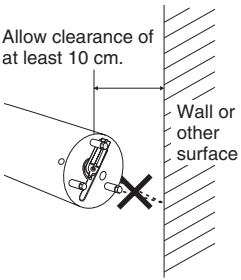
3 Measuring Principle

SS Checker TS-Mx-D uses a method of scattered light. In the method, a light source of a sensor illuminates the surfaces of suspended matter floating in the water, and the light is scattered by these surfaces is detected by a photo element. The measurement value is determined by the amount of scattered light.



Caution

SS checker uses a method of scattered light. Therefore, measurement values may be affected by measurement light reflected from equipment surfaces or accumulated materials if the sensor is installed nearby. Install the sensor with a clearance of at least 10 cm from the sensor surface to equipment or other surfaces.



If it is close, the measurement light hits and the reflected light affects the measurement value.

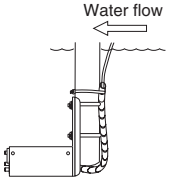
4 Installation

Sensor installation

Before installation, turn off the power switch of SC-U1 or disconnect the power cable from the supply source and wire the power cable after the installation is complete.

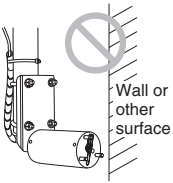
"⃠" denotes "Prohibited action", and "❗" denotes "Required action" .

When installing the sensor, make sure that the sensor is oriented relative to the water flow as shown in the illustration. Otherwise, suspended matter in the water will adhere to the detection surface and affect the measurement value.

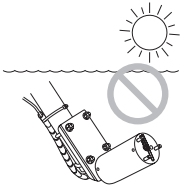


Do not install the sensor with the sensor surface facing down. Bubbles may accumulate in the measurement area, or the measurement light may be reflected off the bottom of the facility or accumulated objects, making it impossible to measure correctly.

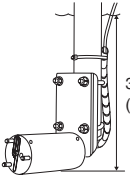
Do not install the sensor near a wall or other surface. Measurement light will strike the surface and the reflected light will affect the measurement values.



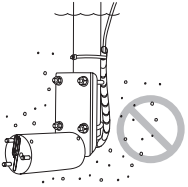
Install the sensor avoiding the situation that the sensor surface receive strong light such as sunlight directly.



With fluctuation of water level taken into account, dispose the sensor so as to be immersed up to of the order of 30 cm below the expected lowest water level.

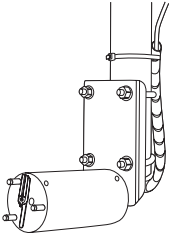


Dispose the sensor in water without air bubbles.



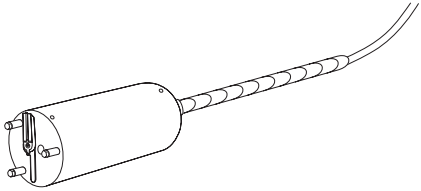
Reference

The sensor can be installed in landscape orientation, and in order to prevent the sensor from hitting the side wall or rotating by the water flow, a mounting attachment (TA-3) for fixing the sensor to the pipe is available as an option.
For details, contact the dealer or visit our website:
https://www.optex.co.jp/e/products/environmental-sensor/
*Pipe: The 25A stainless steel pipe (outer diameter 34 mm) for piping to be prepared by the user.



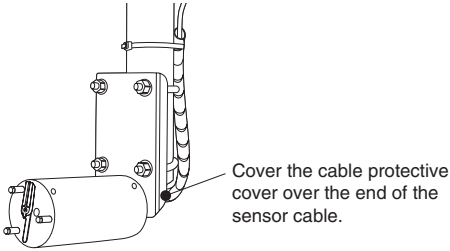
- Read the precautions in the “TA-3 instruction manual” carefully.
- Be sure to install the cable protective cover. Otherwise the cable may be damaged and flooded during maintenance.

