Instruction Manual

Model UV400G
Organic Pollutant Analyzer
(Ultraviolet Absorption Meter)

IM 12K01B01-01E

YOKOGAWA
Yokogawa Electric Corporation

IM 12K01B01-01E
1st Edition

Introduction

Thank you for purchasing our organic pollutant analyzer, Model UV400G.

This instrument is designed so that it is best suited for continuous monitoring of organic pollutants in wastewater.

Before using the instrument, read this manual carefully. Also keep this manual handy for your reference and troubleshooting during operation.

IM 12K01B01-01E
1st Edition: Apr. 2001 (YK)

For the safe use of this equipment

(1) About This Manual

- This manual should be passed on to the end user.
- The contents of this manual are subject to change without prior notice.
- The contents of this manual shall not be reproduced or copied, in part or in whole, without permission.
- This manual explains the functions contained in this product, but does not warrant that those will suit the particular purpose of the user.
- Every effort has been made to ensure accuracy in the preparation of this manual. However, should any errors or omissions come to the attention of the user, please contact the nearest Yokogawa Electric representative or sales office.
- This manual does not cover the special specifications. This manual may not be changed on any change of specification, construction and parts when the change does not affect the functions or performance of the product.
- If the product is used in a manner not specified in this manual, the safety of this product may be impaired.

(2) Safety and Modification Precautions

- Follow the safety precautions in this manual when using the product to ensure protection and safety of personnel, product and system containing the product.
- The following safety symbols and wordings are used on the product as well as in this manual.

(3) The following safety symbols are used on the product as well as in this manual.

 WARNING **or**  **Warning**

Description of precautions to take against dangers such as electric shock that can cause fatal or serious injury to the operator.

 CAUTION

Description of precautions to take against damaging software or hardware that could cause a failure in the system.

 **Note**

Description of items to be noted in order to understand the operation and features of the equipment.

 **Tip**

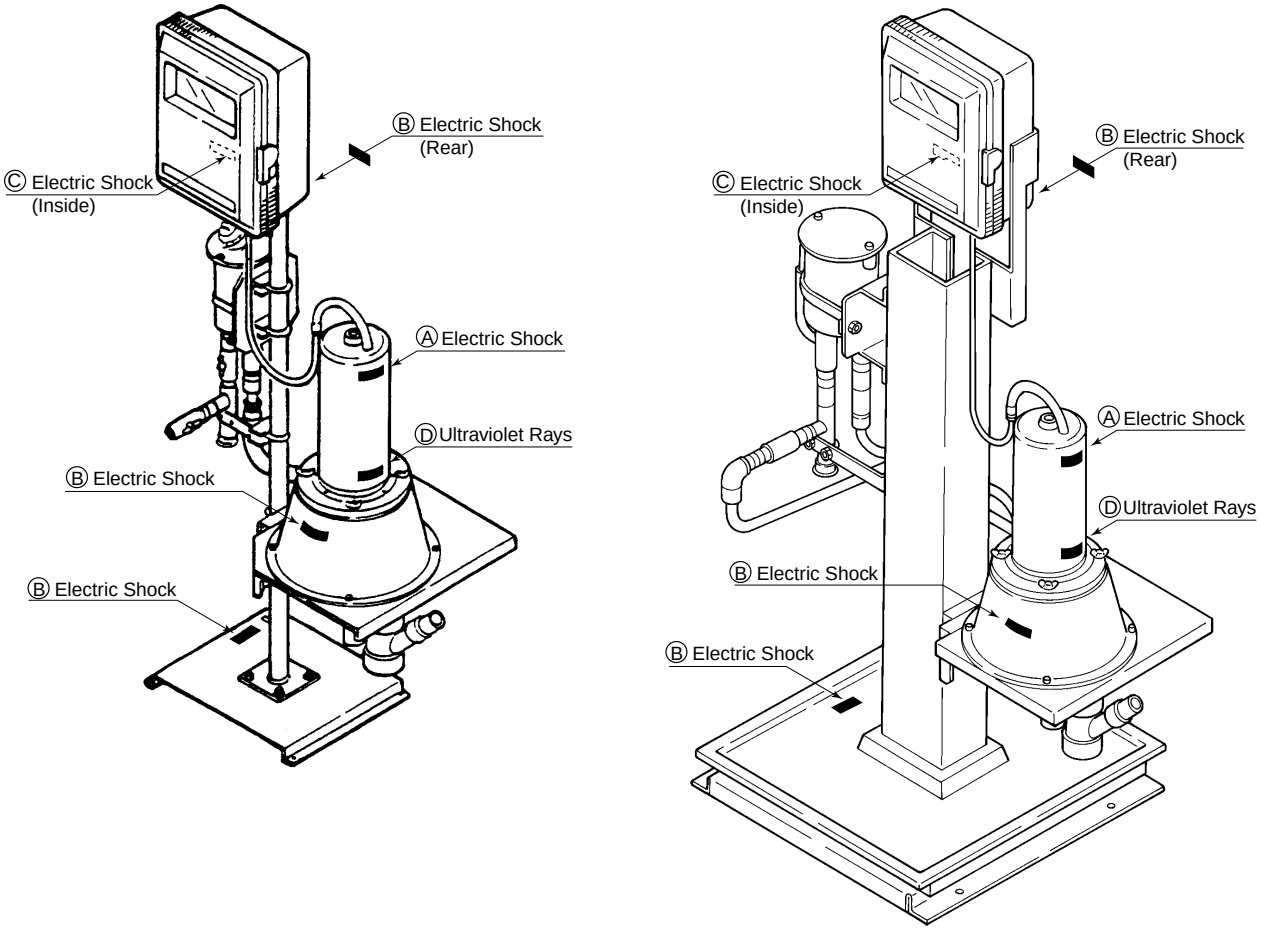
Additional information.

 **SEE ALSO**

An item or a page to be referred to.

For safety operation, warning labels are affixed on the instrument as follows.

Check these like labels before operating or servicing.



Pole-Base Mount Type **Standard Self-supporting Stanchion Type**

F00-1.EPS

(A) Warning: Electric Shock (High Voltage)

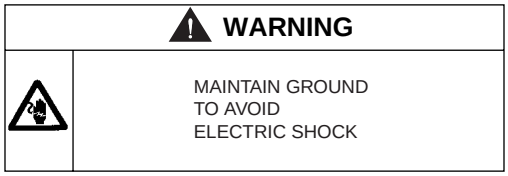
⚠ Warning	
	ELECTRIC SHOCK HIGH VOLTAGE CIRCUIT INSIDE. TURN OFF THE POWER SUPPLY BEFORE OPENING THE INSIDE.

F00-2.EPS

Power supply of approximately 900 V for the ultraviolet lamp is installed inside the detector. Remove power from the converter before disassembling the detector for servicing.

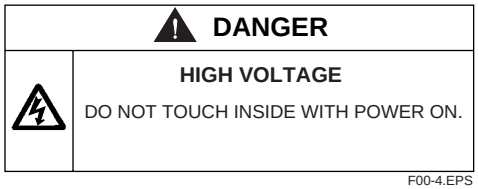
(B) Warning: Electric Shock (Ground)

To minimize the risk of electric shock, be sure to install ground connections for the instrument. Avoid hazardous areas, such as gas tubing, for grounding.



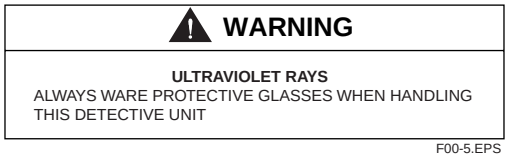
F00-3.EPS

(C) Danger: Electric Shock (High voltage)



F00-4.EPS

(D) Warning: Ultraviolet Rays



F00-5.EPS

This instrument uses a low-pressure mercury lamp that emits ultraviolet rays. The lamp may cause eye damage if viewed directly. When removing the detector from the measuring tank for servicing, ensure that the "MODE SELECT" switch is set to the [STBY] mode or that a protective eyewear is used properly.

To minimize the possibility of trouble, the following should be observed.

• Warm-up

After the power has been turned on, the instrument is required to go through at least one-hour warm-up to stabilize its readings. At power resumption after temporary interruption (within 10 minutes) during a continuous measurement, an approximately 30-minute warm-up is adequate.

• Idling

Do not allow the detector (cell) to run idle for a long period. When the detector is removed from the measuring tank for a long period, power should be removed or the cell unit should be immersed in liquid, such as water sample or tap water, filled in the calibration tank.

After-sales Warranty

- Yokogawa warrants the product for the period stated in the quotation which was delivered upon purchase. Yokogawa shall conduct defined warranty service based on its standard. When the customer site is located out of the specified scope, a fee for dispatching the maintenance engineer will be charged to the customer.
- In the following cases, customer will be charged repair fee regardless of warranty period.
  - Failure of components which are out of scope of warranty stated in instruction manual.
  - Failure caused by usage of software, hardware or auxiliary equipment, which Yokogawa Electric Corporation did not supply.
  - Failure due to improper or insufficient maintenance by user.
  - Failure due to modification, overuse, misuse or maloperation which Yokogawa does not authorize.
  - Failure due to power supply (voltage, frequency) being outside specifications or abnormal.
  - Failure caused by any usage out of scope of recommended usage
  - Any damage from fire, earthquake, a storm and flood, lightning, disturbance, riot, warfare, radiation and other natural changes.
- Yokogawadoes not warrant conformance with the specific application at the user site. Yokogawa will not bear direct/indirect responsibility for damage due to a specific application.
- Yokogawa will not bear responsibility when the user configures the product into systems or resells the product.
- Maintenance service and supplying repair parts will be covered for five years after the production ends. For repair this product, please contact the nearest sales office described in this instruction manual.

Contents

1. Overview

This monitor measures organic pollutants contained in waste water by measuring the absorption of ultra-violet rays at a wavelength of 253.7 nm. Devices that continuously measure industrial waste water, rivers, and lakes are subject to various problems: drift through deterioration of the light source and the detector, dirtying of the cell by the sample water, and the fact that prolonged, stable use becomes impossible. Basically, once the cell has become dirty it becomes increasingly dirtier. Therefore, to prevent the cell from becoming dirty, it is vital that dirt is removed as it appears in the cell. To achieve this continuous cleaning is required. For this purpose, this monitor employs a system of revolutionary cell-length modulation. By this system, two cylindrical cells rotate and powerful wipers continuously clean these rotating cells. In addition to employing a system of revolutionary cell-length modulation, an optical system comparator is built into the circuity. Operation of this circuit at all times ensures stable measurement with respect to drops in sensitivity through deterioration of the light source detector.

As the absorption of visible light rays at a wavelength of 546.1 nm is measured in addition to that of ultra-violet rays, compensation (UV- α“×” VIS calculation) of Turbidity is possible. One of five values (0, 0.5, 1.0, 1.5, 2.0) can be selected for the Turbidity compensation constant α thus allowing the ideal value matched to the Turbidity of the test water to be set.

When using this monitor for the measurement of organic pollutants by total mass control, a high correlation with the COD value in accordance with local measurement by-laws is required. Generally, when such processes as the activated sludge process is carried out, the ratio of humic acid and fulvo acid which are microorganic metabolytes, and tannin increases. Humic acid, fulvo acid, tannin, etc. absorb ultraviolet rays, the correlation between the absorption of ultraviolet rays and COD tends to become higher, which ensure accuracy and the possibility for suitability increases.

2. Installation, Wiring and Piping

2.1 Installing Environment

(1) This analyzer can be sited both indoors and outdoors. When installing outdoors, try to site away from the direct sunlight.
(2) Site nearby to sampling point.
(3) Site within ready access of an rating power supply—AC100V.
(4) Site in a well-ventilated place. Avoid dusty places and places where corrosive gases are generated.
(5) Secure adequate space around the analyzer for daily inspection and maintenance access. See Figure 2.3.1 to 2.3.2 for maintenance space requirement.

2.2 Installation

Installation overviews are shown in Figure 2.1.1 to 2.1.2.

The instrument is shipped in packing of two units: (1) detector and (2) other units (see Figure 2.2.1 to 2.2.2).

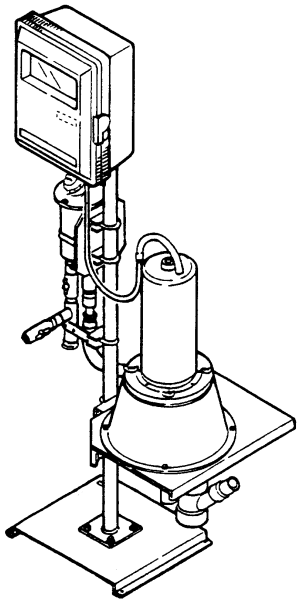


Figure 2.1.1 Pole-mounting Type

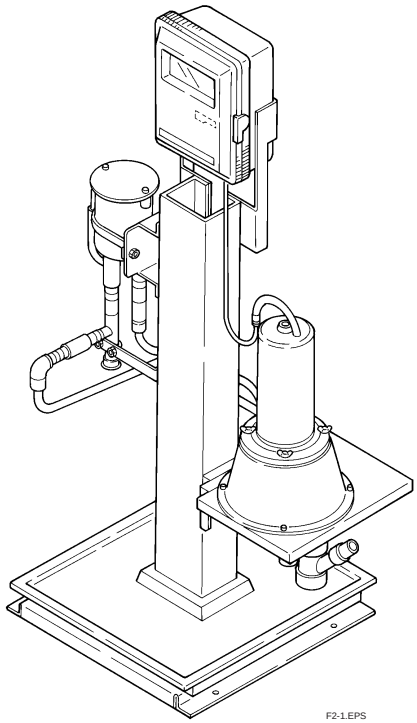


Figure 2.1.2 Standard Self-supporting Stanchion Type

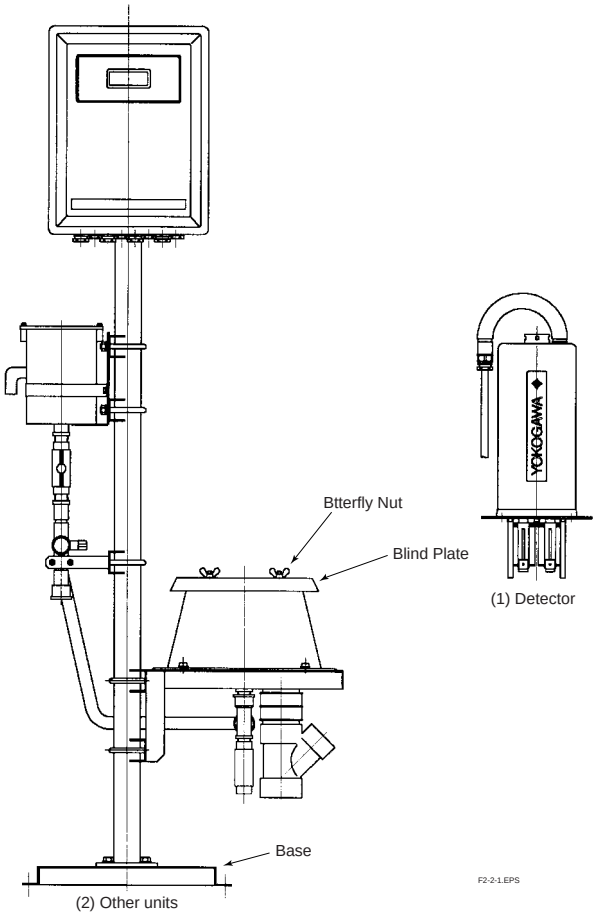


Figure 2.2.1 Shipping Package (Pole-mounting Type)

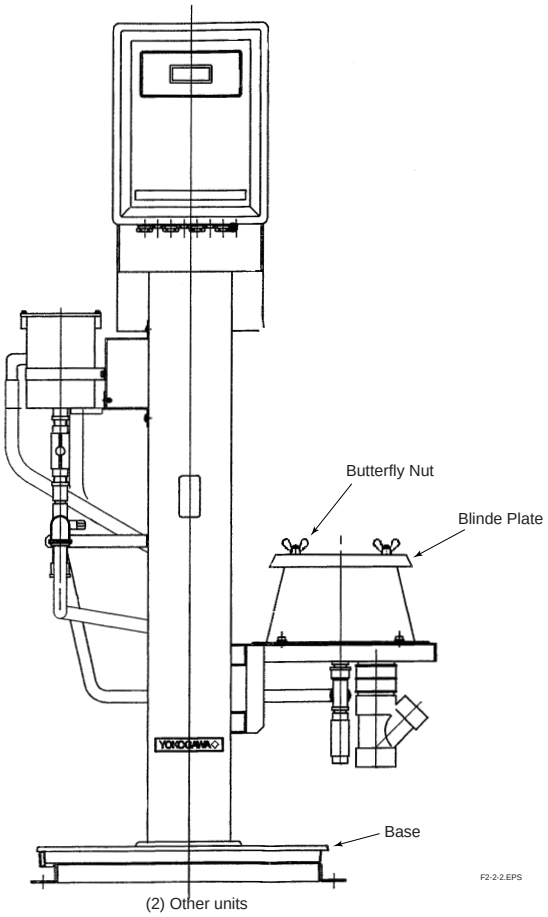


Figure 2.2.2 Shipping Package (Standard Self-supporting Stanchion Type)

(1) Mount the anchor bolts as shown in Figures 2.3.1 and 2.3.2. Secure the maintenance area measuring approximately 1000 mm each for front, rear, and right side and approximately 500 mm for left side.

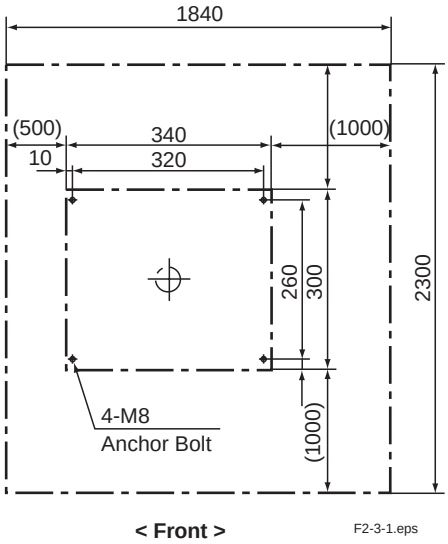


Figure 2.3.1 Anchor Bolt Positions and Maintenance Space Requirement (Pole-mounting Type)

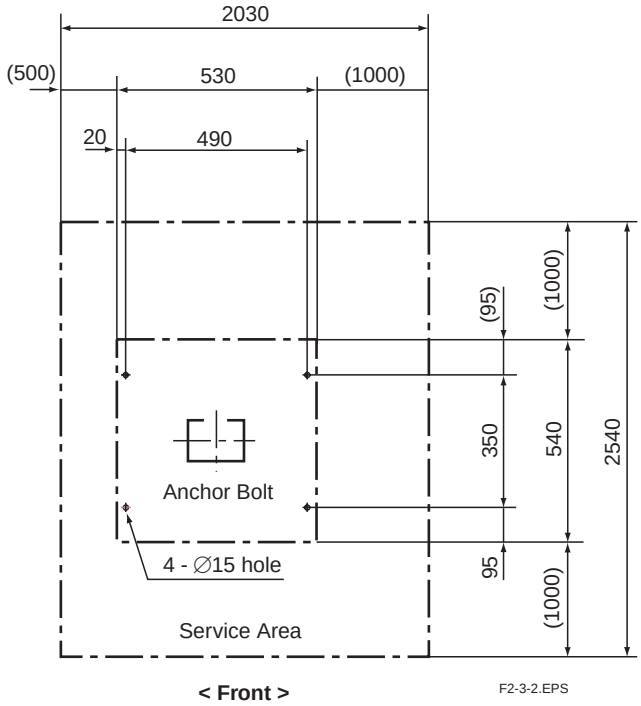


Figure 2.3.2 Anchor Bolt Positions and Maintenance Space Requirement (Standard Self-supporting Stanchion Type)

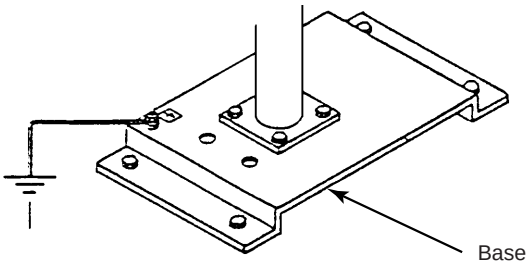


Figure 2.4 Grounding for Base

(2) Fix the base to the anchor bolts (see Figures 2.2 and 2.3)
(3) Make a ground connection to the base (JIS Class 3 grounding, grounding resistance is 100 Ω or less, see Figure 2.4)
(4) Remove four butterfly nuts. Fix the detector onto the blind plate by tightening the butterfly nuts (see Figure 2.2)
(5) Make a ground connection to the detector using a butterfly nut (JIS Class 3 grounding).
(6) Perform the wiring between the detector and the converter (refer to the connection diagram in Section 8.7).
(6-1) Open the display panel inside the converter.
(6-2) Feed the cable together with the cable gland through the hole at the bottom of the converter and fix the cable gland.
(6-3) Feed the cable onto the terminal strip from the left side. Plug in each connector to terminals CN4 (5P, 5 terminals), CN5 (5P, 4 terminals), and CN6 (2P, 2 terminals) on the terminal strip.
(6-4) Close the switch panel and the display panel.

