SICK AG
Erwin-Sick-Straße 1
D-79183 Waldkirch

www.sick.com

SICK
Sensor Intelligence.

MARSIC300

Ship Emission Measuring System

1.   Intended use

The MARSIC300 ship emission measuring device can be used to reliably measure emissions on ships in accordance with MARPOL Annex VI and MEPC.259(68). MARSIC is type-approved by major classification societies for this application and measures both SO_x and CO_2 before and after scrubber, and NO_x before and after SCR (selective catalytic reduction) systems. In addition, MARSIC can be used for process measurements of CH4 with LNG (liquefied natural gas) and dual-fuel engines.

2.   About this document

The purpose of this quickstart guide is to allow you to commission the product quickly and easily and to achieve initial measurement results. This document describes the network setup, initial start-up, leakage test, adjustment, and basic maintenance of the MARSIC300.

This document is addressed to technicians (persons with technical understanding) operating and maintaining the measuring system.

The technicians must have been trained on the device.

3.   Supplementary and other relevant documents

- Technical Information for MARSIC300 (no. 8017585, English)
- Operating Instructions for MARSIC300 (no. 8017316, English)
- Safety Information (no. 8019910, English)

You can download these documents from *www.sick.com*. To find a publication, enter the relevant part number in the search field.

4.   Safety information

!	**IMPORTANT**:

This document is only valid in connection with the documentation listed in section 3 of this document. Please read and observe the safety information and warning notices contained therein.

Only put the device into operation when this document and the Operating Instructions have been read and understood. Contact SICK Customer Service should any questions arise.

- Refer to the device involved for the standards and guidelines of the Declaration of Conformity used.
- Keep this document, together with the Operating Instructions, available for reference and pass these on to a new owner.
- Data integrity:
  SICK AG uses standardized data interfaces such as, for example, standard IP technology, in its products. The focus here is on product availability and features. SICK AG always assumes that the customer is responsible for the integrity and confidentiality of data and rights involved in connection with using the products. In all cases, the customer is responsible for the implementation of safety measures suitable for the respective situation, e.g., network separation, firewalls, virus protection and patch management.

4.1 Property damage

!	**IMPORTANT**:

If probe, sample line, and analyzer are connected to the stack, but power and/or air supply is not in use, the gas route is open and over-pressurized duct will blow wet gas inside the system.

To avoid the risk of condensate, ALWAYS be connected with instrument air and power, or disconnect and plug the sampling filter unit from the stack.

5. Initial start-up

1. Check that all electrical and pneumatic connections are connected properly as described in the Technical Information.
2. Relieve the pressure on all three pressure regulators in the analyzer:
   ▶ Turn the regulators **counterclockwise** to end position.

3. Adjust the manual valve in the analyzer:

   ▶ For **one** I-air supply for common use of ejector air and zero/control air: Turn the valve to the position: "open".

   ▶ For **two** separate I-air supplies for ejector and as instrument air supply: Turn the valve to the position: "closed".
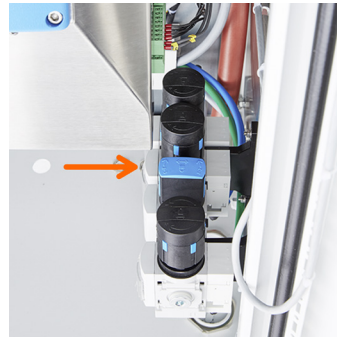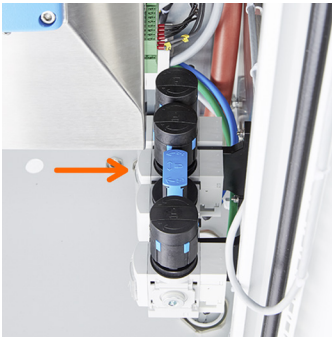
4. Open the external instrument air supply so that the analyzer is fed with clean instrument air.

⚠ **WARNING:**
Risk of severe injury due to excess pressure.
Hoses can burst when the pressure is too high.
▶ Ensure that the pressures are set correctly (see Technical Information).

5. Set pressures on pressure regulators:
   ▶ Slowly turn the regulators **clockwise** to given pressures as shown below.

6 bar   3 bar   4 bar

6. Check that the power supply of the analyzer matches the setting on the ship's network.

7. Check the system power configuration with the information given in the system documentation provided.
   • See name plate on the right side of analyzing unit.