1 **Wrap the cable protective cover on the sensor side of the sensor cable.**



⚠	**Be sure to install the cable protective cover. The cable may be damaged and flooded during maintenance.**

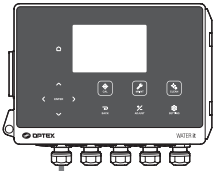
2 **Attach the end of the cable protective cover to a pipe with a cable tying band.**



⚠	**Do not hang the sensor with the sensor cable. If there are walls, equipment, bottom surfaces, or accumulations near the facility, the measurement light will be reflected by them, affecting the measurement value. Keep the detection surface at least 10 cm away from the facility wall.**

Extension of sensor cable

The standard length of the sensor cable is 9 m. To extend the cable, refer to the following.
To extend the cable, connection using pull box is recommended.



Nominal sectional area	Max. cable length X
0.3 mm^2	20 m
0.5 mm^2	40 m
0.75 mm^2	70 m
1.0 mm^2	100 m

Max. cable length X

Pull box, etc.

The cable gland fits the cable sheath diameter of 6 to 8 mm.

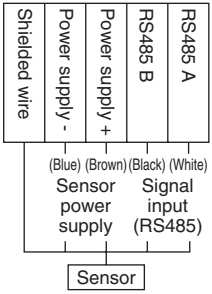
5 Wiring

Use this product by connecting to Universal Transmitter SC-U1.
For installation and wiring to SC-U1, refer to the "Universal Transmitter SC-U1 Installation Manual".

⚠	**Before wiring, turn off the power switch of SC-U1 or disconnect the power cable from the supply source and wire the power cable after all the other wiring is complete.**

1 Connect the sensor to SC-U1.

- The cable gland fits the cable sheath diameter of 6 to 8 mm.
- The sensor cable must be shielded (CVV-S) with a nominal cross-sectional area of 0.2 to 1.25 mm^2.
- Refer to “Extension of sensor cable” P.12 for extension of the sensor cable. To extend the sensor cable, connection using pull box is recommended.
- Wire the terminal block according to the color of the tip of each wire.



6 Sensor Setting

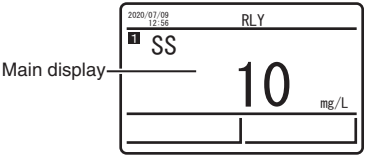
The following settings are available from SC-U1.

To start sensor setting, press SETTING.

Caution	Pressing SETTING automatically retains the measurement value.

Display item (unit selection)

Set the unit of SS to show on the SC-U1 display.



For operation, refer to the "Universal Transmitter SC-U1 Operation Manual", "5.1 Sensor Setting" and " ◆ Display Item".

Caution	When the display item is changed, the settings of “7 4-20 mA Setting” P.16 and “8 Relay Setting” P.18 that have set the display item become OFF. In addition, the values of “10 Adjustment”, “Offset adjustment” P.23, “Span adjustment” P.25, and “2-point adjustment” P.27 are reset to the factory default values. Set again if necessary.

	Measurement item	Display item		Factory default setting
		Item	Unit	
Main display	Suspended solids	SS	mg/L	SS mg/L
		SS	No unit	

Use “No unit” according to the usage conditions.

The following display resolutions are available.

- 0 - 50000: 10

Response time

Set a signal output response time.
A measurement value is calculated using moving average of the time period set by the signal output response time.
For example, if the sensor measures values every 5 seconds and the signal output response time is set to 50 seconds, which is 5 seconds × 10 times, the moving average of 10 times measurement is calculated and used as the measurement value.

For operation, refer to the "Universal Transmitter SC-U1 Operation Manual", "5.1 Sensor Setting" and " ◆ Response Time".

	Setting range	Factory default setting
Response Time	5 to 600 seconds (by 5 seconds)	5 seconds

The recommended value for this product is 30 seconds or longer.
If the response is too fast with the factory default setting (5 seconds), change the signal output response time as needed.

