



Optical Dissolved Oxygen Sensor

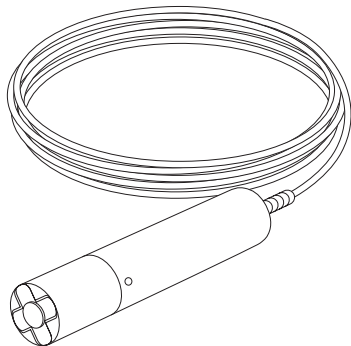
WATER it

DOS-20

**Instruction
Manual**

Thank you very much for purchasing Optical Dissolved Oxygen Sensor DOS-20.

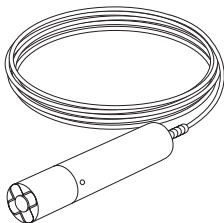
All of this instruction manual must be read before operation of this Optical Dissolved Oxygen Sensor for safe and proper operation. This instruction manual should be kept for future reference such as maintenance.



The instruction manual is also available on the following website.
<https://navi.optex.net/manual/05160/?lang=en>



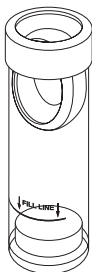
The Contents of Packaging



Sensor: 1



Sensor cap (DOS-CP) :1



Calibration container: 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.	
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1 For Safe Use

Be sure to read this instruction manual in order to use this Optical Dissolved Oxygen Sensor properly.

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

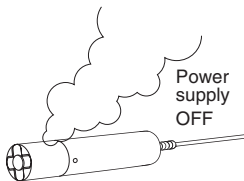


Do not use DOS-20 except for measurement of water quality.

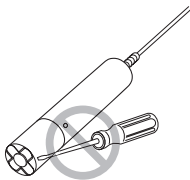
"⊘" denotes "Prohibited action", and "ⓘ" denotes "Required action".



Turn off the Power immediately in the unlikely event that there occur any abnormalities such as smoke or abnormal noise. Otherwise it may cause fire or an electric shock. Contact your dealer after confirming that smoke is no longer being emitted.



Do not disassemble or modify the product. The unit contains high-voltage parts that may cause the outbreak of fire or electric shocks. Contact your dealer for internal inspections, maintenance and repairs.





To clean the product, 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 product with solvent. It may cause failure.

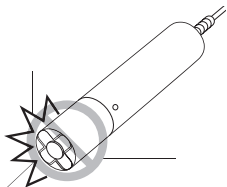


Use the sensor with 12 to 36 VDC.
Otherwise it may cause fire or electric shock.

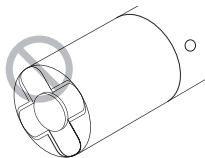
12 to 36
VDC



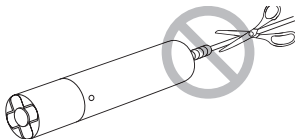
Avoid strong physical shock to the sensor or do not drop it.



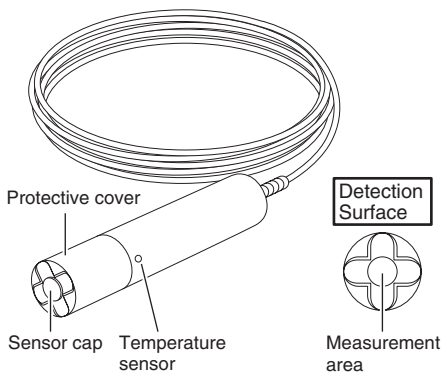
Do not touch the measurement area. If it is soiled, wipe it gently with a clean and soft cloth, etc.



Do not damage the cable. Protect the cable with a spiral tube, etc., When the sensor is pulled up or installed, protect the cable with a spiral tube. Damage to the cable may cause damage, fire or electric shock due to flooding. Water may penetrate into the cable if it is damaged, resulting in malfunctions, the outbreak of fire or electric shocks.

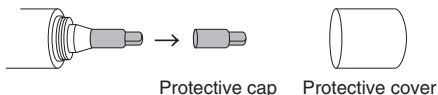


2 Component Name



3 Attaching the Sensor Cap

- 1 Rotate the protective cover and remove it from the sensor, and then remove the red protective cap.

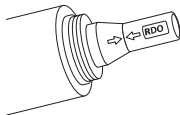


Caution Store the protective cap for later use.

- 2 Remove the sensor cap supplied from the storage case.



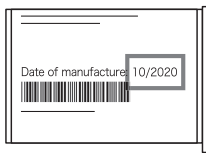
- 3 Align the arrows on the sensor cap and the sensor, push the sensor cap straight onto it and then press it into place while making sure there are no gaps.



- 4 Reattach the protective cover.

Caution

- Before reattaching the cover, check to make sure the O-ring on the sensor has not become detached from the torsion or groove.
- Remove the sensor cap from the vacuum pack just before attaching it, and then attach it as soon as possible.
- Make sure that the sensor cap is attached so that dust or moisture is unable to enter.
- Failure to observe this may result in incorrect measurements.
- The date of manufacture is listed at the location indicated by the illustration on the sensor cap storage container.



4 Installation

Sensor installation

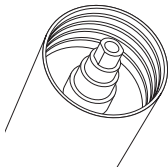


Before installation, turn off the power switch of SC-U1 or disconnect the power cable from the supply source and wire the power cable after the installation is complete.

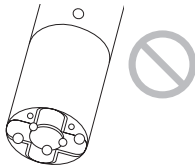
"⊘" denotes "Prohibited action", and "⚠" denotes "Required action".

The end of the sensor cable is equipped with a female screw (1¼-11½NPT) to enable a male screw to be attached to a severed pipe.