⚠ **IMPORTANT:**
The analyzer power supply and network-balancing is individually configured to the power situation aboard and must be consistent with the configuration given in the system documentation.

8. Check the voltage and pneumatic connection on the gas sampling system SFU.
9. Install the gas sampling system on the flange of the exhaust duct: See "SFU Operating Instructions".
10. Check that all steps 1 … 9 of this quickstart guide have been made carefully. In case of doubt, see the corresponding manuals before switching on.

Switch-on

1. Switch on the external power disconnection unit (MARSIC300 has no internal power switch).
   • The green "POWER" LED on the control panel goes on: Energy supply is available.


System initiation and warm-up starts

1. System initiation starts:
   • Yellow and red LEDs go on sporadically.
   • "BOOTING" appears several times on the screen.
   • The "MEASURING" screen appears.
2. The system heats up:
   • Only the green LED is on.
   • Display shows: "INIT/HEATING UP".
   • A downwards counter displays the maximum duration of the process.
   • Display shows: "CONDITIONING".
   • Only the green LED is on, and the status bar shows "MEASURING".
   • The system is ready for operation.

⚠ **IMPORTANT:**
If a measured value blinks or the yellow or red LED is on:
▶ Press the "DIAG" button and refer to the Technical Information, chapter "Error messages and possible causes".

6. Network set-up and connection to PC

1. Check that all electrical and pneumatic connections are connected properly as described in the Technical Information manual, commissioning has been done, and the system is running safely.
2. Connect a computer with the installed SICK-Software SOPAS ET (on your product CD or as a free Internet download) with ETH0 in the MARSIC300.
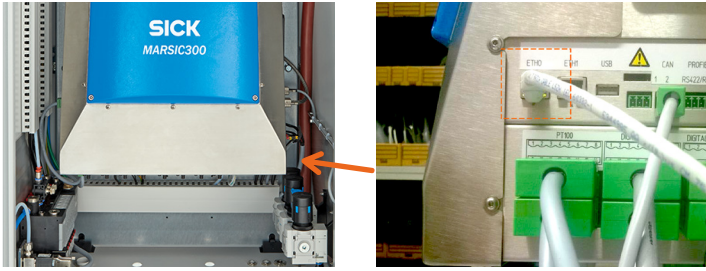

3. Start SOPAS ET on the PC:
   ▶ Search for devices in the right field, and drag the MARSIC300 on the left-hand side into the Project-field.
   ▶ To change the IP-Setting, click on the pencil (marked red in the picture), and confirm the next window with "Yes".
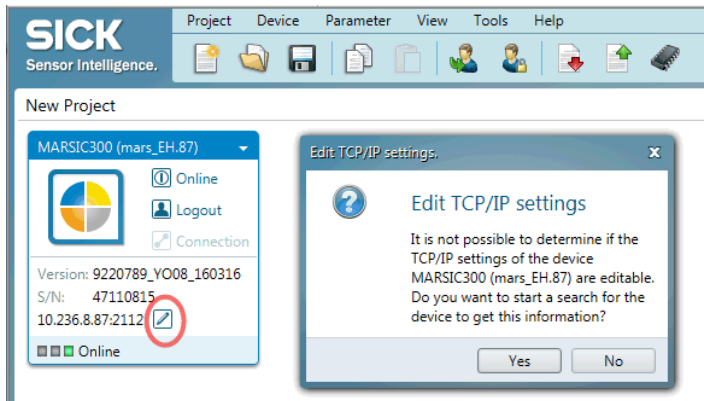
If MARSIC is not found:
- Make sure that no firewall is active.
- The PC and MARSIC300 are on the same subnet.
1. Login the MARSIC300 directly via operating panel as "Authorized Operator", Password "1234".
2. Note down network-setting.
3. Set up the network-setting in the PC-Network accordingly to be able to communicate with SOPAS ET.