7 4-20 mA Setting

Set the 4-20 mA signal output setting from SC-U1.
The factory default setting is OFF for 4-20 mA signal output.

To set 4-20 mA output setting, press SETTING.

Caution	Pressing SETTING automatically retains the measurement value.

Output item selection

Select an item to output by 4-20 mA signal.

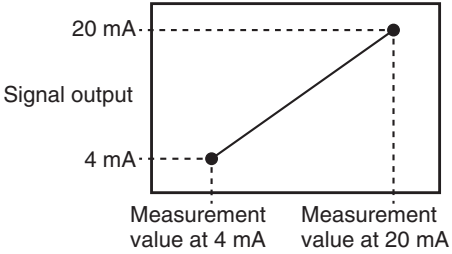
For operation, refer to the "Universal Transmitter SC-U1 Operation Manual", "5.3 4-20 mA Setting" and " ◆ Output Item Select".

Caution	When “Display item (unit selection)” P.14 is changed, the output item of the channel of 4-20 mA setting that has set the display item becomes OFF. Set again if necessary.

Output item [Display]
Suspended solids [SS]

Upper/lower limit of signal output range

For the item by 4-20 mA signal output, set the measurement value to output at lower limit (Lo, 4 mA) and upper limit (Hi, 20 mA).



For operation, refer to the "Universal Transmitter SC-U1 Operation Manual", "5.3 4-20 mA Setting", " ◆ Signal output range lower limit" and " ◆ Signal output range upper limit".

Output item [Display]	Factory default setting	Signal output range Lower limit to Upper limit	Minimum setting range Upper limit - Lower limit ≥
Suspended solids [SS]	Lower limit: 0 Upper limit: 50000	0 to 50000	10

The setting unit depends on the display resolution. (For display resolution, refer to “15 Specifications” P.38)

8 Relay Setting

Set the relay output setting from SC-U1.
The factory default setting is OFF for relay output.

To configure the relay setting, press SETTING.

Caution	Pressing SETTING automatically retains the measurement value.

Alarm output setting

Set the alarm to be output when the measurement value exceeds a certain value.
The following settings are available.

For operation, refer to the "Universal Transmitter SC-U1 Operation Manual", "5.4 Relay Setting" and " ◆ Alarm output setting".

Caution	When “Display item (unit selection)” P.14 is changed, the output item of the channel of relay setting that has set the display item becomes OFF. Set again if necessary.

Setting item	Setting range
	Suspended solids [SS]
Trigger	High Alarm/Low Alarm
Active Level	0 to 50000
Hysteresis	High Alarm: 0 to Active level
	Low Alarm: 0 to (50000 - Active level)
ON Delay	OFF 1 to 120 minutes
OFF Delay	OFF 1 to 120 minutes

The active level setting unit depends on the display resolution. (For display resolution, refer to “15 Specifications” P.38)

Maintenance output setting

Set a maintenance timer for any cycle (“Maintenance timer” P.31) to notify the user when the set period has elapsed.
Use this for notification of sensor maintenance, replacement of consumables, and overhaul timing.
Check notifications by the relay output and dedicated cloud server (SC-U1 and GW connected).
For more information about checking notifications on the cloud server, refer to the cloud server’s help.

For operation, refer to the "Universal Transmitter SC-U1 Operation Manual", "5.4 Relay Setting" and " ◆ Maintenance output setting".

Self Checking output setting

Set an output when a malfunction such as sensor failure or disconnection occurs.

For operation, refer to the "Universal Transmitter SC-U1 Operation Manual", "5.4 Relay Setting" and " ◆ Self Checking output setting".

9 Calibration

Perform calibration before using the sensor or after cleaning.
Distilled or deionized water is required.

To calibrate SC-U1, press CAL.

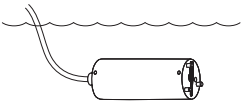
Caution	Pressing CAL automatically retains the measurement value.