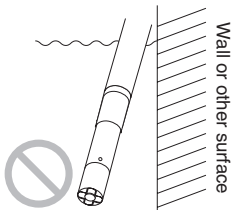
* NPT represents the standards for taper screws used on American pipes.



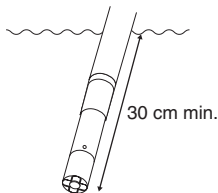
Make sure that air bubbles do not collect on the surface of the sensor when installing it. Correct measurements may be impossible if air bubbles accumulated in the measurement area.



Do not install it near to walls or where water collects. Failure to observe this may result in the dissolved oxygen in the measurement tank being measured incorrectly.



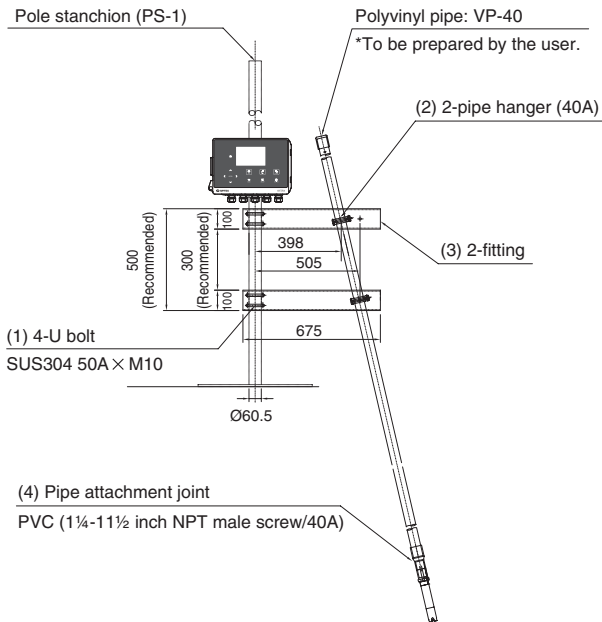
With fluctuation of water level taken into account, dispose the sensor so as to be immersed up to of the order of 30 cm below the expected lowest water level.



Recommendation

- An optional attachment (DA-1) for the DO sensor is also available. This is to be used when installed in a location with fast water currents.
- DO sensor attachment includes items (1) to (4) shown in the following figure.

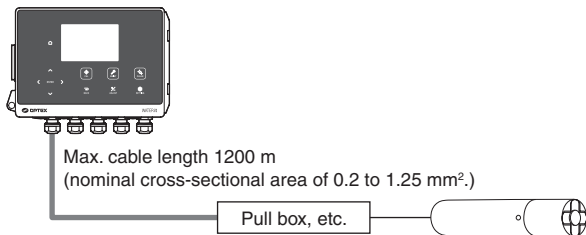
* The VP-40 polyvinyl pipe to be prepared by the user.



Extension of sensor cable

The standard length of the sensor cable is 10 m. To extend the cable, refer to the following.

To extend the cable, connection using pull box is recommended.



- The cable clamp 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 mm².

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".



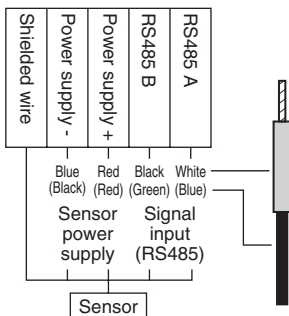
Before wiring, turn off the power switch of SC-U1 or disconnect the power cable from the supply source and wire the power cable after all the other wiring is complete.

Caution

Make sure that the breaker of SC-U1 is not turned off.

1 Connect the sensor to SC-U1.

- The cable clamp 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 mm².
 - Refer to "Extension of sensor cable" P.11 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.



When wiring is cut and used, refer to the color shown in parentheses () to correctly wire the terminal block.

6 Sensor Setting

The following settings are available from SC-U1.

To start sensor setting, press .

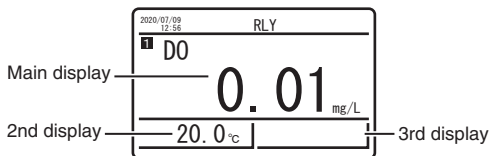
Caution

Pressing  automatically retains the measurement value.

Sensor Setting

Display item

Set measurement items to display as main, 2nd, and 3rd display of SC-U1.



Select an item from the following.

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.15 and "8 Relay Setting" P.17 that have set the display item become OFF.

In addition, the values of "10 Adjustment", "Offset adjustment" P.30, and "2-point adjustment" P.34 are reset to the factory default values.

Set again if necessary.

	Measurement item	Display item		Factory default setting
		Item	Unit	
Main display	Dissolved oxygen concentration	DO	mg/L	DO
	Dissolved oxygen % saturation	%Sat.	% sat	
	Oxygen partial pressure	O-Press	kPa	
2nd display	-	OFF	-	Temp.
	Temperature	Temp.	°C	
3rd display	-	OFF	-	OFF
	Dissolved oxygen % saturation	%Sat.	% sat	
	Dissolved oxygen concentration	DO	mg/L	
	Oxygen partial pressure	O-Press	kPa	

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

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 .

Caution Pressing  automatically retains the measurement value.

Output item selection

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

Select an item from the following.

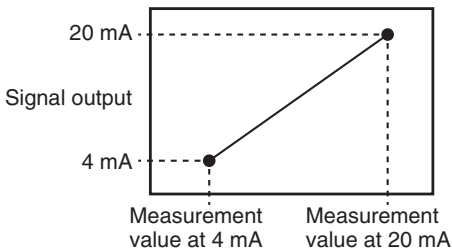
For operation, refer to the "Universal Transmitter SC-U1 Operation Manual", "5.3 4-20 mA Setting" and "◆ Output Item Select".