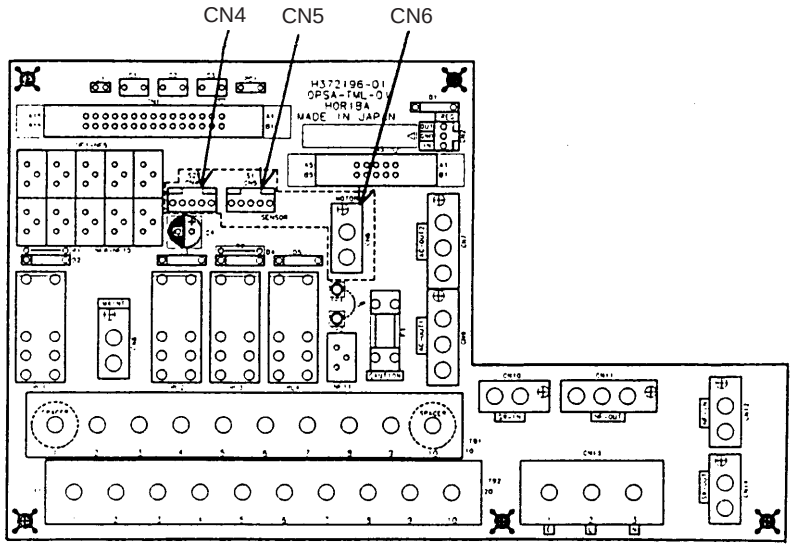


Figure 2.5 Connections between the Detector and the Converter

2.3 Wiring

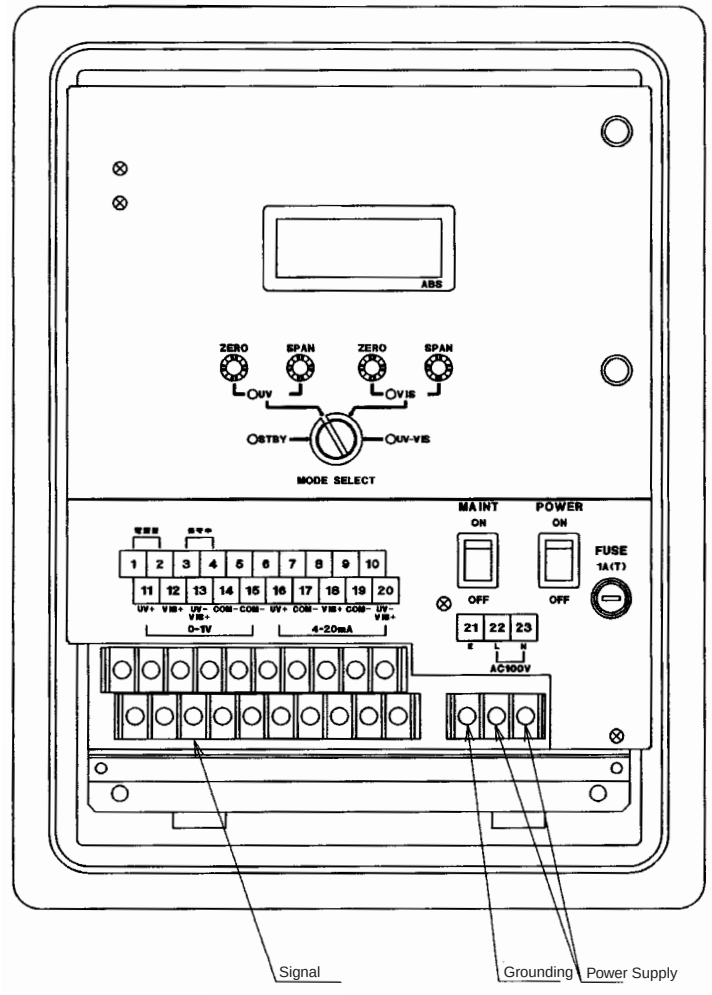


Figure 2.6 Terminal Strip of the Converter

(1) Power supply

Connect the power supply to terminals 22 and 23 of the terminal strip located at the rear of the operating unit. Use a power cable of 1.25 mm^2 (AWG 16).

Always connect a circuit breaker for safety's sake.

(2) Grounding

Carry out grounding work in accordance with local by-laws and regulations.

Connect the grounding wire to terminal No. 21 on the terminal strip.

Always ground the base when installing the operating unit outdoor case.

WARNING

MAINTAIN GROUND
TO AVOID
ELECTRIC SHOCK

F00-3.EPS

To minimize the risk of electric shock, be sure to install ground connections for the instrument. Avoid hazardous areas, such as gas tubing, for grounding.

(3) Voltage Signal Output

UV, VIS and UV-VIS signals can be output as voltage signals. Connect as follows:

UV	connect to terminals No. 11(+), 14(-)
VIS	connect to terminals No. 12(+), 15(-)
UV-VIS	connect to terminals No. 13(+), 15(-)

list 2-3.1

Use 2-core shielded cable and ground the shield at the receiving side.

Connect a device with an input resistance of 100 KΩ or greater.

(4) Current Signal Output

Alternatively, UV, VIS and UV-VIS signals can also be output as current signals. In this case, connect as follows:

UV	connect to terminals No. 16(+), 17(-)
VIS	connect to terminals No. 18(+), 19(-)
UV-VIS	connect to terminals No. 20(+), 19(-)

list 2-3.2

Use 2-core shielded cable and ground the shield at the receiving side.

Connect a device with an input resistance of 500 Ω.

CAUTION

When transmitting long distance, use the current output.

When the current signal output is not used, short the terminals with shorting plate (supplied).

(5) Contact Output

Output from the contacts is effective for power interrupt and in?maintenance.

Connect in accordance with the table below.

Power cut-off	connect to terminals No. 1, 2
MAINT ON/OFF	connect to terminals No. 3, 4

list 2-3.3

Contact capacity is 100 VAC, 1 A (resistance load). Contacts are active when power is interrupted and during-maintenance.

Reference

When installing the special case cover, use a cable of 10 to 12 mm in diameter.

The stop screws of the terminal strip are M3 × 6 mm. Use a crimp-on terminal having an outer diameter of 8 mm or less.

CAUTION

Fix the connection cable securely so that the terminal strip at the rear of the operation unit does not take any excessive pressure.

2.4 Piping

2.4.1 Pole-mounting Type

A typical sampling piping configuration is shown in Figure 2.7.1.

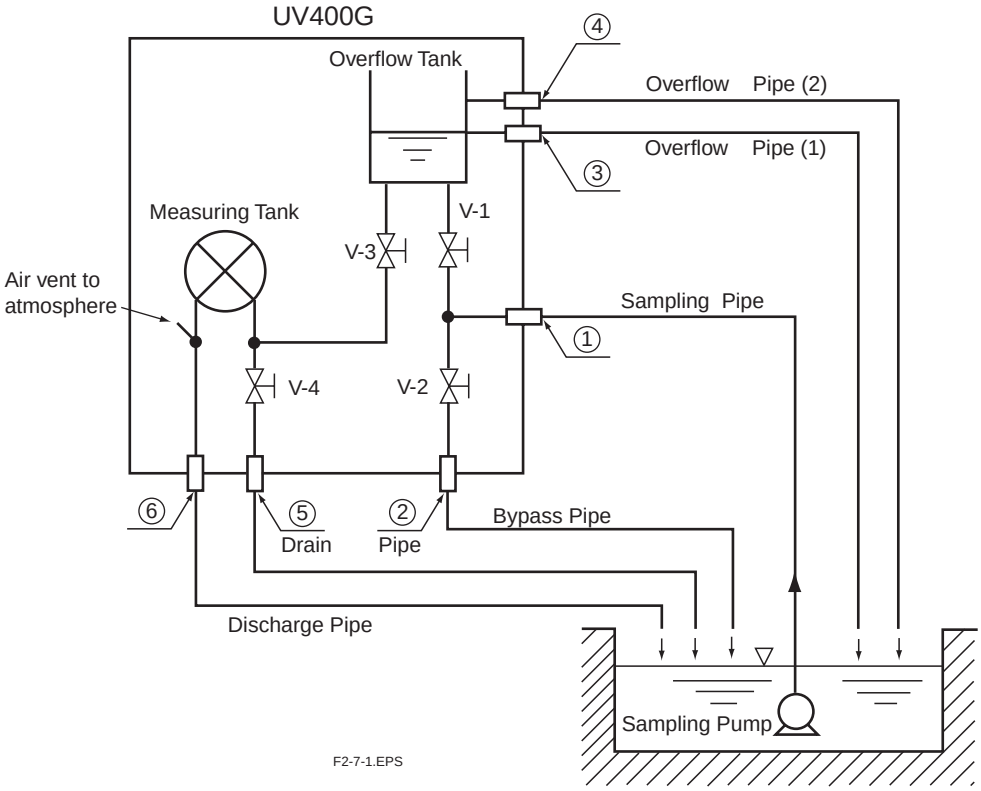


Figure 2.7.1 Typical Sampling Piping (Pole-mounting Type)

The piping connection ports are as follows:

1. Sample inlet	G1/2 female screw
2. Bypass outlet	Rc1/2 screw
3. Overflow outlet (1)	Nominal diameter 13 mm, elbow
4. Overflow outlet (2)	Nominal diameter 20 mm, elbow
5. Drain outlet	Rc1/2 screw
6. Discharge outlet	Nominal diameter 50 mm, socket

The following table shows the pipe diameters.

Pipe Name	Pipe Diameter (regular rigid PVC piping)
1. Sampling pipe	Nominal diameter 13 mm, and more
2. Bypass pipe	Nominal diameter 13 mm, and more
3. Overflow pipe (1)	Nominal diameter 13 mm, and more
4. Overflow pipe (2)	Nominal diameter 20 mm, and more
5. Drain pipe	Nominal diameter 13 mm, and more
6. Discharge pipe	Nominal diameter 50 mm, and more

T2-4-1.EPS

2.4.2 Standard Self-supporting Stanchion Type

A typical sampling piping configuration is shown in Figure 2.7.2.

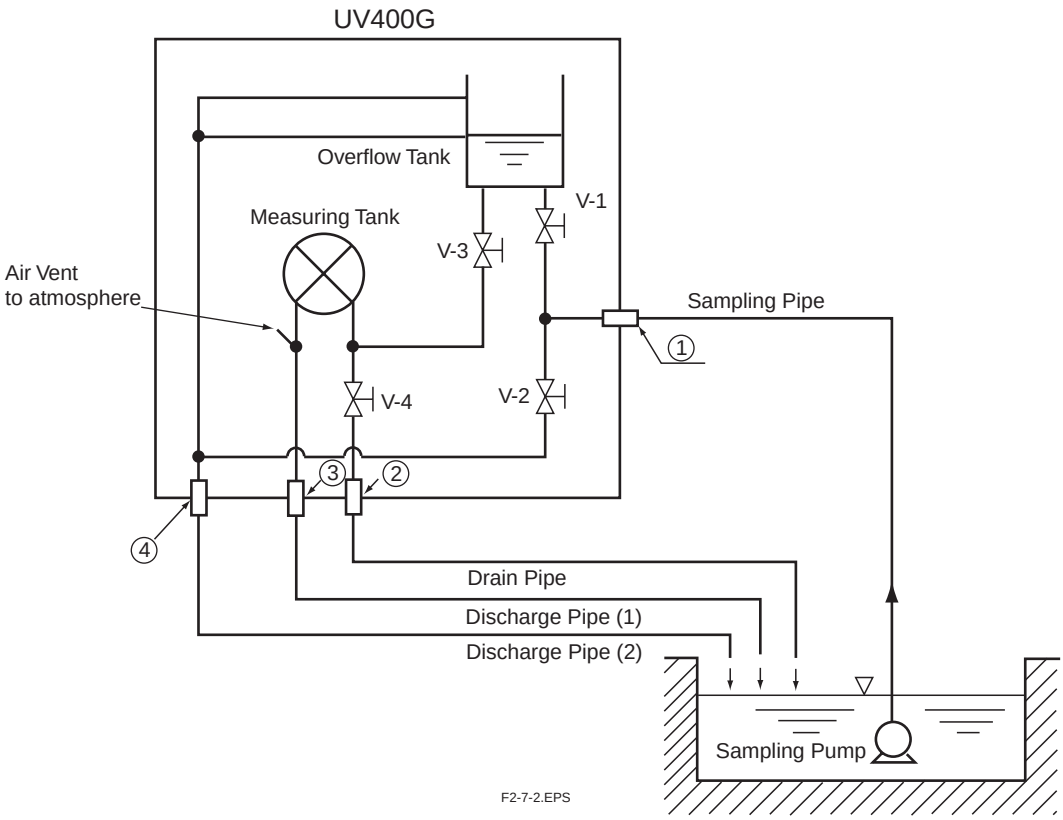


Figure 2.7.2 Typical Sampling Piping (Standard Self-supporting Stanchion Type)

The piping connection ports are as follows:

(1) Sample inlet	G1/2 female screw
(2) Drain outlet	Rc1/2 female screw
(3) Discharge outlet	Nominal diameter 50 mm socket
(4) Discharge outlet	Nominal diameter 40 mm socket

The following table shows the pipe diameters.

Pipe Name	Pipe Diameter (regular rigid PVC piping)
1. Sampling pipe	Nominal diameter 13 mm, and more
2. Drain pipe	Nominal diameter 13 mm, and more
3. Discharge pipe (1)	Nominal diameter 50 mm, and more
4. Discharge pipe (2)	Nominal diameter 40 mm, and more

T2-4-2.EPS

Note

- The pipe diameters listed above correspond to the diameters of the end connection of the UV400G respectively. When the analyzer is installed remotely from a sampling point and drainage, use pipes having larger diameter than those given in the table above.
- When installing the discharge pipe, overflow pipes (1) and (2), and drain pipe, allow for adequate slope toward drainage and do not allow the end of these pipes to plunge into water at drainage.
- When using flexible vinyl tubing, use pressure-resistant, blade-inserted type.
- It is recommended that the pipes be installed to allow easy removal for periodic cleaning.

3. Operation

3.1 Component Functions

3.1.1 Front Panel of the Converter

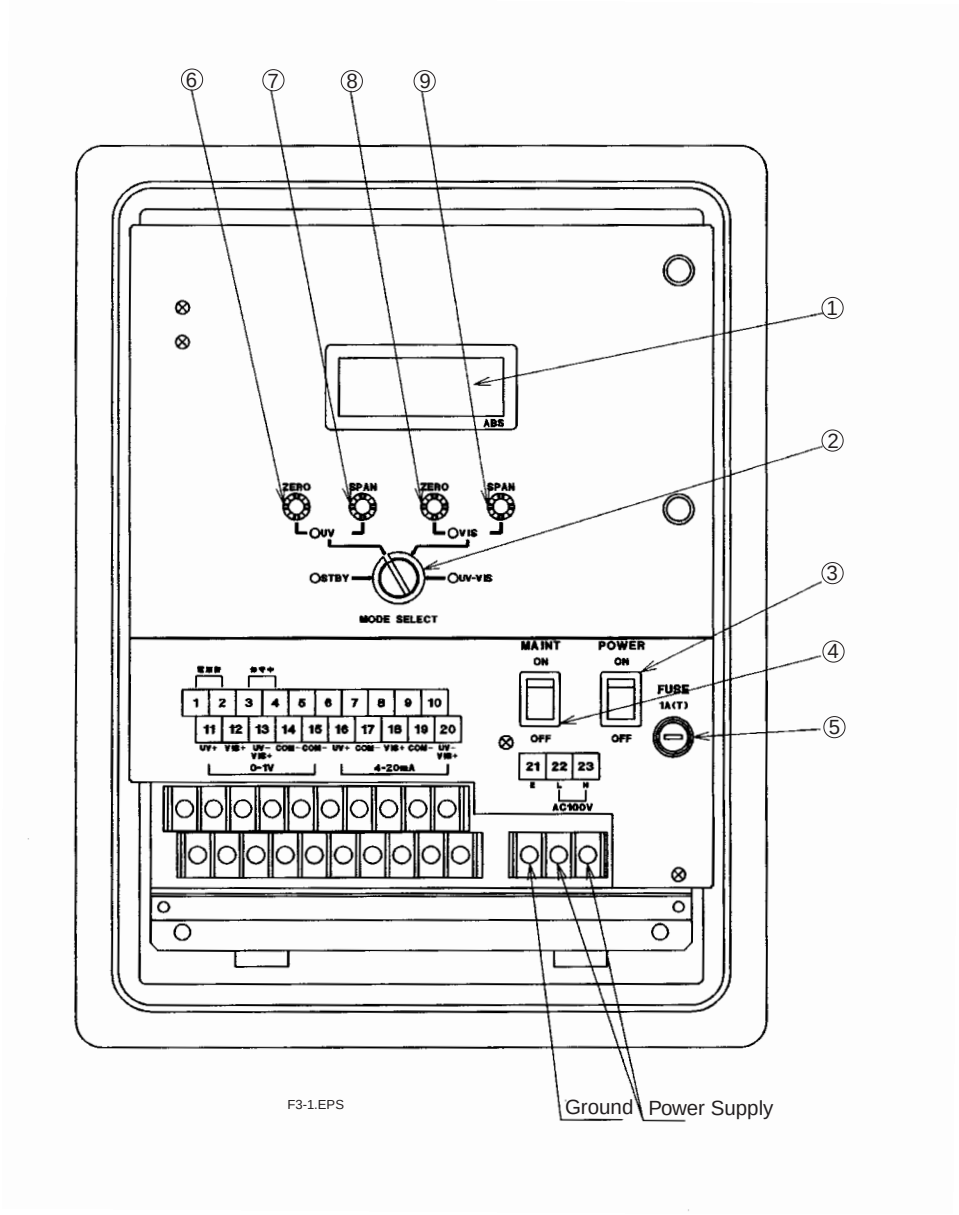


Figure 3.1 Front Panel of the Converter

1. Display: Digital indications of UV, VIS, and UV-VIS values
2. MODE SELECT switch:
   Switches modes from among [STBY], [UV], [VIS] and [UV-VIS]

   [STBY]: Standby status. With the exception that the ultraviolet lamp is turned off, all functions are ready to operate in this mode. This mode is used when cell cleaning or performance check for wiper and others is conducted.

[UV]: UV values are displayed. This mode is used when zero and span calibration is conducted.

[VIS]: VIS values are displayed. This mode is used when zero and span calibration is conducted

[UV-VIS]: Values obtained by subtracting the VIS value from the UV value are displayed.

CAUTION

In normal operation, set the MODE SELECT switch to a mode other than [STBY].