Zero calibration

Immerse the sensor in distilled water or ion-exchange water and adjust the measurement value to the reference value (zero).

1 Clean the sensor's main unit and detection window.

2 Immerse the sensor in distilled water or ion-exchange water.



Caution	• When calibrating, be sure to clean the sensor body and detection window before immersing the sensor in distilled water or ion-exchange water. • When calibrating, keep the detection surface at least 10 cm away from the bottom of the container or the wall. The calibration will not be correct if the measurement light is reflected on the bottom of the container or the wall.

3 Allow the sensor to acclimate to the water temperature for about 5 minutes, and check that there are no bubbles in the detection window.

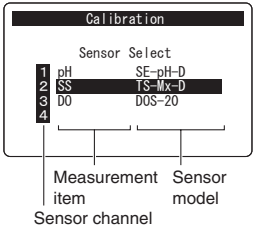
If bubbles are present, perform “Manual cleaning” P.32 to remove bubbles.

4 **Press CAL.**

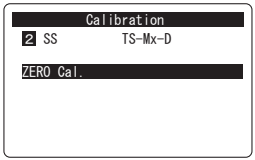
The sensor selection display is displayed.

5 **Select a channel connected to TS-Mx-D using ∧ ∨, and press ENTER.**

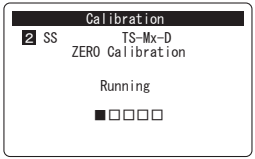
The calibration menu is displayed.



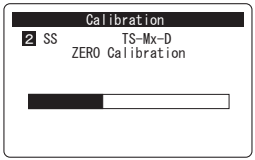
6 **Select [ZERO Cal.] using ∧ ∨, and press ENTER.**



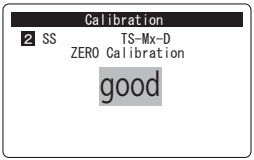
The calibration starts.
During calibration a processing display is displayed.



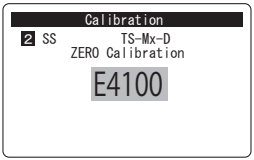
When the calibration is complete, a progress bar is displayed and then the calibration result is displayed.



7 When the calibration is complete, check the result.



good:
The calibration is properly completed.



E4100 to 4199:
Calibration failed.
Try the steps again from 1.

Pressing ENTER or BACK switches to the measurement value display.

10 Adjustment

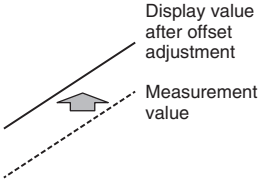
Adjust and display the measurement values according to usage. In addition, adjust and display the measurement values according to the environment where used.

To adjust, press [+/− ADJUST].

Caution	
	• Pressing [+/− ADJUST] automatically retains the measurement value. • If offset, span, or 2-point adjustment has already been performed, be sure to initialize the adjustment before performing the 2-point adjustment. • When “Display item (unit selection)” P.14 is changed, the values of the offset adjustment, span adjustment, and 2-point adjustment that have the display item are reset to the factory default values. Set again if necessary.

Offset adjustment

Set the offset coefficient to add to a measurement value.
Display the measurement value with offset-adjusted to any display value.
For 4-20 mA output (“7 4-20 mA Setting” P.16) and alarm output (“Alarm output setting” P.18), the adjusted values are applied.



Measurement item [Display]	Setting range	Factory default setting
Suspended solids [SS]	-5000 to 5000	0

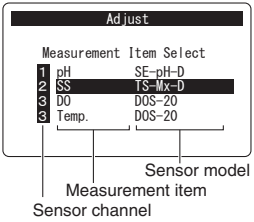
1 **Press [+/− ADJUST].**

The measurement item selection display is displayed.

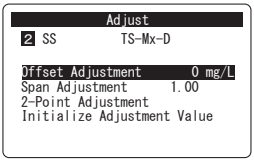
2 Select [SS TS-Mx-D] using ∧ ∨, and press ENTER.