Caution When "Display item" P.13 is changed, the output item of the channel of 4-20 mA setting that have set the display item becomes OFF. Set again if necessary.

Output item [Display]
Dissolved oxygen concentration [DO]
Temperature [Temp.]
Dissolved oxygen % saturation [%Sat.]
Oxygen partial pressure [O-Press]

Upper/lower limit of signal output range

For the item by 4-20 mA signal output, set 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 $\geq$
Dissolved oxygen concentration [DO]	Lower limit: 0.00 Upper limit: 50.00	0.00 to 50.00	2.00
Temperature [Temp.]	Lower limit: 0.0 Upper limit: 50.0	0.0 to 50.0	10.0
Dissolved oxygen % saturation [%Sat.]	Lower limit: 0.0 Upper limit: 200.0	0.0 to 200.0	10.0
Oxygen partial pressure [O-Press]	Lower limit: 0.0 Upper limit: 150.0	0.0 to 150.0	10.0

The setting unit is based on the display resolution of the item set for the display item. (For display resolution, refer to "15 Specifications" P.52)

8 Relay Setting

Set the relay output setting from SC-U1.

The factory default setting is OFF for relay output.

To set the relay setting, press .

Caution Pressing  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" P.13 is changed, the output item of the channel of relay setting that have set the display item becomes OFF. Set again if necessary.

Setting item		Setting range			
		Dissolved oxygen concentration [DO]	Temperature [Temp.]	Dissolved oxygen % saturation [%Sat.]	Oxygen partial pressure [O-Press]
Trigger		High Alarm/Low Alarm			
Active Level		0.00 to 50.00	0.0 to 50.0	0.0 to 200.0	0.0 to 150.0
Hysteresis	High Alarm	0.00 to Active level	0.0 to Active level	0.0 to Active level	0.0 to Active level
	Low Alarm	0.00 to (50.00-Active level)	0.0 to (50.00-Active level)	0.0 to (50.00-Active level)	0.0 to (50.00-Active level)
ON Delay		OFF 1 to 120 minutes			
OFF Delay		OFF 1 to 120 minutes			

Maintenance output setting

Set a maintenance timer for any cycle ("Maintenance timer" P.42) 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".

Sensor cap output setting

Set notification of sensor cap replacement timing.

Caution

If the sensor cap replacement timer is set to OFF, refer to "Sensor cap replacement timer" P.43 and set the output cycle (days) before making the following settings.

After the setting, the sensor cap output is available as a relay output item.

1

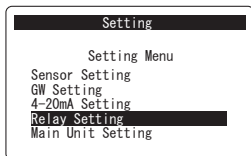
Press .

The sensor selection display is displayed.

2

Select [Relay Setting] using

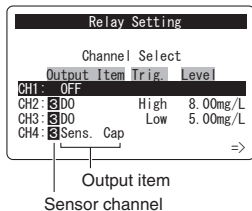
 , and press .



The channel selection display is displayed.

For each relay output channel, the current sensor channel, output item, trigger setting, and active level are displayed.

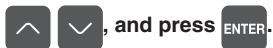
To switch between pages, press



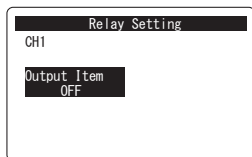
- 3** Select a relay output channel to set using  , and press .

The setting item selection menu is displayed and the current setting of the selected channel is displayed.

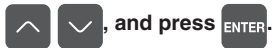
- 4** Select [Output Item] using



The current setting value is displayed.

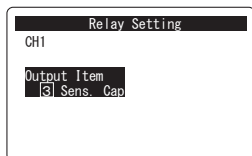
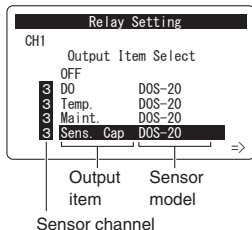


- 5** Select [Sens. Cap] of a channel to set sensor cap output using



If output is unnecessary, select [OFF] and press .

The set sensor channel and [Sens. Cap] are displayed in [Output Item].



Cleaning output setting

Set the cleaning device to operate with relay output.

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

Prepare a sensor cap and calibration container.

Also, prepare the necessary calibration solution for your calibration needs.

To calibrate SC-U1, press .

Caution

- Pressing  automatically retains the measurement value.
- Only dissolved oxygen concentration can be calibrated. If the dissolved oxygen concentration is not set in the displayed item, calibration cannot be performed. The dissolved oxygen saturation and oxygen partial pressure are automatically calculated according to the calibrated dissolved oxygen concentration.

Preparation

- 1 Clean the sensor unit and the measurement area thoroughly to completely remove all moisture.

- 2 Remove the calibration container's storage cap, and replace it with the calibration cap (a cap that allows ventilation).



Calibration cap



Storage cap

- 3 Allow the sensor and the calibration water to acclimate to room temperature for approximately 30 minutes.

1-point calibration: 100% saturation calibration

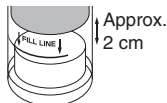
Caution

- Return to adjustment value for salinity to 0 PSU when performing salinity adjustment. ("Salinity adjustment" P.37)
An error will be displayed if salinity adjustment is carried out without doing this, and correct calibration will not be possible.
- It is necessary to perform altitude adjustment in order to achieve accurate calibration when using the sensor in highlands. The default setting for this is 0 m. Refer to "Altitude adjustment" P.39 for details on amending the setting.