4. Edit parameters as needed in the network and confirm with "OK".
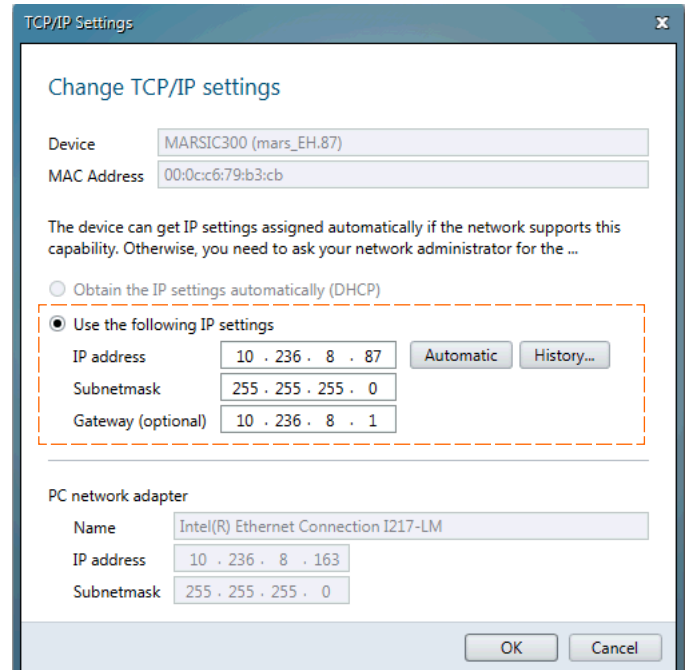
- A warning appears that the device will set offline.
  ▶ Confirm with "Yes"
- The network configuration has now been changed, but the old configuration is still visible.
5. Restart (switch off and on) MARSIC300 to update the IP-configuration on the operating panel and in SOPAS ET.
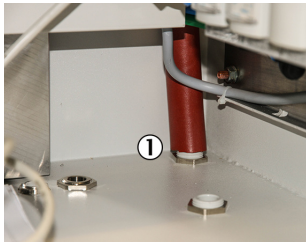
7. Leak tightness check

1. Perform the leak tightness check only when the device is running.
2. Start program: MAINTENANCE/MAINTENANCE SYS./AIRTIGHT TEST
   ▶ Wait until message "Close outlet - discon. purge" appears.
3. Disconnect purge air line ① on analyzer module.
   ▶ Press blue ring downwards as far as possible and pull out the purge air line. This can be done either manually or using the special tool.
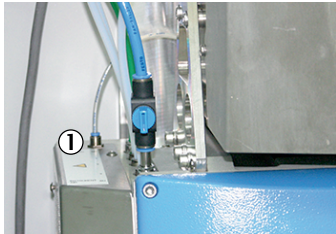
4. Close sample gas outlet:
   ▶ Close the end of the sample gas outlet line (red tube outside the housing) with the plug (included in scope of delivery).

①. Sample gas outlet line   ①. Sample gas outlet at rear of the housing (bottom view)
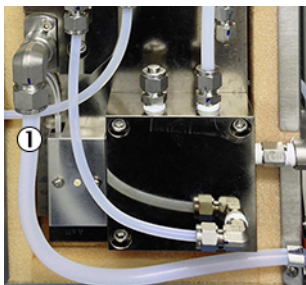
OR

⚠ **WARNING:**
Risk of burns on hot cell
For the leak tightness check, the line on the sample gas outlet must be unscrewed when the cell is hot.
▶ Use heat-resistant gloves.
▶ Use heat-resistant tool.

▶ On the measuring cell: Loosen 4 side screws and remove cover of measuring cell.
▶ Close the sample gas outlet with the 10 mm plug, which is in the leak tightness check set.

①. Sample gas outlet line on cell

- The pressure in the system slowly rises.
- Message "close air valve" appears when the pressure is ≥ 1200 hPa (after about 30 seconds).
- The current pressure is shown in the "Measured value display".

5. Close instrument air valve 2 by turning 90° **clockwise**.
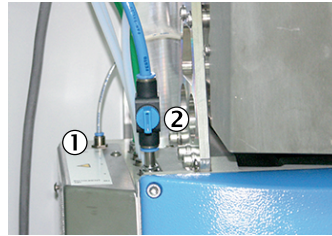
①. Rear (thin) purge air line
②. Instrument air valve (shown "open")

- The pressure no longer rises and measurement starts automatically after about 20 seconds.
- Measurement duration approx. 5 minutes

❗ **IMPORTANT:**
Pressure loss during this time must not exceed 20 hPa.
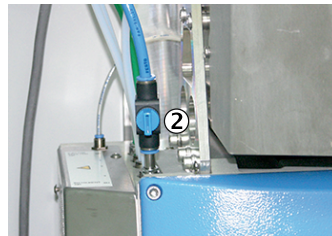Message appears:
"Test OK – open air valve": Test successful
OR
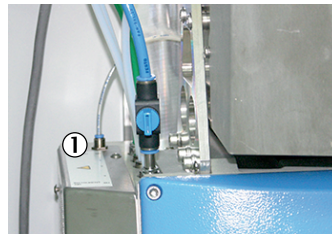"Test failed – open air valve": Test unsuccessful: Analyzer switches to "Maintenance request" state.
▶ See manual for troubleshooting.