Use < > to switch pages.

The adjustment menu is displayed.

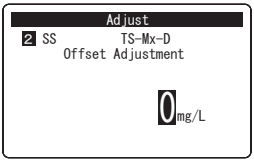


3 Select [Offset Adjustment] using ∧ ∨, and press ENTER.



4 Enter the offset value.

Select a digit by < > and value by ∧ ∨, and press ENTER.

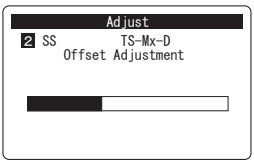


When a value outside the set range is entered, a short beep sounds.

Pressing < > simultaneously while entering a value resets the value to the factory default setting.

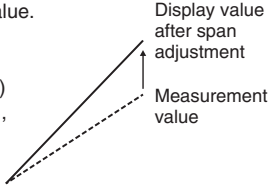
By pressing ⌂ or BACK, the value returns to the one before changing it.

During adjustment a progress bar is displayed.
When completed, the display returns to the measurement value display.



Span adjustment

Set the span coefficient for a measurement value.
Display the measurement value with span-adjusted to any display value.
For 4-20 mA output (“7 4-20 mA Setting” P.16) and alarm output (“Alarm output setting” P.18), the adjusted values are applied.



Measurement item [Display]	Setting range	Factory default setting
Suspended solids [SS]	0.30 to 3.00	1.00

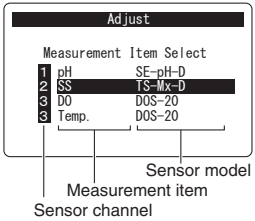
1 **Press [+/− ADJUST].**

The measurement item selection display is displayed.

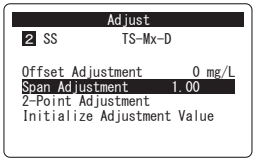
2 **Select [SS TS-Mx-D] using [∧] [∨], and press [ENTER].**

Use [<] [>] to switch pages.

The adjustment menu is displayed.

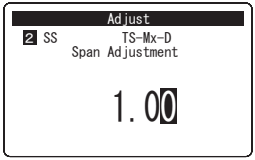


3 **Select [Span Adjustment] using [∧] [∨], and press [ENTER].**



4 Input a span adjustment value.

Select a digit by < > and value by ∧ ∨, and press ENTER.

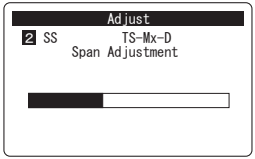


When a value outside the set range is entered, a short beep sounds.

Pressing < > simultaneously while entering a value resets the value to the factory default setting.

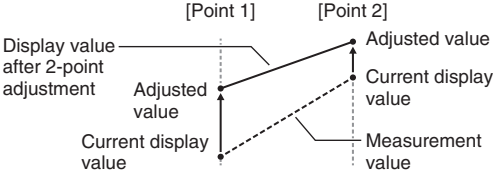
By pressing ⌂ or BACK, the value returns to the one before changing it.

During adjustment a progress bar is displayed.
When completed, the display returns to the measurement value display.



2-point adjustment

Display current values of the 2 points as any adjustment values, respectively.
Performing 2-point adjustment changes the offset and span based on the adjusted values.
For 4-20 mA output (“7 4-20 mA Setting” P.16) and alarm output (“Alarm output setting” P.18, the adjusted values are applied.



Caution	If offset, span, or 2-point adjustment has already been performed, be sure to initialize the adjustment before performing the 2-point adjustment.

Measurement item [Display]	Measurement item setting range (display value/adjusted value)	Factory default setting
Suspended solids [SS]	[Point 1]: 0 to (2nd point value - 10)	0
	[Point 2]: (1st point value + 10) to 50000	50000

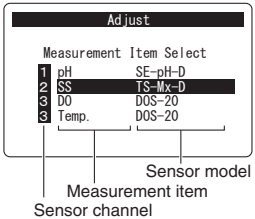
1 **Press [+/−] ADJUST.**

The measurement item selection display is displayed.