1 Prepare calibration ("Preparation" P.21).

2 Soak approximately 10 mL of deionized water into the calibration container sponge.

3 Insert the sensor into the calibration container so that the measurement area is approximately 2 cm above the water-swollen sponge.



4 Leave this to stand for between 5 to 10 minutes before starting calibration.

Caution

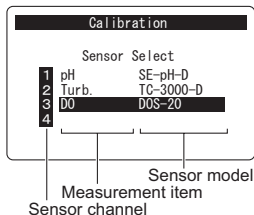
Do not leave the sensor attached to the calibration container for more than 30 minutes.
Condensation on the measurement part may affect the measurement value. Wipe off water, if any, from the measurement block before calibration.

5 Press .

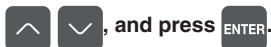
The sensor selection display is displayed.

6 Select a channel connected to DOS-20 using , and press .

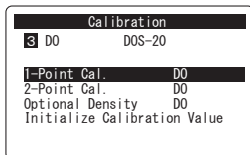
The calibration menu is displayed.



7 Select [1-Point Cal.] using

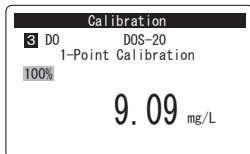


, and press **ENTER**.

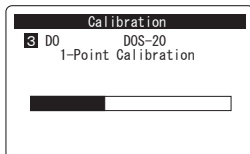


8 Check that the measurement value is stable, and press **ENTER**.

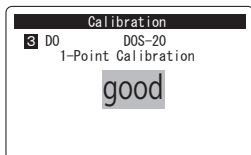
The calibration starts.



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

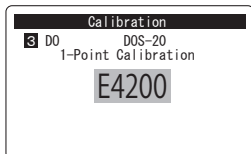


9 When the calibration is complete, check the result.



good:

The calibration is properly completed.



E4200 to E4299:

Calibration failed.

Try the steps again from 1.

Pressing **ENTER** or **BACK** switches to the measurement value display.

Caution

For the relationship between temperature and saturated dissolved oxygen, refer to "Saturated Dissolved Oxygen Content at Each Temperature" P.55.

2-point calibration: 100% saturation calibration and 0-point calibration

Caution

It is necessary to perform altitude adjustment in order to achieve accurate calibration when using the sensor in highlands. The default setting for this is 0 m. Refer to "Altitude adjustment" P.39 for details on amending the setting.

1 Prepare calibration ("Preparation" P.21).

2 Prepare the 1st point calibration.

Prepare the 1st point calibration (100% saturation calibration) based on the 1-point calibration steps. (Refer to "1-point calibration: 100% saturation calibration" P.22, steps 2 to 4.)

3

Press .

The sensor selection display is displayed.

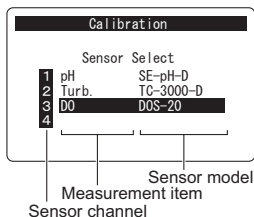
4

Select a channel connected to

DOS-20 using  , and

press .

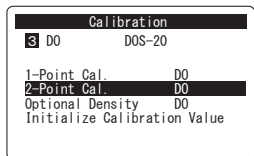
The calibration menu is displayed.



5

Select [2-Point Cal.] using

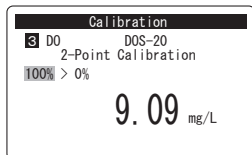
 , and press .



6 Perform the 1st point calibration.

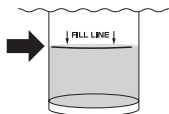
Check that the measurement value is stable, and press .

The display changes to the 2nd point calibration preparation.



7 A zero standard solution is 100 ml of deionized water into which 5 g or more of sodium sulfite has been added and completely dissolved.

8 Remove the sponge used for 1-point calibration from the calibration container, and pour the zero standard solution into the container up until the fill line.



9 Insert the sensor's temperature sensor until it is immersed in the zero standard solution prepared.

Caution

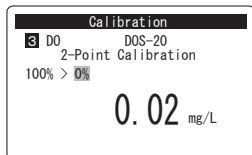
- Insert the measurement area so that approximately 1 cm is left between it and the bottom of the calibration container.
- Insert the sensor so that no bubbles build up on the measurement area.

10 Leave this to stand for at least 5 minutes to allow the temperature to stabilize.

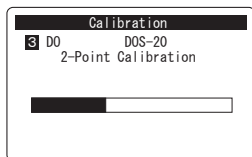
11 Perform the 2nd point calibration.

Check that the measurement value is stable, and press **ENTER**.

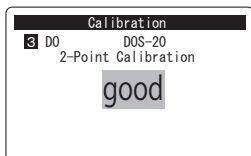
The calibration starts.



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

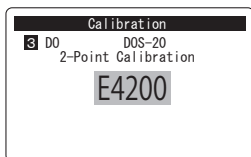


12 When the calibration is complete, check the result.



good:

The calibration is properly completed.



E4200 to E4299:

Calibration failed.

Try the steps again from 1.

Pressing **ENTER** or **BACK** switches to the measurement value display.

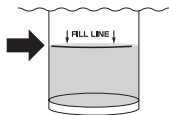
Optional density calibration

It is possible to immerse the sensor in the solution for which the dissolved oxygen concentration is known and align the display value with this concentration.

Item [Display]	Setting range	Factory default setting
Dissolved oxygen concentration [DO]	2.00 to 50.00 (by 0.01)	2.00

1 Prepare calibration ("Preparation" P.21).

2 Pour the solution with the known concentration into the calibration container up until the fill line.



3 Insert the sensor's temperature sensor until it is immersed in the solution.

Caution

- Insert the measurement area so that approximately 1 cm is left between it and the bottom of the calibration container.
- Insert the sensor so that no bubbles build up on the measurement area.