3. POWER switch: When the POWER switch is turned on, the display shows readings and a mode lamp turns on according to the MODE SELECT switch's position.
4. MAINT switch: Maintenance switch. When the MAINT switch is turned on during maintenance and inspection, external contact output is available. In normal operation, turn the MAINT switch off.
5. Fuse holder: Time lag fuse (1A)
6. ZERO control: For zero adjustment in the [UV] mode
7. SPAN control: For span adjustment in the [UV] mode
8. ZERO control: For zero adjustment in the [VIS] mode
9. SPAN control: For span adjustment in the [VIS] mode

3.1.2 Inside of the Converter

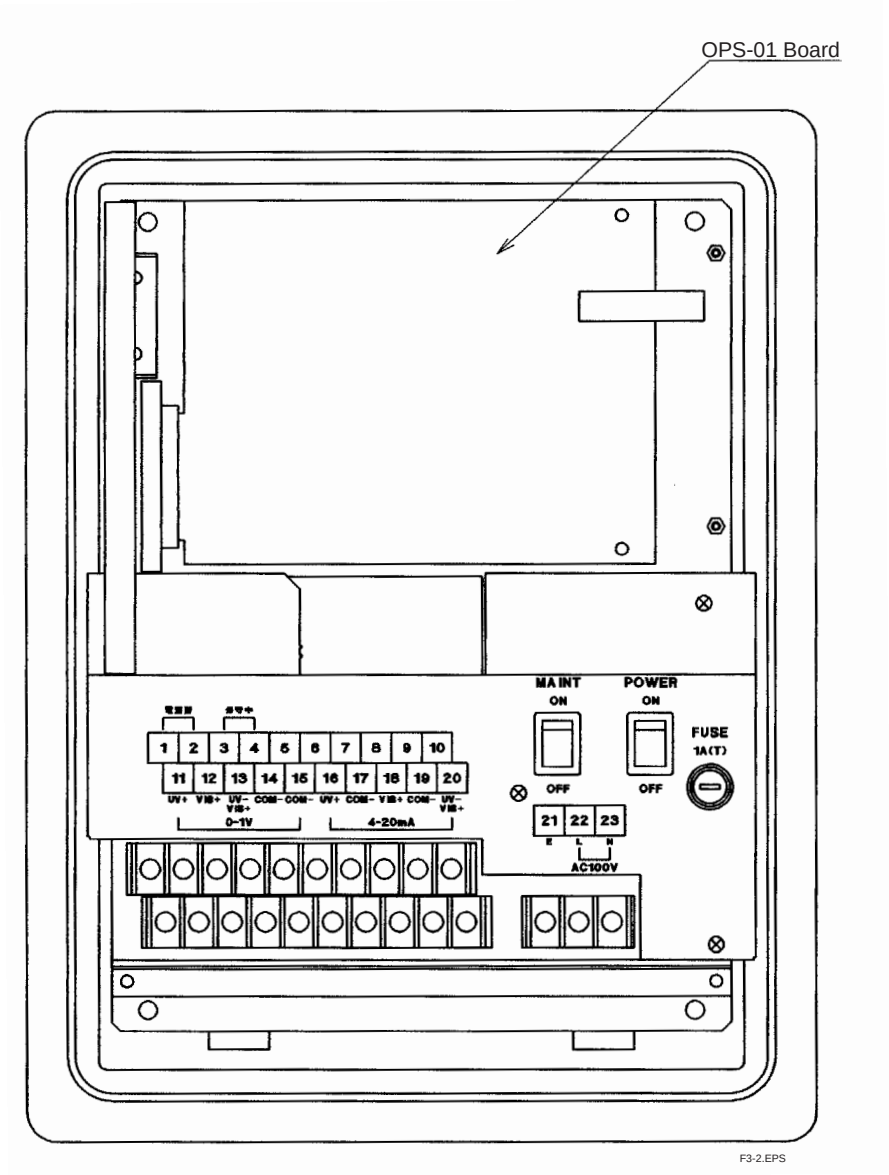


Figure 3.2 Internal View of the Converter

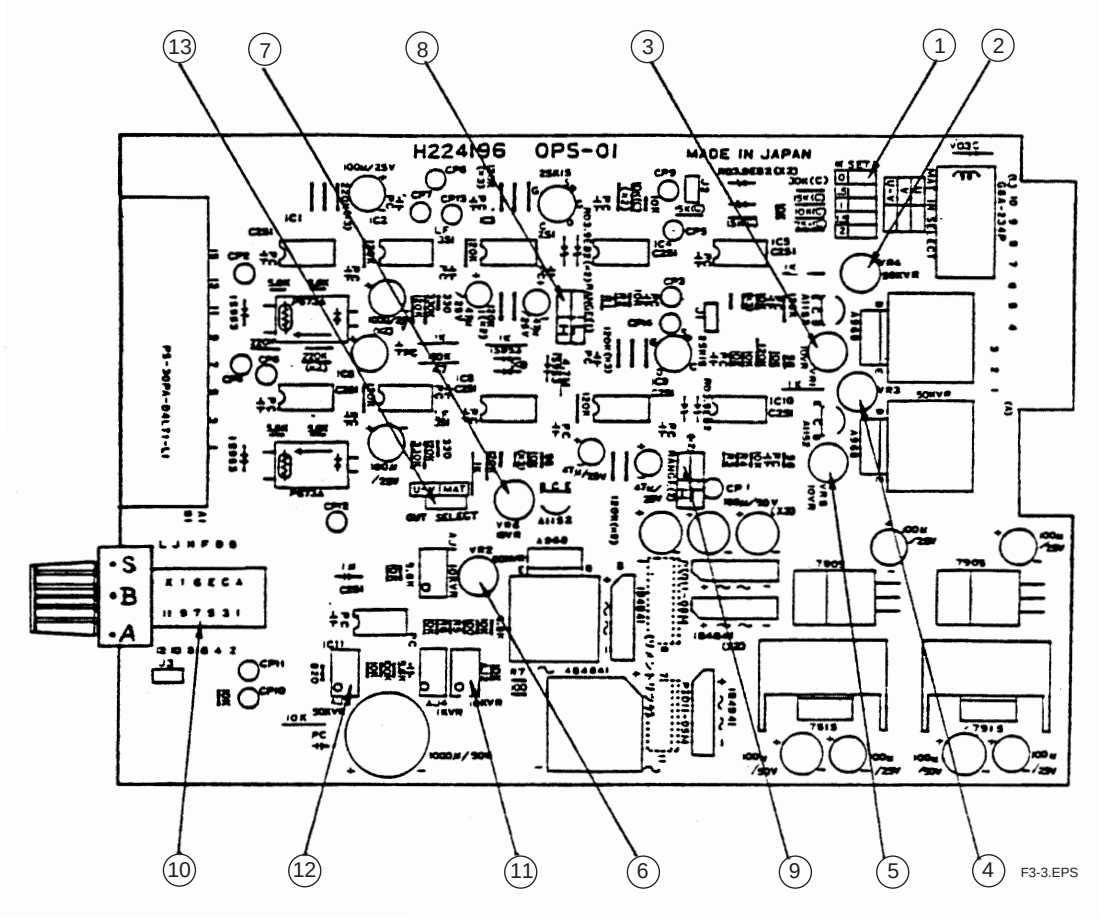


Figure 3.3 OPS-01 Board

1. Connector for setting the turbidity compensation constant (αSET)
10. Select switch for COD conversion function (optional)
11. Control (AJ2) for setting conversion coefficient A (optional)
12. Control (AJ3) for setting conversion coefficient B (optional)
13. Connector for selecting COD conversion output (OUT SELECT)

3.1.3 Setting Turbidity Compensation Constant ((α) SET)

A turbidity compensation constant (α) can be selected from among 5 settings: 0, 0.5, 1, 1.5, and 2.

Constant (α) is set to improve the correlation with the COD value in accordance with local measurement bylaws. Set the Constant (α) by inserting connector 1 for turbidity compensation constant on the OPS-01 board to the required setting using tweezers or pliers.

This constant is set to 0 when shipment.

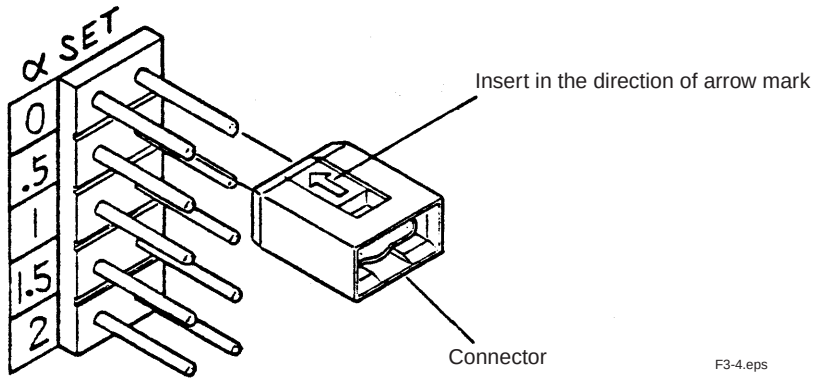


Figure 3.4 Connector for Setting Constant (α)

CAUTION

The connector is made of plastic. Excessive force when using pliers may damage the connector.

3.1.4 Setting COD Conversion Output (Optional)

When the COD conversion output function is supported in the specification, select switch (10) for COD conversion function, control (11) for setting conversion coefficient

A and control (12) for setting conversion coefficient B are added onto the OPS-01 board. The COD conversion value is output from the UV-VIS output terminal of the terminal strip.

The calculation formula is as follows:

$$Y=A+BX$$

where,

Y: COD value

X: the UV-VIS value

A and B: conversion coefficients

A readout of conversion coefficients A and B is displayed at the front panel. The readout is selected by select switch (10) for COD conversion function on the OPS-01 board. Select switch (10) has three settings: S, B and A. S displays the absorption, and A and B display conversion coefficients A and B.

Set connector (13) for selecting COD conversion output (OUT SELECT) to [U-V] before setting conversion coefficients A and B.

Setting conversion coefficient A

Set select switch (10) for COD conversion function to A. All of the mode select display lamps on the front panel will go out and readout of value A will be displayed.

Set the value for A by control (11) (AJ2) for setting conversion coefficient A on the OPS-01 board. The setting range is -100% to +100%.

Setting conversion coefficient B

Set select switch 10 for COD conversion function to B. All of the mode select display lamps on the front panel will go out and readout of value B will be displayed.

Set the value for B by potentiometer (12) (AJ3) for setting conversion coefficient B on OPS-01 board. The setting range is 0.10 to 5.00.

Examples of a setting for calculation coefficients A and B

The following shows an example of outputting 4 - 20 mA (0 - 1 V) at 0 - 50 mgO/l given that the regression line obtained when the measuring range of the monitor is 0 - 0.5 Abs is as shown in the formula below:

Y=A+BX=-1.2+84X ····· formula 1

where,
Y : COD value of manually analysis (mgO/l)
X : indicated value of UV400G (Abs)

<Setting conversion coefficient A>

$$\frac{A}{\text{COD full scale value}} \times 100$$

$$= \frac{-1.2}{50} \times 100 = -2.4\%$$

Values to the right of the decimal point are rounded off. Set the value -2.4 as -2.

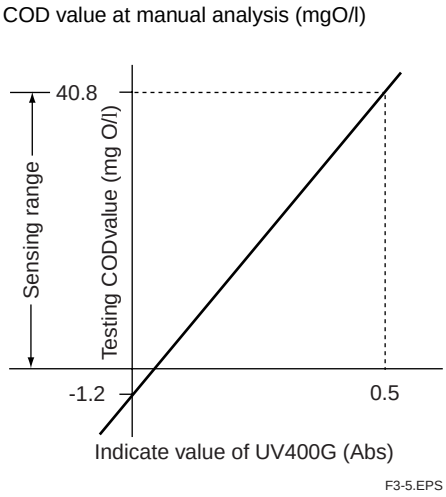


Figure 3.5 Indicate value of UV400G vs. Testing COD value

<Setting conversion coefficient B>
The sensitivity width or 0 - 0.5 Abs is calculated from formula 1 above.

B X 0.5 Abs = 84 X 0.5 X 42 mgO/l

The setting for conversion coefficient B thus becomes

$$\frac{\text{Sensitivity width for 0-0.5 Abs}}{\text{desired COD full scale output range}} = \frac{42}{50} = 0.84$$

Therefore, input [0]. [8] [4].

Accordingly, the output of 4 - 20 mA (0 - 1 V) becomes 0 - 50 mgO/l

Note

Set the coefficient value using the above method when the measuring range of the monitor is 0 - 1 Abs.

When the values have been set for conversion coefficients A and B, set select switch (10) for COD conversion function to S and re-insert connector (13) for selecting COD conversion output (OUT SELECT) from [U-V] into [MAT].

CAUTION

The COD conversion value is for external output only. It is not displayed.

3.1.5 Inside of the Detector

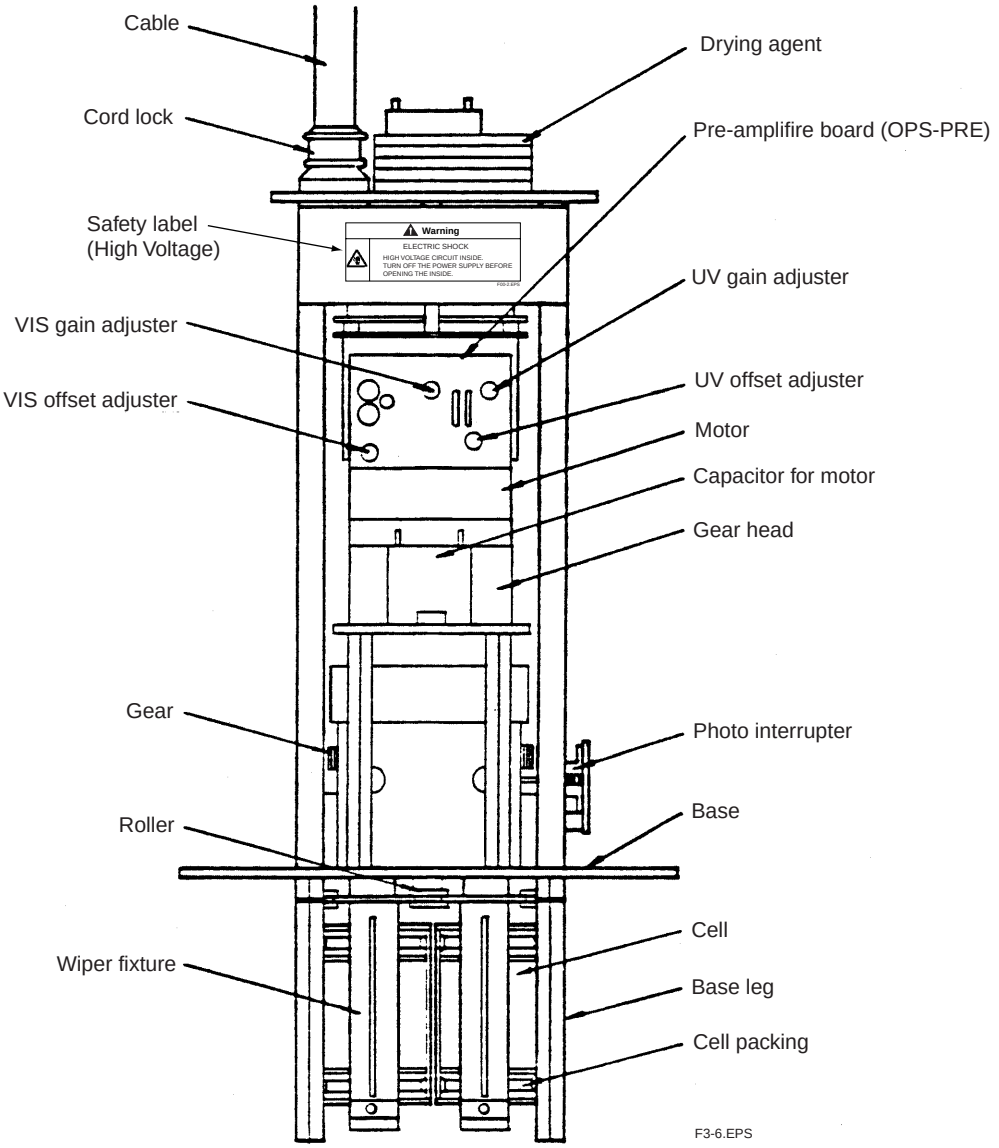


Figure 3.6 Inside of the Detector

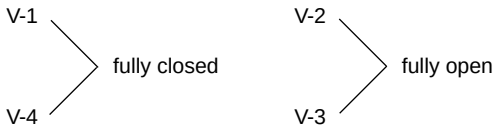
3.2 Preparations

1. Check that the wiring and piping have been installed correctly as specified in Sections 2.3 and 2.4.
2. Take off the lid to the overflow tank.
3. Temporarily remove the detector if it has already been set inside the measuring tank.

CAUTION

When removing the detector from the measuring tank, lay it down on a flat place so as to prevent the detector from toppling over. We recommend placing the detector in the calibration tank for the sake of safety.

4. Adjust the valves as follows referring to the flow schematic and dimensional outlines.



5. Supply sample water from the immersed pump or header within a flow rate range of 2 - 20 liters/min.
6. Gradually open valve V-1 until sample water starts to flow out of overflow outlet (1) of the overflow tank. If sample water does not start to flow out of overflow outlet (1) even if V-1 is fully open, then gradually close V-2 and adjust it until sample water starts to flow out of overflow outlet (1).
7. Check that sample water is overflowing from the two notches located at the upper rim of the inner measuring tank.

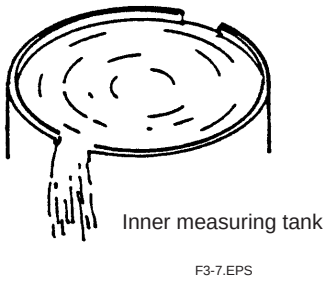


Figure 3.7 Inner measuring tank

8. Mount both the cover of the overflow tank and the detector once the outflow of the sample water from the overflow and inner measuring tank has stabilized.
9. Set the switches on the converter front panel as follows:

   POWER switch to OFF

   MAINT switch to ON

   MODE SELECT switch to [STBY]

10. Set the necessary value for the turbidity compensation constant (α).

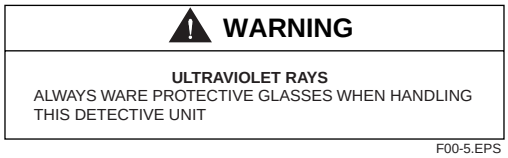
3.3 Startup

1. Turn the POWER switch on the converter to ON.
   Check that the [STBY] lamp is lit, and that some numbers appear on the display.
2. Lift up the detector, and check that the cells rotate and that the wipers are operating smoothly.

CAUTION

The cells are made of glass. Handle them with care.

3. Set the MODE SELECT switch on the converter to [UV]. Check that the [UV] lamp lights up.
4. Lift the detector up again, and check that the ultra-violet lamp is lit.



F00-5.EPS

WARNING

This instrument uses a low-pressure mercury lamp that emits ultraviolet rays. The lamp may cause eye damage if viewed directly. When removing the detector from the measuring tank for servicing, ensure that the "MODE SELECT" switch is set to the [STBY] mode or that a protective eyewear is used properly.

5. Check that the [VIS] and [UV-VIS] lamps light up when the corresponding modes have been selected using the MODE SELECT switch.
6. Return the MODE SELECT switch to its [UV] setting.
7. If no trouble has occurred so far, allow the monitor to warm up for more than one hour.

3.4 Shutdown

The procedure for regular shut?down of this monitor is as follows.

1. Set the MODE SELECT switch on the converter to [STBY].
2. Turn the POWER switch to OFF.

When the monitor is to be shut-down for a long time or put away for storage, follow the shut-down procedure given in Section 6.

4. Maintenance

To ensure prolonged normal operation of the monitor, carry out the following maintenance and inspections. Also, when carrying out maintenance and inspection, turn the MAINT switch at the operating unit to ON. External contact signal output will be operational. After maintenance and inspections, turn the MAINT switch to OFF again.

4.1 Daily Inspection

Visually inspect the following items every day.

(1) Operating unit

(a) Does the POWER switch turn ON?
(b) Is the readout normal?
(c) Is the MODE SELECT switch set to one of [UV], [VIS], or [UV-VIS]?