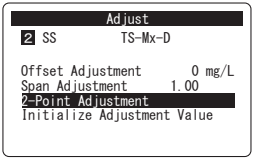
2 **Select [SS TS-Mx-D] using [∧] [∨], and press [ENTER].**

Use [<] [>] to switch pages.

The adjustment menu is displayed.

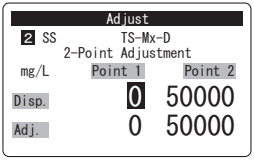


3 **Select [2-Point Adjustment] using ∧ ∨, and press ENTER.**



4 **Enter the [Point 1] display, [Point 1] adjusted, [Point 2] display, and [Point 2] adjusted values in this order.**

Select a digit by < > and value by ∧ ∨, and press ENTER. The value is set and the cursor moves to the next item.



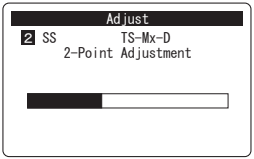
When a value outside the set range is entered, a short beep sounds.

Pressing < > simultaneously while entering a value resets the value to the factory default setting.

By pressing ⌂ or BACK, the value returns to the one before changing it.

After entering the [Point 2] adjusted value and pressing ENTER, a progress bar is displayed.

When completed, the display returns to the measurement value display.



Reference	When a 2-point adjustment is performed, the offset and span adjusted values will automatically replace the values calculated from the displayed and adjusted values of the 2-point adjustment.

Adjustment initialization

Reset the adjustment value to the factory default value.

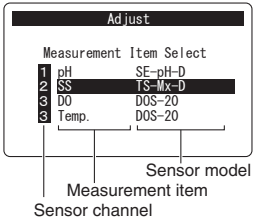
1 **Press [+/− ADJUST].**

The measurement item selection display is displayed.

2 **Select [SS TS-Mx-D] using [∧] [∨], and press [ENTER].**

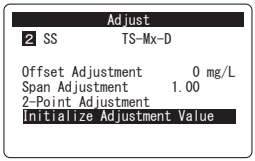
Use [<] [>] to switch pages.

The adjustment menu is displayed.



3 **Select [Initialize Adjustment Value] using [∧] [∨], and press [ENTER].**

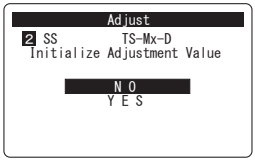
The initialize adjustment value menu is displayed.

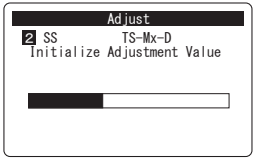


4 **Select [NO] or [YES] using [∧] [∨], and press [ENTER].**

- Selecting [Yes] executes initialization and displays a progress bar.
- Selecting [No] cancels initialization and returns to the initialize adjustment value menu.

During initialization a progress bar is displayed.
After completion, the adjustment value is initialized and the display returns to the measurement value display.





11 Maintenance Setting

Set the maintenance setting from SC-U1.

To perform maintenance, press MAINT.

Caution	Pressing MAINT automatically retains the measurement value.

Measurement value hold

The latest measurement value is retained (held). This is used for sensor maintenance and cleaning.

For operation, refer to the "Universal Transmitter SC-U1 Operation Manual", "8 Maintenance Setting" and " ◆ Measurement value hold".

Hold timer

Set the time period to hold the measurement value.
Select an item from the following.

For operation, refer to the "Universal Transmitter SC-U1 Operation Manual", "8 Maintenance Setting" and " ◆ Hold Timer".