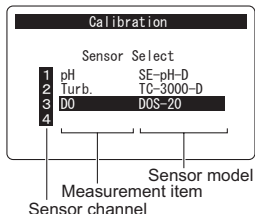
4 Leave this to stand for at least 5 minutes to allow the temperature to stabilize.

5 Press  **SETTING**.

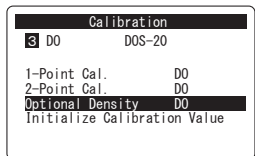
The sensor selection display is displayed.

- 6** Select a channel connected to DOS-20 using  , and press .

The calibration menu is displayed.



- 7** Select [Optional Density] using  , and press .

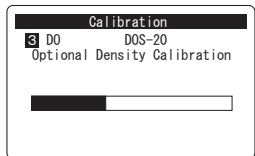
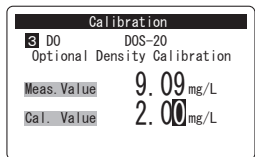


- 8** Current measurement value is displayed on the upper area. Enter the density (calibration value) to adjust to in the lower area.

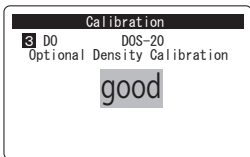
Select a digit by   and value by  , and press .

The calibration starts.

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

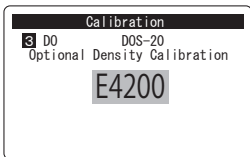


When the calibration is complete, check the result.



good:

The calibration is properly completed.



E4200 to E4299:

Calibration failed.

Try the steps again from 1.

Pressing  or  switches to the measurement value display.

Initialize calibration value

The adjusted values are reset to the factory default setting.

For operation, refer to the "Universal Transmitter SC-U1 Operation Manual", "6 Calibration" and "◆ Initialize Calibration Value".

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 .

Caution

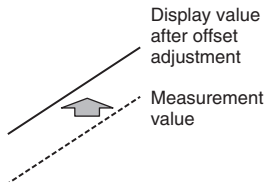
- Pressing  automatically retains the measurement value.
- The dissolved oxygen saturation and oxygen partial pressure cannot be adjusted.
- If offset, span, or 2-point adjustment has already been performed, be sure to initialize the adjustment before performing the 2-point adjustment.
- When "Display item" P.13 is changed, the values of the offset adjustment, span adjustment, and 2-point adjustment that have set 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.15) and alarm output ("Alarm output setting" P.17), the adjusted values are applied.



Measurement item [Display]	Setting range	Factory default setting
Dissolved oxygen concentration [DO]	-5.00 to 5.00	0.00
Temperature [Temp.]	-5.0 to 5.0	0.0

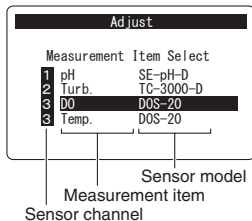
1 Press .

The measurement item selection display is displayed.

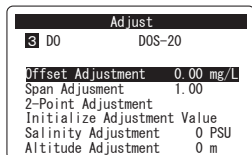
2 Use   to select the item for offset adjustment and press .

Use   to switch pages.

The adjustment menu is displayed.

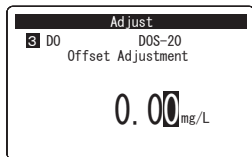


3 Select [Offset Adjustment] using  , and press .



4 Enter the offset value.

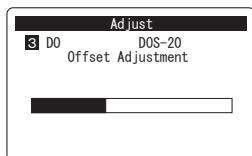
Select a digit by   and value by  , and press .



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 , 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

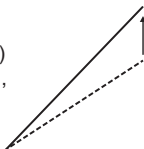
Set the span coefficient for a measurement value.

Display the measurement value with span-adjusted to any display value.

For 4-20 mA output ("7 4-20 mA Setting" P.15) and alarm output ("Alarm output setting" P.17), the adjusted values are applied.

Display value after span adjustment

Measurement value



Measurement item [Display]	Setting range	Factory default setting
Dissolved oxygen concentration [DO]	0.30 to 3.00	1.00
Temperature [Temp.]	0.30 to 3.00	1.00

1 Press .

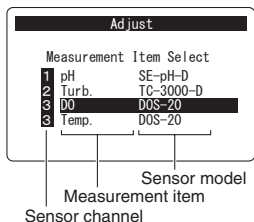
The measurement item selection display is displayed.

2 Select an item to perform span

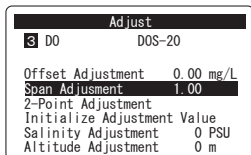
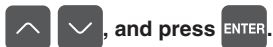
adjustment using  , and press .

Use   to switch pages.

The adjustment menu is displayed.

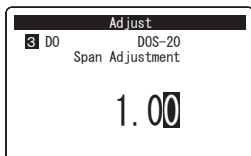


3 Select [Span Adjustment] using



4 Input a span adjustment value.

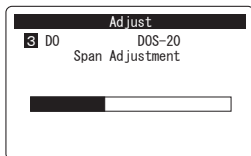
Select a digit by   and value by  , and press .



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 , 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.

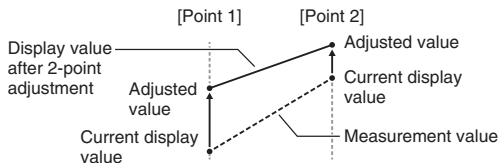


2-point adjustment

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.15) and alarm output ("Alarm output setting" P.17), 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
Dissolved oxygen concentration [DO]	[Point 1]: 0.00 to (2nd point value -2.00) [Point 2]: (1st point value +2.00) to 50.00	[Point 1]: 0.00 [Point 2]: 50.00
Temperature [Temp.]	[Point 1]: 0.0 to (2nd point value -10.0) [Point 2]: (1st point value +10.0) to 50.0	[Point 1]: 0.0 [Point 2]: 50.0

1 Press .

The measurement item selection display is displayed.