(2) Analyzing unit

(a) Is there any abnormal sound from the analyzing unit?

(3) Overflow and measuring vessels, piping

(a) Is there solution overflowing from the overflow or measuring vessel?
(b) Is there any leakage of solutions from the pipe joints?

4.2 Periodical Inspection

Here we describe the periodic checks and maintenance items and recommended maintenance interval. Table 4.1 shows limited-life items and recommended replacement intervals for maintenance, and does not represent a guarantee that these parts will not fail within this interval. The optimum replacement interval depends on operating conditions.

Table 4.1 Normal checks and maintenance management

Item for check/ maintenance	Recommended interval	Action
Zero calibration	Weekly	See Sec.4.3 (3) Zero calibration.
Span calibration	Monthly	See Sec.4.3 (4) Span calibration.
Cell cleaning	• When dirt is noticeable upon visual checking at zero calibration. • When zero drift is drifting 5% or more at zero calibration.	Dirt from sample water adheres to cell despite continuous wiper cleaning. For a while after beginning measurements, clean the cell at every zero calibration to ascertain the degree of the dirt problem, and determine the cleaning frequency accordingly. See Sec.4.3 (3) Zero calibration and Sec.4.4 How to Clean the Cell.
Overflow tank cleaning	When calibrating zero and span	Visual check and cleaning if it is dirty. See Sec.4.8 Cleaning the Overflow and Measuring tank.
Measuring tank cleaning	When calibrating zero and span	Visual check and cleaning if it is dirty. See Sec.4.8 Cleaning the Overflow and Measuring tank.
Pipe cleaning	When calibrating zero and span	Check that prescribed volume flows into overflow and measuring tank. If pipes are very dirty inside, the flow paths will become congested and the measuring tank level will drop, resulting in display errors. Clean in advance.
Replacing wipers	Every 6 months	See Sec.4.5 Replacing the Rubber Wipers.
Replacing the drying agent	Every 6 months	See Sec.4.7 How to Replace the Drying Agent.

T4-2-1.EPS

4.3 Calibration

(1) Calibration solution

Zero solution
Use distilled water. If unavailable, ion exchange water may be substituted.

Span solution
Calibrate with solutions having an absorbance at the measuring wavelength of 60 - 90% of the analyzer's full scale. Dilute the calibration solution ampoule (supplied) with zero solution as indicated below. Calibration solution for both UV and VIS may be made from one ampoule.

(2) How to mix span solution

Prepare the following

(a)	Calibration solution ampoule	1
(b)	Zero solution	Approx. 3 l
(c)	2 l measuring flask	1
(d)	Washing bottle	2

1. Knock down any solution in the neck of the ampoule.

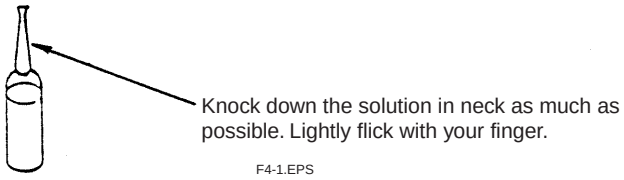


Figure 4.1

2. Score the neck of the ampoule with a knife or cutter.

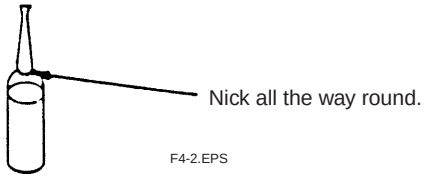


Figure 4.2

3. Break the ampoule.

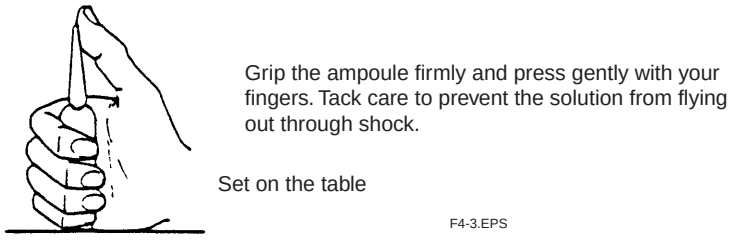


Figure 4.3

4. Pour all of the ampoule solution into a 2 l measuring flask previously washed with zero solution.

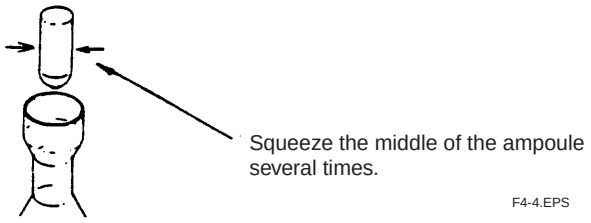


Figure 4.4

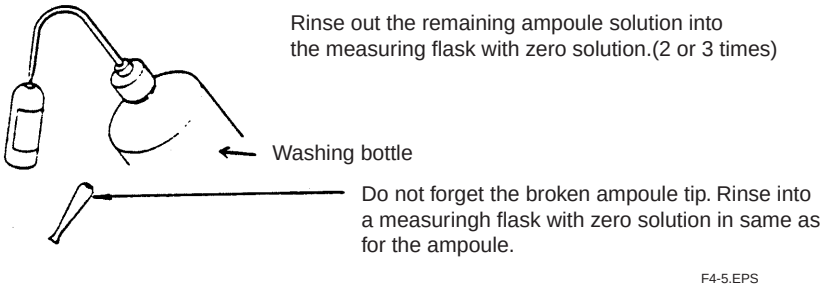


Figure 4.5

5. Pour in the zero solution up to the mark on the 2 l measuring flask, and shake thoroughly to rinse out the solution. The value of this span solution is shown on the ampoule label.

CAUTION

1. Do not use tap water, underground water, or industrial water to dilute the calibration solution (span solution).
2. There are 3 types of calibration solution ampoules depending on the measuring range of the monitor:

   H solution: blue label for 0 - 1 Abs.

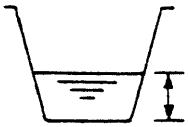
   L solution: red label for 0 - 0.5 Abs.

   H2 solution: green label for 0 - 2 Abs.

3. Store the calibration solution ampoule in a cool, and dark place. Use within 6 month after purchase.
4. Use the calibration solution ampoule quickly after opening.
5. Do not drink the solution in the calibration solution ampoule.
6. Be careful as the calibration solution stains clothing.
7. Do not re-use the calibration solution.
8. The calibration solution may be safely discarded along with ordinary waste water.

(3) Zero calibration

1. Wash the calibration tank (supplied) with zero solution and fill up to the mark with zero solution.
2. Pour tap water into a polythene bucket.

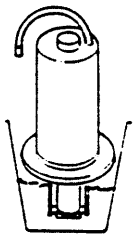


Pour in tap water to a depth of 9 cm.(depth which will not totally cover the analyzing unit base)

F4.6.EPS

Figure 4.6

3. Remove the analyzing unit from measuring vessel. (Do not lose the wing nuts.)
4. Clean the cell of the analyzing unit.
   (a) Remove any foreign objects attached around the cell.
   (b) Next, immerse the cell in the prepared polythene bucket and remove dirt.

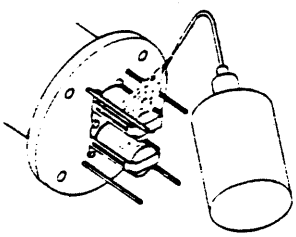


Immerse the cell and shake in all directions to remove dirt.

F4-7.EPS

Figure 4.7

   (c) Wash the cell again with the washing bottle.



Wash the cell with the washing bottle containing zero solution

F4-8.EPS

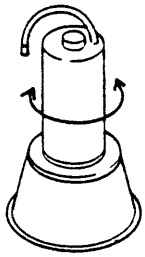
Figure 4.8

   (d) If the cell is extremely dirty, see Sec. 4.4 How to Clean the Cell.

CAUTION

Avoid spilling the solution on the V-ring seal section to which the cell rotary shaft is attached.

5. After cleaning, immerse in the prepared calibration tank.

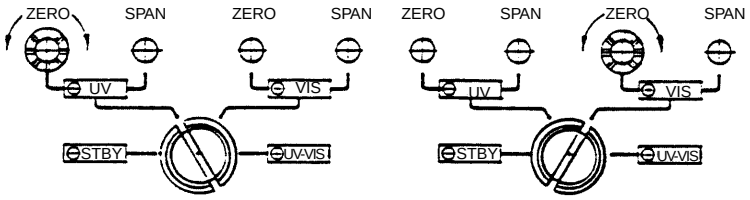


Rock back and forth 2 or 3 times to fit.

F4.9.EPS

Figure 4.9

6. Wait about 3 minutes, check that the display has stabilized, and then set UV and VIS readouts to their zero points using their respective ZERO controls.



F4-10.11.EPS

Figure 4.10 **Figure 4.11**

7. This completes zero calibration. Place the analyzing unit in the measuring tank. If you are to continue with span calibration, follow the procedure below with the analyzing unit placed in a tank containing zero calibration solution.

CAUTION

1. If the readout slowly increases after stabilization, the solution is contaminated. Replace and adjust again.
2. If the temperature difference between washing water, sample water, zero solution, etc. is large, the display is sometimes unstable. Make sure that the temperature difference is as small as possible when calibrating.

(4) Span calibration

Carry out span calibration after zero calibration.

1. Wash the calibration tank (supplied) thoroughly with zero solution, pour in about 100 cc of span solution as prepared in the 2 l measuring flask in, and clean the inside of the tank.

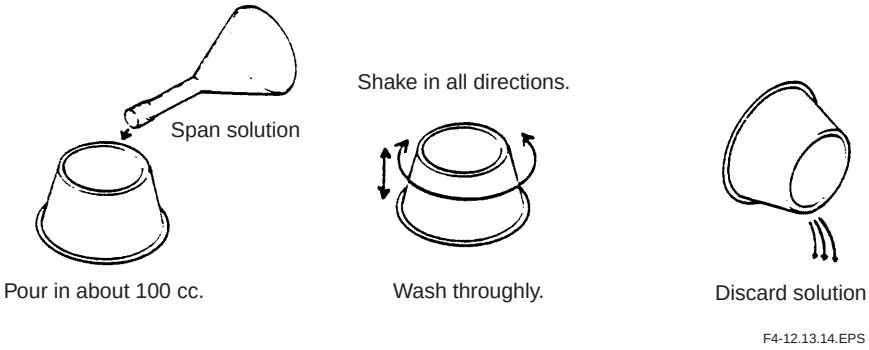


Figure 4.12 **Figure 4.13** **Figure 4.14**

2. After cleaning, pour in the span solution up to the calibration tank mark.

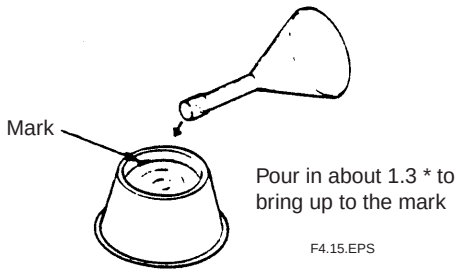


Figure 4.15

3. Pour the remaining span solution into washing bottle.

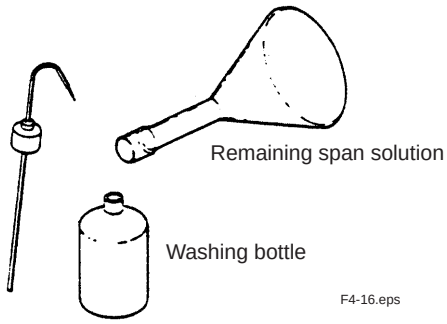


Figure 4.16

(a) You can carry out calibration more effectively if you carry out preparations up till now together with the preparations for zero calibration.

4. Take the analyzing unit out of the zero calibration tank and wash around the cell using the washing bottle containing span solution.

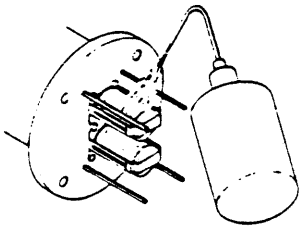


Figure 4.17

CAUTION

Avoid spilling solution on the V-ring seal section to which the cell rotary shaft is attached.

5. After washing with the span solution, immerse in the calibration tank.

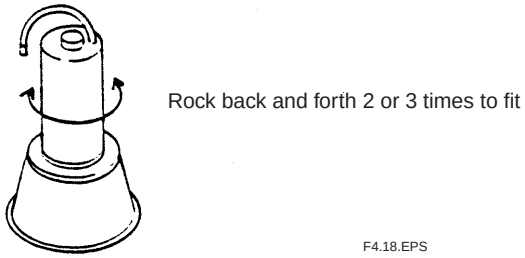


Figure 4.18

6. Wait about 3 minutes, check that the readout has stabilized, then match the UV and VIS to the value of the calibration solution using their respective SPAN controls.

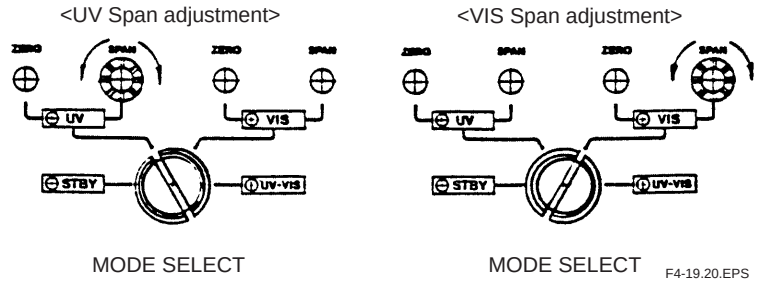


Figure 4.19 **Figure 4.20**

7. Place the measuring tank into the analyzing unit

CAUTION

Do not use the calibration solution in the calibration tank more than once.

4.4 Clean the Cell

1. Turn the MAINT switch at the operating unit to ON. In maintenance contact output is operational.
2. Turn the MODE SELECT switch to [STBY].
   The ultra-violet lamp will light up.
3. Remove the analyzing unit from measuring tank.
4. Clean dirt, algae, etc. from parts around the cell (wiper fixtures, base legs, rollers, etc.) with a brush.

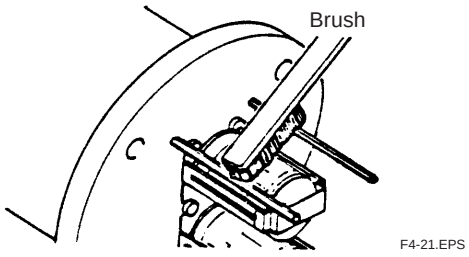


Figure 4.21

5. Polish the cell as it rotates with a wet clean damp cloth, moving the cloth up and down applying light pressure.

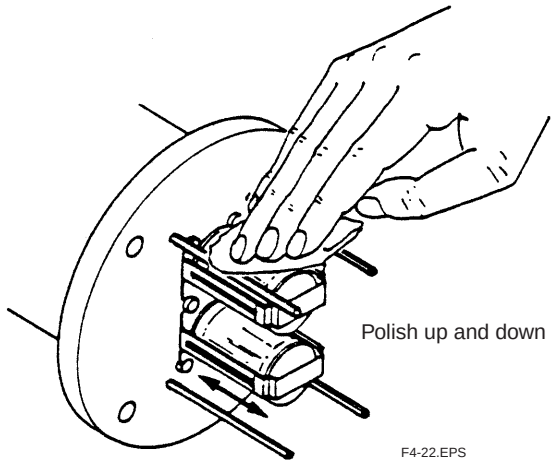


Figure 4.22

6. Rinse off dirt completely with the washing bottle or under the gentle flow of tap water, taking care to avoid spilling the solution on the V-ring seal section to which the cell rotary shaft is attached.
7. After MODE SELECT switch is set to [UV] and ultra-violet lamp lights, immerse in calibration tank containing zero solution and warm up.
   If cleaning is completed within 10 minutes, about 30 minutes is sufficient for warming up.

This completes cleaning.

After warming up, replace the zero solution in the calibration tank with fresh solution, wait about 3 minutes for the readout to stabilize, then carry out zero calibration.

Also, if necessary, carry out span calibration.

WARNING

ULTRAVIOLET RAYS
ALWAYS WARE PROTECTIVE GLASSES WHEN HANDLING THIS DETECTIVE UNIT

F00-5.EPS

This instrument uses a low-pressure mercury lamp that emits ultraviolet rays. The lamp may cause eye damage if viewed directly. When removing the detector from the measuring tank for servicing, ensure that the "MODE SELECT" switch is set to the [STBY] mode or that a protective eyewear is used properly.

CAUTION

1. When cleaning, do not incline the analyzing unit more than 80 degrees from normal. Foreign objects attached to the sealing section of the rotary shaft cause wear to the seal.
2. When washing the analyzing unit immersed in a polythene bucket etc., keep the solution to a depth which will not come over the base (9 cm or less from the base).
3. When taking the analyzing unit out of the measuring tank, choose a level place where it will not topple over if leaving it down.
4. The cells are made of glass. Handle them carefully.

4.5 Replacing the Rubber Wiper

1. Set the MAINT switch ON, MODE SELECT switch [STBY], and the POWER switch to OFF.
2. Remove the analyzing unit from measuring tank. Remove the retaining fixture from the cell as shown in .

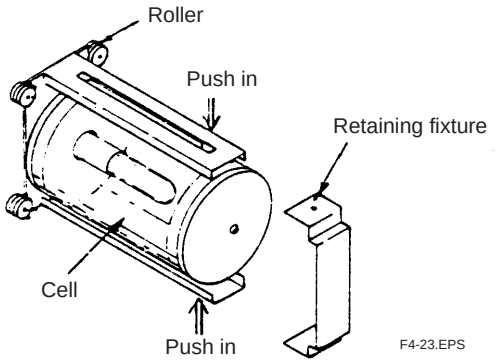


Figure 4.23

3. As shown in 9 grip the rubber wiper with small pliers, pull inwards a little, then tug downwards to remove it.

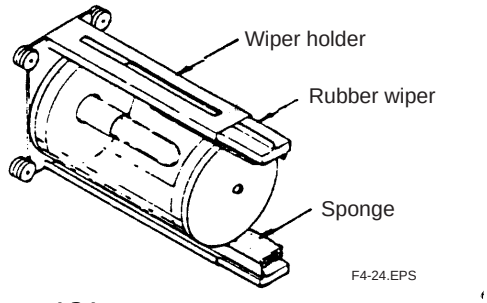


Figure 4.24

4. Insert a new rubber wiper into the wiper plate by reversing procedure 3. Then look from below, as shown in Figure 4.25, and check that the wiper blade is installed in the direction of cell rotation.

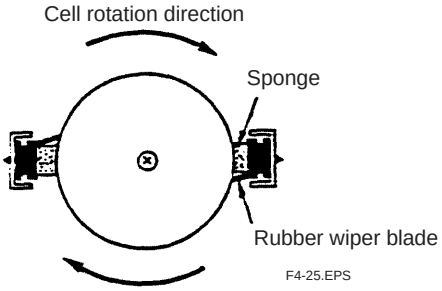


Figure 4.25

5. Replace the retaining fixture.
6. Turn the POWER switch ON, and check that the rubber wiper sponge contacts the cell and the wiper plate moves smoothly.

This completes replacement. Carry out warming up, zero calibration, and if necessary, span calibration.

4.6 Open/Close the Analyzer Unit Cover

CAUTION

Open the analyzing unit cover in as clean a room as possible. Set the MAINT switch to ON, the MODE SELECT switch to [STBY] and the POWER switch OFF.

If the connector at the rear of the operating unit is removed, the analyzing unit can be easily carried into the room.