Output item	Setting range	Factory default setting
HOLD Timer	OFF 10 to 1440 minutes (by 10 minutes)	60 minutes

Maintenance timer

Set a maintenance timer for any cycle to notify the user when the set period has elapsed.
This is used for notification of sensor maintenance, replacement of consumables, and overhaul timing.
Check notifications by the relay output (“Maintenance output setting” P.19) and the dedicated cloud server (SC-U1 and GW connected).
For more information about checking notifications on the cloud server, refer to the cloud server’s help.

For operation, refer to the "Universal Transmitter SC-U1 Operation Manual", "8 Maintenance Setting" and " ◆ Maintenance Timer".

Output item	Setting range	Factory default setting
Maintenance Timer	OFF 7 to 1095 days (by 1 day)	OFF

12 Cleaning

Set the sensor cleaning setting from SC-U1.

To perform cleaning, press CLEAN.

Caution	• Pressing CLEAN automatically retains the measurement value. • Do not press CLEAN while a sensor with a wiper is in the air. This may cause the sensor to malfunction.

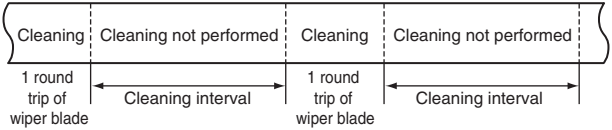
Manual cleaning

Activate the wiper manually. While cleaning the measurement value of the target sensor is retained (held).

For operation, refer to the "Universal Transmitter SC-U1 Operation Manual", "9 Cleaning" and " ◆ Manual Cleaning".

Cleaning interval

Set a time interval to activate the wiper.
This product is a sensor with wipers and it operates as following.



- The setting time for the cleaning interval is the time interval between the end of cleaning and the next cleaning.
- The cleaning action is fixed at 1 wiper blade round trip per cycle.

Select an item from the following.

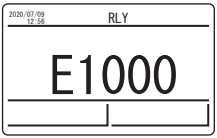
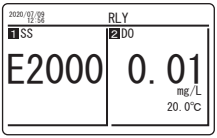
For operation, refer to the "Universal Transmitter SC-U1 Operation Manual", "9 Cleaning" and " ◆ Cleaning Interval".

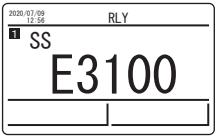
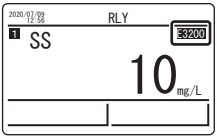
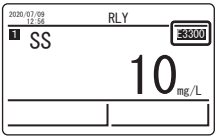
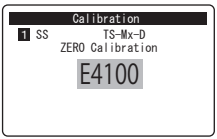
Item	Setting range	Factory default setting
Cleaning Interval	OFF (No cleaning) 10 to 1440 minutes (by 10 minutes)	30 minutes

13 Troubleshooting

Error code list

The following table describes error codes, causes and actions.
If you find any problem other than the error codes, refer to “When in trouble” in the "Universal Transmitter SC-U1 Operation Manual".
When the normal condition is not recovered after the countermeasure is taken, when any problem other than these occurs, or when requesting repairs, check the model and the serial No. of the product, and then contact the dealer.

Error code and details	Cause	Action
E1000 Communications error 	The sensor cable is broken.	Make sure that the cable is not damaged. If any damage is found, contact the dealer.
	The sensor cable is not properly wired.	Turn off power of the transmitter, check the wiring, and be sure to wire properly.
	The sensor is out of order.	The sensor must be repaired. Contact the dealer.
E2000 Sensor processing/sensor failure 	Manual cleaning was carried out immediately after cleaning operation.	Wait a few seconds to return to the measurement value display. When performing manual cleaning, wait at least 5 minutes after cleaning operation.
	SC-U1 was operated while the sensor was being processed.	The sensor is no longer accepting input from SC-U1. The display returns to the measurement value after a few seconds.
	The sensor cable is broken.	Make sure that the cable is not damaged. If any damage is found, contact the dealer.