2 Select an item to perform the 2-point adjustment using

 , and press .

Use   to switch pages.

The adjustment menu is displayed.

Adjust

Measurement Item Select

1	pH	SE-pH-D
2	Turb.	TC-3000-D
3	DO	DOS-20
3	Temp.	DOS-20

Sensor channel
Measurement item
Sensor model

3 Select [2-Point Adjustment]

using  , and press .

Adjust	
3 DO	DOS-20
Offset Adjustment	0.00 mg/L
Span Adjustment	1.00
2-Point Adjustment	
Initialize Adjustment Value	
Salinity Adjustment	0 PSU
Altitude Adjustment	0 m

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 . The value is set and the cursor moves to the next item.

Adjust	
3 DO	DOS-20
2-Point Adjustment	
mg/L	Point 1 Point 2
Disp.	0.00 50.00
Adj.	0.00 50.00

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 , the value returns to the one before changing it.

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

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

Adjust	
3 DO	DOS-20
2-Point Adjustment	
	

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.

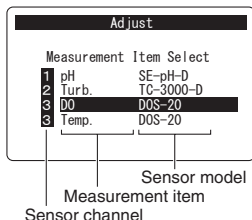
1 Press .

The measurement item selection display is displayed.

2 Select an item to initialize adjustment using  , and press .

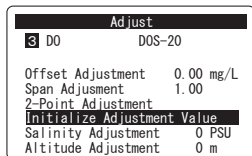
Use   to switch pages.

The adjustment menu is displayed.



3 Select [Initialize Adjustment Value] using  , and press .

The initialize adjustment value menu is displayed.

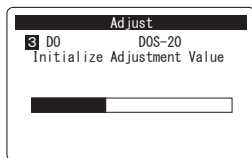
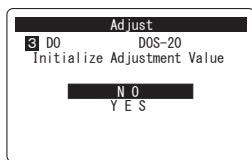


4 Select [NO] or [YES] using  , and press .

- 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.



Salinity adjustment

Perform correction for correct measurement of dissolved oxygen density with a salty solution.

For solutions of the same water temperature, the saturated dissolved oxygen content (mg/L) decreases as the salt content of the solution increases. To measure the correct dissolved oxygen density, it is necessary to correct the salinity even of solution containing salt.

The PSU increments represent the actual salinity increments (not units), and they are the salinity values converted from the level of electrical conductivity. Sea water is about 32 to 35 PSU.

Measurement item	Setting range	Factory default setting
Salinity Adjustment	0 to 42	0

1 Press .

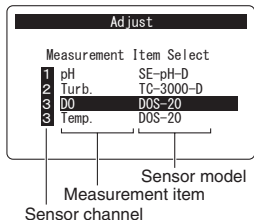
The measurement item selection display is displayed.

2 Select an item to correct salinity

using  , and press .

Use   to switch pages.

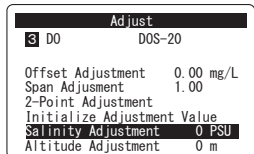
The adjustment menu is displayed.



Adjustment

3 Select [Salinity Adjustment] using

 , and press .

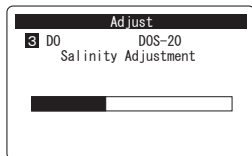
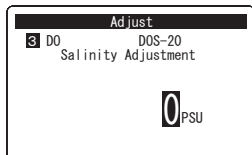


4 Enter the correction value for the salinity.

Select a digit by   and
value by  , and press .

During adjustment a progress bar is displayed.

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



Altitude adjustment

Perform correction for correct measurement and calibration of dissolved oxygen density at high altitude.

The saturated dissolved oxygen content is compared against the oxygen content in the surrounding atmosphere. As the altitude increases, the air pressure in the atmosphere is lowered and the saturated dissolved oxygen content becomes smaller.

Example)

1013 hpa: Saturated dissolved oxygen content is 8.26 mg/L (25°C)

506.5 hpa: Saturated dissolved oxygen content is 4.13 mg/L (25°C)

When the air pressure is halved, the saturated dissolved oxygen content is also halved.

Measurement at high altitude requires altitude adjustment.

This product adjusts by altitude (m) instead of atmospheric pressure (hpa).

Measurement item	Setting range	Factory default setting
Altitude Adjustment	0 to 5000 (by 10)	0

Caution

When setting the altitude with this sensor, the calibration is automatically performed with the use of the altitude adjustment value.

1

Press



The measurement item selection display is displayed.

2

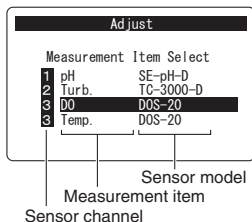
Select an item to perform altitude

adjustment using  , and

press .

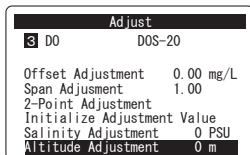
Use   to switch pages.

The adjustment menu is displayed.



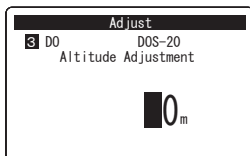
3 Select [Altitude Adjustment] using


, and press .



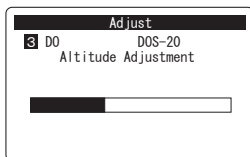
4 Enter an altitude.