1. Remove the clamping bolt at upper part of analyzing unit by turning anti-clockwise with a screwdriver. (Figure 4.26)

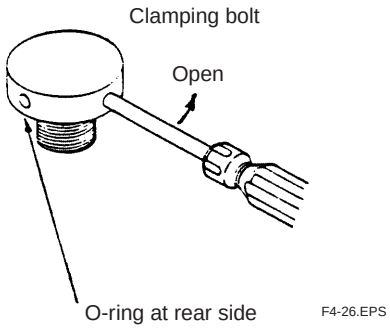


Figure 4.26

2. Remove the lock nut from the receiver tip.
3. While pushing the cable into the receiver, slowly lift up the cover receiver. After opening about 5 cm, return it to its original position. The packing and packing retainer will come out. (Figure 4.27)

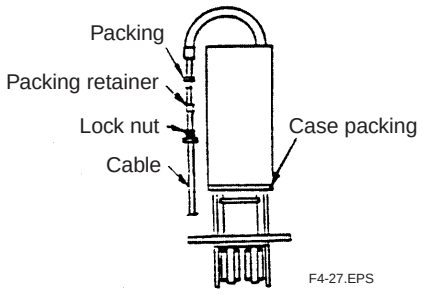


Figure 4.27

4. Put the lock nut, packing retainer and packing in a suitable place, then lift up and open the cover.

CAUTION

When the cover has been opened soon after turning the power supply to the analyzer OFF, the motor will be hot. Handle with care.

5. To close the cover, follow the opening procedure in reverse. Holding the cover receiver and pulling the cable, close the cover as if it were a lid.
6. At this time, line up the receiver base with the cord lock, as in Figure 4.28.

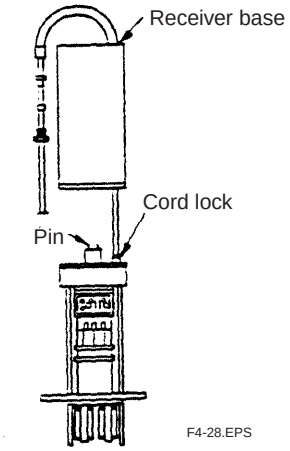


Figure 4.28

7. Check that the two pins are lined up with the holes in the upper part of the cover and fix the clamping bolt. Do not forget to put the O-ring inside the clamping bolt.
8. Put the packing and packing retainer into the receiving tip, and tighten the lock nut.
9. Operate following Start-up.

CAUTION

Before tightening check that there is no rubber, etc., adhering to the cover packing, O-ring, or cable packing seals.

4.7 Replace the Drying Agent

(1) Replacing the drying agent in the analyzing unit case

1. Open case following Sec. 4.6 How to Open/Close the Analyzing Unit Cover above.
2. Take out the old drying agent and replace with new drying agent (supplied). Remove dust from the surface of the new drying agent and insert with the blue surface facing up.
3. Close case following Sec. 4.6 How to Open/Close the Analyzing Unit Cover above.

(2) Replacing the drying agent in the measuring cell

1. Remove the retaining fixture (Figure 4.29). Figure 4.29 to 4.41 explain how to replace the drying agent inside the cell at the light source side.

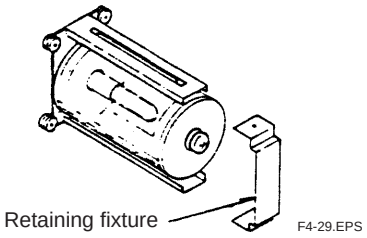


Figure 4.29

2. Carefully wipe moisture from around the cell with cloth.
3. Remove screw (Figure 4.30).

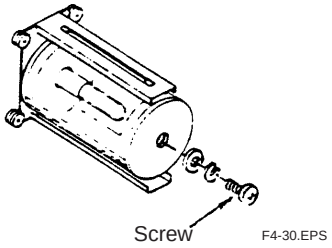


Figure 4.30

4. Remove cell plate D (Figure 4.31)

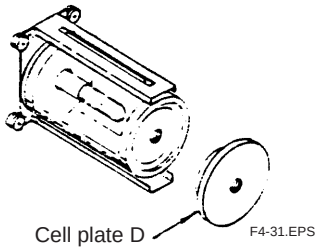


Figure 4.31

5. Remove cell packing with tweezers. (Figure 4.32)

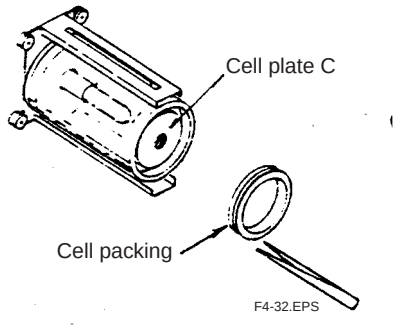


Figure 4.32

6. Remove cell plate C and take out drying agent. (Figure 4.33)

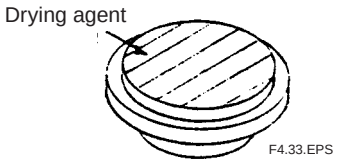


Figure 4.33

7. Place cell plate C, cell packing, and cell plate D as in 12, and tighten screw 2 or 3 turns. (Figure 4.34)

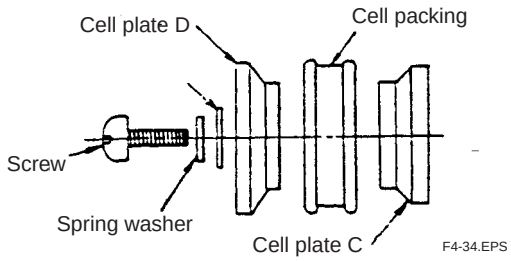


Figure 4.34

8. Peel the upper paper from the double-sided tape and affix to the center of cell plate C.

Remove any powder from the drying agent at this time. (Figure 4.35)

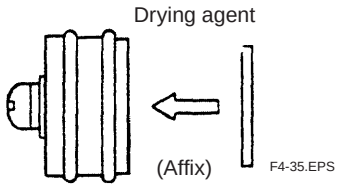


Figure 4.35

9. Insert this block into the cell, tighten the screw all the way, and fit the cell packing closely to the inside of cell. (Figure 4.36)

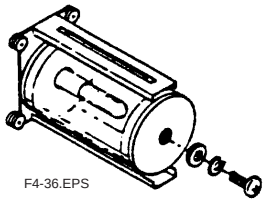


Figure 4.36

CAUTION

Before tightening check that there is no rubber etc., adhering to the cell packing seal.

10. Inspect the cell thoroughly for damage (breaks, cracks, etc.) before replacing the retaining fixture. (Figure 4.37)

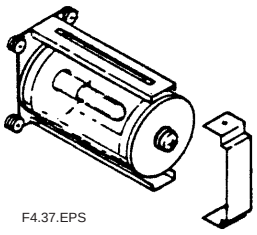


Figure 4.37

11. Follow up by replacing the drying agent in the cell on the detector side, following steps 1 to 10 above.

When the drying agent had been replaced, warm up for about 30 minutes.

Carry out zero calibration, and span calibration if necessary.

Inspect the cell again and check for any abnormalities.

4.8 Cleaning the Overflow and Measuring Vessels

Clean dirt from the inside of overflow and measuring vessels periodically.

1. Turn ON the “MAINT” switch of the control unit, and stop feeding of the sample water.
2. Open the overflow tank lid and take the analyzing unit out of the measuring tanks.

CAUTION

Be careful not to damage the cell unit when removing the monitor from the measuring tank. In addition, put a fluid (sample water or tap water) in the calibration tank so as not to idle operate the analyzing unit.

3. Fully open valves V-1, V-2 and V-3 at the lower part of the overflow tank, and valve V-4 at the lower part of the measuring tank. If the sample water supply cannot be cut off at this time, close valve V-1 and clean valves other than V-1.
4. See Sec. 4.9 Procedure for Removing the Inner Measuring Tank, and remove the inner measuring tank.
5. Thoroughly rinse away dirt from inside the overflow and measuring vessels with tap water, etc. Also, if flow from the overflow tank to the measuring tank is bad, remove the connecting pipe and wash with tap water.
6. Restore the overflow tank, measuring tank, inner measuring tank, and pipes after they have been cleaned.
7. Fully close valves V-1 and V-4 and fully open values V-2 and V-3.
8. Turn on the sample water supply and slowly open valve V-1 until sample water begins to flow out of overflow tank overflow outlet (1).
   If sample water fails to flow from overflow outlet (1) even with V-1 fully open, gradually close V-2 and adjust until sample water flows from overflow outlet (1).
9. Check that sample water overflows from the two notches at the upper rim of the inner measuring tank and is discharged from the waste water outlet.
10. When the flow from overflow and measuring tank has stabilized, put the overflow tank lid and analyzing unit back in position.
11. Turn the “MAINT” switch OFF, and carry out calibrations or measurement.

4.9 Removing the Inner Measuring Vessel

1. Cut off the sample water supply and power supply to the monitor.
2. Remove the analyzing unit and blind plate
3. Grip the inner measuring tank with both hands, and rotate it to the left to remove.

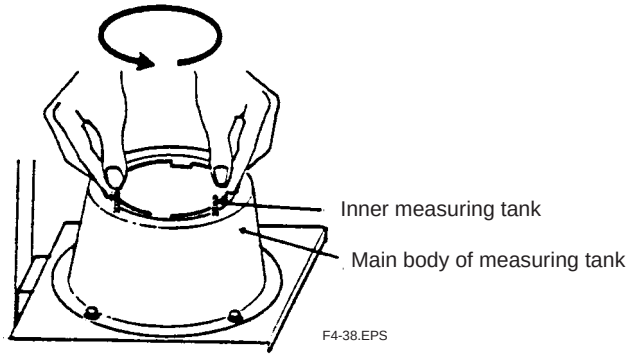


Figure 4.38

4. Remove the flow adjustment plate from the inner measuring tank. The flow adjustment plate spring protrudes into the screw section at the bottom of the inner tank.

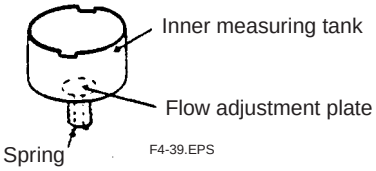


Figure 4.39

5. After cleaning the inner measuring tank, restore the flow adjustment plate back to its original position.

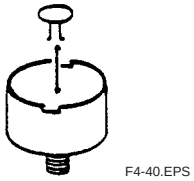


Figure 4.40

6. Line up the inner tank with the screw hole in the measuring tank, and rotate it to the right until it is firmly fixed.

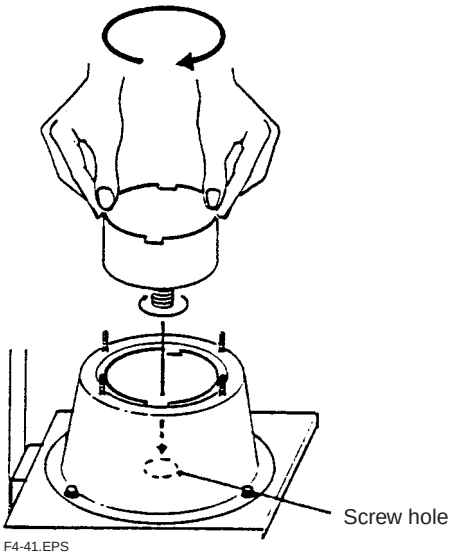
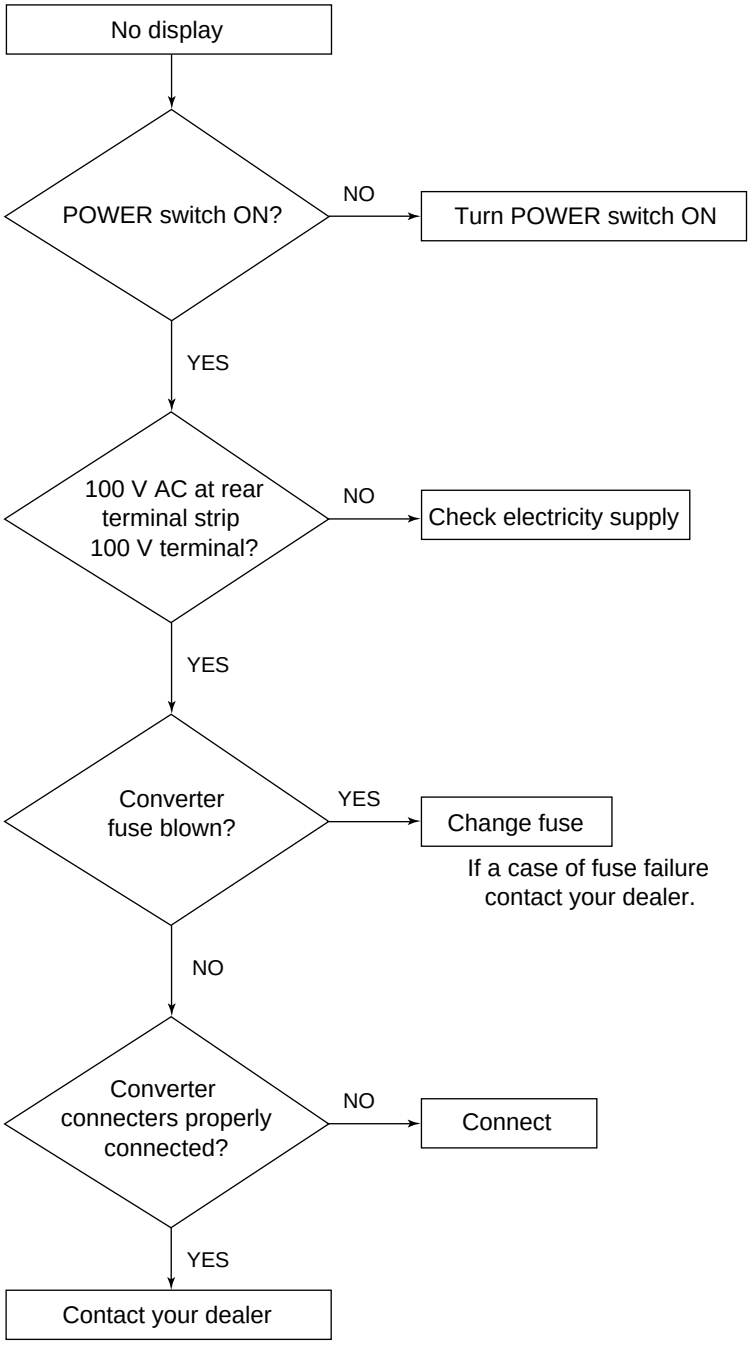