6. Open instrument air valve ② by turning 90° **counterclockwise**.

7. Wait until message "Reopen outlet - connect purge" appears.
8. Reconnect rear purge air line ①.

9. Restore sample gas outlet to its original state.
   ▶ See step 4.

8. Internal adjustment (span)

+i **INFO:**
- "Zero gas" and "Internal reference" adjustments run cyclically (preset) but can also be started manually.
- Span gas adjustment can only be performed manually.
- Validation: Checks the measured value of a component **without** correcting.
- Adjustment: Checks the measured value of a component **with** adjusting.

1. Login as "authorized operator" (password "1234").
2. Set status of the analyzer to "Maintenance" (only if needed):

Menu: MAINTENANCE/MAINTENANCE SIGNAL

```
Measuring
Maintenance signal    1.1
1 On
2 Off


/Maint/Sig
Back   ⬆   ⬇   Set
```
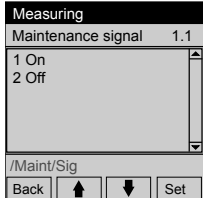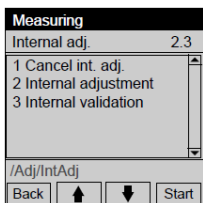
▶ Select "On"
▶ Press [Set]

3. Select internal adjustment:
Menu: ADJUSTMENT/INTERNAL ADJ

4. Start internal adjustment:

Menu: ADJUSTMENT/INTERNAL ADJ

```
Measuring
Internal adj.        2.3
1 Cancel int. adj.
2 Internal adjustment
3 Internal validation

/Adj/IntAdj
Back   ⬆   ⬇   Start
```

▶ Select "Internal adjustment"
▶ Press [Start]

- The measuring screen appears (with a downwards counter to the end of the adjustment).
- When the adjustment is complete, the system automatically switches back to the operating state "Measuring". If "Maintenance" was set manually beforehand, the system switches back to "Maintenance".

5. See adjustment result:

Menu: DIAGNOSIS/RESULTS

```
Measuring
Results              3.5
1 Adj. span gas
2 Adj. internal


/Diag/Res
Back   ⬆   ⬇   Enter
```
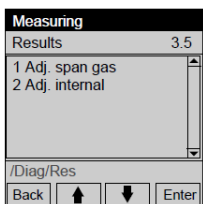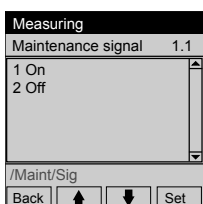
▶ Select "Adj. internal"
▶ Press [Enter]

- If the deviation is higher than a specified limit value, the system switches to classification "Maintenance request". The drift value is saved, but the measured value is not corrected.

6. If the maintenance signal was set, switch it off:
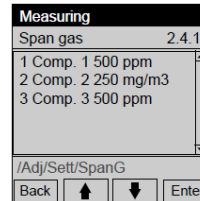
Menu: MAINTENANCE/MAINTENANCE SIGNAL

```
Measuring
Maintenance signal    1.1
1 On
2 Off


/Maint/Sig
Back   ⬆   ⬇   Set
```

▶ Select "Off"
▶ Press [Set]

9. Manual adjustment (span)

! **IMPORTANT:**
▶ Observe span gas conditions (concentration should be 80%...100% of used, precision ±2%)
▶ Please note: For polar gases like SO_2, slow reaction time for dry span gases might be observed!

1. Login as "authorized operator" (password "1234").
2. Check if the concentration of the used span gas is the same as on the certificate of the calibration gas.
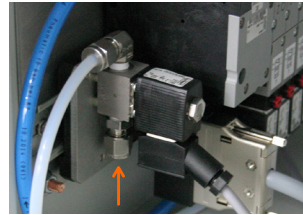
Menu: ADJUSTMENT/SETTINGS/SPAN GAS

```
Measuring
Span gas             2.4.1
1 Comp. 1 500 ppm
2 Comp. 2 250 mg/m3
3 Comp. 3 500 ppm


/Adj/Sett/SpanG
Back   ⬆   ⬇   Enter
```