Select a digit by   and value
 by  , and press .



During adjustment a progress bar is displayed.

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



11 Maintenance Setting

Set the maintenance setting from SC-U1.

To perform maintenance, press



Caution

Pressing



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.18) and the dedicated cloud server (SC-U1 and GW connected).

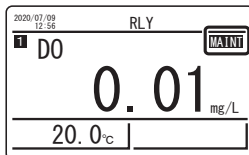
For more information about checking notifications on the cloud server, refer to the cloud server's help.

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

Sensor cap replacement timer

Set a replacement period of the sensor cap.
Perform notification using a relay output when the set period has elapsed
(Refer to "Sensor cap output setting" P.18).
"MAINT" is displayed on the measurement value display for the sensor for which the sensor cap replacement notification has been issued.



Item [Display]	Setting range	Factory default setting
Sensor cap replacement timer [Sens. Cap Replacement]	OFF (Not recommended) 30 to 365 days (by 1 day)	365 days

Sensor cap replacement is set to 365 days as the factory default setting.
It is recommended to operate with this setting.

◆ Canceling sensor cap replacement notification

Cancel the sensor cap replacement notification.

1 Replace the sensor cap (Refer to "3 Attaching the Sensor Cap" P.8).

Purchase the replacement sensor cap (DOS-CP). After replacing to a new sensor cap, the sensor cap replacement notification is automatically cancelled and the count of the sensor cap replacement timer is restarted.

Reference	If the date and time setting of SC-U1 is incorrect and a sensor cap replacement notification is issued, clear the timer according to "◆ Sensor cap replacement timer setting" P.44.
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◆ Sensor cap replacement timer setting

Perform the following steps to shorten the sensor cap replacement timer according to the measurement target.

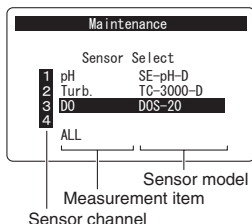
1 Press .

The measurement item selection display is displayed.

2 Select [DO DOS-20] using

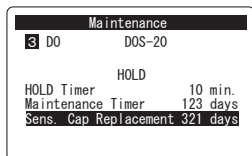
 , and press .

Sensor cap replacement timer setting must be set for each sensor. The setting is not available if [All] is selected. The maintenance menu is displayed.



3 Select [Sens. Cap Replacement] using  , and press .

The number of days remaining in the set sensor cap replacement timer is displayed to the right of the timer.

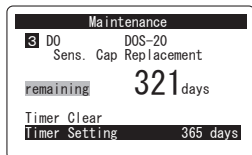


4

Select [Timer Setting] using



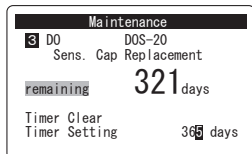
, and press



5

Select a digit by   andvalue by  , and press

The entered number of days is fixed and the display returns to the maintenance menu.



To reset the elapsed days and set the days for the timer, select

[Timer Clear] using  , and press



- When the value is 30, press  to select [OFF], but operation in [OFF] is not recommended.
- When [OFF] is set, press  to display the sensor cap replacement timer input display.

12 Cleaning

Set the sensor cleaning setting from SC-U1.

To perform cleaning, press .

Caution

- The optional cleaning device is required to carry out cleaning.
- The cleaning process consists of cleaning activation time and post-cleaning standby time.
- Pressing  automatically retains the measurement value.

Manual cleaning

Manually activate the cleaning device. Perform cleaning only if the cleaning output has been set using relay output.

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

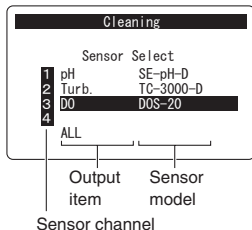
1 Press .

The sensor selection display is displayed.

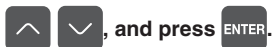
2 Select [DO DOS-20] using , and press .

By selecting [ALL], all of the connected sensors can be selected.

The cleaning menu is displayed.



3 Select [Manual Cleaning] using



The cleaning device is activated and the display returns to the measurement value display.

The sensor under cleaning shows "CLEAN" on the measurement value display.
In addition, "C" is displayed in the sensor selection display.

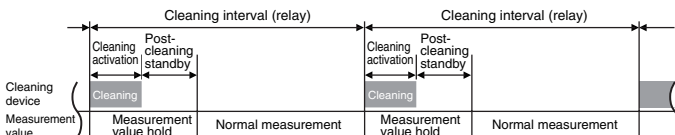
Cleaning	
3 DO	DOS-20
MANUAL CLEANING	
Cleaning Interval RLY	30 min.
Cleaning Activation	30 sec.
Post-cleaning Standby	30 sec.

Cleaning	
Sensor Select	
1 pH	SE-pH-D
2 Turb.	TC-3000-D
3 DO	DOS-20
4	
ALL	

Cleaning interval (relay)

Set the time interval between cleaning actions.

The settings are to activate the cleaning device using a relay output ("Cleaning output setting" P.20).



Select an item from the following.

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

Item [Display]	Setting range	Factory default setting
Cleaning Interval (Relay) [Cleaning Interval-RLY]	OFF (No cleaning) 10 to 1440 minutes (by 10 minutes)	30 minutes

Cleaning activation

Set the time period for cleaning.
Select an item from the following.

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

Item	Setting range	Factory default setting
Cleaning Activation	10 to 120 seconds (by 10 seconds)	30 seconds

Post-cleaning standby

Set the standby time after cleaning.
Select an item from the following.