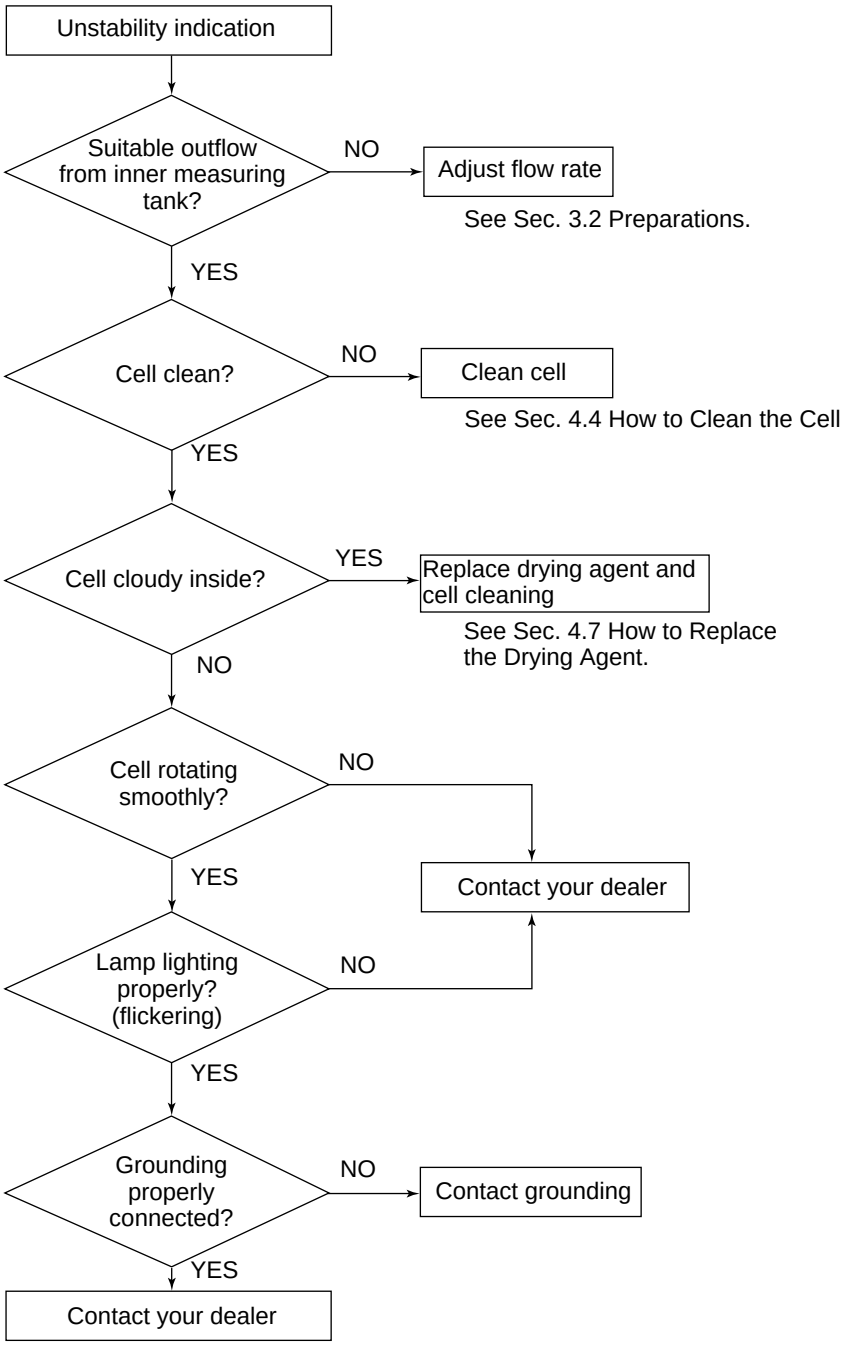
Figure 4.41

5. Troubleshooting

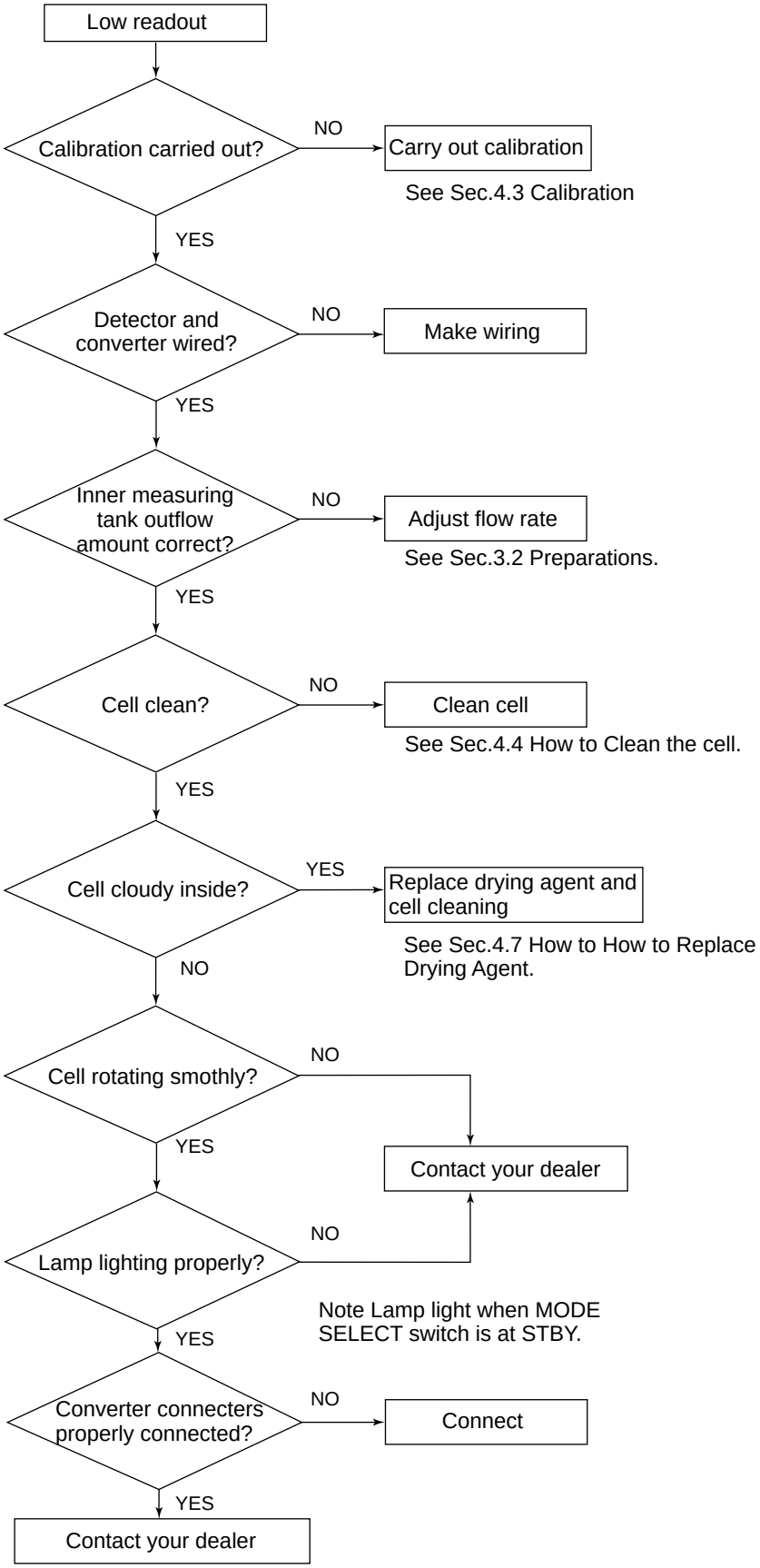
5.1 No display



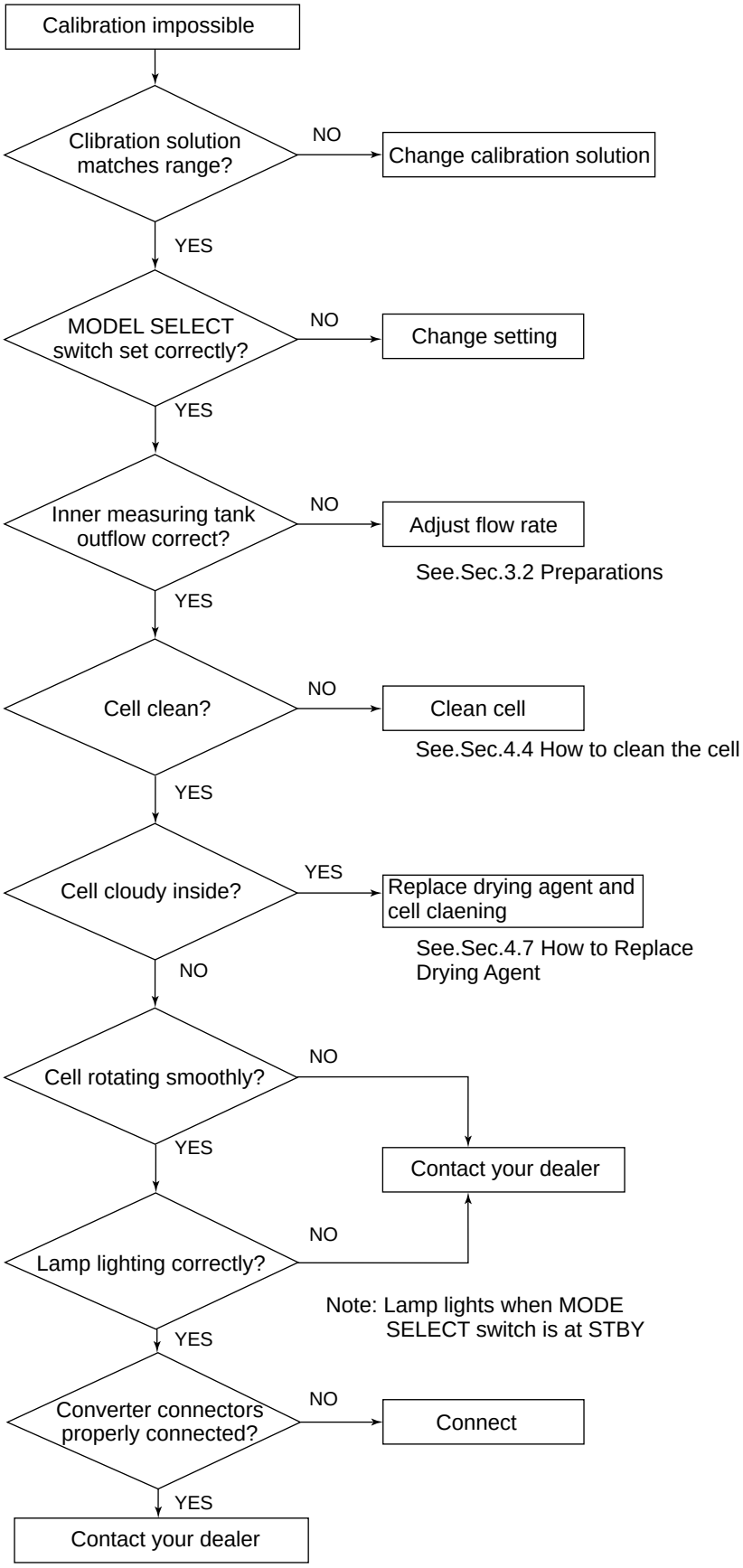
5.2 Unstability indication



5.3 Low readout



5.4 Calibration impossible



6. Long-terms Storage

1. Shut off sample water supply and power supply to the monitor.
2. See Sec. 4.8 Cleaning the Overflow tank and Measuring tank, and clean tanks thoroughly. Also, after cleaning leave tanks so that water cannot enter (to prevent damage by freezing).
3. See Sec. 4.4 Clean the Cell, and clean the cell unit.
4. If sited outdoors, indoor storage of the converter and detector is recommended.

7. Maintenance Parts

(1) Auxiliary Parts

Name	Part Number	Q'ty	Description	Recomended Replacement Cycle
Calibration solution L (*1)	K9430EA	1box	0 to 0.5 Abs, 6 pcs/box	1 box/6 months
Calibration solution H (*1)	K9430EB	1 box	0 to 1 Abs, 6 pcs/box	1 box/6 months
Calibration solution H2 (*1)	K9430EW	1 box	0 to 2 Abs, 6 pcs/box	1 box/6 months
Calibration tank	K9430EC	1 piece	For calibration	When damaged
Rubber wiper	K9430ED	1 bag	Cell cleaning, 4 pcs/bag	1 bag/6 months
O-ring	K9430EZ	1 bag	12 pcs x K9430EE	1 piece/6 months
Desiccant	K9430EG	1 pair	Detector case, 5 pcs/pair	1 pair/6 months
Desiccant	K9430EH	1 pair	Detector cell, 2 pcs/pair	1 pair/6 months
Cell	K9430FF	1 piece	For detector, clear fused quartz	When damaged
Fuse	K9430EF	1 piece	For converter, TGDL-LA	When damaged

*1: One piece per calibration is used. A calibration solution should be used within six months after purchase.

(2) Overhaul Parts

It is recommended that the UV400G be overhauled yearly by Yokogawa to ensure reliable performance through simple daily maintenance.

Parts required for overhaul are listed below.

Name	Part Number	Q'ty	Description
Overhaul kit	K9430EJ	1	Contains all parts required for overhaul
[Contents]			
Motor	K9430EL	1	Motor assembly
Motor gear head	K9430EM	1	Motor assembly
Light source (mercury lamp)	K9430EK	1	Detector cell
V-ring	K9430EP	2	Detector cell
Seal washer	K9430ES	14	Detector cell
Roller	K9430EN	6	Detector cell
Cell packing 2	K9430ER	4	Detector cell
O-ring	K9430EE	1	One of 12-piece pack (K9430EZ)
Desiccant	K9430ET	1	One of 5-piece pack (K9430EG)
Desiccant	K9430EQ	1	One of 5-piece pack (K9430EH)
Rubber wiper	K9430EV	4	One of 4-piece pack (K9430ED)

Note: The overhaul kit, K9430EJ, is recommended for yearly overhaul.

8. Specifications

8.1 Standard Specifications

Object of measurement: Organic pollutant in water

Measurement principle: Ultraviolet light absorptiometry with cell length modulation (see chapter 9)

Measurement wavelength: Ultraviolet ray (UV); 253.7 nm
Visible light (VIS); 546.1 nm

Measuring range: 0 to 2 Abs

Output range: 0 to 0.5 Abs, 0 to 1 Abs, or 0 to 2 Abs

Output signal: 3 signals; UV, VIS, UV-VIS

Simultaneous output of 4-20 mA DC (load resistance 500Ω or less) and 0-1 V DC (load resistance 100kΩ or greater) for each signal

Contact output: Under-maintenance signal; Non-voltage make contact (capacity: 100 VAC, 1 A)

Power cutoff signal; Non-voltage make contact (capacity:100 VAC, 1A)

Display: Digital (3 1/2 digit, LCD) for absorption

COD conversion function (optional)

Conversion formula: Y=A+BX

Where, Y: COD conversion value (output)
X: Absorption (UV-VIS)

Conversion system: Analog amplifier

Output signal: 4-20 mA DC (load resistance 500Ω or less)

0-1 V DC (load resistance 100kΩ or greater)

Simultaneous output (changeover to UV-VIS output)

Setting range: A: -100 to +100% (resolution 1%)

B: 0.10 to 5.00 (resolution 0.01)

Calculation accuracy: ±1% of full scale (no setting error included, A=0%, B=1)

Light source: Low-pressure mercury discharge tube

Photo detector unit: Silicone photocell

Automatic cleaning system: Continuous wiper cleaning

Sample requirements

Temperature: 2 to 40°C

Pressure: 20 to 500 kPa (0.2 to 5 kgf/cm^2)

pH: 4 to 10 pH

Flow rate: 2 to 20 L/min

Wetted part materials:SUS304, R-PVC, fused quartz, nitrile rubber, Duracon™, EPDM, nylon, fluororubber, chloroprene rubber

Finish:

Converter:Polyurethane resin, baked finish, Munsell 0.6GY3.1/2.0 and 2.5Y8.4/1.2

Other units:Epoxy denatured melamine resin, based finish, Munsell N1.0

Operating requirements

Ambient temperature: 0 to 40°C

Ambient humidity: 90% RH or less

Storage requirements

Ambient temperature: 0 to 40°C

Ambient humidity: 85% RH or less

Power supply: 100 VAC ± 10%, 50/60 Hz, 70 VA

Weight: Approx. 32 kg

8.2 Characteristics

Repeatability: ± 2% of full scale

Linearity: ± 5% of full scale

Stability: Zero drift; 2% of full scale per day

Span drift; 2% of full scale per day

Response: 90% within 1 minute (for sample flow rate of 5 L/min)

Influence of ambient temperature fluctuation: Within specified repeatability at an operating ambient temperature within its requirement ±5°C

Influence of water sample temperature fluctuation: No influence on instrument itself within required sample temperature

Influence of power supply fluctuation: ± 2% at 100 V ± 10%

8.3 Accessories

Name	Part Number	Q'ty	Description
Calibration solution L	K9430EA	2 boxes	0 to 0.5 Abs, 6 pcs/box
Calibration solution H	K9430EB	2 boxes	0 to 1 Abs, 6 pcs/box
Calibration solution H2	K9430EW	2 boxes	0 to 2 Abs, 6 pcs/box
Calibration tank	K9430EC	2 pcs	For calibration
Rubber wiper	K9430ED	2 bags	Cell cleaning, 4 pcs/bag
O-ring	K9430EE	1 piece	Sealing for mounting screw of the detector
Fuse	K9430EF	1 piece	Time lag fuse, 1 A
Desiccant	K9430EG	1 pair	Detector case, 5 pcs/pair
Desiccant	K9430EH	1 pair	Detector cell, 2 pcs/pair

8.4 Model and Suffix Codes

1. UV400G Organic Pollutant Analyzer (Ultraviolet Absorption Meter)

Model	Suffix Code	Option Code	Description
UV400G	·····	·····	Organic pollutant analyzer
Measuring range	-1	·····	0 to 0.5 Abs
	-2	·····	0 to 1 Abs
	-3	·····	0 to 2 Abs
Stanchion	N	·····	Not required
	A	·····	Pole-base mount type
	B	·····	Standard self-supporting type
COD conversion function	N	·····	Not required
	A	·····	Required
Special specifications for MLIT (*1)	N	·····	Not required
	A	·····	Required
————	-A	·····	Always -A

Note: When the UV450G is used for COD conversion, COD conversion function is not required for this UV400G.

(*1) When the special specifications for MLIT (Japanese Ministry of Land, Infrastructure and Transport) specified, the following specifications will be added.This Instruction Manual does´nt include Special Specifications.

(1) Light source interruption: When the light source is cut off, the indication LED on the panel turns on and power source interruption contact output is activated.

(2) Water sample interruption: When water sample flow is cut off, the indication LED on the panel turns on and water sample interruption contact output is activated. Water sample is detected by the float switch of the overflow tank.

2. Organic Pollutant Analyzer (Ultraviolet Absorption Meter), Detector

Model	Suffix Code	Option Code	Description
UV401G	·····	·····	Organic pollutant analyzer Converter
Measuring range	-1	·····	0 to 0.5 Abs
	-2	·····	0 to 1 Abs
	-3	·····	0 to 2 Abs
————	N	·····	Always-N

Note: UV401G is a replacing part for UV400G depending on the UV400G specification.

3. Organic Pollutant Analyzer (Ultraviolet Absorption Meter), Converter

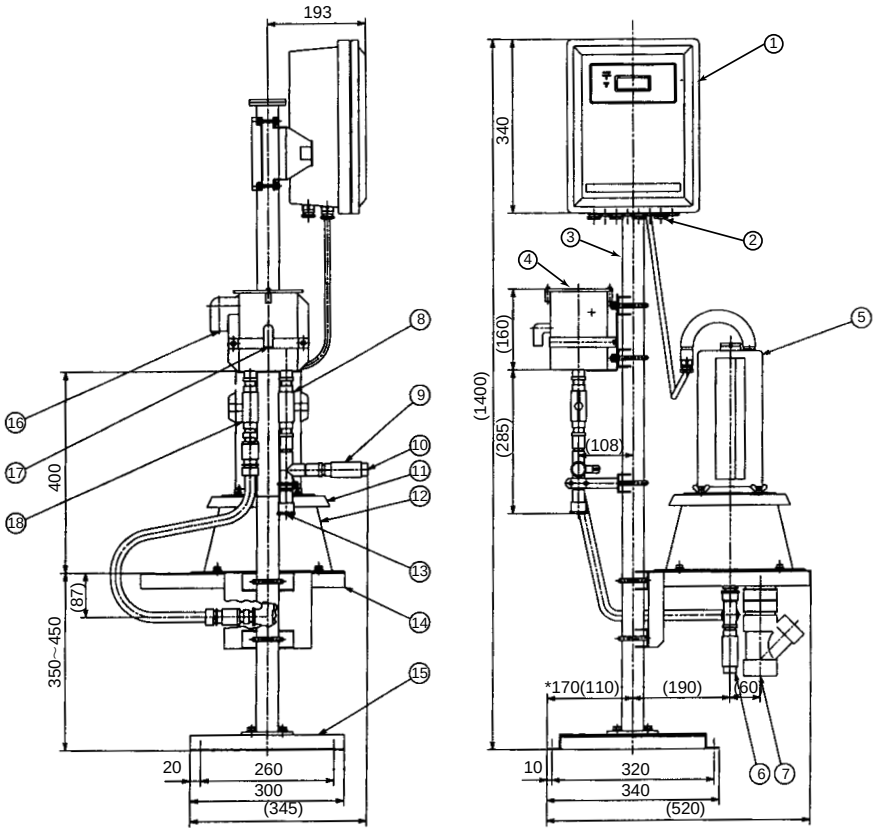
Model	Suffix Code	Option Code	Description
UV402G	.....	.....	Organic pollutant analyzer Converter
Measuring range	-1	.....	0 to 0.5 Abs
	-2	.....	0 to 1 Abs
	-3	.....	0 to 2 Abs
————	N	.....	Always-N
COD conversion function	N	.....	Not required
	A	.....	Required
Special specifications for MLIT	N	.....	Not required
	A	.....	Required

Note: UV402G is a replacing part for UV400G depending on the UV400G specification.

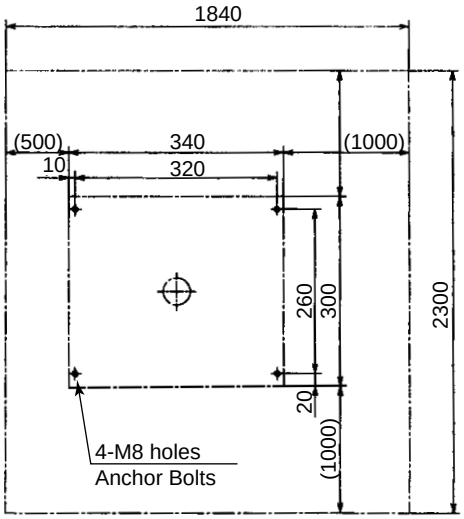
8.5 External Dimensions

8.5.1 UV400G Organic Pollutant Analyzer: Pole-Base Mount Type

Unit: mm



Note : Dimensions marked with symbol * are determined, either 170 mm or 110 mm, according to the position of the pole mounted.