Error code and details	Cause	Action
E2000 Sensor processing/sensor failure	The sensor cable is not properly wired.	Turn off power of the transmitter, check the wiring, and be sure to wire properly.
	The sensor is out of order.	The sensor must be repaired. Contact the dealer.
E3100 to E3199 Measurement error 	The detection window is not clean.	Clean the detection window if it is not clean.
E3200 to E3299 Temperature error 	The temperature of the water to measure is out of the usage range.	The water temperature must be 0 to 40°C.
E3300 to E3399 Humidity error 	The internal humidity of the unit exceeds its limit.	The unit must be overhauled or repaired. Contact the dealer. Reference: “Overhaul” P.37
E4100 to E4199 Calibration error 	The detection window is not clean.	Clean the detection window if it is not clean.

14 Maintenance

Caution	• To clean the sensor, lightly wipe with a clean, soft cloth and water diluted with a mild detergent, and then wipe with a dry, soft cloth. • Do not wipe the sensor with organic solvent such as benzine. • Do not put oil such as grease on a wiper blade.

Maintenance (monthly)

Perform the following operations every month.
- Clean the detection window and wiper blade using tap water.
- Inspect the detection window for damage and/or degeneration.
- Inspect the wiper blade for wear and/or deformation.
- Inspect the wiper blade that it is tightly fixed.
- Inspect the sensor cable for damage and/or degeneration.
- Immerse the sensor in measurement water of the known concentration and check that the correct value is displayed on the transmitter.

Periodic inspection (every 3 months)

Perform the following inspections every 3 months.
- Terminal block screws of the transmitter are not rusted.

Replacement of consumables

- Replace the wiper blade once a year as rough standard. In addition, replace it when adequate wiping effect cannot be produced.
- Replacement wiper blade and hanging bracket are included in the optional maintenance kit (TSC-MK). For replacement, purchase TSC-MK.

Calibration

The sensor is designed to be able to measure stably for a prolonged period of time. In order to maintain the reliability of measurement, however, calibration should be carried out at least once a year.

Long-term storage

If the sensor is not used over a prolonged period, perform the following operations.

1. Detach the sensor cable from the transmitter.
2. Drain off the water from the sensor and clean it.
3. Store the unit away from direct sunlight.

Overhaul

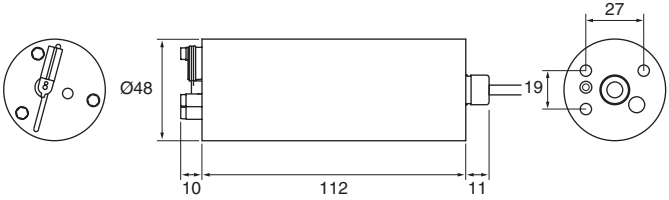
As the packing will deteriorate over time, we recommend replacing the maintenance parts every 3 years. For details, contact the dealer.

15 Specifications

Name	SS Checker
Model	TS-Mx-D
Measurement range	0 - 50000 mg/L (kaolin)
Display resolution	0 - 50000 mg/L: 10 mg/L
Power supply voltage	24 VDC±10%
Current consumption	Standard: 30 mA max. Cleaning: 230 mA max.
Communications (function)	MODBUS (RTU/ASCII)
Cleaning system	Wiper cleaning system
Operating temperature	0 to 40°C (unfrozen)
Major material	SUS316L, Sapphire glass, Fluorocarbon rubber, EPDM, PVC (cable)
Dimensions	Approx. ø48 × 133 mm
Weight	Approx. 1.1 kg
Degree of protection	IP68, maximum depth of 2 meters (underwater type)
Sensor cable length	9 m
Option	Transmitter (SC-U1) Mounting attachment (TA-3) Maintenance kit (TSC-MK)

Specifications are subject to change without notice.

16 External Dimensions



(mm)

■ EU contact information
■ UK contact information

https://navi.optex.net/cert/contact/

Whole document of the DOC can be referenced in the following website ;
www.optex.net

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