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

Item	Setting range	Factory default setting
Post-cleaning Standby	10 to 180 seconds (by 10 seconds)	30 seconds

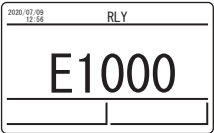
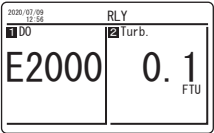
13 Troubleshooting

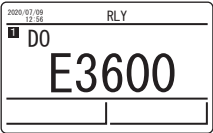
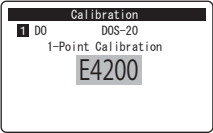
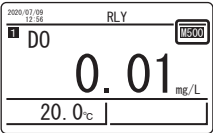
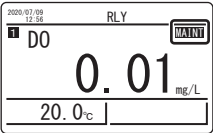
Error code list

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 	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.
	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.

Error code and details	Cause	Action
E3600 to E3699 Sensor 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.
E4200 to E4299 Calibration error 	Calibration failed.	Remove dirt and bubbles from the measurement block and perform calibration again. Contact the dealer if the error occurs again. The sensor must be repaired.
		If the salinity correction is being made, set the correction value to 0 PSU and then perform the calibration again.
M500 to M599 Sensor cap error 	The sensor cap is not properly attached.	Properly attach it referring to “3 Attaching the Sensor Cap” P.8.
	The sensor cap has deteriorated.	Refer to “Replacement of consumables” P.51 to replace the sensor cap.
MAINT Maintenance notification 	The sensor cap replacement timer has passed.	Refer to “◆ Canceling sensor cap replacement notification” P.43 to cancel the notification.
	The maintenance timer has passed.	Refer to the “Universal Transducer SC-U1 Operation Manual”, “● Canceling maintenance notification” to cancel the notification.

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 benzene.

Maintenance (monthly)

Perform the following operations every month.

- Clean the measurement block using tap water.
- Inspect the measurement block for damage and/or degeneration.
- Inspect the sensor cable for damage and/or degeneration.
- Inspect the installation bracket for corrosion.
- 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 sensor cap every year.
- Purchase the replacement sensor cap (DOS-CP) for replacement.

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 (Refer to "9 Calibration").

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.

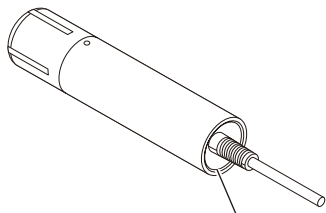
15 Specifications

Name	Optical Dissolved Oxygen Sensor
Model	DOS-20
Measurement item	Dissolved oxygen concentration (mg/L) Temperature (°C) Dissolved oxygen % saturation (%) Oxygen partial pressure (kPa)
Measurement range (Display resolution)	Dissolved oxygen concentration: 0.00 - 50.00 mg/L (0.01 mg/L) Temperature: 0.0 - 50.0°C (0.1°C) Dissolved oxygen % saturation: 0.0 - 200.0 (0.1 %) Oxygen partial pressure: 0.0 - 150.0 kPa (0.1 kPa)
Measurement resolution	±0.1 mg/L (0 - 8 mg/L) ±0.2 mg/L (8 - 20 mg/L) ±10% of reading (20 - 50 mg/L)
Response time	90% response: < 45 seconds 95% response: < 60 seconds (measurement water temperature: 25 °C)
Power supply voltage	12 to 36 VDC
Current consumption	25 mA max. (24 VDC)
Communications (function)	MODBUS (RTU/ASCII)
Operating temperature	0 to 50°C (unfrozen)
Major material	ABS
Dimensions	ø48 × 204 mm
Weight	Approx. 850 g (including cable length of 10 m)
Degree of protection	IP68, maximum depth of 200 meters (underwater type)

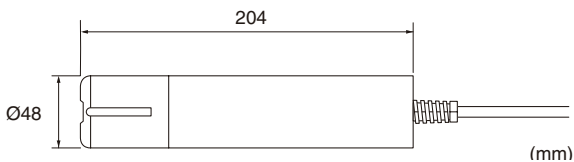
Sensor cable length	10 m
Sensor cap replacement cycle	Every year after sensor installation (guideline)
Sensor cap storage period	2 years after manufactured date (when stored in the specified container) Storage temperature: 1 to 60°C
Option	Transmitter (SC-U1) DO Sensor Attachment (DA-1) DO Sensor Adapter (DA-1AP) Replacement Sensor Cap (DOS-CP)

Specifications are subject to change without notice.

16 External Dimensions



1 1/4-11 1/2 NPT Female Screw



Saturated Dissolved Oxygen Content at Each Temperature

(In the case of 1 hPa and salinity level of 0 PSU)

Temperature (°C)	Saturated Dissolved Oxygen Content (mg/L)	Temperature (°C)	Saturated Dissolved Oxygen Content (mg/L)	Temperature (°C)	Saturated Dissolved Oxygen Content (mg/L)	Temperature (°C)	Saturated Dissolved Oxygen Content (mg/L)
1	14.22	11	11.03	21	8.92	31	7.43
2	13.83	12	10.78	22	8.74	32	7.31
3	13.46	13	10.54	23	8.58	33	7.18
4	13.11	14	10.31	24	8.42	34	7.07
5	12.77	15	10.08	25	8.26	35	6.95
6	12.45	16	9.87	26	8.11	36	6.84
7	12.14	17	9.67	27	7.97	37	6.73
8	11.84	18	9.47	28	7.83	38	6.62
9	11.56	19	9.28	29	7.69	39	6.52
10	11.29	20	9.09	30	7.56	40	6.41

■ 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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<https://www.optex.co.jp/e/products/environmental-sensor/> 2021.11 59-2960-1