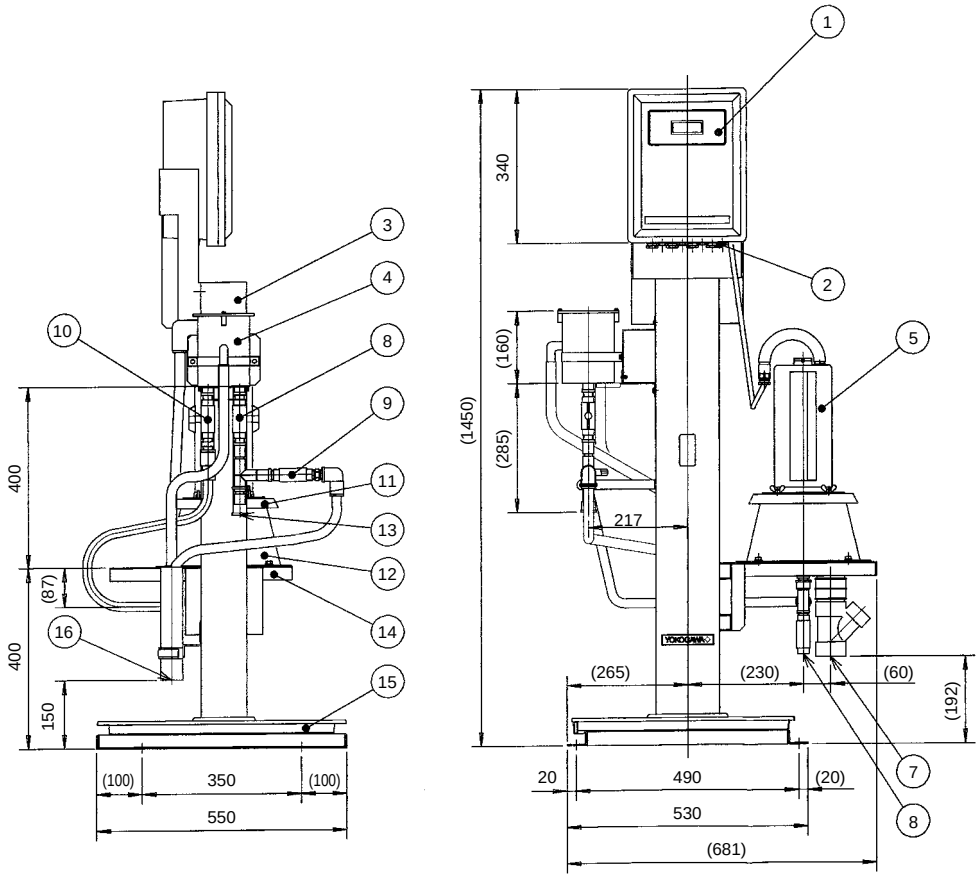
<Front>

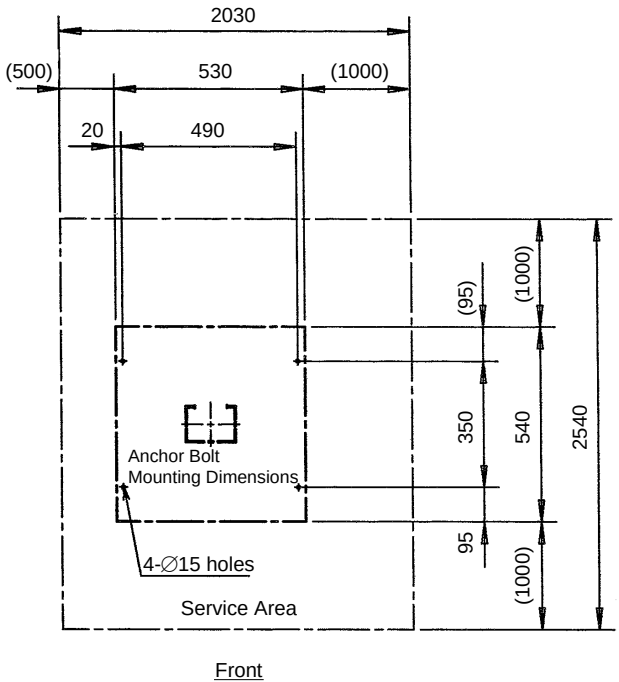
Maintenance Space Requirement

No.	Part Name	Description
1	Converter	
2	Wiring connection	
3	Stanchion	
4	Overflow tank	
5	Detector	
6	Drain outlet (V-4)	Rc1/2
7	Discharge outlet	Nominal Diameter 50 mm socket
8	Ball valve (V-1)	
9	Ball valve (V-2)	
10	Bypass outlet	Rc1/2
11	Blind plate	
12	Measuring tank	
13	Sample inlet	G1/2 female
14	Analyzer stand	
15	Base	
16	Overflow outlet (2)	Nominal Diameter 20 mm elbow
17	Overflow outlet (1)	Nominal Diameter 30 mm elbow
18	Ball valve (V-3)	

8.5.2 UV400G Organic Pollutant Analyzer: Standard Self-supporting Stanchion

Unit: mm

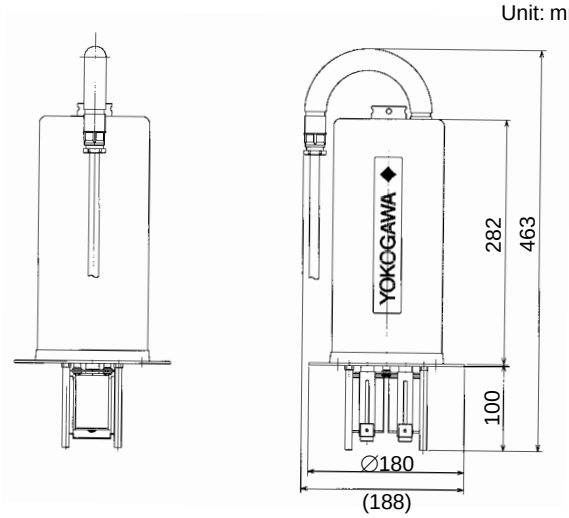




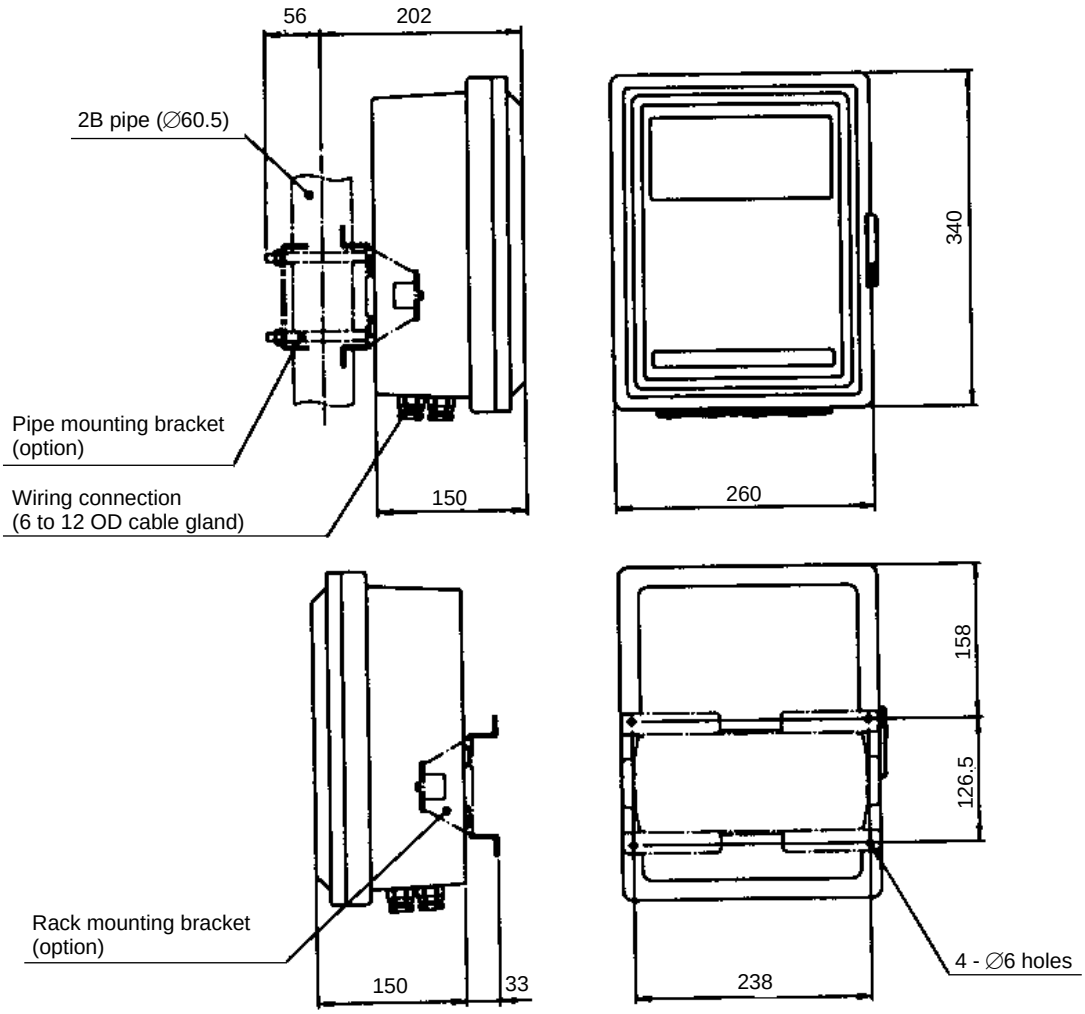
No.	Part Name	Description
1	Operating unit	
2	Wiring connection	
3	Ball	
4	Overflow tank	
5	Analyzing unit	
6	Drain outlet (V-4)	Rc1/2
7	Discharge outlet	Nominal Diameter 50 mm socket
8	Ball valve (V-1)	
9	Ball valve (V-2)	
10	Ball valve (V-3)	
11	Blind plate	
12	Measuring tank	
13	Sample inlet	G1/2 female
14	Analyzer stand	
15	Base	
16	Discharge outlet	Nominal Diameter 40 mm pipe

• UV401G Organic Pollutant Detector (UV401G)

Unit: mm

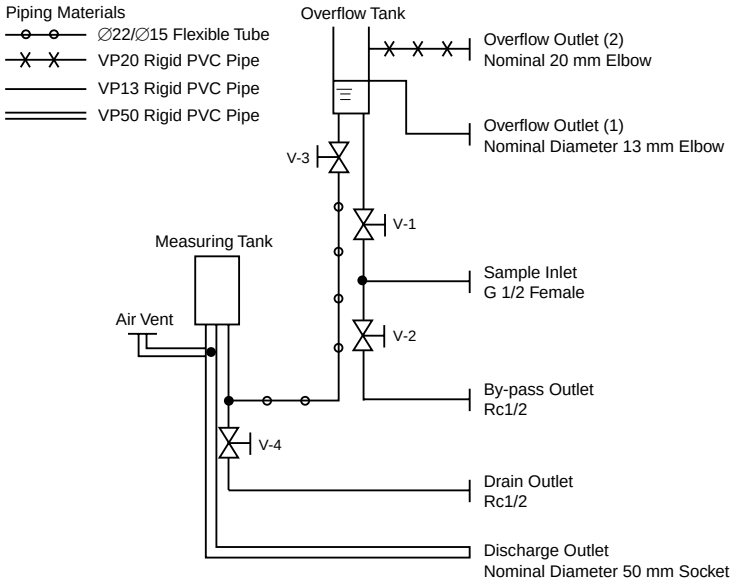


• UV402G Organic Pollutant Converter (UV402G)



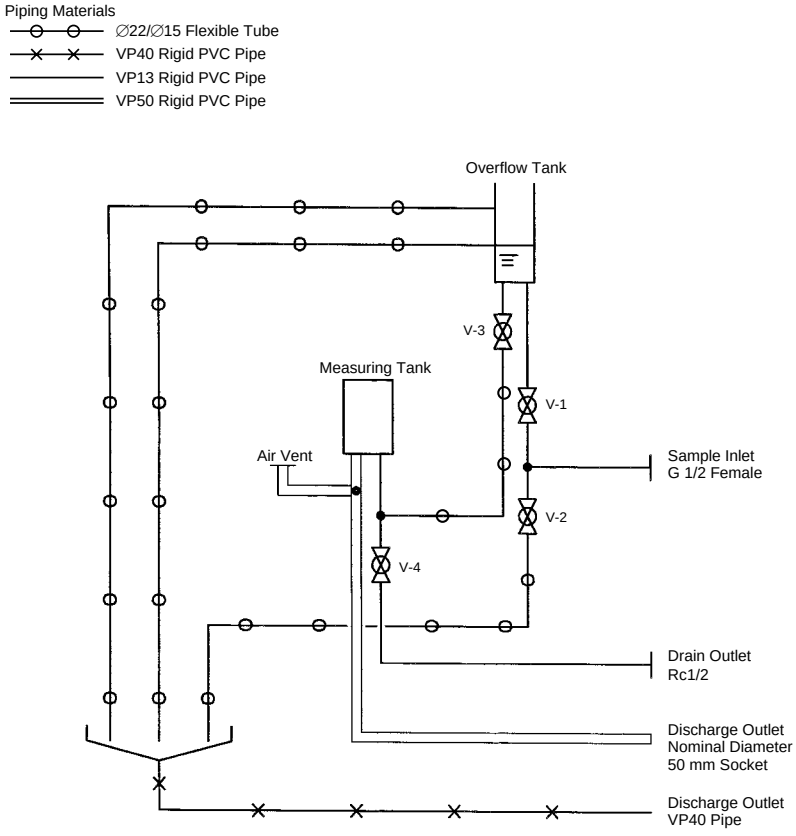
8.6 Flow Schematics

8.6.1 Pole-Base Mount Type



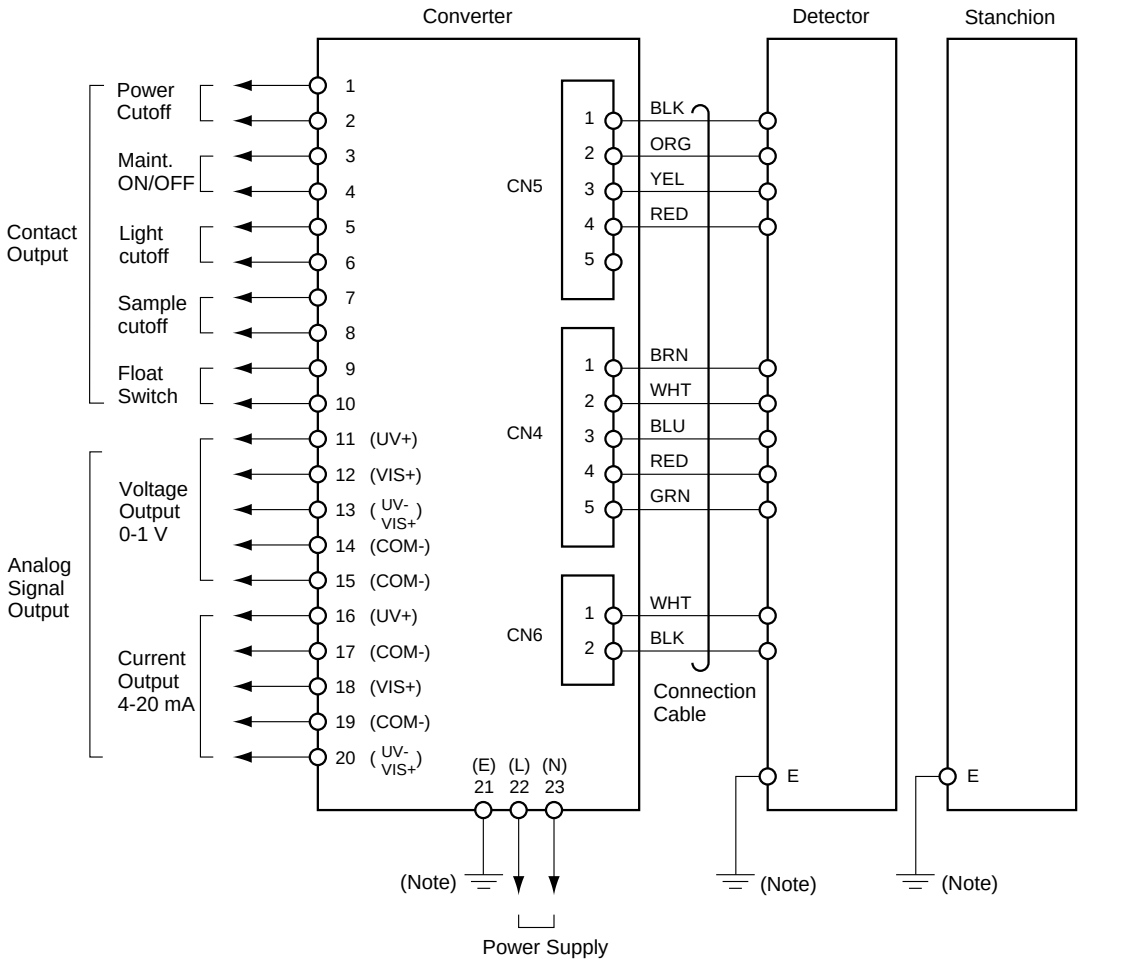
Note: Piping for the discharge outlet should be installed so that the port is free from rear pressure.

8.6.2 Standard Self-supporting Stanchion Type



Note: Piping for the discharge outlet should be installed so that the port is free from rear pressure.

8.7 Connection Diagram



(Note) JIS Class 3 grounding, grounding resistance is 100 Ω or less

9. Measurement Principle

The UV400G differs from conventional UV analyzers in that a system of revolutionally cell length modulation is employed. By this system, two pairs of cylindrical cells are positioned as shown in the figure below, and a light source and detector are located at a position eccentric from the centers of the cylinders. The cylindrical cells are configured in such a way that the distance between the two cells (cell length) is modulated continuously and periodically by rotating the two cells using the center of the light source and detector as the center of rotation.

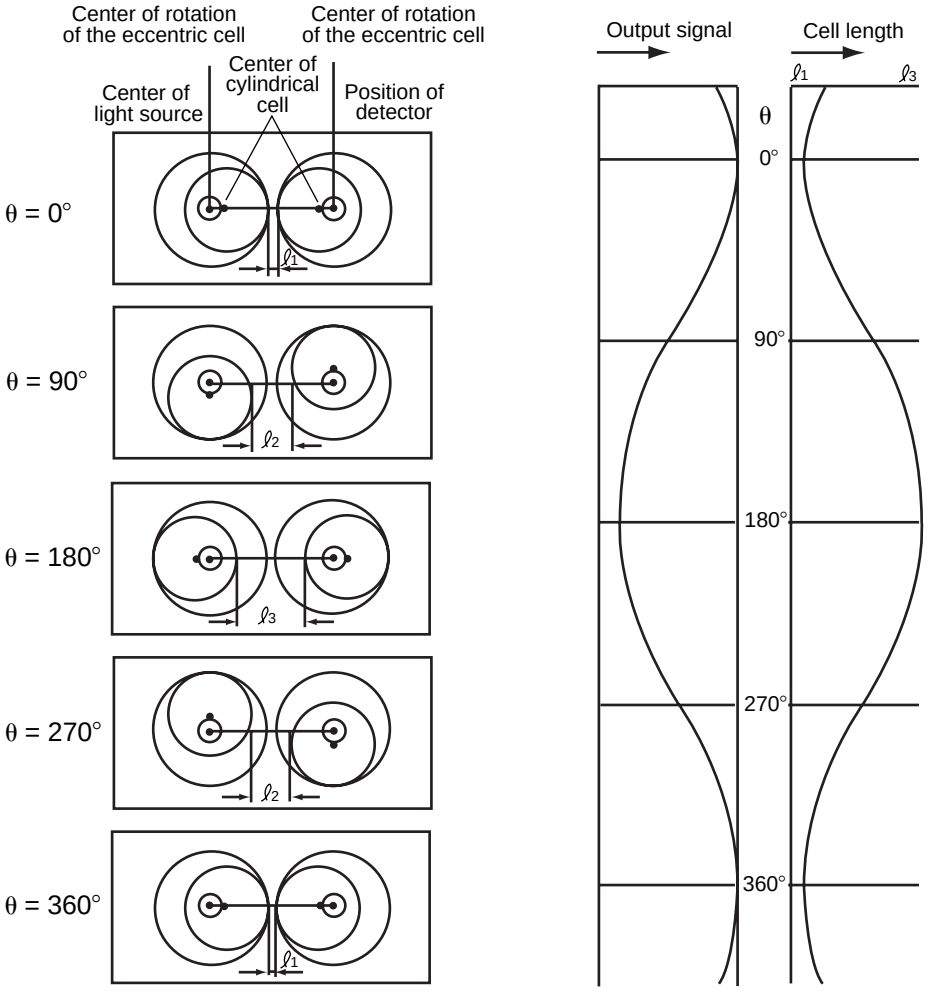


Figure 9.1

The signal produced by light emitted from the light source entering the detector becomes an AC signal that is used for amplifying the difference in the absorbance (output) at the time of maximum cell length (θ = 180°) and minimum cell length (θ = 0°). This signal contains a DC signal component that possesses the output at the center (mean value) of amplification.

*** Optical compensation**

The operation of optical compensation is shown schematically below. After conversion at the detector, the signal is amplified at the photoelectric amplifier and passed through a low-pass filter (LPF) and high-pass filter (HPF).

The AC signal extracted at the high-pass filter is converted to DC at the rectifying circuit and is used as the measurement value signal.

The DC signal extracted at the low-pass filter is compared with the reference voltage by the comparator, and controlled so that it becomes equal to the reference voltage.

Let us assume that an unstable signal has been generated through deterioration of the detector or dirtying of the cells. The amplifier is controlled so that the signal in that case is made equal to the reference voltage and a constant value is maintained. By this, compensation of the optical system is carried out, and stable values are obtained for the measurement signal without any effect from the optical system.

Also, use of this optical system compensation circuit allows linearity with respect to the density to be maintained without having to linearize the signal.