3. Set status of the analyzer to "Maintenance" (only if needed):

Menu: MAINTENANCE/MAINTENANCE SIGNAL

```
Measuring
Maintenance signal    1.1
1 On
2 Off


/Maint/Sig
Back   ⬆   ⬇   Set
```
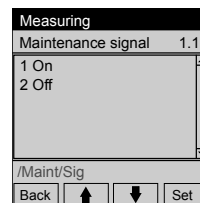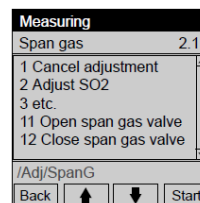
▶ Select "On"
▶ Press [Set]

4. Connect the desired span gas to the span gas valve.

5. Turn the span gas on and set the pressure to approx. 3.5 bar.
6. Open span gas valve: Menu: ADJUSTMENT/SPAN GAS.
7. Start adjustment (in this example: SO_2):

Menu: ADJUSTMENT/SPAN GAS

```
Measuring
Span gas             2.1
1 Cancel adjustment
2 Adjust SO2
3 etc.
11 Open span gas valve
12 Close span gas valve
/Adj/SpanG
Back   ⬆   ⬇   Start
```

▶ Select "open span gas valve"
▶ Press [Start]

The span gas through flow is shown on the display (measuring screen). As long as the span gas through flow is not correct, an appropriate message is shown.

8. Adjust the pressure on the cylinder pressure reducer so that the flow shown is 200 ... 400 l/h.
- The measuring screen appears (with a downwards counter to the end of the adjustment).
- When the adjustment is complete, the system automatically switches back to the operating state "Measuring". If "Maintenance" was set manually beforehand, the system switches back to "Maintenance".

9. See adjustment result:

Menu: DIAGNOSIS/RESULTS

```
Measuring
Results              3.5
1 Adj. span gas
2 Adj. internal

/Diag/Res
Back  ↑   ↓   Enter
```
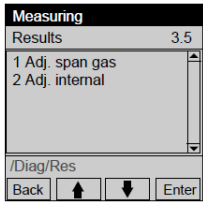
▸ Select "Adj. span gas"
▸ Press [Enter]

- If the deviation is higher than a specified limit value, the system switches to classification "Maintenance request", and the measured value is not corrected.

10. Shut off the span gas cylinder.

11. If the maintenance signal was set, switch it off:
    Menu: MAINTENANCE/MAINTENANCE SIGNAL.

+i INFO:
- Adjustment of O_2 is done automatically with instrument air. The oxygen content of the instrument air is used for measurement. If manual adjustment is required, proceed as described above.

10. Zero setting

! IMPORTANT:
▸ Observe quality and quantity of instrument air conditions.

+i INFO:
- "Zero gas" adjustments run cyclically (preset) but can also be started manually.
- Validation: Checks the measured value of a component **without** correcting.
- Adjustment: Checks the measured value of a component **with** adjusting.

1. Login as "authorized operator" (password "1234").
2. Check if the instrument air is available in required quality and quantity.
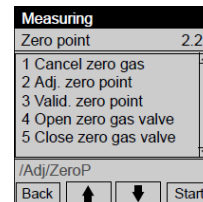3. Set status of the analyzer to "Maintenance" (only if needed):

Menu: MAINTENANCE/MAINTENANCE SIGNAL

```
Measuring
Maintenance signal   1.1
1 On
2 Off

/Maint/Sig
Back  ↑   ↓   Set
```
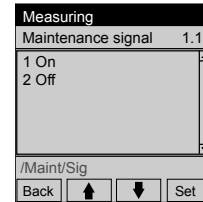
▸ Select "On"
▸ Press [Set]

4. Start zero point adjustment:

Menu: ADJUSTMENT/ZERO POINT

```
Measuring
Zero point           2.2
1 Cancel zero gas
2 Adj. zero point
3 Valid. zero point
4 Open zero gas valve
5 Close zero gas valve

/Adj/ZeroP
Back  ↑   ↓   Start
```

▸ Select "Adj. zero point"
▸ Press [Start]

- The measuring screen appears (with a downwards counter to the end of the adjustment).
- When the adjustment is complete, the system automatically switches back to the operating state "Measuring". If "Maintenance" was set manually beforehand, the system switches back to "Maintenance".

5. If the adjustment was successful, the components are set to "zero".

- If the deviation is higher than a specified limit value, the system switches to classification "Maintenance request". The zero point is corrected.