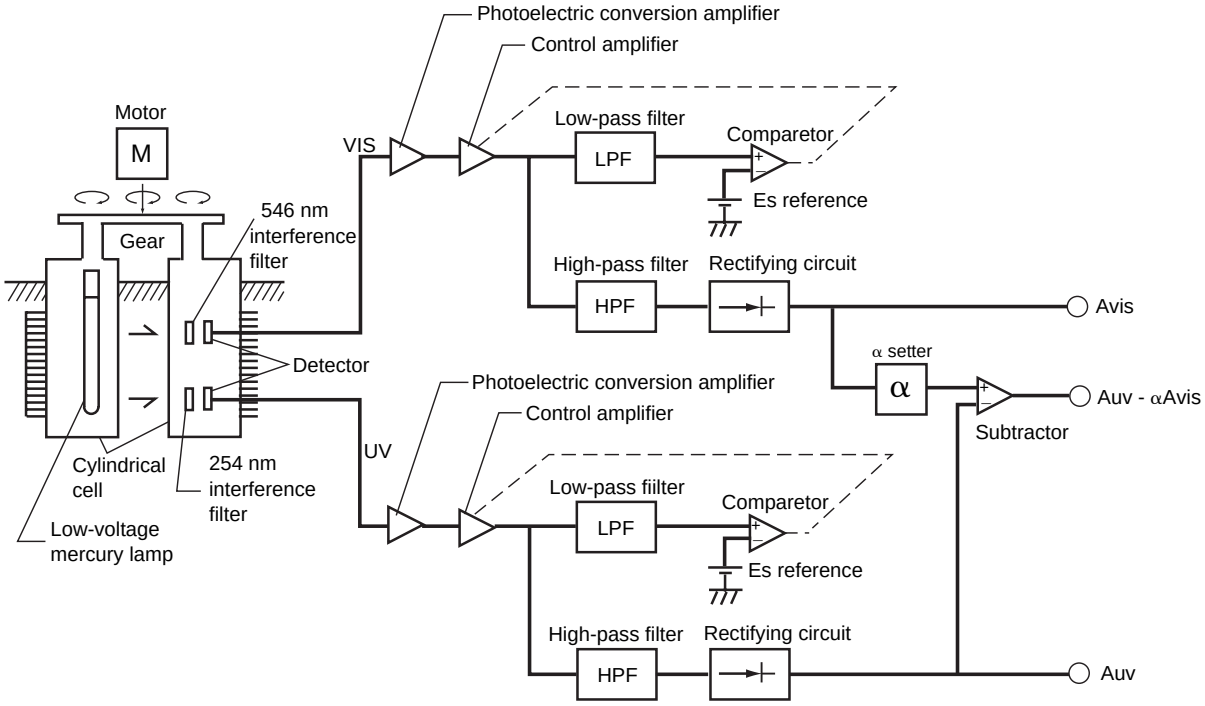


Figure 9.2

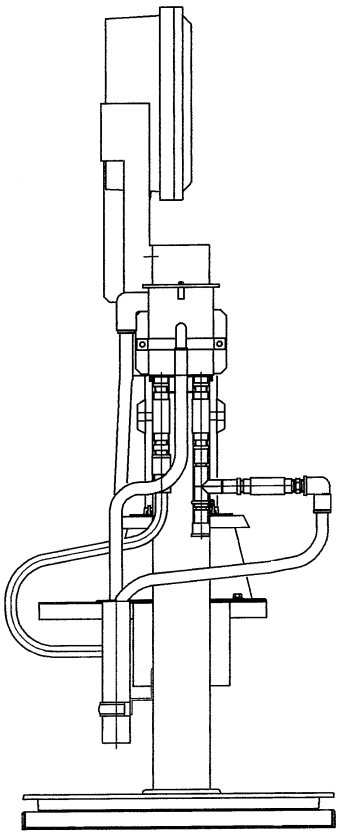
*** Turbidity compensation**

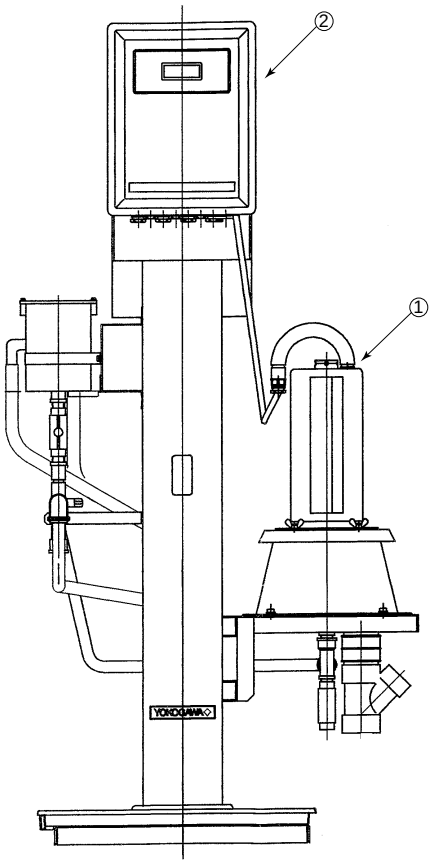
With the UV400G the absorbance of ultra-violet rays (UV) and visible light (VIS) can be measured independently. In addition, a Turbidity compensation constant-setter and subtractor are used thus allowing near-ideal Turbidity compensation of the UV-αVIS output.

Customer Maintenance Parts List

Model UV400G
Organic Pollutant Analyzer

EXA UV





① Organic Pollutant Detector

Model	Suffix Code	Option code	Description
UV401G	·····	·····	Organic pollutant analyzer, detector
Measuring range	-1	·····	0 to 0.5Abs
	-2	·····	0 to 1Abs
	-3	·····	0 to 2Abs
————	N	·····	Always N

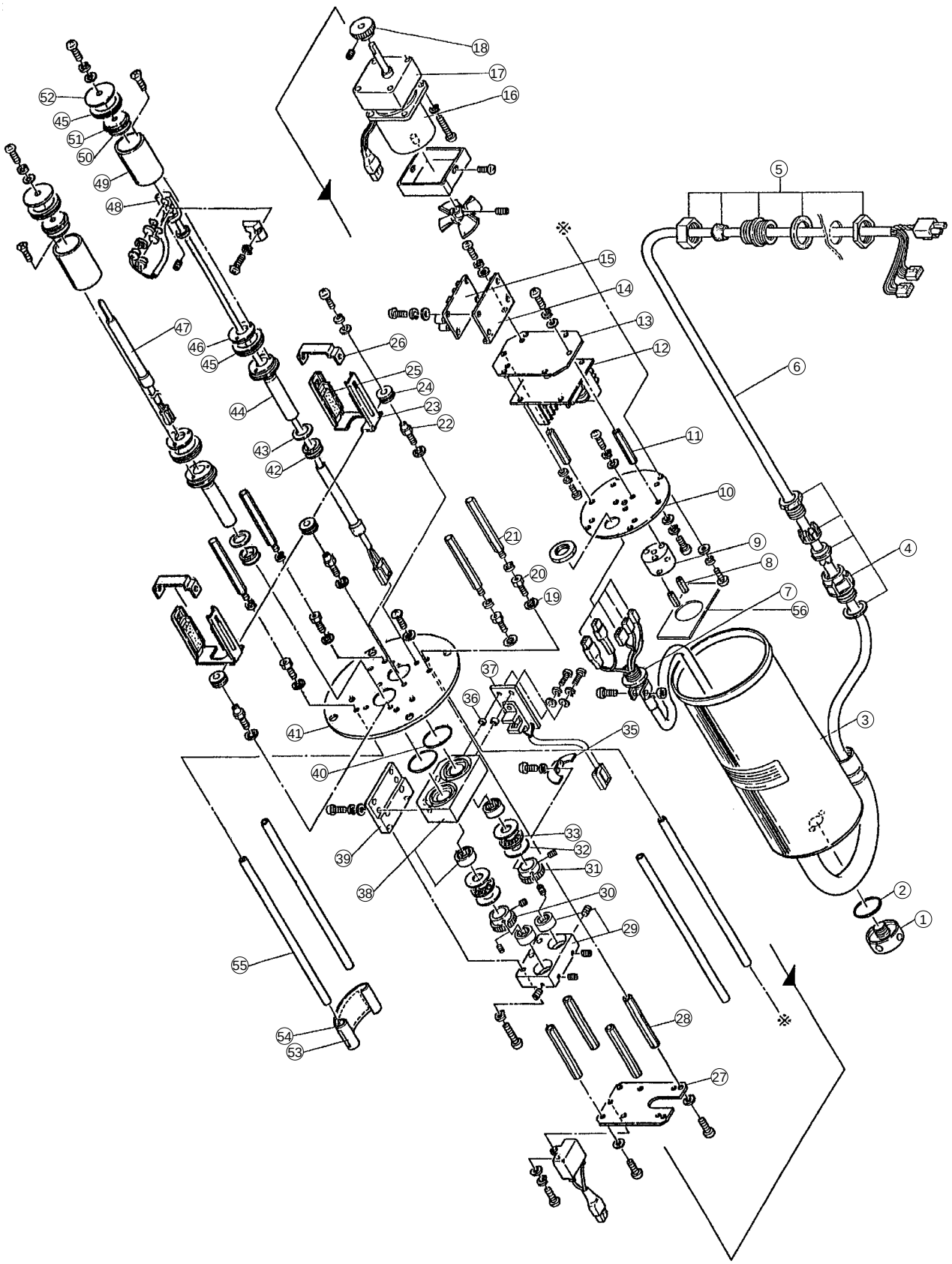
Note : UV401G is a replacing part for UV400G depending on the UV400G specification.

② Organic Pollutant Converter

Model	Suffix	Option Code	Description
UV402G	·····	·····	Organic pollutant analyzer, converter
Measuring range	-1	·····	0 to 0.5Abs
	-2	·····	0 to 1Abs
	-3	·····	0 to 2Abs
————	N	·····	Always N
COD conversion function	N	·····	Not required
	A	·····	Required
Special specifications for MLIT	N	·····	Not required
	A	·····	Required

Note : UV402G is a replacing part for UV400G depending on the UV400G specification.

CMPL 12K01B01-01E
1st Edition : Apr.2001(YK)

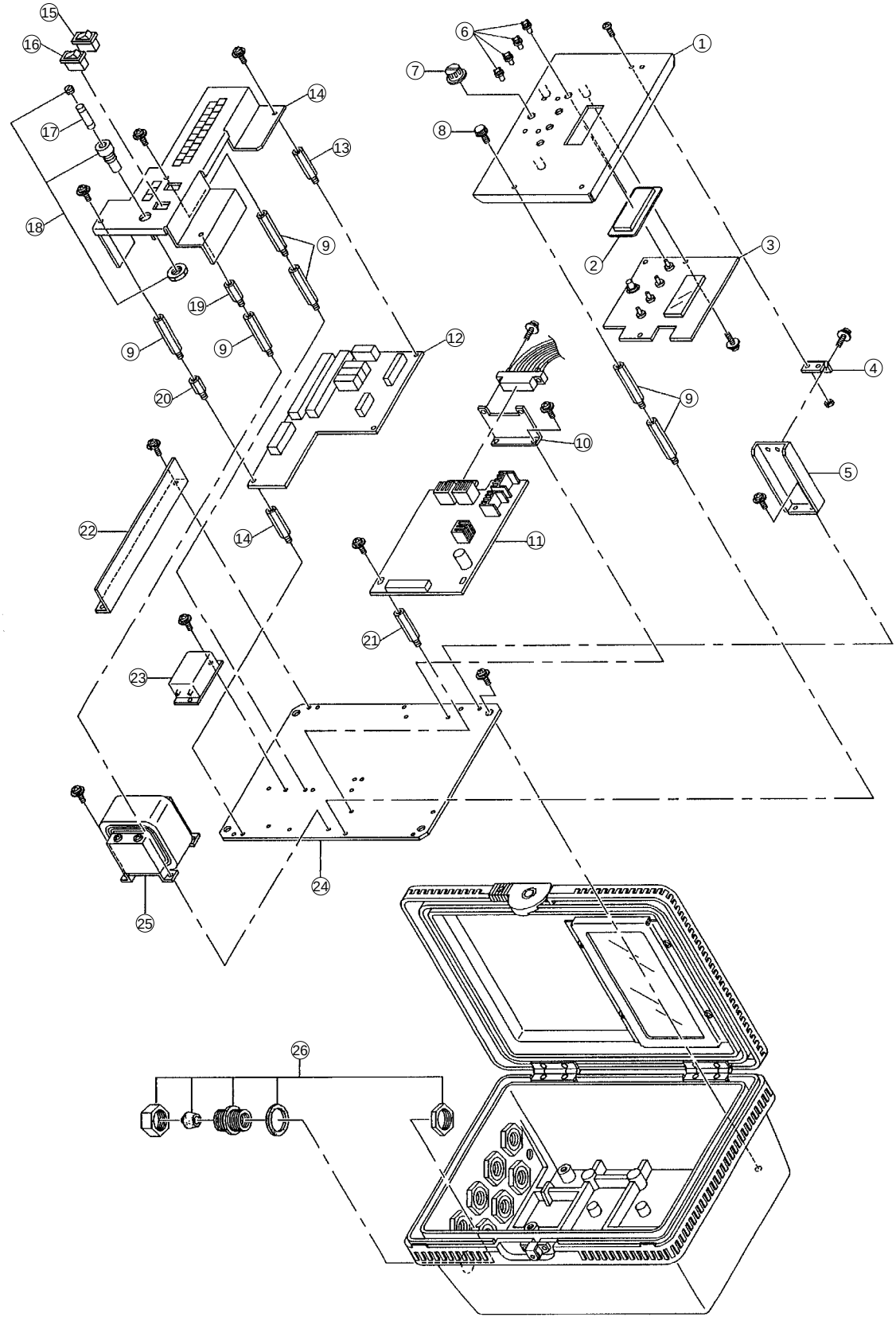


1st Edition : Apr. 2001(YK)

Item	Part No	Qty	Description
2	K9430EZ	1	O-RING (12 pcs)
25	K9430ED	1	WIPER RUBBER
49	K9430FF	1	CELL for 0-1/1.5 abs measuring range

MAINTENANCE PARTS SET : K9430EJ (included below parts)

Item	Part No	Qty	Description
2	K9430EE	1	O-RING
16	K9430EL	1	MOTOR
17	K9430EM	1	GEAR HEAD
19	K9430ES	14	SEAL WASHER
24	K9430EN	6	ROLLER
25	K9430EV	4	WIPER RUBBER
42	K9430EP	2	V-RING
45	K9430ER	4	CELL PACKING
47	K9430EK	1	MERCURY LAMP
50	K9430EQ	1	CELL DRYING REAGENT
56	K9430ET	1	DRYING REAGENT



1st Edition : Apr. 2001(YK)

Item	Part No	Qty	Description
3	K9430FB	1	OPS-FPL SET
11	K9430FC	1	OPS-OI SET
12	K9430FD	1	OPS-PRL SET
17	K9430EF	1	Fuse (1A)

1st Edition : Apr. 2001(YK)

Revision Record

Manual Title : Model UV400G Organic Pollutant Analyzer (Ultraviolet Absorption Meter)
Manual Number : IM 12K01B01-01E

Edition	Date	Remark (s)
1st	Apr. 2001	Newly published

Instruction Manual

Model UV400G
Organic Pollutant Analyzer
(Ultraviolet Absorption Meter)

Supplement

Thank you for selecting our UV400G Organic Pollutant Analyzer.
The Instruction Manual IM 12K01B01-01E supplied with this product has been amended as follows, please make a note in your copy.

On P.4-13, in Subsection 4.7, (1), 2, "... insert with the blue surface facing up." should read "... insert with the film surface facing down."
On p.7-1, in Section 7, (1) Auxiliary Parts "Cell K9430FF", detector measuring range added to description.
On CMPL 12K01B01-01E p.3, in Customer Maintenance Parts List, Parts No. K9430FF "Cell", measuring range corrected on description.

YOKOGAWA
Yokogawa Electric Corporation

IM 12K01B01-01E
1st Edition

4.7 Replace the Drying Agent

(1) Replacing the drying agent in the analyzing unit case

1. Open case following Sec. 4.6 How to Open/Close the Analyzing Unit Cover above.
2. Take out the old drying agent and replace with new drying agent (supplied). Remove dust from the surface of the new drying agent and insert with the film surface facing down.
3. Close case following Sec. 4.6 How to Open/Close the Analyzing Unit Cover above.

(2) Replacing the drying agent in the measuring cell

1. Remove the retaining fixture (Figure 4.29). Figure 4.29 to 4.41 explain how to replace the drying agent inside the cell at the light source side.

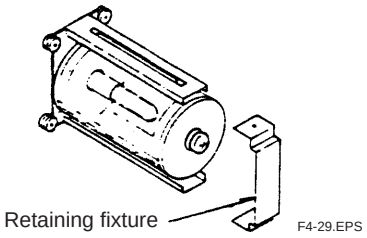


Figure 4.29

2. Carefully wipe moisture from around the cell with cloth.
3. Remove screw (Figure 4.30).

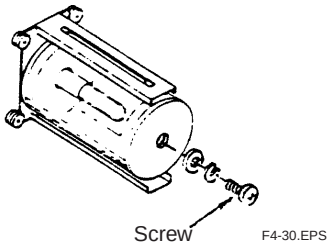


Figure 4.30

4. Remove cell plate D (Figure 4.31)

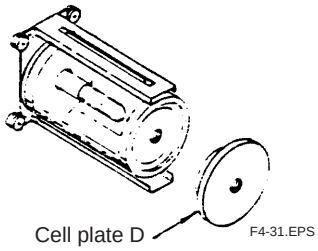


Figure 4.31

7. Maintenance Parts

(1) Auxiliary Parts

Name	Part Number	Q'ty	Description	Recomended Replacement Cycle
Calibration solution L (*1)	K9430EA	1box	0 to 0.5 Abs, 6 pcs/box	1 box/6 months
Calibration solution H (*1)	K9430EB	1 box	0 to 1 Abs, 6 pcs/box	1 box/6 months
Calibration solution H2 (*1)	K9430EW	1 box	0 to 2 Abs, 6 pcs/box	1 box/6 months
Calibration tank	K9430EC	1 piece	For calibration	When damaged
Rubber wiper	K9430ED	1 bag	Cell cleaning, 4 pcs/bag	1 bag/6 months
O-ring	K9430EZ	1 bag	12 pcs x K9430EE	1 piece/6 months
Desiccant	K9430EG	1 pair	Detector case, 5 pcs/pair	1 pair/6 months
Desiccant	K9430EH	1 pair	Detector cell, 2 pcs/pair	1 pair/6 months
Cell	K9430FF	1 piece	For detector for 0 to 1 or 0 to 0.5 abs measurimg range, clear fused quartz	When damaged
Fuse	K9430EF	1 piece	For converter, TGDL-LA	When damaged

*1: One piece per calibration is used. A calibration solution should be used within six months after purchase.

(2) Overhaul Parts

It is recommended that the UV400G be overhauled yearly by Yokogawa to ensure reliable performance through simple daily maintenance.

Parts required for overhaul are listed below.

Name	Part Number	Q'ty	Description
Overhaul kit	K9430EJ	1	Contains all parts required for overhaul
[Contents]			
Motor	K9430EL	1	Motor assembly
Motor gear head	K9430EM	1	Motor assembly
Light source (mercury lamp)	K9430EK	1	Detector cell
V-ring	K9430EP	2	Detector cell
Seal washer	K9430ES	14	Detector cell
Roller	K9430EN	6	Detector cell
Cell packing 2	K9430ER	4	Detector cell
O-ring	K9430EE	1	One of 12-piece pack (K9430EZ)
Desiccant	K9430ET	1	One of 5-piece pack (K9430EG)
Desiccant	K9430EQ	1	One of 5-piece pack (K9430EH)
Rubber wiper	K9430EV	4	One of 4-piece pack (K9430ED)

Note: The overhaul kit, K9430EJ, is recommended for yearly overhaul.

Item	Part No	Qty	Description
2	K9430EZ	1	O-RING (12 pcs)
25	K9430ED	1	WIPER RUBBER
49	K9430FF	1	CELL for 0 to 1 or 0 to 0.5 abs measuring range

MAINTENANCE PARTS SET : K9430EJ (included below parts)

Item	Part No	Qty	Description
2	K9430EE	1	O-RING
16	K9430EL	1	MOTOR
17	K9430EM	1	GEAR HEAD
19	K9430ES	14	SEAL WASHER
24	K9430EN	6	ROLLER
25	K9430EV	4	WIPER RUBBER
42	K9430EP	2	V-RING
45	K9430ER	4	CELL PACKING
47	K9430EK	1	MERCURY LAMP
50	K9430EQ	1	CELL DRYING REAGENT
56	K9430ET	1	DRYING REAGENT