6. If the maintenance signal was set, switch it off:
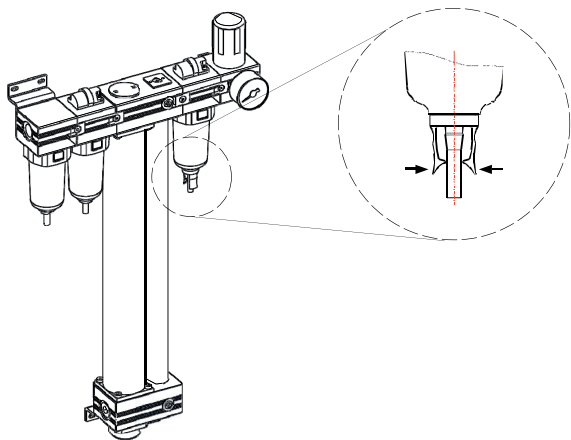   Menu: MAINTENANCE/MAINTENANCE SIGNAL.

11. Weekly maintenance

External instrument air conditioning (optional)
1. Check external instrument air conditioning for condensate.

!	**IMPORTANT:**

▶ The condensate level should never be above the "Maximum" mark on the bowl.

▶ To drain condensate from the bowl, press the plastic tabs together as shown. This opens the valve.

▶ If a significant pressure loss occurs, see the operation manual for the membrane dryer (section 3.2.).

12. Monthly maintenance

Gas sampling system: Check the glass fiber filter and seals

⚡ **DANGER:**
Hazard by voltage.
Live parts are accessible after the weatherproof cover has been opened.
▶ Disconnect the gas sampling system from the power supply before opening the weatherproof cover (for example by switching off the measuring system).

1. Remove the weatherproof cover:
   ▶ Unlock the screw closures.
   ▶ Pull the weatherproof cover away from the probe tube and lift.
2. Replace the glass fiber fine filter.

⚠ **WARNING:**
Risk of burns on hot surfaces.
The filter can reach high temperatures during operation.
▶ Use heat-resistant gloves.
▶ Provide a heat-resistant support as required.

⚠ **WARNING:**
Hazard by toxic substances.
Depending on the sample gas composition, the fine filter cartridge may contain toxic substances.
▶ Observe the relevant safety regulations.
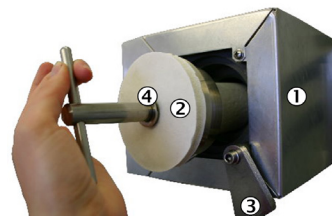▶ Dispose of fine filter cartridges in an environmentally compatible manner.

Replace fine filter cartridge
1. Loosen the rotary handle counterclockwise.
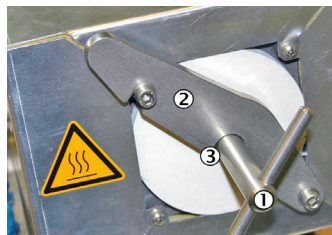
①. Rotary handle
②. Mounting bracket
③. Pressure disk (covered)

2. Swing the mounting bracket to the right.
3. Pull the filter cover with glass fiber fine filter cartridge out using the rotary handle.

①. Filter housing
②. Filter cover
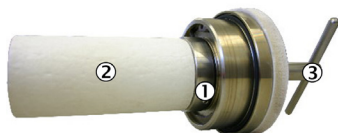③. Mounting bracket
④. Pressure disk

4. If the filter cover is hot: Place the filter cover on a heat-resistant mat.

5. Pull out the bottom flat seal with a hook.

①. Bottom flat seal

6. Loosen the glass fiber fine filter cartridge from the filter handle by opening the spiral thread.


①. O-ring
②. Glass fiber filter
③. Rotary handle

7. Insert new bottom flat seal.
8. Renew the O-ring in the filter cover.
9. Fit new or cleaned glass fiber fine filter cartridge on the filter cover and tighten the spiral thread. If one side of the fine filter cartridge has a groove: The groove must point in the direction of the filter cover.
10. Replace the filter cover.
11. Swing back the mounting bracket. Make sure that the pressure disk is behind the mounting bracket.
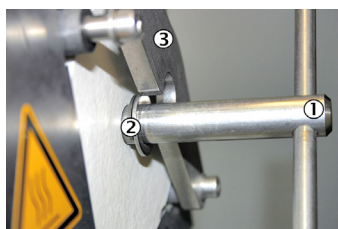
①. Rotary handle
②. Pressure disk
③. Mounting bracket

12. Tighten the rotary handle clockwise.
13. Fit the weatherproof cover again.
   ▶ Fit the weatherproof cover in the direction of the probe tube.
   ▶ Lock the screw closures.